

RED10 Research Evaluation

Reports from the evaluation of all research at the
University of Gothenburg 2010



UNIVERSITY OF GOTHENBURG

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Editors: Susanne Holmgren and Gustav Bertilsson Uleberg

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FOREWORD

In order to deal with growing competition and the profiling requirements that are increasingly becoming a feature of higher education, we need to be able to maintain our position – not just nationally, but also globally. A number of measures have therefore been initiated in order to strengthen the University of Gothenburg. One of these measures is the *Research evaluation for development of research 2010 (RED10)* project.

We will, of course, continue to develop those research areas in which we are already strong. At the same time, we will identify the strategically important areas where we have not yet achieved the desired strength, but where we have the potential to lead the field in the future. Our complete academic environments concept will be maintained and refined. Education shall have a scientific basis, and research shall be developed in close interaction with relevant education.

The results from the completed evaluation will now be dealt with and addressed at all levels within the university. This work will probably lead to difficult choices for everyone in terms of priorities within various areas. However, the work is essential and we need all to engage in this.

The research evaluation forms a natural part of the foundation for the University of Gothenburg's long-term strategy for 2013-2020. Other parts of this foundation include the review of first-cycle education and innovation operations, as well as the work involved in the new organisational structure.

Thanks to everyone who took part in the far-reaching RED10 work. By drawing wise conclusions and making the right choices, we will pave the way for the future success of the University of Gothenburg.

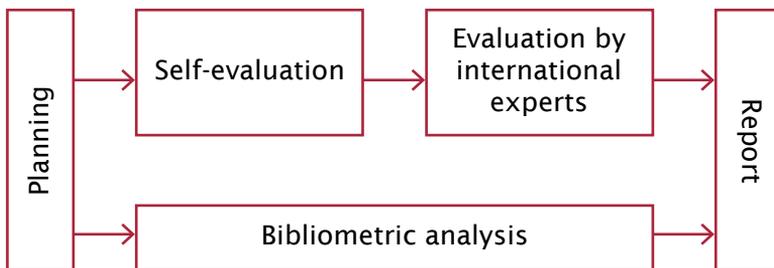
Pam Fredman
Vice-Chancellor

PREFACE

Self-knowledge is important in all contexts, including research. Therefore, the Vice Chancellor of the University of Gothenburg, Pam Fredman, decided to commission an evaluation during 2010 of all research at the University and its conditions and requirements. A number of aims were stated, with the overall objective being to identify strengths and weaknesses in current and planned research at the University. The process was named the “Research Evaluation for Development of Research at the University of Gothenburg, 2010”, or simply RED10.

RED10 is the first evaluation of all research at the University of Gothenburg as a whole. The ambition was to give a general overview rather than to rank the individual performance of the University’s some three thousand researchers. It is also important to stress that there has been no intention to compare different disciplines at the University directly with each other, but in each case to evaluate them in relation to the international standards of their own fields. Consequently, the different panel reports should be read as individual documents.

The evaluation has been performed in two “flows”. The first was a self-evaluation by the departments followed by an expert assessment by 122 well-renowned and



RED10 evaluation process

highly respected international scientists, forming 18 peer review panels. The second consisted of a detailed bibliometric analysis that has been commissioned to external expertise. These have been performed in parallel with – and independently of – the panels' evaluations, and the results of the bibliometric analysis have not been made available to the panels. Keeping the two procedures separate, one being mainly qualitative and the other being quantitative, will provide a valuable opportunity for the leadership of the University to validate the reliability of the procedures.

The assessments of the panels are based on a description and self-evaluation of research performance from each department, data records on personnel and PhD students, publication lists per individual and department, and basic statistics on the number of publications in different categories per year. Each panel met for 1-2 days (not in Gothenburg and at different times) to discuss their tasks. We see it as a great advantage that this procedure allowed us (the RED10 management) to be present at all meetings and provide the same information about the University and about aims, procedure and criteria for evaluation to all involved.

Irrespective of this, it is unavoidable that style, form and detail vary between the different panel documents. For one thing, the department has been the organizational unit of the evaluation, although there are differences in size from two to about 300 researchers (or, counted as full-time equivalents of research positions, from 0.38 to 220). The discrepancy in size has been partly compensated for by allocating text length quotas for the self-evaluation, and by the number of experts representing each subject area in the different panels, but a complete correlation to size could not be realistically achieved. This has made the level of detail slightly uneven in the information provided for the invited experts, which is to a certain extent mirrored in the reports. Furthermore, we (the RED10 management) have been extremely careful not to influence the opinions expressed in the reports in any way. Hence we have refrained from editing the report beyond mere layout and correcting data.

Timeline and acknowledgements

The planning was started in October 2009 by the project leader Susanne Holmgren, who was soon thereafter joined by the project coordinator, Gustav Bertilsson Uleberg. As instructed, the planning was carried out using the recent evaluation of Lund University as an inspiration, and we want to express our gratitude to the project leader in Lund, Professor Bengt Söderström, for his invaluable help and support in the start-up phase. An advisory group was formed, and the members – Sally Boyd (The Department of Philosophy, Linguistics and Theory of Science), Hans Hedberg (The Faculty of Fine, Applied and Performing Arts), Ulf Lekholm (The Institute of Odontology) and Håkan Carlsson (The University Library) – have been our mentors, experts, sounding board and general support during and between repeated meetings throughout the process.

Plans and ideas were also scrutinized by a reference group consisting of all deans and the student representative Sofie Blombäck, chaired by the Vice-Chancellor's advisor Staffan Edén. Anna Clara Stenvall has made life easier for us with her quick and accurate handling of data, texts and numerous other tasks as project assistant. The Department of Zoology kindly gave us a home during the project, and Bernt Carlsson and Lars-Åke Andersson have happily helped with a number of practicalities. We thank you all.

The project plan for RED10 was formally accepted by the Vice-Chancellor in January 2010, and a self-evaluation period of three months started on the 1st of February. We are deeply indebted to all of you who helped us in the initial period to set up and test procedures for sampling data. This includes university experts in personnel and finance issues, and others. In particular, we want to mention Ann-Sofie Olsson who helped us immediately whenever we needed it.

More than 3,000 people were involved in the next phase, when the heads of department, the deans and the Vice-Chancellor, and indeed every single researcher and PhD student, worked to compile data, publications, facts and texts. The administrative staff at different levels, including the University Library, also contributed. We appreciate the time and effort it has taken (on top of everything else!) to produce accurate and verified data. Above all, we appreciate the challenge faced by the leadership of each department in selecting (and justifying!) the “best” and “most promising” research at their respective departments. We are so grateful that you have kept to deadlines and provided the documents asked for. You have also been very helpful in providing extra materials that have been requested by the panels, at short notice.

Edited texts and overview tables of retrieved data were sent out to the panel experts at the beginning of July 2010, and the 18 panel meetings were held from late August to late October in Copenhagen, London or Frankfurt. Venues were chosen to maximize the time for collaboration and to minimize travel for the panellists. After the meeting, the panels produced preliminary reports, based on the available written material. It has been truly fascinating and overwhelming to meet all the different experts, with their dedication, enthusiasm and knowledge, as well as their professionalism and integrity in approaching the task.

In late November, the chairs and vice chairs of all panels met in Gothenburg for a one-week site visit to the University. This included visits to the departments as well as meetings with heads of department, deans, the Vice Chancellor and different categories of researchers. After this, the panel reports were finalized. Internal comparisons and discussions during the week resulted in the general comments and recommendations for the University from the panels. We would like to express our

PREFACE

thanks to all the experts for being so active, inquisitive and productive throughout a full week with a tight schedule, and a special thanks to Professor Susanne Renner for taking on the responsibility as chair of chairs. A large number of people helped ensure that the site visit ran smoothly, including heads of departments, PhD student pilots and the University Guest Service and Conference Centres. Thank you all very much.

The bibliometric analysis was carried out by external experts, and form a separate section of the report. Kudos to the University Library's Bibliometric Services for your efficient contribution.

We are convinced that the process as such has been valuable to the parties involved. We trust that the results of the evaluation will form a basis and support for future strategic decisions at the University. We also hope that the report will be used both by the departments (or comparable units) for their own quality work, and by the individual scientists for inspiration. Finally, we suggest that you follow the recommendation from one of the panels to the University: *“Be courageous, forward looking and act big for the benefit of the University of Gothenburg!”*

Gothenburg, February 2011

Susanne Holmgren
Project leader

Gustav Bertilsson Uleberg
Project coordinator

UNIVERSITY OF GOTHENBURG

FACTS AND FIGURES

Budget year 2010

Education at first- and second-cycle levels

38,900 students, of which 65% are female

27,411 full-time students

22,475 annual performance equivalents

5,051 degrees taken, *of which*

459 two-year master's degrees (masterexamina)

818 one-year master's degrees (magisterexamina)

1,452 bachelor's degrees (kandidatexamina)

34 university degrees (högskoleexamina)

2,288 professional degrees (yrkesexamina)

Third-cycle education

1,958 active research students, *of which* 59% are female

314 newly enrolled research students, *of which* 57% are female

295 doctoral degrees

41 licentiate degrees

Staff

5,700 employees corresponding to 4,978 full-time positions (58% women), *of which*

477 professors

2,628 teaching staff/researchers and doctoral student appointments

1,873 technical/administrative staff

FACTS AND FIGURES

Finances

SEK 3,518 million in direct government funding

SEK 1,647 million in external funding and other income

SEK 5,165 million in total income

Premises

374,700 m²

SEK 605 million

Faculties

The Sahlgrenska Academy – medicine, odontology, health and care sciences

The Faculty of Science

The Faculty of Arts

The Faculty of Fine, Applied and Performing Arts

The Faculty of Social Sciences

The School of Business, Economics and Law

The Faculty of Education

The IT Faculty

The Board of Teacher Education (*not included in RED10*)

Source: The University of Gothenburg's Annual Report 2010

Part I

General recommendations

GENERAL RECOMMENDATIONS TO THE UNIVERSITY

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GENERAL RECOMMENDATIONS

This section provides a summary of the results of the RED10 evaluation, based on the 18 panel reports and the concluding discussion of the panel chairs and vice-chairs at the end of the site visit to the University of Gothenburg. More detailed recommendations for particular faculties and departments may be found in the subsequent individual panel reports.

1. PANEL MANDATE AND USE OF GRADES

The panels' mandate was to identify particularly strong research groups and opportunities for renewal. It was also an important task to identify weak areas and provide suggestions for actions where relevant (and possible). Strong research is recognized internationally, often very soon after it is first published. Scientists who are peers therefore have little difficulty in agreeing what constitutes the top achievements and the current frontier of their field. Research activities with the highest quality ratings ("outstanding" and "excellent") are found in many departments widely spread over the University. Some panels, however, were unable to use the recommended grades for all aspects to be evaluated, usually because the self-evaluation materials lacked crucial information. In a few such cases, departments had been restructured during the years 2009 or 2010, and they had thus had their current structure for too short a time to be evaluated as a single department. In these cases, the panels provided more general assessments. Other panels found it difficult to give single grades for departments of highly uneven performance, and some then resorted to using two or more grades, while others elected not to grade some aspects at all.

The panels paid considerable attention to forward-looking recommendations. Given the widespread age-heavy demographic profile at the University of Gothenburg and the expected large number of professorial retirements over the next few years, it was often difficult for panels to evaluate whether a department's "future visions" were realistic. In this situation, the panels saw it as an important task to make suggestions about how upcoming retirements and the accompanying hiring opportunities might be used to strengthen existing research areas or redirect efforts.

2. GENERAL STATEMENTS AND SUGGESTIONS

The panels found many excellent and enviable elements at the University of Gothenburg, including its unique position in the life sciences, the medical sciences and several areas in the humanities and arts. Our focus on the more critical aspects in the following pages does not mean that we overlooked the strengths of the University. To find specific information on particularly impressive research at the University of Gothenburg, the individual panel reports should be consulted.

Below are the concerns that recurred during panel deliberations and which were summarized by the chairs and vice-chairs during the day-long concluding discussion in Gothenburg. The concerns that came up most frequently were the need to:

- (i) foster national and international collaboration and recruitment from outside the University of Gothenburg,
- (ii) strengthen the flux of postdoctoral and early-career scientists from and to the University,
- (iii) review the departmental and faculty structure and, where appropriate, reduce the number of highly specialized and under-staffed research groups,
- (iv) foster the dissemination of best practice within the University in relation to research and research planning,
- (v) promote interdisciplinary research both within the University and in collaboration with European and international partners.

Many of the RED10 panels were dismayed by the extent to which the processes of appointment, promotion and funding work against the University's ability to recruit internationally. This appears to work in both directions: Overall, there are relatively few hires of talent from outside Gothenburg, and it is unclear how many young post-doctoral researchers are able to obtain vital, formative experiences in the international research community. As the international and European research communities become ever more networked and increasingly work together in transnationally financed programmes requiring mobility, national structures that inhibit mobility constitute an ever more serious disadvantage.

3. STRATEGIES AND VISIONS

During the site visit, the RED10 panels became more aware of the University's strategic document, but we saw no evidence of this document having yet had an impact at departmental level. For areas that are deemed to be of strategic importance to the University, ways need to be found of encouraging departments to adopt the University's strategy, for example when it comes to recruiting female professors. Measuring and monitoring department activities would already influence behaviour. If the RED10 evaluation is to have an effect lasting beyond 2010/2011, it is crucial to monitor if and how departments react to RED10 panel recommendations. We are aware of the online reporting system, but currently it appears not to be suited for monitoring purposes. More stringent systems of support and reward will need

GENERAL RECOMMENDATIONS

to be put in place. The university-level and faculty-level databases should provide consistent, reliable and relevant information for strategic planning and monitoring, as well as for potential RED10 follow-up measures.

At departmental level, many of the 18 panels noted weak leadership and a lack of strategic planning, although this impression might have been due in part to poorly prepared self-evaluation materials. The sections on “Future vision” in particular often appeared to have been thrown together without much thought or effort. Indeed, the poorly prepared vision statements were among the few things that the RED10 panels felt reflected poorly on the University of Gothenburg and unnecessarily burdened several panels’ task. In a few cases, sloppily prepared self-evaluations and thoughtless vision statements felt like an insult to the panel members who had come with a serious and positive attitude towards the RED10 research evaluation project. Improved administrative support at departmental level might help strategic planning and would almost certainly help with planning and running budgets, accounting and reporting to funding agencies. Modern electronic tools should be introduced for this.

The “complete academic environment”

A central strategy of the University of Gothenburg is to create a “complete academic environment”, i.e. a strong and fruitful interaction between research and teaching in all academic settings. While the RED10 mandate did not include an evaluation of the teaching at the University, it appeared to us that the “complete academic environment” is unlikely to exist in all departments. A problem here is the way in which research time is distributed according to rank. With senior professors having more research time, it is unavoidable that they spend less time with students and that the students see more of the members of staff who have a very heavy teaching load and hence less time for research. Furthermore, the teaching duties of PhD students mean that they take responsibility for a lot of early-level teaching.

4. ORGANIZATION

Due to the very uneven departmental sizes and structures, we do not find it useful to make comprehensive statements about the organization of research at the University of Gothenburg, but refer to the individual panel documents on this issue. These will show that both mergers and (in other instances) splits are suggested. A topic that came up many times was the overlap in research and research organization in the natural sciences and health sciences between the University of Gothenburg and Chalmers University of Technology on the one hand, and between the University of Gothenburg (Sahlgrenska Academy) and Sahlgrenska Hospital on

the other. In connection with this, problems with double employment and double leaderships that need to be solved were encountered.

5. FINANCES AND ECONOMY

The University of Gothenburg is a full-scale university including all natural sciences and health sciences, as well as creative arts, humanities and social sciences; only engineering is not represented, this being covered by Chalmers. The situation concerning external funding varies from large international grants in the medical sciences to smaller regional grants in the creative arts and humanities. A consequence of this diversity is that it is difficult to make overall statements about research funding.

The site visit revealed disturbing inconsistencies in how staff members perceive resources being allocated within the University. Talking with deans, department chairs and regular academic staff yielded strikingly different descriptions of the procedures for the allocation of resources. This is unhealthy, and is a source of considerable complaints. It is important that the allocation and reallocation of resources be made more transparent.

The resource allocation system at the University distinguishes between teaching and research. This makes it important that the resources given for teaching do indeed cover the actual expenses, and it is most panels' impressions that this may not be the case. It is also extremely important that good research is rewarded, and as part of making the financial system more transparent, a clearer reward system could be implemented (rewards for high-level publishing exist in some departments).

External grants come with an overhead. The way the overhead is handled varies considerably between the departments. Once more, the system should become more transparent.

The management of grants requires complicated technical administrative work to compute exact social costs, salaries, overheads, etc. It is a waste of resources to let professors be responsible for this work. It would probably reduce expenses and increase research output if the administrative management of grants was handled by the administrative function.

6. DEMOGRAPHY, WORKING CONDITIONS AND GENDER ISSUES

Female versus male staff

Most of the 18 panels noted an under-representation of women in the most senior academic positions, even where they were well represented in the lower rank positions. Some improvement was noted where concerted action had been taken. For example, after a critical report of sex ratios among professors in the Faculty of Education, women professors increased from 19% in 2001 to 33% in 2008 and women docents from 31% to 75%. There are still hardly any women at any level among the staff in certain other fields, such as information technology.

One issue raised with regard to working conditions was that female professors are overloaded with committee work as a result of the gender imbalance at the higher ranks. This type of overload could be dealt with in the design of the yearly working plan for the overloaded persons. Perhaps a system could be found where committee work would “buy” a certain amount of later research time.

As far as the panels could ascertain, parental leave policies at the University are in place and work well. However, with this exception, a strong criticism is that awareness and monitoring of the implementation of University policies is patchy. The gender issue appears to be almost ignored in some departments.

Renewal of staff

Imminent retirement of many (usually male) professors constitutes both an opportunity and a threat. It provides a chance for renewal, but the loss of outstanding researchers could also lead to a loss of quality unless promising younger people (“rising stars”) can be found and attracted to the University of Gothenburg. In the medium term, the removal of research council funding could exacerbate the difficulty of finding mid-career researchers to replace the retirees. Of course, the upcoming retirements also offer opportunities for senior appointments from the outside (but see below).

There is an absence of diversity among the academic workforce in terms of both nationality and ethnicity. Recruitment is predominantly Nordic, mainly Swedish, and, in some departments, overwhelmingly local.

Consequences of internal promotion

Several RED10 panels noted a ‘professorial elevator’ type of career development, meaning a system in which senior appointments are made without the candidate(s) being subjected to external competition. No numbers appear to exist on the sever-

ity of this problem at the University of Gothenburg, and a general statement is therefore not possible. It may be that such automatic chains of promotion to the highest rank lead to positions not being filled for a long time when the candidate “in line” does not (yet) have the required qualifications. As Swedish academic salary levels are making it difficult to attract top researchers, either from other career choices or internationally (see also below), internal recruitments may sometimes be unavoidable and provide more opportunities for women to progress to senior levels (although this hypothesis is difficult to reconcile with the scarcity of female senior professors or the supposed “professorial elevator” career system).

Career development

Overall, the RED10 panels were uncertain whether junior academic staff have (too) high teaching loads, since most panels received little to no information about teaching loads, the value placed on teaching or the monitoring of staff teaching obligations. A few panels that did have information about teaching loads felt that they were too high and made it very difficult for junior staff to engage in research. Some department heads claimed that professors received guaranteed research time regardless of the quality of their work and their record in securing external grants, but other departments reported fairer policies.

Another, very important, issue concerning working conditions is the lack of mentoring programmes for postdocs and mid-career academic staff. Mentoring programmes for junior academic staff can no longer be considered a discretionary luxury, but should be mandatory in all departments. A well-established mentoring programme would also be helpful in making the University of Gothenburg more attractive, both nationally and internationally. The lack of formal junior academic staff mentoring is a serious weakness that the University should address as a matter of high priority (see the individual panel reports where this comes up again and again). Actions might include mentoring by role models from outside the University in areas where none are currently available within the University; this would apply to areas where women are massively under-represented.

7. RECRUITMENT AND MOBILITY

Internal recruitment

Overall and across departments, recruitment of academic staff into the University of Gothenburg appears to be predominantly internal. There are notable and important exceptions to this rule, but it is our general view that internal recruitment is a trait that is too dominant to be healthy for the University. An internal recruitment tendency clearly has negative consequences for innovation and credibility (that is,

the reputation of the University), and there must be a greater focus on recruitment from outside the University and preferably internationally.

We realize that changing Swedish national policies is outside the purview of a University evaluation panel. However, the outside evaluations of Uppsala and Lund universities came to similar conclusions about the need for Swedish universities to recruit both nationally and internationally if they want to retain a worldwide competitive edge. It is also clear that all positions should be filled in broad and open competition to find the best candidate available at a given time and salary level. This requires advertisement in appropriate media (which the University should fund so that all departments can afford it). It is worrying that several panels learned that departments apparently occasionally do not even advertise positions openly or in appropriate media. We recommend strongly that a policy of “best practice in recruitment” be formulated and appropriately disseminated to ensure that no department has doubts about University policy in this regard.

International recruitment

International as well as national recruitment depends on the existence of strong research environments. Internationally competitive research environments will be highly attractive to researchers from other institutions, both within Sweden and abroad. Good childcare, parental leave, spousal hiring and other directed policies could help to offset comparatively low Swedish professorial salaries (in some research areas).

Further on the topic of internationalization, the University of Gothenburg has a long list of partner universities as listed on web pages¹. Action should be taken for students and researchers to take full advantage of these contacts with the aim of increasing researcher mobility (in both directions).

The University of Gothenburg’s ability to serve as a magnet for international talents is highly variable. Certain departments, such as the Department of Business Administration and the Department of Cell and Molecular Biology, have recruited much of their staff and many postdocs internationally. Others, however, have recruited up to 100% of their staff from within the University, and often from within their own department. This appears to be partly due to non-competitive salaries. In order to alleviate this problem, some countries have introduced an especially low tax rate applicable for 3-5 years to researchers and business-related experts from

¹ For example: iCON, University’s databas with international contacts <http://icon.gu.se>, the Sahlgrenska Academy Student exchange programmes <http://www.sahlgrenska.gu.se/english/education/exchange/> and FP7 project LIFECYCLE <http://www.lifecycle.gu.se/project-partners/ugot/>

abroad². While national taxation-rules are beyond the realm of University decisions, such an arrangement might be worthwhile lobbying for to improve international Swedish academic recruitment.

Another feature of the University of Gothenburg that counters international recruitment is unattractive or non-existent start-up packages. Clearly, a faculty or University policy on this issue would be desirable, and the current situation might – we feel – be remedied by using some of the strategic money available at faculty level for supporting postdoc or PhD positions for newly hired professors.

Dual career strategy

An additional factor that could contribute to making the University of Gothenburg more attractive for international academic staff would be the creation of a dual career strategy. We think this is chiefly a question of creativity and of making good use of the University's excellent relationships with institutions and businesses in the Gothenburg area. We suggest that the University takes the initiative to establish a 'memorandum of understanding' on this issue with relevant institutions and businesses to make a dual career programme both feasible and viable.

Retirements bring opportunities

As the University is facing a situation with a high number of retiring professors, funds becoming available from a few of these positions might be temporarily allocated to creating competitive start-up packages (see above for details of why this is a strong desideratum). We feel that such an investment would soon pay off in terms of bringing in extra resources for research, and thereby replenish the positions invested.

Age and mobility of PhD students

Virtually all panels commented on the problems arising from PhD students being relatively old when they obtain their degree. Such candidates will usually be at a competitive disadvantage in the job market. In some departments, for instance, in health sciences, the financial construction for supporting PhD students, however, is such that doing a doctoral programme becomes a part-time enterprise. Substantial time is spent teaching or doing clinical work.

In addition, this structure does not promote the willingness of PhD students to spend time abroad. An important recommendation to enhance mobility is to urge students to include a stay abroad early on during their studies, ideally at undergraduate or MSc level, financed by programmes such as NordPlus, Erasmus Mundus or Marie Curie (which is for pre- as well as post-doctoral students).

² See for example the report from the EU's Scientific and Technical Research Committee (CREST): http://ec.europa.eu/invest-in-research/pdf/download_en/fisc_inc_country_overview_ipts_final.pdf

Support to increase internationalization

We are uncertain whether the International Office at the University is sufficiently staffed to be helpful in promoting the international mobility of researchers, but experience tells us that the visibility of serious attempts at internationalization would already go some way towards achieving this goal.

Language issues

There are few language issues. Swedish is used when the theme is directly related to Swedish society, and English predominates where the respective research depends on international knowledge exchange in this language. The visibility of publications in the humanities and many social science disciplines at the University may be negatively affected, however, by the widespread tendency to publish in Swedish.

8. DOCTORAL STUDIES AND GRADUATION

During their site visits, the panel chairs were given an opportunity to meet with a few PhD students. They were very content and the only anxiety felt appeared to be due to the limited prospects of future employment. The net study time for completion of a PhD at the University of Gothenburg takes on average 4.0 years (data from Ladok), which is internationally competitive. There is a trend for the latest generation of candidates to take less time to complete their degree than previous cohorts did. However, much longer times (both net study time and in particular gross study time), such as were encountered in several departments, create disadvantage for candidates in the job market.

Strong recommendations are:

1. PhD students should be encouraged to get in touch with researchers at foreign institutions of higher learning as early as possible during their training.
2. The University of Gothenburg should institute PhD committees throughout the University. These are small committees (with or without non-local members) that meet with the student once a year, or to which the student sends a short annual progress report. Such committees contribute greatly to a structured PhD education, help to maintain and raise quality, and contribute to the scientific exchange among academic staff. The presence of a member from outside the University on the PhD examination panel should be mandatory where a department has only a few professors. This is established practice in some areas of the natural sciences.

9. FACILITIES

It was the general impression that the physical facilities at the University of Gothenburg are excellent. Important exceptions to this overall assessment may be found in individual panel reports, which each include a section on the department's facilities.

10. COLLABORATION

Collaboration at the University of Gothenburg, especially at the local and national level, is unevenly developed, and we suspect much more could be done in this area. Details can be found in the respective sections in the individual panel reports.

11. RELATIONSHIP WITH SOCIETY

Full advantage has not yet been taken of the clear potential for bringing research results from the University to society, including patent development. While several panels noted cases where university professors are using their industrial or other societal contacts to invite guest lecturers and to help students find placements in industry or public services for shorter or longer periods of time, overall these examples seemed few (or were not included in the self-evaluation materials provided by the departments). The panels also found few examples where R&D money from industry was being attracted. Lastly, joint research and teaching efforts with partners in developing countries appeared scarce, but again perhaps they had been left out of self-evaluation materials.

12. WEBSITES

The quality of websites is becoming more and more important. These sites serve to attract future students, display excellence and offer contact information. To test whether the University of Gothenburg websites meet these goals we asked the following three questions: Can I find the contact information of the head of Department X? Can I find the contact information and most recent papers by researcher Y? Can I find out who is working in area Z in Gothenburg? Unfortunately, most of the current department websites fail to answer the above three questions satisfactorily (i.e. quickly and clearly). In addition, it is an obvious requirement that web pages in English and Swedish provide the same clear and consistent information. Links should be updated and maintained, and a minimal uniformity in the appearance of personal websites would seem recommendable. Personal web pages should also be required to contain a certain minimum of information. We also recommend

the introduction of uniform email addresses for key persons, e.g. `prefekt@deptA.gu.se`, `dekan@fakA.gu.se`, etc. (suitably forwarded to the right person).

13. CONCLUDING REMARKS

We would like to end this **general summary and our overall recommendations** by saying that the organization of the RED10 process functioned extremely smoothly and that the RED10 staff greatly facilitated our task by providing additional information and answering our numerous questions speedily and competently.

As stated above (first section), if the RED10 evaluation is to have a real effect, it would be crucial to monitor if and how departments react to RED10 panel recommendations. For such a follow-up evaluation, we would like to make two recommendations:

Firstly, the quality of the self-evaluation reports should be improved. More and relevant information could have been provided without exceeding the limits of writing space and would have helped us to better understand the research activity in many departments (in some cases possibly even leading to higher scores).

Secondly, the available time for panel chairs to meet with staff and leadership in the departments was short and not always used in the best way. The departmental meetings were not organized along the same lines, thus giving the separate panels very different amounts of time for questions and discussions. What is needed in a future evaluation process is a firmer structure and clearer purpose for these meetings.

We hope that our comments will contribute to a continued sound and strong development of research at the University of Gothenburg. The positive impact of the RED10 effort will depend largely on how the time- and cost-intensive evaluation is followed up by the departments, the faculties and the University.

Part II

Expert evaluations of departments

TERMS OF REFERENCE FOR THE PANEL WORK

METHOD OF EVALUATION

The evaluations of ongoing and planned research at the University have been performed by 18 expert panels³, composed of internationally recognized and distinguished scholars. Each panel has had a chair, a vice chair and 2–7 other appointed members. Each of the departments at the University was grouped under one of the 18 evaluation panels³. The panels have written individual reports for each evaluated department or comparable unit, and where applicable have also highlighted common features of units within the same panel. These reports are collected in the following section. A summary report on general observations regarding the whole University, compiled by the chair of chairs Professor Susanne Renner and agreed upon by all chairs and vice-chairs, precedes this section.

The material available to the experts as a basis for the evaluation includes the documentation, evaluation and plans that the departments (or comparable units) themselves submitted in a “self-evaluation”, and publications (registered in Gothenburg University Publications – GUP) and other information from existing databases. Additional materials have been provided to the panels on request. Each panel of experts held a one- or two-day meeting for internal discussions. Panel chairs and vice-chairs have carried out site visits to the University lasting one week, meeting university, faculty and departmental leaders and selected researchers, as well as visiting departments.

3 See “Panels and experts”, page 521

EVALUATION CRITERIA AND ASSESSMENT SCALE

The chief criteria for evaluating the research at the University of Gothenburg have been:

- **Quality** (international⁴ comparability and innovative power)
- **Productivity** (scientific⁵ production)
- **Uniqueness**
- **Relevance** (scientific, social and socioeconomic significance)
- **Organizational capacity** (flexibility, control and leadership)
- **Interactive vitality**

The evaluators were expected to assess research units according to a six-point scale (described below) using these criteria. This should be done primarily at departmental (or comparable unit) level, but might also have been done at lower or higher organizational levels. Individuals were, however, not to be evaluated as such.

Evaluation according to the criteria given should be made with due consideration for the mission of the department or unit in question, as expressed in the self-evaluation.

The panels were asked to interpret the chief criteria as follows:

Quality was to be understood as a measure of excellence and of the attention received by the unit and its research. Quality is founded on the reputation and position of the unit within the community of researchers. The quality should be assessed on the basis of the ability of the unit to achieve and present clear-cut scientific² analyses and results. The assessment should reflect the position of the unit in relation to frontiers of research in the field or discipline, which is best judged through peer review. In the analysis, the peers were expected to rely on their own expertise and knowledge of the field.

Productivity relates to the unit's total volume of scientific reports. These are usually in the form of written publications, but other forms of documentation are possible. Productivity should be judged in relation to the number of (full-time equivalent) researchers at the department or unit.

4 Although the ratings should primarily be expressed in terms of international standing, it was recognized that certain fields may not allow an international comparison in all respects. They may still be of high quality, and presumably several aspects of the research such as methods and infrastructure could be directly compared to the international level.

5 In all contexts of this evaluation the expression "scientific" has included research and development activities at the Faculty of Fine, Applied and Performing Arts.

Uniqueness. Certain strands of research within the university may be unusual or even unique in the world of science. The history or geographic location of the university or the city may make the university a well-suited site for a particular kind of research in a field, which is not carried out at other universities. In order to promote research diversity overall, such research may have a special value to be carried out here.

Relevance is a criterion which includes the scientific, technological, social, cultural or socioeconomic significance of scientific work. The research was to be placed in relation to the international development of the field of study or to important developments in society locally, nationally or internationally.

Organizational capacity is a criterion which concerns the internal structure of the unit. In addition, the experts were asked to assess the capacity of the unit for initiating and successfully implementing the work it has planned.

Interactive vitality or collaboration is a criterion that includes the department's contact with the rest of the world, including participation in inter- and cross-disciplinary cooperative research efforts and networks.

The experts were also asked to assess or comment on future plans, future potentials and possibilities, research activity and teaching, interactions with society, gender and equal opportunity issues and other relevant issues, as specified below.

Assessment scale

The panels were asked to use the full scale as described below for the overall assessment and the criteria quality, productivity, uniqueness and relevance. Modified scales, as indicated under the specified headings below, were suggested for the remaining criteria.

Outstanding. Outstandingly strong research, including from an international perspective. Great international interest with a wide impact, normally including publications in leading journals and/or monographs published by leading international publishing houses. The research has world-leading qualities.

Excellent. Research of excellent quality. Normally published so that it has great impact, including internationally. Without doubt, the research has a leading position in its field in Sweden.

Very good. Research of very high quality. The research is of such high quality that it attracts wide national and international attention.

TERMS OF REFERENCE

Good. Good research attracting mainly national attention but possessing international potential; high relevance may motivate good research.

Insufficient. The research is insufficient and reports have not gained wide circulation or do not receive national and international attention. Research activities should be revised.

Poor. The research is quite inadequate and lacks potential. Research activities should be discontinued.

In cases where the research is of a national character and, in the opinion of the evaluators, should remain so, the concepts of “international attention” or “international impact”, etc., in the assessment criteria above may be replaced by “international comparability”. See also footnote 4.

THE REPORTS

Panel report outline

The panels were asked to write one report per department, using the headings below. Where a panel assessed more than one department, an introductory section summarizing or discussing common aspects was suggested. The panels were asked to give reasons for their gradings and specific recommendations where relevant. Where lower grades (insufficient, poor) were chosen, the panels were asked to state whether the aspects receiving these grades are worth developing or not.

Overall assessment (of department)

A short general quality assessment of the unit in question, regarding on the one hand the research at the unit and on the other hand the setting as a whole.

Research quality, productivity, uniqueness and relevance

The panel’s view on the quality, productivity, uniqueness and relevance (including up-to-dateness) of achievements and ongoing research activities at the department, both in general and in relation to the goals and strategies of the unit.

These have been the key issues when evaluating achievements and ongoing research. See the definitions above for criteria and grading. The panels were asked to rate the parameters according to the full 6-grade assessment scale described above.

Organization and research infrastructure

Assessment of the organization of the unit; whether it is a logical and functional unit, and how effective and professional its leadership and administration are. Comments

on how good the facilities are, and if there are special resources and other infrastructure details that are stimulating or restricting in relation to the research carried out at the department.

Furthermore, an assessment of whether the goals and strategies for the department's research programme are realistic in relation to resources, and suggestions on in what ways these could be improved.

The panels were asked to use the ratings Excellent, Very Good, Good, Poor or Poor but worth developing.

Collaboration and networks

Comments on the interactive qualities reflected in local, national and international collaboration and participation in networks. Evaluation of the level of and added value of interdisciplinary versus intradisciplinary structures and activities, as well as incentives for developing and participating in different types of collaboration.

The panels were asked to use the rating Excellent, Very Good, Good, Poor or Poor but worth developing.

Future plans

Comments on the general quality and uniqueness of the department's future research plans. Judging whether the plans are well-chosen and well-formulated in the light of developments within the field in question, and whether a) the plans are realistic with regard to current staff, finances and infrastructure and/or whether b) the planned development of these elements is realistic. Infrastructure includes leadership and administration as well as facilities. Also, an assessment of whether there is room for improving the plans and the infrastructure.

The panels were asked to rate the plans for the future according to a four-grade scale: Excellent, Very Good, Good and Poor.

Future potentials and possibilities

Comments on possible potential and directions recommended for the research. Notes on potentials and unique opportunities. Also, notes on current activities or plans with poor future potential and restricted possibilities.

Research activity and teaching

One of the University's central strategies is to create "a complete academic environment", i.e. strong and fruitful interactions between research and teaching in all academic settings. Comments on whether remarkably good (or poor) relationships

and balance between research and teaching were found, and the effects of this, were asked for.

Interactions with society

Comments on whether interactions with society are above or below the expected level for the field in question.

Gender and equal opportunity issues

The University of Gothenburg strives for a good gender balance and equal opportunities. Comments on any observations on these issues regarding both the present situation and the plans for the future, and suggestions for improvement, were asked for.

Other issues

The panels were encouraged to introduce new headings for special purposes, if required. The panels were asked not to give lengthy descriptions of their observations; instead, a concise explanation or justification for their statements and grading was requested. The panels were asked not to grade or comment on individual researchers, unless they were indicated as good examples.

PANEL 1 – PHILOSOPHY, LINGUISTICS AND LANGUAGE

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1A. THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

1A.1 Overall assessment

The evaluated unit is the smaller part of a joint Department shared by the University of Gothenburg and Chalmers University of Technology. On the University of Gothenburg side, the Department mainly consists of two professors, two senior lecturers and several PhD students. The joint Department deservedly enjoys a high international reputation. The University of Gothenburg contingent, which would be too small in size and scope to form a separate computer science department, has contributed more than proportionally to the success of the larger unit. The panel is informed that the University of Gothenburg side of the Department will be strengthened in terms of the number of academic staff in 2010-2011.

1A.2 Research quality, productivity, uniqueness and relevance

The research carried out by the group is characterized by outstanding quality, combining fundamental, theoretically important research with a broad relevance both for other research fields and for society.

The two University of Gothenburg professors evaluated in the period 2004-2009 are highly productive scientists of outstanding international reputation and standing. Their work is highly original and has influenced the field. They have different – but connected – rather special interests, giving the Department a unique profile. The work of the less senior colleagues is intellectually ambitious, and exhibits a high degree of potential for application in computer games, software interfaces and medicine. The group's publications appear in high impact journals and conference proceedings (which is the most important outlet for world class research in this field) and with leading international publishers. One of the professors has received several prestigious prizes and other honours for his work.

Assessment: *Outstanding*

1A.3 Organization and research infrastructure

If viewed together with the Chalmers components of the joint Department, the organization and infrastructure is excellent. As pointed out in the Department's SWOT analysis, the effective administration of the University of Gothenburg components would be seriously hampered if this section was to stay at its current small size. However, we understand that the University of Gothenburg section of the Department is being expanded, which should resolve this problem.

The leadership within the Department as a whole is excellent, both in terms of personnel management and support, and in terms of creating an intellectually stimulating atmosphere.

Assessment: *Excellent*

1A.4 Collaboration and networks

The collaboration between the University of Gothenburg and Chalmers within this unit appears to work well. The members of the group are not only engaged in several international collaborations, some of them are also initiators and leaders of scientifically ambitious EU projects. Members of the group also have close collaborative partnerships with local industry.

Assessment: *Excellent*

1A.5 Future plans, potentials and possibilities

The planned integration of software engineering into the Department and the opening of new positions will not only provide the badly needed additional mass and balance, it will also offer a great chance to generate much higher profit from the existing core of excellence.

The recent success in FP7 and the European Research Council (ERC) will require professional management in various ways, from accounting and reporting routines to managing the attention given to the acquired status as a locus of excellence. The Department leadership shows a good understanding of, and capacity to manage, these challenges. The professors have firm plans for how to maintain and develop excellence while taking care not to let quantity come at the expense of quality.

Assessment: *Excellent*

1A.6 Research activity and teaching

The research and teaching activities are well integrated. The University of Gothenburg scientists contribute greatly to the two degree programmes of the Department. As a general rule within the Department, colleagues of all levels contribute to the undergraduate programme, as do industrial research collaborators when the opportunity arises. An example that demonstrates this excellence is the fact that even bachelor's students have regularly been chosen to present their project results at international conferences.

1A.7 Interactions with society

The excellent research of the Department is of high relevance to society, but most of the more fundamental science is not really suited for establishing immediate channels of impact to other parts of society. Some of the work has immediate relevance in the areas of games and medical applications for rehabilitation. However, the organizational basis and concrete mechanisms for a stronger systematic and sustainable connection with industry can still be developed further.

The establishment of the planned Software Center could change the picture considerably. However, in order to fully benefit from this potential for reputation, education, science and funding, the University of Gothenburg should definitely not leave the major investment and profits to Chalmers.

1A.8 Gender and equal opportunity issues

As in other computer science departments, especially departments with a heavy component of theoretical computer science and formal foundations, the development towards a gender balance is a challenge. There are no women among the nine PhDs produced in the last decade, and just one out of twelve licentiate degrees went

to a female graduate. Although the evaluated department is too small to expect a statistical balance to be achieved, it may also be too small to resolve a structural problem of the entire discipline or even of the entire education system. This is an issue that the leadership of the Department takes very seriously.

1A.9 Summary of assessments – the Department of Computer Science and Engineering

Research quality, productivity, uniqueness and relevance: *Outstanding*

Organization and research infrastructure: *Excellent*

Collaboration and networks: *Excellent*

Future plans, potentials and possibilities: *Excellent*

1B. THE DEPARTMENT OF PHILOSOPHY, LINGUISTICS AND THEORY OF SCIENCE

1B.1 Introductory remarks and overall assessment

At the time of evaluation, less than two years had passed since the Department of Philosophy, Linguistics and Theory of Science was formed from sections of previous departments. The creation of the Department may partly have been motivated by administrative efficiency and recognition of the potential for future collaboration rather than actual existing convergence of the research interests of the three academic environments. However, there are a number of promising initiatives, measures and activities aimed at integrating the disciplines academically and developing common interests and interdisciplinary research activities. The Department shows firm leadership in this respect. It would be premature, however, to evaluate the results of those efforts. It should be borne in mind that this review is partly based on an assessment of the research carried out before the Department was formed.

Overall, in the period 2004-2009, the research carried out by staff currently located at the Department of Philosophy, Linguistics and Theory of Science document a very good standard in terms of quality and quantity. In the rather heterogeneous Department there are a number of individual researchers and research groups that receive international acclaim. However, there are also areas within the Department characterized by more limited outputs, in particular with regard to international peer-reviewed publications. The extensive in-house publishing is likely to mean that the research has less international impact than it should. Certain subject areas

do not appear to have realized their full potential for participation in research on an international level. A number of measures have been taken since the merger into the Department of Philosophy, Linguistics and Theory of Science in 2009 to meet these challenges and to improve productivity and quality. The panel would like to express its strong support for these measures, being aware that they might at times be perceived as a discontinuity with local university traditions and culture, for instance in terms of publication strategies, interdisciplinary collaboration or allocation of research time.

Our overall assessment is then that the Department consists of some outstanding areas and some less impressive ones. The current leadership is excellent and there appears to be general support for the strategies, and hence we see the Department becoming consistently excellent.

1 B.2 Research quality, productivity, uniqueness and relevance

Although the panel is impressed by how far the integration of the Department has progressed in a relatively short time, when considering the research during the period 2004–2009, it is inevitable that it is dealt with separately to some extent. Also, even in an integrated environment, the disciplines can be expected to be important as separate knowledge traditions and methodological perspectives.

The average publication quality and quantity for 2004–2009 across the Department is not consistent with the aim of being an internationally recognized unit. Although there may be good reasons to choose Swedish/Nordic publishers for some research, there is concern over the extensive use of in-house publishing. Indeed, in the list of the most frequently used journals and publishers, the University of Gothenburg appears at the top. This is likely to reduce the impact of the research. For all units it is the case that the relatively poor record in international publishing masks great differences, with world class research being present in most units. Efforts are being made in the new Department to change this publishing pattern. These efforts should be given high priority, in particular in the disciplines and research groups where international publication is particularly low. The potential for the research having international impact across the board is there.

The philosophy section is a leading Department in its field in Sweden, ranking among the four best, and being comparable in quality to some of the best Departments in the UK. This is especially true of the research within logic and practical philosophy, in which there are well established research groups with a breadth of interests and quality of output that is needed for a self-maintaining excellent research environment. A good number of philosophers at Gothenburg have an international reputation and are able to publish their work through channels involving

the strictest forms of peer review. The overall quality in theoretical philosophy and in the history of philosophy is somewhat less impressive, with publications tending to be either in less prominent international journals or in Swedish (sometimes with Gothenburg publishers).

The research in linguistics covers a range of topics, from logic and formal semantics of natural language to dialogue research, language resources and forensic speech science, although some core areas like morphosyntax and phonology are missing. This may not be accidental since they are well-covered within the Department of Swedish. If this is the result of co-ordination between Departments, this is to be commended.

The section has an international reputation for its work in computational linguistics and for its contribution to work in formal semantics of natural language. All of these activities have a high international profile, and several members of the section are among the most distinguished scholars in their fields worldwide.

In terms of the number of positions and reported publications, theory of science is the smallest of the three research areas within the Department. This research area in Gothenburg is quite well-known and well-reputed, but at present there seems to be only one senior member of staff – one professor in theory of science. The panel is informed that vacancies will be filled in 2011, which will improve the situation radically. It will then be important to both consolidate the discipline and develop its contribution to the collaborative research environment of the Department of Philosophy, Linguistics and Theory of Science as a whole.

Theory of science is less of a normal science with a well-established hierarchy of international journals or a clearly defined peer community. Historically, three origins may be discerned: philosophy of science, the predominantly sociological, historical and anthropological interdisciplinary field of science and technology studies (STS) and the foundational problems in the various natural, medical and social sciences. This is seen in a frequent demand for “double competence” of senior academic staff, that is, research qualifications in a disciplinary approach to study science (e.g. philosophy, sociology, history or STS) as well as research qualifications in some special science (to be studied). Accordingly, within this field of research, it may be seen as equally or more prestigious and relevant to publish for the community of those being studied, as for one’s own peer community. For the same reasons, many ambitious theory of science research projects can be closer to a typical Mode 2/ consultancy activity than Mode 1/“basic research”. Still, quite a number of relevant international journals exist. Although there is a strong tradition and a clear potential in the theory of science area in Gothenburg, the panel would need to see more activity, productivity and international ambition in order to grade it as very good.

A more ambitious publication strategy would also need to involve a clearer international profile – whether one wants to specialize in science policy studies, in STS work, or develop lines of research into foundational problems or in close, Mode 2-like collaboration with special sciences to a level that has international relevance.

The Department is quite unique in its combination of research expertise in philosophy, linguistics and theory of science. This combination provides a potential for truly original interdisciplinary research in the long-term, if the Department succeeds in its plans for developing common research interests and foci. The themes defined in the self-evaluation document (written in April 2010) are so broad (“health”, “society”, etc.) that they could include a very wide range of research. The next couple of years will show whether the focus under these themes will truly lead to collaborative projects. If it does, the Department has found a unique brand, nationally and internationally. During the site visit in November 2010, the panel could confirm that there had been significant development, above all in terms of collaboration between practical philosophy and linguistics.

Although the theory of science group is small and has fewer international publications than the other sections, its strength can be said to lie in its uniqueness. When seen in a longer time frame than five years, the University of Gothenburg has a strong tradition in what can be described as the Scandinavian approach to theory of science and, to the best of the panel’s knowledge, even in a relatively weaker period with regard to activity and productivity, the theory of science area in Gothenburg is the leading one in Sweden.

Some of the work done within the Department lends itself well to development into applications. For instance, those specialising in applied philosophy often communicate their research to a broader audience, collaborate with people from different disciplines, or are consulted on ethical issues arising from the use of various medical technologies or legal proceedings.

The logic and dialogue research carried out by the Department is of excellent relevance with regard to current directions within computational linguistics and semantics, with future potential technological and even commercial applications. The main application areas are interfaces between human users on the one hand and technology or knowledge repositories on the other, as they will be needed for mobile and ambient computing applications. The work in forensic speech science has high relevance to society, not only for civil security and the judicial system but also for future voice-driven applications that adapt to the special properties and requirements of users.

The evaluated research within theory of science is characterized by its excellent societal relevance. Most of the research contributions are linked directly to some actual decision problem in society and academia, be it on scientific (mis)conduct, controversies, science policy or the application of research. The research is also part of the critical aspect of the humanities and social sciences, with ambitions going beyond mere description or theorization.

Assessment: *Very good*

1 B.3 Organization and research infrastructure

The Department was formed in 2009, and accordingly none of the outputs assessed have been the result of, or even influenced by, the effectiveness of the leadership or the functionality of the structure of the Department under evaluation. Still, the panel saw evidence during its site visit that there is strong leadership that has a clear understanding of the strengths and weaknesses of the Department and has largely taken the measures, or is in the process of taking the measures, necessary to develop an overall excellent research environment.

The new Department is co-located in one building, which will help the development of cohesion. Research infrastructure is particularly important for empirical and experimental research in linguistics. The available facilities appear adequate, although it should be noted that the panel did not perform a detailed evaluation of this point.

Assessment: *Excellent*

1 B.4 Collaboration and networks

As noted above, there is a particular need to develop collaboration internally in this new and heterogeneous Department. There is promising collaboration between philosophy (practical, logic and theoretical) and linguistics, while the collaborative contribution of theory of science remains both a potential and a challenge.

Logicians at Gothenburg have an extensive international network and collaborate with researchers within the University of Gothenburg and Chalmers, as well as with a number of international universities. Some of the Department's members specialize in interdisciplinary research. There are some particularly interesting collaborations and networks between those studying bioethics, including philosophy of health and quality of life studies, and researchers within medicine and bioethics (nationally and internationally) and, more generally, expert commissions offering advice on bioethical issues. These efforts have resulted in a number of co-authored articles published in international journals, as well as in Swedish journals aiming at an audience of professionals (e.g. in medicine). This is also true for those philoso-

phers working at the intersection between philosophy and psychiatry, where there seems to be a solid research group with participants from different disciplines. This area is also one in which Gothenburg philosophers publish internationally. Business ethics seems to be another upcoming area of applied philosophy where Gothenburg's contribution is significant. These positive aspects are reflected in a number of external research grants and occasional publications in some of the best, relevantly specialized and cross-disciplinary international peer-reviewed journals.

Linguistics has excellent cross-departmental collaboration and international networks. Members of the unit collaborate within the University and with Chalmers through the Centre for Language Technology. The national Graduate School in Speech and Language Technology, which is based at the University of Gothenburg and coordinated by members of the Department, has ensured a high level of contact and collaboration within Sweden. Participation in various EU Framework projects has provided collaboration with other groups within Europe. Individual personal international collaborations by some members of the Department are also a strong point.

There is less evidence of networks involving the theory of science unit. According to the self-evaluation document, the Department enjoys broad international collaboration, including in the field of science policy studies. However, in the publication record there is barely any evidence of any collaboration outside the group itself.

Assessment: *Excellent*

1B.5 Future plans, potentials and possibilities

The self-evaluation report, taken as a plan, is not sufficiently focused for a clear judgment to be made on future plans. The panel's site visit, however, revealed that plans to bring the Department together and exploit its strengths exist and are being further developed. During the short period since the creation of the Department, it has had to solve a number of practical and financial problems. It is not surprising then that serious research planning on a more detailed level is relatively recent.

In the self-evaluation document, the Department established 'interaction' as the theme characterizing its research in general. It may be good to be able to gather colleagues around such a broad theme, but in order to ensure that there is collaboration with appropriate outputs, reference needs to be made to clearer foci within the general theme. To some extent this is already being done.

There is a need for long-term development of research capacity at international level, in terms of publication strategies (also involving PhD students), allocation of research time, etc. The Department acknowledges this challenge and has plans for how to tackle it.

1B.6 Interactions with society

The Department's interaction with society is impressive. Its Research and Education Strategic Plan makes reference to the importance of collaboration with society, both through government and the commercial sector. Workload models used take this activity into account.

Assessment: *Very good*

The philosophy and theory of science researchers in particular have shown a serious interest in engaging with wider societal issues, and have been quite successful in doing so. Colleagues in computational linguistics have developed a range of applications and have close collaborative relationships with language technology companies, one of which is a spin-out company from the Department. The Department also hosts a number of knowledge development companies.

1B.7 Gender and equal opportunity issues

30% of the professors of the Department are women. Both philosophy and theory of science have a gender imbalance, in that there is a majority of men at all levels of staffing. Linguistics, on the other hand, has a majority of women in junior positions. As at many other universities, it is important to remember that a majority of female junior members of staff is not necessarily enough to correct the male predominance at the senior level. The Department is aware of the need to ensure that the imbalance is addressed, but in some areas it is difficult to find candidates. For instance, within philosophy the Department is strong in logic, and this is one of the areas in philosophy that, in Scandinavia, finds it hardest to attract the interest of female talent.

1B.8 Other issues

There has been growth in external funding, but external funding still seems low compared to other Faculty of Arts departments. It is not clear why this is so.

1B.9 Concluding recommendations

- That measures are taken to ensure that research productivity in terms of international peer-reviewed publications is increased, so that the highest standards are met across the Department. There is a lot of high quality research within the Department that deserves an international audience, but that has not yet achieved this. The measures will need to target several dimensions: policies, mentoring, incentives and academic culture. If measures are developed and implemented along lines already started, the Department has the potential to reach overall excellence.
- That as the merger process is completed and the more practical and financial challenges have been resolved, the Department should work strategically along

several axes to realize more of its potential. On the one hand, this involves strengthening the productivity within the group where needed. On the other, it will be important to build on the excellent groups and projects that already exist. To give one example for the purpose of illustration, it is easy to imagine a further strengthening of the interdisciplinary research activities in the health area where philosophical, linguistic and theory of science (e.g. STS) perspectives could be complementary and result in highly original research. Extra-departmental networks should also be encouraged. To build on existing successful projects appears to be one promising strategy, both to further improve what is already excellent and to involve more research staff in international publishing activities.

- That the plans to encourage “PhD candidates to be more active in collaborative publishing with senior academics” (self-evaluation document) is carried out.
- A number of senior academic staff with excellent international reputations will retire in the relatively near future, and we strongly recommend that there is reappointment at professorial level to these posts and that everything possible is done to ensure that applications are encouraged from around the world.

1B.10 Summary of assessments – the Department of Philosophy, Linguistics and Theory of Science

Research quality, productivity, uniqueness and relevance: *Very good*

Organization and research infrastructure: *Excellent*

Collaboration and networks: *Excellent*

Future plans, potentials and possibilities: *Very good*

1C. THE DEPARTMENT OF SWEDISH

1C.1 Overall assessment

The Department has some eminent scholars with a long history of publications which have had a substantial impact on their respective fields. At the same time, there are some senior members of staff whose output either in terms of publications or different types of technological infrastructure, does not appear to match the reported amount of research time. A large number of less senior staff members also have few significant publications, but do not have much research time as part of their contract. There does then appear to be discrepancies between research time allotted and outputs produced.

The self-evaluation document lists five general areas of research, and some of these appear to have quite a coherent research programme. In others, the research is divided into so many topics that the impression one gets is that they have arisen out of personal research agendas and do not fit within any joint strategy. For the future health of the department, it would seem crucial that the research profile is not left to personal preferences.

The document reports that there is interaction and cross-fertilization without providing tangible evidence of outcomes of this collaboration. It is also doubtful that appropriate quality and impact can be achieved with such a wide-ranging and relatively uncoordinated range of research topics.

A broad range of research is being carried out, but there is not always evidence of appropriate dissemination, collaboration within the Department or reported external collaboration.

1C.2 Research quality, productivity, uniqueness and relevance

It is difficult to give an overall assessment of research productivity and quality, given that the categories in the University publications list have been interpreted in very different ways. However, a pattern emerges of a lack of strategy and ambition within the Department in this area. With respect to quality, it is to be noted that the number of publications in peer-reviewed journals is disappointing; this is true for national publications, but also particularly for international journals. The need to publish in Swedish and in Swedish outlets is recognized, and we would expect to find a high proportion of work published in Swedish, but a large number of staff work in areas where high quality research should have international relevance even if the generalizations, conclusions and theory developments are based on Swedish. There is evidence within the Department both of colleagues having had a major impact on an international field with their publications on Swedish and of strong publication records, mainly to a Scandinavian audience. However, there are also many instances where the choice of outlet is either evidence of lower quality or of a failure to do justice to the potential for international impact.

There are reports of collaboration in the self-evaluation document – within the Department, as well as nationally and internationally – that are not evidenced by the publication records in that outputs of the collaboration have not appeared in outlets with high international impact. In some cases, this may be because the collaborative links are still at an early stage.

Of similar concern is the fact that around 40% of all publications are published in-house by the University. In terms of contributing to international research and

moving the discipline forward, publications should more frequently be targeted at venues with a wider international audience.

There appears to be little connection between the amount of research time for a particular category of staff and the amount of evidence for research activity. Some staff with a high proportion of research time have relatively few tangible outputs, and some staff with little or no research time are listed as examples of good research contributors.

The electronic linguistic data collections have a high standing for anyone working on Swedish and, to some extent, other Scandinavian languages anywhere in the world. In addition, successful work on scientific tools for empirical research and on the application of linguistic knowledge for language technology applications has been beneficial for the reputation of the Department.

The work carried out within grammar and grammatical modelling is promising and should result in joint, high impact publications. There is also a strong tradition of lexicographic work which has been largely applied, but which has the potential for more impact on the methodological and theoretical debate. Second language acquisition is listed as an area of strength in the self-evaluation document, and the Department participates in a number of projects in this area. However, the senior leadership in this area has been lost with the departure of a senior member of staff, but with continued leadership the unit could develop and have a bigger international impact.

The Department has a number of colleagues with a strong research reputation. It has the potential for a national and international research reputation, contributed to by a broad range of colleagues on a range of topics, but there is some way to go towards ensuring that all research is of an appropriate standard and reported through appropriate channels. The Department would also benefit from stronger leadership and management in the area of research.

Assessment: *Good*

1C.3 Organization and research infrastructure

Apart from the general fields of Swedish linguistics and Scandinavian comparative and historical linguistics, there are three formal research units: Språkbanken (the Language Bank), the Center for Lexicology and Lexicography, and the Institute for Swedish as a Second Language.

The breadth of the Department is emphasized in the self-evaluation document, and it is argued that breadth creates a fertile environment for collaboration 'where

theory, applied research and concrete applications inform each other in fruitful ways'. An example provided of this is how the resources and tools developed and maintained by Språkbanken are used by other units within the Department, and how the research carried out within these other units in turn feeds back into the development of Språkbanken's resources. We applaud this type of interaction, but see little evidence of it in joint research projects or publications.

There is little or no information on what structures are in place to encourage research collaboration. Descriptions of structures do, in many ways, give the appearance of fragmentation.

The presence of excellent and financially well-supported electronic resources through Språkbanken provides an invaluable resource for the Department. There is, however, also a concern that this is seen as a service resource by outside users, and it is important for the Department's research reputation that it continues to deliver separate research outputs.

Assessment: *Good*

1C.4 Collaboration and networks

Members of the Department play an active role in the Centre for Language Technology maintained jointly by the University of Gothenburg and Chalmers. A number of the groups play a role within Scandinavian or European collaborative networks such as CLARIN and FLaReNet. The Department plays a key role in a range of collaborative organisations in the area of lexicography, in particular within the Nordic countries.

As mentioned in 1C.2, in some instances, collaboration is still at too early a stage to have had impact in terms of outputs, for instance the collaboration with Berkeley FrameNet or the involvement with Digital Areal Linguistics collaboration with Uppsala University and Max Planck, Leipzig.

Assessment: *Good*

1C.5 Future plans, potentials and possibilities

The SWOT analysis does not give the impression that there has been any reflection on what changes there may be in the future, either internally or externally, what measures can be taken to mitigate the effect of threats, and what can be done to exploit opportunities. The Department has not been able to recognize its weaknesses. All weaknesses stated in the SWOT analysis are external. Therefore it is not surprising that no plans for improvement have been proposed.

The age profile of senior staff is such that there will be some major changes over the next few years. We would recommend that external appointments are made to ensure new blood at the senior level. The research culture needs to be changed, and we believe senior leadership within the research areas is required for this.

Assessment: *Good*

1C.6 Research activity and teaching

The research activity is said to influence the teaching, especially at master's and PhD levels. Some text books have been written by members of the Department and jointly with the Universities of Uppsala and Stockholm, and a database of grammar exercises has been developed.

Crucial evidence of interaction would be the involvement of senior research-active staff in the delivery of undergraduate teaching.

1C.7 Interactions with society

The Department produces research output which is used by a non-academic audience, for instance dictionaries and lexicons. It also has projects which are applied directly in health care and cultural heritage institutions.

A number of colleagues publish in popular science journals. Some members of the Department are engaged in knowledge transfer through television, radio and other media. In the words of the self-evaluation document, this involvement 'is not so much a matter of explicit policy, as a deeply rooted shared conviction' of the importance of ensuring non-academic dissemination of research findings and of ensuring that this research has an impact on public debate. Because it is not part of a strategy, it appears to be left largely up to private initiatives as to what opportunities are taken for such dissemination and what resources (in terms of staff time) go into it. As the Department develops procedures for measuring research activity, it may also wish to take a more active overview of the interactions with society. Although research and knowledge transfer activities interact closely and are to some extent dependent on each other, they do also compete for the same staff time and a balance must be struck between them. Much of this output to the general public appears to stem from the general discipline knowledge of individual members of the Department, rather than from specific research projects. It would be good to see the connection between research and public dissemination made more directly.

Through the *Institute for Swedish as a Second Language* (ISA), the Department interacts with a number of public bodies to provide advice on government policy. However, no specific examples are provided of how this input has shaped national policy or provision, for instance in terms of a specific policy having been shaped by the work

carried out within the Department or of a member of the Department having been a member of a public body formulating policy or regulation. The Department provides Swedish language teaching and a number of research projects in this area are mentioned, but there is no explicit link between these projects and either research outputs.

1C.8 Gender and equal opportunity issues

There is a good gender balance among most groups of academic staff, except for a dominance of female registered PhD students (above 80%) and male professors (80%). Measures would need to be taken to facilitate a better gender balance at the senior (professor) level.

1C.9 Concluding recommendations

- That a Departmental research strategy is developed which sets out clearly and explicitly the expectations of research-active members of staff. We propose that all members of staff should be involved in developing this document to ensure broad buy-in, but we expect that the document would include:
 - a statement of the Department's expectations of an active researcher; this could involve reference to conference attendance, published outputs and grant application, for instance;
 - a system of support to help members of staff meet these expectations;
 - a strategy aimed at encouraging colleagues to publish research results in outlets where it can have the appropriate impact;
 - the introduction of training sessions dealing with topics such as the need for national and international impact, how to publish in high impact journals, and how to be successful in grant applications; separate sessions may be required for PhD students;
 - the introduction of a research mentoring system where more experienced colleagues support individuals trying to develop a higher profile in research;
- That a Departmental strategy is developed for the dissemination of research to non-academic audiences and that such activity is recorded appropriately;
- That a way is found of ensuring fairer distribution of research time, so that the amount of research time corresponds more closely with research activity than with rank. In order to avoid downward spiral effects, this should be combined with support for members of staff developing a research record after a time of less activity.

1C.10 Summary of assessments – the Department of Swedish

Research quality, productivity, uniqueness and relevance: *Good*

Organization and research infrastructure: *Good*

Collaboration and networks: *Good*

Future plans, potentials and possibilities: *Good*

PANEL 2 – NON-SWEDISH LANGUAGES AND LITERATURES

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2. THE DEPARTMENT OF LANGUAGES AND LITERATURES

2.1 Introduction and overall assessment

The Department of Languages and Literatures is the largest of the new departments that make up the Faculty of Arts at the University of Gothenburg. It carries out research and teaching in African, Asian and European languages and literatures, focusing especially on Bantu languages in African studies, Japanese and Arabic in Asian studies, and English, German, Classics, Romance and Slavic languages among European studies. (The exceptions are that there is teaching but no research in Chinese and Hebrew, and no undergraduate teaching in African languages.)

The present Department is the result of a merger of a number of separate departments into one as part of the reorganization of the Faculty of Arts that took place in 2009. The impetus for this was a need to consolidate specialties, as well as to streamline administration and balance budgets – several departments had been seriously in the red.

The time chosen for an evaluation has therefore not been optimal, as the new Head and Deputy Heads of Department have had to devote much of their time to matters of organization, administration and budgeting (and in so doing, have been highly successful). There has not yet been much time to develop and implement concerted strategies for future research, and it has therefore been a pleasant surprise to discover how much has already been achieved thanks to efforts by individual scholars as well as the department leadership. But challenges remain: creating a unique profile will not be a simple task, as there are other departments that also include literature, comparative literature and linguistics.

Based on our observations described in more detail below, we consider the Department *very good to excellent*, despite the evident constraints under which it is currently working.

2.2 Research quality, productivity, uniqueness and relevance

The number of research staff at the Department of Languages and Literatures has fallen dramatically: seven professors have retired in 2010, in addition to those who retired during the period of evaluation. This means that the Department has lost more than one third of its professors in one year, and that there are only 13 professors at the present time. Although there are now seven professors fewer than at the beginning of 2010, no positions have even been advertised. There are 25 senior

lecturers (*universitetslektorer*),⁶ with a basic allocation of 10% research time; this proportion is due to rise to 20%, but it has obviously not allowed a great deal of research activity. In addition to the tenured senior lecturers, there are some 16 staff members with temporary research positions, some of whom are senior lecturers and some of whom are research fellows (*forskarassistenter*) with four-year contracts. The number of doctoral degrees showed an impressive increase in 2007 and 2008 (16 and 14, respectively) but dropped to the more “normal” eight in 2009 – this may be related to the decrease in the number of doctoral students.

In a large department like this, it is obvious that quality will vary from one unit to another, and also between individual researchers. We judge the research quality as *excellent* or even *outstanding* in some cases, but mostly as *very good*. Very few could be rated as *poor*. We would particularly like to point out the excellence of work in English and German corpus linguistics, Slavic, Romance and African linguistics and Arabic studies, as well as in English, French and Spanish literature, and also in English, Spanish and Latin by outstanding young scholars. Other young scholars have also produced very promising work. There is very good work in German literature, and this is also very satisfactory with regard to quantity.

Productivity and quality are often linked, but not always. Some members of the Department have concentrated on having a large output but have not always maintained scholarly standards. In other cases low productivity is related to the demands of time-consuming projects or heavy investments of time in teaching and/or administrative work.

Overall productivity is reasonable. A superficial survey based on the bibliometric data supplied to us indicates that there has been an increase in the number of publications appearing in peer-reviewed journals, but the bibliometric database is often inaccurate, and a closer look shows that a high proportion of listed works is published in a local environment, in *festschrifts* or ad hoc publications without an international readership. This seems to be due to cultural and historical factors; the pressure to publish in peer-reviewed journals appears to have been low in some of the original departments. Another factor contributing to this could be the current assessment procedures for hiring and promotion, where individual works are judged on merit alone by an external evaluator, without regard to international impact.

Nevertheless, many researchers have secured a wide international audience, mostly by contributing to international peer-reviewed journals and in some cases having books published by prestigious international presses such as Mouton de Gruyter or Oxford University Press. However, we believe that the often excellent work done in the Department deserves more international exposure, and that researchers should

⁶ Figures for senior lecturers and researchers may not be exact due to some lecturers having temporary research grants and listings as both lecturers and researchers.

be encouraged to seek greater visibility outside Scandinavia. The work of editing digitally published journals (*Moderna språk*, *The Nordic Journal of English Studies*) carried out by department members already contributes to international impact.

The international exposure given to the time-honoured University *Acta* series will depend on inter-library exchange policies. This needs to be monitored in view of the present climate of cuts in library funding all over the world.

Many kinds of unique work are being done in the Department, at all levels. The threatened specialty of African linguistics is unique in Sweden, as are translation studies, trans-cultural studies and multilingual cultural studies. The research and teaching of Dutch should also be mentioned here.

Many researchers within the Department have also contributed widely to the popularization of their research fields in newspapers and magazines, etc., and have thus added to the general awareness and societal relevance of their disciplines. Department members have also produced textbooks in fields such as German literature and Dutch grammar.

As a whole, the Department serves present-day societal concerns very well – maintaining high standards in the study of non-European as well as European languages and cultures is a pre-requisite for Sweden's existence as a multi-cultural society in a globalized world.

Overall, we find the Department *very good to excellent* in the face of the radical reductions in staffing at the most senior levels that have taken place.

2.3 Organization and research infrastructure

It is remarkable how well the department leadership has managed to merge a panoply of different departments into a coherent whole in a short period of time, including bringing down the deficits of several smaller units. Our meetings with the Head and Deputy Head of Department were highly satisfactory and gave us a good sense of how well the Department now operates. Informal conversations with many individual members of the Department convinced us that there is a high degree of satisfaction with the present structure.

The physical facilities, individual offices, library resources (both within the Department and at the adjacent University Library) are outstanding. *Språkbanken* is a unique and invaluable resource.

We consider both organization and infrastructure to be *excellent*.

2.4 Collaboration and networks

The research problems experienced by the Department of Languages and Literatures at the University of Gothenburg are not different from those cropping up in Humanities departments throughout Europe and the US. Professors used to write articles and books, and their best students were accepted to work with them. Today's scholars must interact with colleagues from sister disciplines and work with specialists from abroad, publish in international journals, and their efforts must be relevant to society. We can no longer regard research as an independent or isolated activity.

The Department meets high expectations as regards collaboration and networks. There is a high degree of collaborative work inside the Department as well as with other departments, and there is international networking within each of the disciplines. Many department researchers have also been successful in acquiring external funding for their projects. Several of the networks are remarkable for their innovation and the development of new areas of research, such as the international project on Old Church Slavonic and Latin American cultural studies. Several researchers participate in inter-departmental work initiated by the Committee for Mediaeval Studies, such as the project on legitimacy and identity in the Middle Ages, which in turn has led to the University of Gothenburg becoming the Swedish participant in a Nordic project concerning the Nordic countries and mediaeval expansion in Europe. Furthermore, there are active contacts with the European network *Representations of the Past: The Writing of National Histories in Europe*, which is based in Manchester. The Faculty project *Cultural Borders of Europe*, with participants from the Department of Historical Studies and the Department of Literature, History of Ideas and Religion, must also be mentioned in this context, as must co-operation on corpus work with the University of Oslo.

Intra-departmental activities include joint seminars in linguistics, literature and ancient languages, the latter dealing with translations and versions of the Alexander Romance in Greek and other languages, as well as seminars dealing with editorial principles, editions being an important activity of the Department.

Not only is there one-way support from *Språkbanken* to the Department, but there is also collaborative work underway on the sustainable development and accessibility of linguistic corpora.

We rate the Department of Languages and Literatures as *excellent* with regard to collaboration and networking.

2.5 Future plans

Plans are in place to fill vacancies and bring the Department up to full numbers and strength. The goals and strategies for the Department research programme thus include maintaining the unique chair of African linguistics, which has been entirely funded by the Faculty. As the Department has already lost several professorships due to recent retirements, leading to substantial savings for the Faculty, there should be no problem in ensuring continued funding for the chair of African linguistics, as well as chairs in other subjects.

The Department has now been functioning for just one year, and efforts have had to be put into consolidation and organization. Due to the circumstances, no fully developed strategic plan is in place as yet, and we did not expect one. However, the energy and determination we have seen convince us that the Department will develop such a strategy and implement it in a satisfactory way.

We rate planning within the Department of Languages and Literatures as *very good*.

2.6 Future potential and possibilities

We find the potential of the Department of Languages and Literatures to be *excellent*. Our recommendation is that the Department should develop areas of study according to the new themes that different networks – intra- and interdepartmental – can produce, e.g. when a literary scholar interacts with a specialist in music and another in the history of architecture, they are bound to find new and complementary areas of research.

2.7 Research activity and teaching

Critical mass is necessary for conducting meaningful research. Especially in fields like classics and African languages, the new department organization has brought a great improvement because it facilitates interaction among researchers. Nonetheless, we wish to emphasize the need for maintaining core groups of scholars working in all areas. Great work has been – and is being – done in the writing of grammars of endangered languages.

2.8 Interactions with society

We found faculty members ready to interact with the surrounding Swedish society. The Department is not an ivory tower or an island of researchers – there is great awareness of the needs of a modern multicultural society. Many graduate students in English carry out research that is relevant to language teaching, an essential topic in a society like Sweden, where English is the dominant foreign language. Members of the Department also contribute regularly to newspapers and popular magazines, and, as mentioned above, textbooks and other pedagogical works are also published.

2.9 Gender and equal opportunity issues

Based on the situation at the end of 2010, the gender distribution is fairly even among professors and senior lecturers, with a slight majority of women. Among junior and temporary researchers with different types of employment, there is a strong dominance of women; only about 20% are men. The majority – about two-thirds – of currently registered graduate students are women, and one-third are men. From a traditional point of view, with a situation where women are under-represented, gender equality is not a problem in this department.

We raised the gender issue with some female PhD students, who were very satisfied with their situation. However, one might wish for more even recruitment among the sexes in future. Moreover, providing equal opportunities may become an issue in the coming decades, when students from new minority groups reach PhD level.

2.10 Summary and recommendations

We have found excellent infrastructure, very good to outstanding research in many areas, and a number of promising young scholars working in a vibrant atmosphere. The reorganization into a new department has been an overall success.

Recommendations for the leadership of the University of Gothenburg

The University of Gothenburg has the explicit aim of being a truly global institution. However, it is our impression that the humanities are not considered central to this goal – thus the importance of a vibrant Department of Languages and Literatures, and of cultural studies in a wider sense, has not been stressed in the published strategic plans for the University. This is a dangerous oversight – a basic knowledge of English will not take you everywhere. It is necessary for a nation that wants to assume a global responsibility to have an awareness of foreign cultures that can only be guaranteed with the level of cultural knowledge that comes with cutting-edge research and dissemination of results.

This has now also been formally recognized in the recent revision of the Swedish Constitution recently passed by Parliament. Sweden's membership of the European Union is now part of the Constitution, and Sweden is officially declared to be a multi-cultural society. The consequences for research and education are obvious: research and teaching of non-Swedish languages and literatures must be strengthened at all Swedish universities, and must be assured the requisite funding. Social change and attitudes to foreign cultures can only be achieved via deeper insights and their dissemination. The excellent work carried out within the Department can serve as a foundation, and should be rewarded and supported by society and by the University's leadership. A major investment in research of the kind carried out at the Department is a must for a university that has higher aspirations than being a polytechnic institute or college.

Recommendations for the Faculty Board

Even before the formation of the Department of Languages and Literatures, the individual departments that now constitute the Department have been severely depleted by the non-replacement of retired full professors. Three chairs of English and one each in German, French and Russian have not been advertised, and in the past semester, the chair of African languages, which had been advertised and for which two candidates had been short-listed, was cancelled. (This is all the more remarkable as the Faculty had already made considerable savings by not appointing new professors of European languages and the chair had been approved by the previous Dean.)

Not only do African language studies at the University of Gothenburg hold a unique position in Sweden – the University is the only Swedish university where this branch of language studies exists – but there have been excellent results and publications by both the outgoing professor (top-ranked by specialists worldwide) and other researchers, including doctoral students. Innovative work in the description of previously unrecorded languages is currently being carried out by doctoral students. Sweden spends vast amounts of money on development in Africa and cannot afford to lose this unique professorship devoted to the languages of this continent.

It is equally necessary to find replacements for the recently retired professors of European languages. It is a myth that efficient communication can be totally ensured by English – the other EU languages and cultures, as well as Slavic languages, are also needed for international understanding. As regards English, a high standard must be maintained, considering its position in the world and in Sweden. In the ancient languages, productive temporary staff should be given permanent positions and a new appointment should be made in the area of Classical Greek language or literature to further strengthen this already strong field and to broaden its range (within an established spectrum from Republican Rome to Byzantium). We urge the Faculty Board and the University leadership to channel the funding necessary to reach and maintain high standards to the Department.

It has become clear that communications between the Dean's Office and the Department of Languages and Literatures have not been optimal. It is absolutely essential that decisions by the Dean and the Faculty Board are not made without prior consultation with the Department. The Dean is responsible for improving communications.

Recommendations for the Department

The Department needs to pursue the innovative approaches that have already been undertaken and develop a strategic plan for the future of the Department. This

should obviously involve filling the vacancies at professor level, as well as apportioning existing funding and supporting and coordinating plans for external grant applications. It is of the utmost importance that these vacancies be filled by advertising the positions nationally as well as internationally.

Freeing the unused research potential of university lecturers is also an important task which will involve efforts in terms of the organization of teaching at all levels to create substantial blocks of time enabling scholars to pursue their goals. Assigning financial support will require transparency and impartiality.

The department leadership must also monitor research activities and encourage international dissemination of results. We see a need for an annual review of each researcher's production and productivity, as well as supervision of input to the University Library's bibliometric database. It is important that scholarly work be published in international peer-reviewed journals or, in the case of monographs, by well-regarded publishers or in renowned series with a wide distribution. In cases where slowness or a lack of publications is due to the significant and time-consuming nature of research enterprises, we recommend interim publication to strengthen the profile of the Department. Publication in newspapers, magazines or other local periodicals should be reserved for works that aim towards popularization and interaction with society – and there, of course, it is essential.

Although this is not officially part of our assignment, we also wish to stress that continuity between undergraduate and graduate levels of education is essential. The Bologna educational plan emphasizes combining research and teaching, and actually mandates that students participate actively in the acquisition of knowledge and learn to critically analyze the wealth of information available. Implementing this is also likely to lead to the recruitment of graduate students and further strengthen the Department.

2.11 Summary of assessments – the Department of Languages and Literatures

Overall assessment: *Very good to Excellent*

Research quality, productivity, uniqueness and relevance: *Very good to Excellent*

Organization and infrastructure: *Excellent*

Collaboration and networking: *Excellent*

Future plans: *Very good*

Potential: *Excellent*

PANEL 3 – CULTURE, RELIGION AND HISTORICAL STUDIES

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INTRODUCTORY REMARKS

Panel 3 for the University of Gothenburg RED10 project recognizes the importance of the principle of a research evaluation exercise. Many of its members have participated in comparable exercises elsewhere, and they believe that such an evaluation of research quality offers important guidelines for future university developments. In the evaluation context, the special conditions for the humanities are, however, usually not taken into account. Departments in the humanities build on very strong disciplinary traditions that do not easily merge together in new administrative units. To assess multidisciplinary departments sometimes implies combining excellent disciplinary outcomes with weaker ones, resulting in more or less empty overall assessments. Given this situation, it is important to regard the mission of the humanities in their entire context, since their scientific utility is often systematically underestimated. In addition to research, the education of future generations

of scholars and professionals and the participation of intellectuals in public debate, and in developing cultural and social conditions for citizens, are crucial tasks. The University of Gothenburg can consider itself lucky in hosting such a wide variety of different research areas in the humanities that are able to contribute to the scientific community as well as to society at large.

We agree that the contributions and the reputations of universities also reside in nurturing intellectual freedom, stimulating innovative and blue-sky research, encouraging unorthodox thinking and fostering the debate between academia, civil society and politics/government. A narrow focus on metric data, an overemphasis on benchmarking and a concern with economically measurable indicators are dangers that are implicit in each assessment exercise relating to the humanities, which above all are meaning producers. In a wider cultural context, we believe it is imperative to keep the role of universities as leading centres of intellectual life at the forefront. This means, among other things, that our assessments are guided by a concern for maintaining, fostering and nurturing speculative thinking, advanced academic research, a vibrant intellectual environment for both teachers and students, and the degree to which the intellectual life of the University interacts or articulates with other sections of society.

In summary, universities are and should be centres of intellectual excellence, debate, disagreement and the exploration of novel ideas, the different, including the uncomfortable, the disagreeable, and even the marginal. We therefore believe that the mission of research assessments is not solely to identify what constitutes success (or the opposite) in narrowly defined terms, but also to ensure that the intellectual mission and the intra-university role of departments is strengthened for the future. We see particular potential in cooperation between the humanities and other fields of knowledge. We suggest that such interdisciplinary research and cross-faculty cooperation are further strengthened to ensure these goals are met. Innovation might occur if new research areas are allowed to emerge, are recognized and are nurtured across present boundaries.

One of the present problems seems to be the lack of clearly defined and transparent reward structures within the departments, for example, in relation to a conscious publication strategy. We believe it is important to explicitly support and reward publishing activities through a coherent incentive structure that not only rewards participation and contributions to international scholarly discussion and research activities, but which also offers incentives for contributions to the development of the humanities in Sweden. It is equally important, in our opinion, to offer benefits for efforts to expand intellectual debates in Sweden in the Swedish language, for example through textbooks, and to reward successful endeavours to transmit Swedish research findings to the international arena. We suggest that departments consider

actively enhancing the cooperation with neighbouring departments, making strategic choices to promote dynamism, innovation and excellence in their respective fields. A deliberate policy could also reveal any over-emphasis on provincialism which otherwise might be a risk.

During the site visit in which the chair and vice-chair of the panel took part, some more general problems for Gothenburg research and Gothenburg scholars became clear. For example, it seems as if very few efforts have been made to overcome the so-called “leaking pipeline”, which results in the loss of female scholars in the trajectory between PhD and professorial level. Women only made up the majority of senior staff in one of four departments. It was disappointing that departments did not address this problem in their self-evaluations. In general, the site visits gave the chair and vice chair a more positive view of the research taking place at the departments than reading the documents alone.

Another problem relates to the absence of conscious recruitment policies when professors retire (or leave their positions). It appears that the need to recruit new professors to substitute those that no longer work as professors in the department is too often disregarded. This happens when some senior scholar who has been promoted to the position of professor works in the department, or when there are hopes that some of the senior scholars will soon be promoted. Although the system of promoting senior staff to the title of professor is most welcome on an individual level, and in spite of its obvious benefits for women, we are convinced that the future of the departments cannot rely on promoted professors, who are appointed without competition and without international comparison. We see the lack of recruitment of new professors as a particular problem for the Department of Cultural Sciences.

In some areas of research, individual research tends to be favoured rather than collaborative research or team-based projects. Although we recognize the fact that individual scholarships might be appropriate for many types of research, the significant absence of collaborative research is a problem that needs to be addressed. In particular, international joint research and cooperation customarily leads to higher impact through international publications and heightens the international visibility and recognition of Gothenburg’s research capabilities. It is recommended, therefore, that the departments evaluated by this Panel make a substantial effort to integrate their research agendas in wider cooperative research programmes. Efforts of this kind would also improve long-term planning which, in some cases, could be more elaborate than shown in the self-evaluations. Such initiatives merit efficient support at all administrative levels of the University.

In many cases we found a lack of orientation towards the future, which partly explains why so many departments in Panel 3 have presented less than convincing fu-

PANEL 3 – CULTURE, RELIGION AND HISTORICAL STUDIES

ture plans and visions. However, we also recognize that this is the very first research assessment exercise carried out by the University of Gothenburg, which explains the lack of familiarity with the kinds of documents that need to be provided in a short time period.

In the following reports on the departments (three from the Faculty of Arts and one from the Faculty of Science), it is important to recognize the heterogeneity of the assessed units in a number of dimensions: size, age, composition of staff, research profile and position within the research community. Some departments are rated very good or excellent in only a few parameters. For example, the Department of Conservation is excellent in uniqueness and relevance, the Department of Historical Studies is very good in research quality and organization, and the Department of Cultural Sciences is good in terms of individual networks and shows very good interaction with society; however, the Department of Literature, History of Ideas and Religion reaches the level of very good or excellent in all parameters. Within the departments, cultural heritage, built environment, rock carvings, older history (e.g. medieval), musicology, gender studies, religion and history of ideas are areas with good potential.

The research area of gender studies has particular potential, because within all the departments that we assessed, gender studies stands out by demonstrating especially high quality, good networking and innovation. We recommend that the University takes advantage of this potential. One possibility is to gather all gender studies scholars under the same umbrella as a separate research and teaching unit or department. This would, however, undoubtedly make the units and departments from which these scholars are taken less interdisciplinary, and would have an adverse impact on the opportunities for mainstreaming gender perspectives into other disciplines. Another possibility is to support the cooperation between gender scholars in a more informal way, retaining their positions at the original departments, but assuring them enough resources to make indispensable cooperation flourish. Among the decisions that Gothenburg University needs to take, we foresee measures that significantly enhance Gender Studies. For a large, unified Gender Studies teaching and research unit to make an impact (with possible co-operation with the Swedish Secretariat for Gender Research) it is of outmost importance that the scholars involved see greater opportunities in mutual cooperation than staying at their department of origin. We therefore suggest that the gender studies community at the University of Gothenburg is given the opportunity to present its visions before a final decision is taken.

The announcement to chairs and vice chairs that another committee is assessing structural and administrative parts of the University was met with great surprise. The departments being assessed by Panel 3 have merged very recently, and cross-

disciplinary research can hardly be found to a great degree at this early stage. We find that the recently merged departments definitely need more time to find their profile.

The Department of Cultural Sciences is, however, not functioning well in its present form. This is partly due to the fact that eight different disciplines have been forced to merge, partly due to the short time that has elapsed since the merger on 1 January, 2009, and partly due to the lack of leadership observed during the site visit. Some solutions are offered in the specific report on this department. The Department could be given considerably more time to find a strong core for teaching and research, or the possibility of splitting it into two different departments could be considered. Which solution is best depends on how the Department itself and the University see the potential that the Department offers, in spite of the low assessment.

3A. THE DEPARTMENT OF CONSERVATION

3A.1 Overall assessment

Conservation was established as an independent discipline by the Faculty of Arts in cooperation with the Faculty of Science in 1991. It was transferred to the Faculty of Science in 1992/93. The crafts education programme in Mariestad was brought under the framework of the University in 2004. The Department of Conservation with its present profile was established in 2006-2007. The Faculty of Science identified the Department as a profile area for research and education at the University of Gothenburg. During this time, the Department has shown ambitious efforts to develop its training programmes into academic paths with considerable scientific impact.

The research production of the Department, however, is relatively low and mainly directed towards a national research audience. The area of built cultural heritage produces good research of high quality, but lacks international publication. Although internationally recognized researchers are found among the academic staff within the conservation of cultural heritage objects and technical material studies, this area is characterized by a level of research production that is too low. In addition, despite the existing good opportunities for international collaboration, this area has very little international involvement in terms of formal research projects. The new field of craftsmanship science still seems to be at the stage of initial devel-

opment. Despite this, there is a definite basis for developing this area – as well as the Department as a whole – into a significant actor on the international research stage. However, this requires that a clear profile for crafts research relating to other research areas is defined, together with the full exploitation of the research potential in all areas, including a balanced input of staff and financial resources.

In general, the self-evaluation report is good, but unfortunately the weaknesses mentioned are not being dealt with. It is recommended that the Department adjusts its plans, strategies and investments for future research development in order to improve the conformity of these with the defined relevant interdisciplinary research profile.

3A.2 Research quality

The research profile of the Department of Conservation is defined as problem-based, interdisciplinary and expressly contextual subject studies. The field studies include a wide variety of cultural objects, from individual artefacts to entire collections, from buildings to neighbourhoods, and from gardens to landscapes. The primary knowledge area is said to be delineated by the concepts of “material culture” and “conservation”. However, high quality, convincing research is found only in the area of building and urban studies. Although the research in this area is rather local and national in nature, it is of a quality that deserves a higher degree of international publication.

The research in the field of Conservation of Cultural Heritage Objects seems weaker. Of the selected two most important publications, only one is a peer-reviewed article at international level. However, it represents only part of the research expertise within the Department. Further publications of the same quality should be expected in the nearest future. The peer-reviewed article selected by the Department to be of particular importance was published in a highly respected journal within the field of conservation. However, it can be characterized as a mainstream report on preliminary experimental research in a field that has been the subject of many studies, international projects and publications. Moreover, the publication does not represent a project by the Department of Conservation, but a project in which the Department is a partner contributing to only part of the work. This indicates that research in this field at the University of Gothenburg is still developing. However, there is the potential for the Department to play a more leading role as the researchers are internationally recognized experts in their fields.

The new area of Gardens, Landscapes and Craftsmanship is still a young research area, and it is too early to expect high levels of research activity of international quality. The fact that the research and practice in the two main areas of research at the Department (Built Environment and Conservation of Cultural Heritage Ob-

jects, including technical material studies) are internationally well developed and have contributed to high quality research in, for example, studies of historical crafts methods and techniques, means that there is also experience and expertise present which can support the development of the area of Gardens, Landscapes and Craftsmanship. However, this requires a better integration of the Department's three areas of research of (Conservation of Cultural Heritage Objects, Built Environment and Craftsmanship) with a clear profile of the crafts area towards cultural heritage. Moreover, this also requires that the research should be based on well-balanced, more sufficient research activities in all three areas, including a higher degree of international involvement and collaboration.

Assessment: *Good*

3A.3 Productivity

According to the self-evaluation, the Department has produced a total of 0.8 publications per full-time equivalent (FTE) researcher in 2004 and 2.2 publications per FTE in 2009. The publication data is influenced by a relatively high contribution under the categories "Monograph, book" and "Journal/newspaper article" for the years 2007 and 2009. Unfortunately, no information on the type (scientific, textbook, etc.) of publications in the category "Chapters in monograph, book" is given. Excluding this data from the statistics, the development in production shows a continuing increase over the period. The development levels off during the last three years, indicating stabilization at around 35 publications per year.

The Department has contributed a total of 46 peer-reviewed scientific papers, of which 22 are journal articles. In addition, four doctoral theses have been produced. There has been a growth in the number of peer-reviewed scientific journal articles per year since 2006, and conference papers have risen from zero in 2004 to a stable figure of around six per year from 2007 onwards. In 2009, the calculated FTEs devoted to research, including PhD students, was 13.6. In 2009, the total number of peer-reviewed papers (no doctoral theses were produced) was 13, corresponding to 1.0 per FTE devoted to research.

70% of the publications have only one author, and 2% are interdisciplinary publications published in collaboration with an author outside the Department but within the Faculty. 2% are interdisciplinary publications published in collaboration with an author outside the Faculty but within the University. This contrasts with the Department's statement and aim that its research profile should be multidisciplinary and interdisciplinary, and that it conducts its research along thematic cross-disciplinary lines. Moreover, only 14% of the refereed journal articles are published in collaboration with at least one author outside Sweden. Additionally, only relatively few foreign journals and publishers appear on the lists in the self-evaluation

report. Participation in reviews and editorial work are important contributions to the research society and reflect, when they are invited by the international society, recognition of the researchers and their work.

Assessment: *Good*

3A.4 Uniqueness

There is good potential for developing unique research at an international level, provided that the Department of Conservation develops the interdisciplinarity and collaboration that it aims for between the three main areas of research: Craftsmanship, Cultural Heritage and Built Environment. However, this requires the definition of a clear profile for Craftsmanship research that relates to the two other research areas and the full exploitation of the research potential in all three areas, including a balanced input of staff and financial resources.

Assessment: *Excellent*

3A.5 Relevance

The research profile and the actual research produced are highly relevant, both in relation to the educational programme and to society. A higher degree of international involvement would be of benefit to both the Department as well as to national and international research.

Assessment: *Excellent*

3A.6 Organization and research infrastructure

The placement of the Department of Conservation within the Faculty of Science seems logical in view of the methodological nature of the field that draws on science and technology. Moreover, the more humanities-oriented research and the crafts studies, which constitute important and necessary parts of the education and research, seem to be well integrated and in balance with the technical aspects of the Department's activity. The organization and research infrastructure seem logical, functional and effective.

However, it seems clear that resources, particularly in the area of Conservation of Cultural Heritage Objects, in the form of finances and staff, including support for the PhD programme, need to increase in order to bring the research quality and production to a higher level. Moreover, efforts in helping the Department achieve more active international research cooperation would probably result in improved access to external funding.

Assessment: *Very good*

3A.7 Collaboration and networks

The Department of Conservation finds it strategically important to develop collaboration and networking, and aims to achieve synergies between undergraduate teaching, research and professional practice. To fulfil these aims, the Department has ongoing contact with heritage professionals, conservators, architects, carpenters, gardeners, and other specialists from the public and private sectors. Moreover, this provides the Department with access to equipment, expertise and “real life” projects, and leads to collaborations with numerous regional and national institutions, authorities and foundations. In relation to its size and resources, the Department’s regional and national collaboration activities are very good. On the other hand, the self-evaluation report does not mention international research collaboration, although several of the Department’s research publications include international co-authors. This exposes a weakness in the Department’s research strategy. The dearth of international collaboration is not included in the SWOT analysis, although it does mention a “small research environment” as a weakness.

Experience shows that international cooperation, e.g. in European research projects, can compensate for the small research environment and can contribute significantly to the critical mass of collaborators. It reflects a defensive attitude that, in the SWOT analysis, the Department identifies the fact that “network contacts can undermine academic independence” and “dependence upon contacts with the outside world” as weaknesses only.

Assessment: *Good*

3A.8 Future plans

The Department has selected “Craftsmanship research” as the most promising research area. The goal is to make the area scientifically legitimate and productive, and to bring the Department international recognition as a centre for scientific craftsmanship research. The research is described as: “hands-on experimentation undertaken by craftsmen, rather than theoretical research...” It is well recognized that this research area is problematic and not recognized by the scientific society, and the Department has not yet received funding from the major research foundations. There is no doubt that the Department is advanced within crafts research. However, it is less clear whether this includes the direct management and control of scientific development or whether it is a specialization that leads away from scientific research. Obviously, crafts require considerable knowledge and competences. On the other hand, it is doubtful whether crafts should be paralleled with science (cf. the question on performing arts and research). The clear non-theoretical approach is especially worrying, as it implies a romanticizing of crafts. It would be interesting to study crafts from a more philosophical perspective as a kind of silent or practical skill that cannot be articulated in a simple way. However, this is not in-

cluded in the description and emphasizes the need for a more clearly defined profile of this area. This should include a better harmony and balance with the other areas of the Department to meet the plan to “Develop a distinctive profile in research by focusing the application and integration of disciplinary and professional knowledge in cultural heritage conservation”.

The self-evaluation report does not clearly state how and what resources are necessary to bring the area of Conservation of Cultural Heritage Objects to an international research level (this weakness seems to be ignored in the report), as well as making the PhD programme more effective (apart from a plan to bring in more PhD students) in general.

Assessment: *Good*

3A.9 Future potential and possibilities

Assuming that efforts and resources are put into a better balance in the research activities of all three main areas, and that the crafts area is developed in accordance with the intended research profile, the potential and opportunities for the Department to contribute to international development and research in the area are good.

Assessment: *Very good*

3A.10 Research activity and teaching

The objective of the Department of Conservation is to train researchers and professionals both to plan the built environment and to work practically with the conservation and development of cultural heritage. Most research within the Department has been conducted in the two subject area groups of Built Environment and Conservation of Cultural Heritage Objects. The self-evaluation report states that the educational programmes are based on real-world situations, using “problem-based learning” in which students move between problem solving, study and reflection, with the addition of scientific literature and problems that require research. This is supported by the description of the course programme on the Department’s website.

Assessment: *Good*

3A.11 Interaction with society

The Department of Conservation features close interaction with regional and national institutions, public bodies and other relevant actors in a broad sense. However, the Department’s international interaction could be improved.

Assessment: *Above* (national) and *below* (international) the expected level for the field in question – could be improved

3A.12 Gender and equal opportunity issues

The academic staff includes too few women, although there are many female doctoral students, which may lead to a better gender balance in the future.

3A.13 Summary of assessments – the Department of Conservation

Research quality: *Good*

Productivity: *Good*

Uniqueness: *Excellent*

Relevance: *Excellent*

Organization and research infrastructure: *Very good*

Collaboration and networks: *Good*

Future plans: *Good*

Future potential and possibilities: *Very good*

Research activity and teaching: *Good*

Interaction with society: *Above* (national) and *below* (international) the expected level

3B. THE DEPARTMENT OF CULTURAL SCIENCES

3B.1 Overall assessment

It is difficult to make an overall assessment of the Department, since the new structure, which has totally changed the administrative framework of the disciplines, has been in place for only one year. The merger of Art History and Visual Studies, Cultural Studies, Ethnology, Film Studies, Gender Studies and Musicology took place at the beginning of the 2009. As noted in the self-evaluation, the implementation of the new structure has required considerable staff resources. After the site visit, it became clear that the subjects are starting to form links with each other and create research programmes. The number of professorships in the Department has decreased dramatically during the last year due to retirements. However, the positions will be filled over the course of the next few years, mainly through the system of upgrading, which we do not regard as recommendable.

The structure of the Department must be regarded as the given administrative point of departure for the academic work. It seems meaningless to maintain the Department in its present form if it is only to function as an administrative framework. The self-evaluation clearly shows that the management of the Department has so far taken a fairly sceptical attitude to this task, without indicating possible academic

or structural alternatives to the Department's present form. The perspectives outlined for implementing academic cooperation between the Department's subjects are extremely vague, except for some joint seminars and some indistinct plans for common research applications. The focus in the self-evaluation lies on describing the development of the individual disciplines. This is done absolutely satisfactorily, with excellent accounts of cross-disciplinary cooperation between the subjects. The problem is the total absence of an overall vision for the development of the Department as a unified, scientific unit. We regard this also as a leadership problem.

In the next few years, it will be absolutely essential to put a great deal of energy into creating academic cooperation between the Department's subjects. This could, for example, be done by putting together a common, extensive research project, which would involve researchers from all the Department's disciplines (and relevant external colleagues, naturally) with the aim of preparing an application for significant project funding. A suitable point of departure for such a common project could be to determine the Department's own understanding of the concept "cultural studies". It would be very important to give the Department's own version of cultural studies in relation to earlier schools in the field, e.g. the Birmingham School of Cultural Studies, which also had researchers from different disciplines, such as studies in media, semiotics, youth research, sociology and anthropology. By using such a model, it would also be possible to approach a definition of the academic identity of the Department as a whole, which is missing from the self-evaluation. A starting point might be a common research programme in the Department's core areas, which we have identified as Gender Studies, Urban Studies and Contemporary Culture.

In any event, enhanced efforts are needed to attract external funding for the Department. This should, of course, also take place in connection with the researchers' participation in cross-departmental projects.

Resources must be assigned to the preparation of project applications. But as stated above, the site visit gave the impression that researchers in the different fields are starting to form links with each other and create joint research projects.

3B.2 Research quality

The Cultural Sciences self-evaluation rightly points to the fact that it is not possible to present a comparative evaluation of the research carried out at the Department as such, since it does not resemble other departments due to its unusual combination of disciplines. There are several multidisciplinary departments at the University of Gothenburg, but the combination of subjects is less natural in this Department compared to, for example, the Department of Literature, History of Ideas and Religion. It would be necessary to re-evaluate the Department of Cultural Sciences after a longer period than one year.

The published research has been carried out within the previous structural framework. Therefore, no “departmental research” is produced, but instead research is produced within e.g. film, gender and ethnology.

Within each of the subjects, excellent research is produced (for example, in Musicology, Urban Studies and Gender Studies), but not much that extends beyond the national borders.

It is regrettable that the Department has not made an effort to minimize the numerous mistakes in the bibliography. In addition to simple misprints, there are double entries, incorrect categorizations, strange use of the criterion “peer review” (e.g. used for a contribution to a Festschrift), missing page and editor information, etc. The bibliography gives the impression of lacking a sense of scholarly accuracy.

Assessment: *Good*

3B.3 Productivity

The number of publications is large, but the bibliography does not make it possible to ascertain how much constitutes actual personal research and how much is of a more secondary character. Some of the entries in the bibliography are clearly irrelevant pamphlets, prefaces and the like. Nor is it possible, based on the bibliography, to form a picture of the Department’s possible production of textbooks and other teaching material. Researchers from the different subjects publish textbooks, and some of these textbooks are published in new versions.

A controllable criterion for measuring the extent of the Department’s *scientific* production could be to compare the number of peer-reviewed articles with the number of professors, lecturers and researchers. In 2009, there were 29 persons employed in these three categories. 19 peer-reviewed articles were published in that year. This is not a very high output, but is relatively satisfactory. The number of monographs is large, and the same goes for popular articles and articles in newspapers. Although the bibliography lists all single publications in one category, and does thus not give a picture of the actual scientific production, the amount of published work is satisfactory.

Assessment: *Good*

3B.4 Uniqueness

This assessment on uniqueness does not relate to the whole department, but is based on individual publications, particularly within Gender Studies and Musicology. The reason why the assessment is not higher is that only a small number of publications have been published internationally. Although the Department has a

unique combination of disciplines, it has not been able thus far to make the best use of its potential.

Assessment: *Good*

3B.5 Relevance

If only the Swedish-speaking cultural area is considered, the assessment should be higher, but there is no significant international impact (perhaps with some exceptions). It is striking that almost only Swedish-speaking channels are used for publication. When it comes to the relevance for Swedish society, we would say that the Department comes much higher on the scale thanks to the close cooperation with institutions such as museums and commissioned publications concerning the development of towns or cities.

Assessment: *Good*

3B.6 Organizational capacity

The organization is perhaps efficient and economical at administrative level, but seen from the needs of research, it does not – at least at present – appear appropriate. It seems that the managerial resources focus on the individual disciplines and their cooperation projects, while larger research projects seem not to be prioritized. As previously pointed out, what is missing is an overall aim for all cultural sciences. What is specific to cultural sciences at the University of Gothenburg?

The self-evaluation does not specify the Department's relationship with the newly established "Centre for Urban Studies". It is possible that a common budget and common planning are necessary in order to achieve synergy effects.

Assessment: *Poor*

3B.7 Collaboration and networks

All researchers participate actively in networks, seminars, conferences, etc. The number of contributions to these is satisfactory. The Department features active cooperation with other departments at the University of Gothenburg. Quite rightly, the Department frequently also invites prominent foreign scholars.

The focus of the scientific cooperation is on Swedish structures (with single anthologies, which have brought together researchers from various Swedish universities), but there is also a very satisfactory level of participation in international research cooperation (for example, in the form of seminars). The researchers are included in good international networks. It is, however, noteworthy that there are few long-term study periods abroad.

Assessment: *Good*

3B.8 Future plans

It is sensible to continue supporting fields where there is already strong research activity. The description of the development opportunities for the individual disciplines is both detailed and convincing. The self-evaluation does not, however, include any vision of the development of the Department as one academic unit. There is, for example, a plan to develop two projects within film studies, and the self-evaluation also speaks of researchers in the Department having joint research applications. These undoubtedly have good cross-departmental potential, but the presentation is too short to judge whether there are realistic opportunities for these plans to be realized. The issues include how the research impact of such projects is ensured. There is a balance between refining each of the disciplines and establishing common projects for all subjects represented at the Department. Both are necessary in order to ensure academic impact and the legitimacy of the juxtaposition of subjects.

Assessment: *Poor*

3B.9 Future potential and possibilities

It is obvious that Gender Studies is the Department's strongest subject. The Department also wishes to become the new base for a planned Centre for Gender Studies, which could bring together gender studies scholars from different departments. This plan may bring significant opportunities.

There are also particular development possibilities within musicology, and the project on urban development seems to have considerable potential. Some of the most productive researchers within youth studies and gender studies are, however, no longer employed at the Department. This has resulted in a decrease in research resources. It is quite worrying that this obvious lack was not foreseen in the self-evaluation. As the number of professors has decreased from nine at the time of the self-evaluation to three or four at the time of the site visit, the Department is in real trouble. Immediate action is needed if future potential and possibilities are not to be jeopardized.

Although it will be necessary, as mentioned above, to make a special effort to develop actual departmental research, it is obvious that the many good individual projects, which thrive at the Department, should continue to be given a good framework for further development in future.

3B.10 Research activity and teaching

The structure of the Department makes it difficult to establish a scientific connection between undergraduate university education and the Department as a schol-

arly unified unit. The experiment with a programme in “heritage studies” should be promoted as an example of interdisciplinary education based on research.

An important way of creating a connection between research and the degree programmes is the researchers’ production of text books and other teaching materials. It is mentioned in the self-evaluation that researchers from all disciplines publish text books, but we do not have a complete overview of these. The bibliography does not list this type of publication separately.

3B.11 Interaction with society

The Department has published several publications directly intended for society, and general dissemination activities, for example in newspapers, are extensive.

Assessment: *Very good*

3B.12 Gender and equal opportunity issues

The self-evaluation does not comment on this point. The material submitted does not indicate any specific problems in this area. A gender balance among the permanent employees can be noticed. However, the few purely research-oriented positions are mainly filled by women.

3B.13 Summary of assessments – the Department of Cultural Sciences:

Research quality: *Good*

Productivity: *Good*

Uniqueness: *Good*

Relevance: *Good*

Organizational capacity: *Poor*

Collaboration and networks: *Good*

Future plans: *Poor*

Interaction with society: *Very good*

3C. THE DEPARTMENT OF HISTORICAL STUDIES

3C.1 Overall assessment

The Department was formed in 2009 and consists of three different subjects (Archaeology, Classical Studies and History), each with its own traditions and research profiles. Considering the total number of academic staff (34) and doctoral students (14), the number of research areas seems rather large. This applies in particular to Classical Studies. In order to attain the goals of the University strategy and obtain research of the highest international standard, we recommend that the Department focuses on a smaller number of research areas. Seen from a national perspective, most universities would benefit from a higher level of specialization within their smaller subjects. It is notable that, for the period 2004-2009, the Department hired no new employees at all among its academic staff. The Department has decided on a strategic plan with measures taken to support research and internationalization.

3C.2 Research quality

The Department produces very good quality research. In several subject areas, the research has a very strong or leading position in Sweden. This applies in particular to research within the following areas: rock carvings and the Bronze Age, heritage studies, medieval history, regional history, gender research, and Cypriot and Latin American archaeology. In some of these areas, the research no doubt also has an international impact.

Considered as a whole, however, a rather high amount of the Department's research is published in Swedish, and is therefore inaccessible to an international circle of readers. Of the 15 journals most frequently used for publication, 13 are Swedish, one is Norwegian, and one is Dutch. The second most frequently used journal is 'Arkeologen', a kind of student forum published by the Department itself. An important goal for the future should be to publish more frequently in international peer-reviewed journals. A step in this direction is that resources have been allocated in the Department's strategic plan for the revision of foreign language texts, and that all lectures/researchers are encouraged to participate in international conferences.

At present, the research quality at the Department as a whole is considered to be 'very good'. With a focus on a smaller number of research areas and more international publishing, the conditions for achieving a higher rating in the future would be very good.

Assessment: *Very good*

3C.3 Productivity

The Department has a good level of productivity with around 640 registered publications listed for the six-year period 2004-2009. The academic staff during this period has varied between 44 (in 2004) and 34 (in 2009) people, and the number of doctoral students has varied between 11 (2004) and 14 (2009). This means that every academic employee or doctoral student has, on average, published 1.9 – 2.2 publications a year, including all types of publications.

As is common within the humanities, quite a lot of the publications consist of monographs, which means that they represent a large amount of research compared to short articles. There are, however, also a lot of short articles, reviews, reports, etc. found in the publication list.

For the future, it is desirable to increase the number of publications in international peer-reviewed journals.

Assessment: *Good*

3C.4 Uniqueness

The three subjects (Archaeology, Classical Studies and History) share interests in some research areas, the most important of these being heritage studies, archaeology and gender research. The work taking place within the interdisciplinary and interfaculty project ‘The Heritage Academy’ seems particularly promising. It has the potential both to be nationally leading and to attract international attention. Gender research has a long tradition at the Department, as well as within the University as a whole. This is an important area of research, while not being nationally or internationally unique.

The University of Gothenburg is particularly well suited for research into rock carvings (cf. the University’s emblem) and the Bronze Age. This is not only because of the world-famous rock carvings in the region (typified by the World Heritage Site in Tanum), but also because of earlier research work at the Department resulting in expertise of the highest international standard. This research area is further strengthened by the externally funded national database which is currently under construction. The contemporary use of rock carvings as cultural heritage bridges this research area in a way that is beneficial to the interests of ‘The Heritage Academy’.

Within the subject of History there is a strong tradition of studying medieval history and regional history. Both these traditions are of very good quality, but would benefit from more international publication and a wider geographical perspective.

The focus on regional history has its equivalent in many other countries, and this would certainly be worth some problematization and theorizing.

Within Classical Studies there seem to be almost as many research areas as academic scholars. This division between interests means that it will be very difficult to obtain the highest international research standard in any of the departments. Even though a lot of the research is, as a matter of course, conducted in an international context, this does not automatically feed back to the Department as a research environment. It seems that some kind of national strategy is needed for the subject of Classical Studies at Swedish universities.

Assessment: *Very good/Good*

3C.5 Relevance

Seen as a whole, the relevance of the scientific work carried out at the Department is very good. Once again, ‘The Heritage Academy’ and Gender research are worth mentioning in particular, since they so obviously relate to important issues in both scientific research and public debate.

Regional history is a research area that is of public interest within the region itself, and of principal interest within the European Union, where the importance of regions is expected to continue to grow at the expense of nations. Regional history could also be of interest within a socioeconomic context and the realm of ‘storytelling’. This opens up new possibilities for interdisciplinary and interfaculty research.

Assessment: *Very good*

3C.6 Organization and research infrastructure

The organizational structure of the Department is clear-cut and functional. The strategic plan has resulted in several important improvements in research infrastructure.

Frequent and well-attended (including by the professors) research seminars are of the utmost importance for a creative research environment. Several different research seminars are held at the Department, but it is not entirely clear how these live up to these ideals. There is no information in the form of schedules for the seminars to be found on the Department’s website (read on 14 September). This is particularly problematic in relation to the general doctoral seminar and the subject-based doctoral seminar.

Assessment: *Very good*

3C.7 Collaboration and networks

The Department collaborates extensively at different levels, and participates in both national and international networks. The two EU-financed Marie Curie programmes and the EU-financed Nordic Interreg project are very good examples of international collaboration. ‘The Heritage Academy’ is a most important interdisciplinary and interfaculty project.

Assessment: *Very good*

3C.8 Future plans

It is notable that the SWOT analysis is completely dominated by (structural) threats at the expense of strengths, weaknesses and opportunities. The plans for the future seem reasonable. Considering the number of academic staff it would, however, be highly advisable to focus on a smaller number of research areas in order to obtain more effective results. Otherwise, there is a risk that the research is too diverse to achieve the quality needed for attracting increased international attention.

Assessment: *Good*

3C.9 Future potential and possibilities

Assuming an increased focus on a smaller number of research areas (cf. ‘Uniqueness’ above), and a higher degree of publications in international peer-reviewed journals, the Department has excellent potential to be of a high international standard. To fulfil this goal, it is extremely important to have a sufficient number of doctoral students and postdoc positions to form a creative research environment. Interdisciplinary and interfaculty research projects should also be encouraged.

3C.10 Research activity and teaching

The Department has a convincing commitment to integrating research and teaching. The research focus on heritage has, for example, led to the introduction of a bachelor’s programme in heritage studies, which can be followed by two master’s courses.

3C.11 Interaction with society

The Department features impressive interaction with society above the expected level for its field.

3C.12 Gender and equal opportunity issues

The number of women professors is remarkably low, and this is a problem that is not dealt with in the self-evaluation. In order to improve the situation, we recommend that this issue is addressed as soon as possible.

3C.13 Summary of assessments – the Department of Historical Studies:

Research quality: *Very good*

Productivity: *Good*

Uniqueness: *Very good/Good*

Relevance: *Very good*

Organization and research infrastructure: *Very good*

Collaboration and networks: *Very good*

Future plans: *Good*

Interaction with society: *Above* the expected level

3D. THE DEPARTMENT OF LITERATURE, HISTORY OF IDEAS AND RELIGION

3D.1 Overall assessment

The Department was established on 1 January, 2009. There was a merger of three disciplines: Religious Studies, History of Ideas and Comparative Literature. As the name of the Department suggests, it consists of a combination of three essentially different disciplines. In the self-evaluation, it is claimed that the combination nevertheless has been “an innovative move” and also that “we soon found common ground for further development”. For example, the connection between religion and the history of ideas, and the common base of theology and comparative literature in philosophical textual scholarship, have resulted in numerous studies. It is quite obvious that most of the research carried out at the Department falls within the three separate disciplines.

3D.2 Research quality

The research at the Department has an excellent reputation nationally. The research of the history of ideas into political ideas is at the national forefront, and the studies in older Swedish literature, not least of the baroque period, are pioneering. Research into neo-Latin literature could also be mentioned, but this is not brought up in the self-evaluation. Islamic studies at the Department must also be mentioned. It is only natural that the national perspective should be dominant here. A large majority of all studies are written in Swedish and are aimed at a Swedish audience. Swedish journals and publishers are used almost exclusively.

Assessment: *Very good*

3D.3 Productivity

The number of peer-reviewed articles is rather small: in 2009, the Department had 14 professors, 24 senior lecturers/associate professors and six researchers. 17 peer-reviewed articles were published in that year. There is a large number of non-peer-reviewed articles. Many articles are newspaper articles.

Assessment: *Very good*

3D.4 Uniqueness

Parts of the Department of Literature, History of Ideas and Religion represent highly unique research areas. Here we find interesting projects, e.g. on Islam, modern Hindu movements and Esotericism, and New Age. Outstanding research is conducted on the history of political ideas and the analysis of modern continental philosophy. In other areas, research is less outstanding, thereby motivating the overall assessment on uniqueness.

Assessment: *Excellent*

3D.5 Relevance

The Department's researchers lead the way nationally in many areas. There should, however, be an effort to improve the dissemination of research results to the international research community. It is regrettable that such a large number of the dissertations are written in Swedish. Also, only national impact is mentioned in the self-evaluation, with nothing being said of international significance.

Assessment: *Very good*

3D.6 Organization and research infrastructure

Each of the disciplines has its own finances and teaching programmes. What is shared are cross-disciplinary seminars for staff and students, which is very good. In order to develop a more unified department, the aim should be to develop one common research programme.

Assessment: *Very good*

3D.7 Collaboration and networks

Very good cooperation exists with other departments, and this is also true to some extent at European and worldwide (India, USA) levels. There is also significant internal cooperation within the Department between the three disciplines, in the form of joint seminars for scholars and students.

Assessment: *Very good*

3D.8 Future plans

The Department points out that so far it has not had the time to do very much, since it has only existed for one year, but it seems to be involved in working towards a shared research profile and preparing common funding applications, etc. We found during the site visit that the Department has a clear vision of how to develop in the future.

Assessment: *Very good*

3D.9 Future potential and possibilities

The Department itself mentioned religious studies, and this is obviously one of the areas where it has great future potential. In terms of Islamic studies, the Department might consider increased cooperation with Islamic studies at Lund University.

Greater interaction and research cooperation with all scholars in Gender Studies at the University of Gothenburg would create a strong environment and integrate the different activities that, as such, are excellent, but which are too small in their wider settings to make an impact.

3D.10 Research activity and teaching

The Department has several research projects, such as literature and gender, conceptual history and continental philosophy, Islam and Esotericism, which are highly relevant to teaching. The Department has presented a policy for developing a so-called complete academic environment, which we were also able to verify during the site visit.

Assessment: *Excellent*

3D.11 Interaction with society

The staff members participate in public debates and interact with society in a number of different ways. Some members of the staff have also founded consulting companies. However, there is still the potential to increase interaction with society with the aim of achieving a better understanding of the humanities.

Assessment: *Very good*

3D.12 Gender and equal opportunities issues

Very few professors are women (only 21% in 2009), and the number of women among senior lecturers is also low (33%). This means that there are too few women who hold a permanent position at the Department. We recommend that this issue is addressed as soon as possible.

3D.13 Summary of assessments – the Department of Literature, History of Ideas and Religion

Research quality: *Very good*

Productivity: *Very good*

Uniqueness: *Excellent*

Relevance: *Very good*

Organization and research infrastructure: *Very good*

Collaboration and networks: *Very good*

Future plans: *Very good*

Research activity and teaching: *Excellent*

Interaction with society: *Very good*

PANEL 4 – EDUCATION

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INTRODUCTORY REMARKS

Structural changes have taken place in the Faculty of Education over the last two to three years. Previously the Faculty consisted of one very large department, the Department of Education, with 292 academic staff and two small departments, the Department of Work Science (22 staff) and the Department of Food, Health and Environment (27 staff)⁷. The new structure came into being on 1st July 2010, and the Faculty now consists of five departments, as follows⁸:

7 These numbers were as detailed in the initial self-evaluation report for the Faculty as at September 2009, i.e. employed personnel September 2009 according to the University of Gothenburg personnel database (PA-datalagret). Academic staff here includes PhD students.

8 These numbers indicate numbers of employed personnel Sept 2010 according to the University of Gothenburg personnel database (PA-datalagret). Academic staff here includes PhD students.

PANEL 4 - EDUCATION

- The Department of Education and Special Education (142 academic staff)
- The Department of Education, Communication and Learning (70)
- The Department of Pedagogical, Curricular and Professional Studies (79)
- The Department of Food and Nutrition, and Sport Science (54)
- The Department of Work Science (22)

The RED10 evaluation was carried out when the restructuring was in the first phase of implementation. This has proved a challenge to the evaluation team, not least as the initial documents received by the Panel described the old departments.

Prior to and during the site visit in November 2010, some new information was provided⁹. This new material has been helpful in understanding the size and composition of the new departments, but there are significant gaps and inconsistencies in the documentation. The Panel did not have consistent information concerning the numbers of research-intensive staff and the full-time equivalence of researchers. The proportion of research time varied considerably in the different staff categories, and the raw numbers do not describe the research resources in an accurate way. This has made it difficult to make comparisons between the departments and with other faculties and departments within the University. In the final report, numbers of the staff have been checked by the RED10 office before publishing the report. Inconsistency in the data during the evaluation, e.g. the numbers of the staff raises an urgent need that university databases should be updated immediately when structural changes happen.

The Panel notes that the departments knew the form the Faculty restructuring would take in autumn 2009. Considering this, the Panel was surprised that virtually all initial documentation and reflections received were based on the old structure. Although this is perhaps understandable in changing circumstances which overload the work of the Faculty and the departments, it may also be an indication that the new structure is not entirely accepted among the academic staff.

The Dean's report suggests that the dominant reason for the change was managerial '... with [the former] Department of Education's matrix organization in particular making it difficult for the Faculty Board to exercise control in accordance with the legislation and regulations that govern university sector operations'.

9 These documents included personnel lists for the new departments, outlines of the new departments and the decision on the split (although these were in Swedish so of limited use to approximately half of the Panel), details of some of the statistical data broken down by the new departments, a strategic plan for the Department of Work Science (in Swedish) and some details from the Department of Education, Communication and Learning and the Department of Pedagogical, Curricular and Professional Studies regarding their departments and future work streams.

In discussions with the academic staff during the site visit, the arguments presented for the restructuring were both administrative and academic. On the one hand, they were presented as making the Faculty more efficient and its activities more cost-effective. On the other hand, there was also an intention of encouraging researchers to become more dynamic and collaborative within a more coherent academic structure.

Although there were some researchers who were positive about the change, there were also many voices, especially among senior staff, that suggested that splitting the former Department of Education into three uneven education departments was a mistake. . In addition, a group joined with the Department of Food, Health and Environment to form the new Department of Food and Nutrition, and Sport Science. Our overall impression is that there are many uncertainties about how the new structure will operate and, in particular, how it will enhance quality.

It is also the case that under the new structure, as well as the old, there is considerable variation in size, research activity and staffing profiles between the departments in the Faculty, and relatively little integration or collaboration between those departments most directly concerned with education and the other two (the Department of Work Science and the Department of Food and Nutrition, and Sport Science).

Prior to the site visit, we could not find clear strategic plans or outlines describing how all the new departments would work in the next coming years or how they would work with each other. We received clearer indications from some of the departments in their presentations during the course of the site visit, but these now need to be translated into clear departmental strategy papers that are available to all.

A further complication for this review arose from the fact that new arrangements for teacher education were being put in place nationally and within the University of Gothenburg. We were given inconsistent accounts of how these might impinge on the different departments. More clarity is needed in relation to how research in different departments will relate to teacher education in the future.

The Panel apologizes if there are misunderstandings in its comments and recommendations. Of necessity, this evaluation is based mainly on the evidence from the old departments. Our assessment of research quality is based on previous research carried out in the research groups which now contribute to the work of the new departments. We cannot yet say very much about how the new departments will themselves operate in practice but, where we can, we have commented on their future plans.

Against this background, and given that the new departments have not yet had sufficient time to consolidate their plans and internal structure, the Panel thinks it important that no drastic structural, financial and managerial decisions be taken at Faculty level as a result of the present evaluation without careful consultation with the departments. At the current time, additional structural or financial changes are likely to be premature and risk giving rise to unproductive turbulence in the departments.

We will now consider each of the current departments in turn, before offering observations, tentative conclusions and recommendations for the Faculty overall.

4A1. THE DEPARTMENT OF EDUCATION AND SPECIAL EDUCATION

4A1.1 General features

The current departmental structure has only been in place since July 2010, so it is hard to assess the Department as an operational unit. However, there are researchers and research programmes from the former department that continue in the new department and bring their capacity to this new unit.

According to the University of Gothenburg personnel database (PA-datalagret) Sept 2010, the new department consists of 142 employees, including twelve professors, 48 senior lecturers/associate professors, four researchers, 3 research fellows and and 19 PhD students¹⁰.

The Panel has received several different accounts of the numbers of staff and PhD students in each of the new departments. It is therefore very difficult to say with any confidence exactly what the research resources are in terms of research-intensive personnel. However, this department is the largest in the Faculty and it has a large resource base in terms of research staff. Professors have 55% (range 16-97%) of their time for research and associate professors have on average 40% (range 6-97%). Amounts vary considerably also for other levels of research-active staff.

¹⁰ Academic staff here includes PhD students. Circa another 23 PhD are registered at the department and 4 professors emeriti are active at the department (information provided at site visit).

The Department has the following research programmes, which all have their roots in the former Department of Education:

- Prerequisites, Education, and Outcomes (FUR)
- Learning and Assessment of Foreign Languages
- Special Education
- Gender and Education
- School Development
- Power, Education, Democracy and Structural Relations
- Politics in Education (PoP)

The Department has a strong a strong social science-oriented approach in research opening up opportunities for cooperation with e.g. political science and sociology and other social sciences. and, according to the Dean's report, the new department will include work on educational sociology and, as the Department's name suggests, special education.

4A1.2 Overall assessment

The overall impression is that research programmes have relevant visions and agendas for their research, but they are described and outlined as individual programmes and not in the context of an overall strategy for the whole Department. The programmes are well-networked, both nationally and internationally. They also have high levels of impact in society, and have been successful in attracting external competitive research money (SEK 40 million between 2006 and 2009). They have attracted significant amounts of commissioned research funding (SEK 60 million), especially for *Learning and Assessment of Foreign Languages*. The Panel has assessed the new department – the Department of Education and Special Education – mainly on the earlier achievements of its research groups and its programmes, but also by taking into account ongoing research. As an overall assessment of the Department, the Panel considers the Department *Very good* with some *Excellent* features. The quality and productiveness are uneven across the Department. The Panel has given more detailed assessments to those research programmes considered to have the most potential.

Assessment: *Very good* with some *Excellent* features

4A1.3 Research quality, productivity, uniqueness and relevance

Research quality

Two research programmes out of the seven listed above were included in the evaluation category 'most successful research area with a strong national or international

impact'. These are *Prerequisites, education and outcomes* (FUR) and *The Political in Education* (PoP), and are discussed further below.

Prerequisites, education and outcomes (FUR). The programme involves different areas of research that draw on data collected as part of a large-scale longitudinal study, involving a sample of persons born in 1948. Data from two further cohorts have been collected. It appears to be producing impressive and useful knowledge about the Swedish population, particularly with respect to the impact of education policy on student attainment. The methodological developments concerning multilevel modelling and linking datasets appear very impressive and, in some respects, groundbreaking.

From experience of similar cohort studies in the UK, these data sources are highly valuable and, despite being expensive to administer and run, support a wide range of high-quality and useful research. The stated size of the Gothenburg team appears quite small given the scale of the operation (although presumably this number does not include those undertaking the fieldwork). Given the size of the team, the number of outputs in this area – particularly peer-reviewed journal and conference articles – is impressive. More emphasis may be needed on articles for the media and reports that are easily accessible for policymakers, journalists and the public, as the topics covered in this research would be of considerable interest to those outside academia. This may also help in terms of securing further funding.

There is no doubt that this is one of the most impressive programmes in the Faculty. The Panel was therefore concerned to hear that future funding for this programme had not yet been secured and urges the University to support the continuation of the programme until further external funding is forthcoming. The loss of a planned new cohort would have long term consequences and reduce the value of the existing cohorts for making comparisons over time.

The Political in Education (PoP). This programme has gained significant amounts of high-profile funding. It is undertaking highly relevant work in the area of education policy and the politicization of education – for example, politics and its impact on teacher professionalism.

Achievements listed in the self-evaluation report comprise areas of recent work and publications. These areas are extremely important when developing education in society. The panel welcomes the PoP research programme's plans to develop even stronger links to broader educational activities, including the production of media articles and reports alongside peer-reviewed journal articles. It would be valuable also to analyse and provide evidence of specific impacts on policy or practice in order to achieve greater impact. The current move to improve research communication is welcomed

and is necessary in order to achieve greater impact. This includes the production of media articles and reports, alongside peer-reviewed journal articles.

Overall, the quality of the work that comes under the new Department is high, and these two central research programmes – *Prerequisites, education and outcomes* (FUR) and *The Political in Education* (PoP) – appear to be very highly regarded in Sweden and internationally. They appear to be asking crucial questions and breaking new ground in terms of methodology. While the reviewers are not in a position to comment on the specific journals listed as those most frequently used, it is noteworthy that only four out of eleven are in English, and this could limit international impact.

Assessment: *Very good*

Productivity

The new Department of Education and Special Education consists of more than half of the personnel who made up the former Department of Education (IPD). The productivity of the former Department of Education (as there is no information on this broken down by the new departments) appears rather low when looking at total outputs (all possible types of documents reported in the University publication database) per research active staff (ca 1.6 in 2004 and 1.8 for 2009). The new department has some active groups and researchers, but overall productivity remains unbalanced. The new department should prepare an action plan exploring how to become more effective in publishing in different forums and how to help researchers to publish in international peer-reviewed journals. This support could include training for scientific writing in international journals as well as services for researchers, for example language checking by native speakers.

Assessment: *Good*

Uniqueness

The work of FUR and PoP has significant unique features within the Swedish context, such as large-scale longitudinal data collection and methodological advancement in this area. The team has also created classroom interaction databases covering a large set of recordings collected over many years.

Assessment: *Very good*

Relevance

The two programmes described in detail (FUR and PoP) in the self-evaluation document demonstrate the relevance of much of the work of the new department. The other research programmes also have indications of high relevance. The documents distributed during the site visit indicate that the old Department of Education had

14 research programmes altogether and 19 research collegia. In the new Department of Education and Special Education there are seven research programmes. The research areas covered by the various programmes are highly relevant for the development of education in schools as well as in the wider society. The research areas can thus make a very valuable contribution to future developments in different educational settings. While the Panel recognizes the value of the research programmes' work, it also expresses a concern that the individual programmes seem to work separately without strong synergies. More collaboration between research programmes could increase their relevance to educational issues and challenges in society.

Assessment: *Very good*

4A1.4 Organization and research infrastructure

It is difficult to comment on the organization of the new department, as it has only been established since July 2010. Looking at the old Department of Education, the proportions of senior and junior research positions seem relatively stable. Although the number of professors has declined, there are more senior lecturers/associate professors. There is a similar pattern between the 'other' (more junior) researchers and PhD students in that, although the numbers of more junior researchers are declining, there appear to be increasing numbers of PhD students coming through the system who could boost numbers at the level of junior researcher in the future.

In terms of the resources that were available within the former Department of Education, the four highlighted special resource sources in the self-evaluation appear useful. GOLD (The Gothenburg Educational Longitudinal Database) is presumably a national resource that can be drawn upon by researchers across the country. From the documentation received, it is unclear what the added-value or aim of the COMPEAT (Center for Comparative Analyses of Educational Achievement) project is, but it does seem to have considerable potential because it makes data from the international studies of educational achievement conducted by the IEA during the period 1964 to 1991 available for further analysis.. The Panel suggests that the Department should make future plans regarding how this resource could add even more value.

Across the whole University, there are several processes that are working to support the delivery of a research environment that is likely to foster innovation and high-quality research, such as Research and Innovation Services, GU Holding and the GUP database. The Panel did not get a clear picture regarding how infrastructures in the Faculty of Education fit with these processes.

Assessment: *Good* with some *Excellent* features

4A1.5 Collaboration and networks

The work of the old Department of Education appeared to be quite strong in terms of collaboration, with 24% of publications written with someone outside the Department and 17% with someone outside the University. The highest proportion of collaboration appears to be with the University of Gothenburg's close partner institution, Borås University College in Sweden. There is also a relatively high level of international collaboration, with 27% of refereed journal articles being published in collaboration with at least one non-Swedish based author.

One crucial area that is raised in the self-evaluation report (for the old Department of Education, although the problem is reflected in the new departments) is that the researchers who are extensively involved in scientific networks internationally will be retiring within the next five years. This is clearly an issue that needs to be addressed through improving capacity building and recruitment strategies.

The Swedish network on *Studies in the Political in Education* is coordinated by PoP. This network involves colleagues and research programmes from five universities, across a range of disciplines. There is also collaboration across faculties and disciplines in other research programmes, such as *Gender and Education*. However, the overall impression is that there is relatively little collaboration with the other new departments and within the whole University across faculties and disciplines.

Assessment: *Very good*

4A1.6 Future plans

The research direction outlined for the Department takes the form of a research programme called *Differentiation, Epistemic Organisation and Values*. It is unclear whether this is an overarching research programme or whether this is one of a range of programmes being led from the Department. The outline of this programme remained vague even as described during the site visit, so it is difficult to make a substantive judgement. It would be useful to have a better understanding of the relevance of the programme outlined in relation to policy. What are the methods that will be used? How do current plans relate to work in the other education departments?

Assessment: *Good*

4A1.7 Future potentials and possibilities

It will be important to secure funding for the cohort studies run under the FUR research programme. This seems crucial, as it provides high-quality useful data for analysis. The Dean also regards this as 'internationally strong research'. The Panel

agrees very much with this, and recommends that all efforts should be made to secure future funding streams for the FUR database.-

4A1.8 Research activity and teaching

The Department of Education and Special Education is the biggest contributor within the Faculty in terms of the number of staff members and breadth of research programmes. It has a significant responsibility towards ensuring quality in different educational sectors in Sweden.

In terms of the old Department of Education, there appeared to be processes in place to connect research and teaching, although it was also clear that there were two distinct groups – researchers and teachers.

The new research programme – *Differentiation, Epistemic Organisation and Values* – appears to acknowledge the importance of avoiding the research-practice divide, but it is not clear at this stage how this will be achieved.

4A1.9 Interactions with society

While there does seem to be a certain level of engagement with external stakeholders – i.e. practitioners, policymakers, journalists, etc. – through the production of press articles and reports, there is little specific evidence of impact as claimed in the self-evaluation document. The range of research topics covered appears to be relevant to a variety of audiences and therefore it would seem important to disseminate findings. University-wide programmes, such as developing an electronic database of research reports, support this objective.

Further consideration of the incentive structures faced by researchers would be useful. It would be helpful to design an action plan on how to activate and deepen interaction between researchers and societal stakeholders and to seek evidence on how such interaction impacts on the levels and types of engagement with policymakers, journalists and others in the broader society.

4A1.10 Gender and equal opportunity issues

The issue of there being a small proportion of women in senior roles was raised in the previous evaluation of education research that was undertaken 15 years ago by the then Humanities and Social Sciences Research Council of Sweden. In the old Department of Education (which is the most appropriate unit of comparison) the trend appears to be positive, with the proportion of female professors increasing from 18% to 33% between 2004 and 2009. As the Dean of the Faculty describes, there is an even more positive picture at the docent grade over the whole Faculty where, in 2008, 75% of docents were female, compared to just 31% in 2001.

However, this is also a unbalanced situations. The optimal span for each sex is 40-60%.

The new Department of Education and Special Education is considerably larger than the other two new education departments. It is approximately the same as the other two departments considered together. When looking across the four new departments, the Department of Education and Special Education has a high proportion of female staff (73%). This is similar to the Department of Education, Communication and Learning (72%), but higher than in the Department of Pedagogical, Curricular and Professional Studies (62%) and the Department of Food and Nutrition, and Sport Science (29%).

4A1.11 Summary of assessments – the Department of Education and Special Education

Overall assessment: *Very good* with some *Excellent* features

Research quality: *Very good*

Productivity: *Good*

Uniqueness: *Very good*

Relevance: *Very good*

Organization and research infrastructure: *Good* with some *Excellent* features

Collaboration and networks: *Very good*

Future plans: *Good*

4A2. THE DEPARTMENT OF EDUCATION, COMMUNICATION AND LEARNING

4A2.1 General features

According to the University of Gothenburg personnel database (PA-datalagret) Sept 2010, the new Department of Education, Communication and Learning comprises a total of 70 people. These are predominantly the members of the Linnaeus Centre for Research on *Learning Interaction and Mediated Communication in Contemporary Society* (LinCS) and the *Early Childhood Education* (ECE) unit. The academic staff in the Department comprises six professors, 27 senior lecturers, one researcher, two research fellows, one postdoc, six PhD students and 27 ‘Others’¹¹. It should be noted that LinCS is a multidisciplinary research unit including members

¹¹ Circa another 18 PhD students are registered at, but not employed by, the department.

of the department but also scholars at the IT Faculty and the Faculty of Arts of the University of Gothenburg and at the Swedish School of Library and Information Science the University College of Borås.

It is not easy to get an overview of the Department, as it is a new unit. The analysis of the different documents shows that the Department has two main foci of research corresponding to the two groups just mentioned: research into the relationship between *learning and media*, in particular how digital technologies and media transform the way in which knowledge and information circulate in society, and research into *Early Childhood Education (ECE)*, i.e. communicative processes and children's meaning-making and knowledge formation in everyday practices, as well as in institutional activities. We learned during the site visit that youth studies have very recently joined this group. Since the Department is not yet fully constituted as a unit, and since the two groups have quite different characteristics and functions, the evaluation will differentiate the two groups. This fact in itself already shows a potential area for development.

4A2.2 Overall assessment

The Panel has assessed the new Department of Education, Communication and Learning on the basis of an evaluation of the two main research groups' future plans and their earlier achievements. It has also taken into account its ongoing research. As an overall assessment of the Department, the Panel believes that the Department achieves the grade of *Excellent* with some *Outstanding* features. The main problem remains planning for the future and the construction of real unity across the Department as a whole. This is a significant challenge. The Panel believes that the organization and research infrastructure should be enhanced and developed in such a way that it strengthens synergies both within child and youth research and with LinCS, and thereby creates more common resources for future research.

Assessment: *Excellent* with *Outstanding* features

4A2.3 Research quality, productivity, uniqueness and relevance

Research quality

Both the groups that make up the Department publish in very good international journals, as well as in national journals. They also produce handbooks that are referenced at national and even international level. Their projects are funded by a significant amount of money. Most importantly, the LinCS group is considered to be a leading group internationally in the domain of the role of new media for learning and for the changing nature of skills in relation to literacy, numeracy and information. The contribution of ECE to the elaboration of preschool didactics is quite original: it tries to combine knowledge coming from education, developmen-

tal psychology and subject didactics to develop an approach to learning for young children in institutional contexts.

Assessment: *Excellent*

Productivity

The productivity of both main groups within the Department is high. It is difficult to know exactly how many people are directly involved in research, which makes a precise evaluation difficult. The LinCS group, which has members in three faculties and at the University College of Borås, has 47 researchers (including PhD students). LinCS has existed between 2006 and 2009, and has produced 351 papers, i.e. a mean of seven per person during the period considered, which is quite considerable. Many papers (more than 150) are peer reviewed, and 91 are chapters in monographs. The ECE group is also very productive, with 255 publications during the same period for 40 researchers (number of researchers according to the self evaluation report from the former Department of Education), a mean of six papers, with a particular interest in popular science books. Both groups have received significant levels of external funding. LinCS has received more than SEK 100 million (approximately EUR 10 million) between 2004 and 2009, in addition to a national research programme and a programme at the University of Gothenburg on learning that are not included in this overall figure. ECE has received SEK 16 million for funded and commissioned research over the period 2005 to 2009.

Assessment: *Very good*

Uniqueness

Both groups are unique in their domain. LinCS, although working in a very competitive domain, has been able to develop an original approach in using a multimodal and sociocultural approach to the question of new media, and more specifically digital technologies, in the construction of knowledge, relying on video records of learning processes. The preschool didactics approach of ECE is particularly interesting insofar as it looks at the conditions that allow the construction of knowledge, mainly in institutional contexts, by children in different domains such as literacy, mathematics, natural science, aesthetics, as well as participation and influence. This kind of didactic approach, oriented towards knowledge, is quite rare in early childhood education, and is probably due to the tradition of phenomenography being transposed to this new domain.

Assessment: *Excellent*

Relevance

The research in both groups is highly relevant from the point of view of both research *problématiques* and societal demands. They both contribute to central social questions of constructing knowledge in a knowledge society: questions concerning the changes introduced by new media, and concerning new functions of early childhood education that can no longer be the simple continuation of what has been done before.

Assessment: *Excellent*

4A2.4 Organization and research infrastructure

From the information provided, it is not easy to make a comprehensive evaluation of the infrastructure. There is little doubt, nevertheless, that LinCS has an excellent infrastructure, as can be seen quite immediately from its website. It is very well organized, with a board and an international advisory board, a laboratory, an international network and regular collegia with internationally renowned lecturers. ECE's organization is more difficult to understand. There is a strong relationship with practice, since many researchers have their roots in preschool teaching and other similar domains.

Assessment: *Very good* with *Excellent* features; *Excellent* for LinCS – *Good* for ECE

4A2.5 Collaboration and networks

The international collaboration and the networks in which LinCs is involved are extensive, and are mainly in Northern Europe, the USA and Australia. The group participates in several important international projects such as Kaleidoscope. The international advisory board gives a good idea of this international embedding. ECE is also quite well integrated in international projects, although these seem less clearly established, a combination of formal and informal interactions, and more reliant on personal contacts. It is therefore quite difficult to know what exactly the work carried out in international networks is. Nonetheless, there are clearly established relationships and international responsibilities, and, at national level, collaborations with other entities such as the Gothenburg Centre for Environment and Sustainability and the National Centre for Excellence in the Teaching of Mathematics.

Assessment: *Excellent*; *Excellent* for LinCS and *Very good* for ECE

4A2.6 Future plans

What is described as strategic plans and obstacles for the Department is, in one sense, only the continuation of what has already been done. For ECE, the idea of preschool didactics is quite interesting: a 'multidisciplinary area where insights from

various disciplinary types of knowledge have to be combined with research findings from education, developmental psychology and other fields'. This is certainly a way of concretizing what has already been done, which is interesting, but quite vague. In terms of new media for learning, nothing more is said other than the necessity of increasing multidisciplinary collaboration and maintaining adequate laboratory facilities, which is not a very precise way of defining future plans. This is obviously not enough.

The overall plans are not clear at the whole department level. The abovementioned research groups have identified their own profiles and future plans, but synergies between them and a more holistic picture of the whole Department are still lacking.

Assessment: *Very good*

4A2.7 Future potentials and possibilities

It seems quite obvious that the continuation of the research groups as they are constituted contains, in itself, an essential potential. There is no doubt that the two groups constituting the Department are particularly dynamic and will continue to be national and international reference points.

The most important point is that the two groups have to become a single entity, a department, and that the potential of each one has to strengthen the other one to a certain degree. It is very difficult to say how this can be done. Let us look first at each group separately.

For ECE, the idea of a preschool didactics that refers explicitly to different domains of knowledge ('insights from various disciplinary types of knowledge') is promising. It would be interesting to make explicit links to different domains of subject didactics, but this is not elaborated in any detail. Nonetheless, in referring to didactics, the members of ECE show the direction in which they want to go, namely towards the construction of knowledge – or learning – in relatively clearly defined institutions and knowledge domains. This is a very interesting and original perspective.

LinCS takes the point of view that 'Learning can no longer be seen as a purely educational phenomenon [has it ever been?], rather it must be understood and studied in relation to the cultural, social and economic transformations that currently take place in society, a development in which digital technology is central'. This is certainly true. But interestingly enough, this point of view does not result, as it appears to, in defining precisely what the specific contribution of 'educational phenomena' could be, in relation to other ways and places of learning, and what digital technology can bring in different forms and places of learning. To put it in other words: it

is as if learning is one and the same thing, whatever the context may be. This at least is the impression one gets from the quoted sentence.

As one can see, there seem to be two different tendencies in the Department that can create a very interesting dynamic: one more oriented towards different types of knowledge in an institutional setting of education; the other more interested in learning in general in natural settings with digital means. Can this dynamic be used to develop new challenges? The Department needs such challenges. However, others could certainly be defined.

4A2.8 Research activity and teaching

Both groups propose interesting teaching activities, based on their research: *Master's Programme in Educational Science Specialising in Children and Youth, Early Childhood Education or European Master in ECE* for the ECE group, and the *Doctorates in Education Sciences* for the LinCS. Furthermore, the LinCS organizes the Master's programme Learning, Communication & IT, the theme New Media, Teaching and Learning within the doctoral school Centre for Educational Science and Teacher Research, and a Doctoral School in Educational Sciences.

4A2.9 Interactions with society

The Department's interactions with society are manifold and important. As shown above, LinCS works in a field that is central: the development of new forms of learning in society. And ECE looks at how to construct knowledge from the beginning of institutional education in relation to teaching and the education of young children that has become a most important topic in the social debate.

4A2.10 Gender and equal opportunity issues

The analysis of the composition of the two groups from the point of view of gender shows a more or less equal opportunity.

4A2.11 Summary of assessments - the Department of Education, Communication and Learning

Overall assessment: *Excellent* with *Outstanding* features

Research quality: *Excellent*

Productivity: *Very good*

Uniqueness: *Excellent*

Relevance: *Excellent*

Organization and research infrastructure: *Very good* with *Excellent* features

Collaboration and networks: *Excellent*

Future plans: *Very good*

4A3. THE DEPARTMENT OF PEDAGOGICAL, CURRICULAR AND PROFESSIONAL STUDIES

4A3.1 General features

According to the University of Gothenburg personnel database (PA-datalagret) Sept 2010 the Department has a staff of 79 employees including one professor, 29 associate professors/senior lecturers, two researchers, 1 research fellow and 38 “other personnel” One visiting professor was also active at the department.¹²

As for other departments, the numbers of research-intensive staff members are inconsistent in the different documents received by the Panel. However, all documents suggest that the Department is rather small in terms of numbers of full or associate professors.

Staff members primarily encompass former members of the *Subject Matter Education* unit and the *Learning and Teaching* unit (those focusing on *Teaching, teachers, learning* and those focusing on *Phenomenography and variation theory*). Some people come from the former units for *Adult Learning, Language and Literature, Special Needs* and *Individual Culture and Society*.

In the self-evaluation report, two research strands were identified within the Department’s overarching research area: *Thematic studies of pedagogical practices: A promising area for future research*. The first strand (1) focuses on the content of teaching and learning, with particular regard to critical features of content knowledge as this plays out in lesson structures and classroom interaction, and the second (2) focuses on the life of the classroom, with particular regard to student-teacher interaction and teachers’ professional identity and life. At this stage, the two strands are not described in the document in a way that makes it completely clear how they are meant to be connected and balanced. In principle, it is possible to study content without paying much attention to life in the classroom, and conversely to study teachers’ professional life and classroom interactions without paying attention to the content of teaching and learning. It is the Panel’s view that it will be a major task for the new Department to come to grips with establishing connections between the two strands so as to avoid a compartmentalization into two relatively independent sub-departments.

In a new additional document (sent to the Panel and delivered in the site visit), produced after the creation of the Department of Pedagogical, Curricular and Profes-

¹² According to the department they have (Dec 2010) a staff of 59 employees, 2 full professors, 25 associate professors/senior lecturers and 32 in the category other personnel. There are also 1 visiting professor and 6 professors emeriti associated with the department as well as 9 university teachers and 1 research assistant.

sional Studies, it is indicated that the Department will have three main focal areas, roughly corresponding to three research environments within the Department. It is indicated that each roughly comprises one third of the scientific staff, with three senior researchers in each, the figures indicated totalling 45 researchers. These focal areas are: (1) *Learning and teaching subject matter: phenomenography, variation theory and learning studies*, (2) *Learning and teaching natural science and technology: design-based research on sequences for teaching and learning*, and *Content-oriented theory building* and (3) *Studies of teachers' activities in school: teaching and professional practice*. This can be interpreted as a further elaboration of the two abovementioned strands, where the former encompasses the two first-mentioned focal areas, and the latter is reformulated into the third focal point. The Panel still sees a need for the Department to work to clarify how these focal areas are to be related to one another.

These three main areas are considered to be promising research strands because they have been successful in obtaining external research funding. However, it seems that the three research strands are based more on a compendium of earlier research grants than future-oriented purposeful strategic planning. It can also be seen from the statistics that research grants are declining and commissioned research is increasing. These trends would need a strategic analysis and goal-setting for the future. Is this the direction in which the new Department wants to move? What are the advantages or disadvantages of this?

From the data available, one can infer that quite a few of the members of the Department have gained their doctorate at a relatively late age. This probably reflects the fact that several members have had careers as teachers and/or method-oriented teacher educators, only becoming engaged in research proper after several years of practice. It should be seen as a sign of strength that the old Department of Education has been able to provide a sufficiently stimulating and supportive environment for the transition of practitioners into researchers. It would be desirable if DPCPS were able to continue and develop these successful efforts.

Based on these observations, the Panel hereby offers its assessment of the Department of Pedagogical, Curricular and Professional Studies in the categories indicated in the RED10 guidelines.

4A3.2 Overall assessment

The Panel considers the research carried out within the new Department of Pedagogical, Curricular and Professional Studies to be important, with a very good foundation on earlier strong research traditions of phenomenography. The Department is in a transition stage and there are signs of restructuring research towards new educational challenges. The Panel's view is that there are many good features in the ongoing research, but that the Department has not yet found a clear strategy. It

also has very limited resources with which to fulfil all the demands and goals that are needed in order to become an internationally recognized research unit.

Overall assessment: *Good*

4A3.3 Research quality, productivity, uniqueness and relevance

Research quality

Without having made a detailed statistical summary of the publications, it seems from the publication lists that the vast majority of the publications are either local or national reports, contributions to conference proceedings, or chapters in books in Swedish or English. Moreover, there are quite a few single- or multiple-authored monographs in Swedish or English. There are several papers in Swedish or Nordic magazines or in Nordic peer-reviewed journals, whereas the number of papers in international journals with peer review is somewhat limited. This is not so surprising, since a lot of the publications address specifically Swedish issues and themes of considerable national interest but not necessarily of international relevance in all respects. This is particularly true of topics related to curricula, (national) testing and national teacher education. In addition, due to the relative scarcity of a wide array of truly international journals (not to be confused with journals in English, some of which may themselves be somewhat parochial), research on subject matter didactics and subject-specific professional teacher development has a tradition of being published in international, edited anthologies with peer review. So, although there is indeed unexploited scope for increasing the number of publications in international peer-reviewed journals, obtaining this should not be the only criterion for progress and success. Rather, efforts should be made to provide assistance and guidance to those academics in the Department with no or very few publications, so as to help them become true members of the research community.

It follows from what has been said above that the research across the Department is diverse, both when it comes to productivity and quality, and when it comes to uniqueness and relevance. There are groupings and individuals in the Department whose quality clearly deserves the grading *Very good*, while for others the grading should rather be *Good*. On average, across groupings and individuals, the grading *Good*, and *Very good* in some respects, seems to be a fair one. The Panel suggests that the Department should put some effort into reviewing current publication strategies so as to gradually place more emphasis on peer-reviewed national and international publications (journal articles and books) without jeopardizing the attention paid to significant national issues.

Assessment: *Good* and *Very good* in some respects

Productivity

There are marked differences between the least and the most productive researchers. Around 15 researchers have produced ten or more publications during the period under consideration, while the remaining people have published 1-9 items between 2004 and 2009/10. Some of the particularly productive researchers are well-known internationally for their research, a few – including emeriti not mentioned in the list of staff but still active, working within the areas covered by the new Department – being at the forefront of international research within their specialty.

It is indicated in the supplementary document that, during the last five years, the first-mentioned group amongst the three (*Learning and teaching subject matter: phenomenography, variation theory and learning studies*) has produced 45 publications, three doctoral dissertations and 30 conference papers. During the same period of time, the second group (*Learning and teaching natural science and technology: design-based research on sequences for teaching and learning and Content-oriented theory building*) has produced 57 publications and three doctoral dissertations, while the last-mentioned group (*Studies of teachers' activities in school: teaching and professional practice*) has produced more than 70 publications, including four doctoral dissertations. This suggests an average of five publications per researcher for the period under consideration, which is at least satisfactory, especially given that some of the researchers are junior researchers. It is a little difficult to obtain specific information in an aggregated and comprehensive form about the research contributions of individual researchers.

As an addendum to the previous observation, it is also worth noting that the more productive researchers are – not necessarily very surprisingly – of older (career) age than the less productive ones. As mentioned, some of the more productive researchers either have retired or are about to retire. The Panel suggests that close attention should be paid to finding ways to counteract this imbalance when the Department develops more specific plans for the future. In the threats section of the SWOT analysis, awareness of this problem is indicated, since it is pointed out that there are fewer opportunities to obtain research funds for younger researchers.

Assessment: *Good* with some *insufficient* features

Uniqueness

In selected areas – including phenomenography and variation theory – some of the research carried out is rather unique, both nationally and internationally, whereas in other respects the research corresponds to research found elsewhere, except when the focus is on *problématiques* that have specifically Swedish contexts.

Assessment: *Good*

Relevance

By and large, since large parts of the research carried out is close to actual school, classroom and assessment practices, the topics and themes of the research are generally very relevant, both nationally and internationally. The nationally-oriented research would gain in relevance if international, for example if comparative perspectives and components were given more prominence.

Assessment: *Very good*

4A3.4 Organization and research infrastructure

As the organization and research infrastructure of the new Department cannot really be said to be fully in place yet, our assessment has to be based on the achievements of the past as well as on the plans put forward for the future. It is important to note that the leadership of the Department seems to be very committed and engaged in helping to establish a fertile and inclusive research environment. At the site visit, it did appear that the Head of Department now has a plan that will allow it to become effective and functional as a Department, in particular if efforts are being made to establish clearer links between the proposed overarching research strands. The goals and the strategy outlined seem realistic in relation to the resources of the Department, even though generating and maintaining sufficient research funds to cater for the professional development of younger researchers does seem to be one of the significant challenges in the not too distant future.

The evident commitment of the Department leadership leads the Panel to grade the overall organization and research infrastructure as potentially *Very good*, but given certain aspects of the current situation, such as ongoing funding, a relative lack of senior staff and the provision of opportunities for younger and less experienced researchers, and linking some very small groups of researchers to the core of the Department's research, *Good* seems to be a more appropriate grade for the time being.

Assessment: *Good*

4A3.5 Collaboration and networks

It is evident that large parts of the publications listed are publications with more than one author. In several cases co-authors are other members of the Department, often in many different combinations, but there are also many publications with external – including international – co-authors. This suggests that the Department's researchers are well connected internally, nationally and internationally.

There is, however, some degree of diversity: some of the groups are very well connected nationally and internationally, in some cases playing the role of hub in their network, corresponding to the grade *Excellent*, whereas others are more local or

regional/national in their degree of connectedness, corresponding to the grades *Very good* or *Good*.

Assessment: *Very good*

4A3.6 Future plans

Given the necessarily limited, and to some extent preliminary, nature of the plans put forward, the Panel finds these plans very reasonable and well thought out. It sees a clear potential in them to become efficient yet inclusive instruments for focusing the future research of the Department on a few key areas of academic as well as practical significance, at a level which is tractable. This results in the grading *Good* with some *Very good* features. The most important challenge to the Department seems to be to strike a balance between focus, coherence and homogeneity on the one hand, and fertile conditions for academic freedom, the pursuit of individual ideas and the cultivation of new, promising ideas on the other.

Assessment: *Good* with *Very good* features

4A3.7 Future potentials and possibilities

If the most important insufficiencies (in particular as regards research productivity) and imbalances (in particular between senior and junior researchers, and productive and less productive researchers) in the Department indicated above are remedied, and if satisfactory funding is made available to the Department, the Panel sees the potential for the Department to gain a strong foothold of national and international significance.

Assessment: *Very good*

4A3.8 Research activity and teaching

It is difficult to judge the present situation in an adequate manner, but in the event that the University of Gothenburg is accepted as a teacher training institution as a consequence of the application submitted to the Swedish National Agency for Higher Education, it may well be expected that the Department will have a key role to play in teacher education and that its research will have close links to its teaching activities.

It came up in the site visit discussions that the Department has a strong vision for practice-oriented research and how the Department could contribute to teaching and learning in schools in its various subjects, particularly in mathematics and science, and to teacher training. These important visions should be further developed. There is a great deal of potential in these visions but there is a danger that in the current circumstances, where there is very limited research funding, they will not

come to fruition. Strong leadership is needed to clarify and embed these aspects of research in the Department.

Assessment: potentially *Very good*

4A3.9 Interactions with society

A considerable amount of the research carried out at the Department is done on commission from various Swedish agencies. This suggests that the actual and potential interaction with society is very good.

Assessment: *Very good*

4A3.10 Gender and equal opportunity issues

Female staff make up 62% of the Department of Pedagogical, Curricular and Professional Studies. No other clear evidence on this was made available to the Panel.

4A3.10 Summary of assessments – the Department of Pedagogical, Curricular and Professional Studies

Overall assessment: *Good*

Research quality: *Good* and *Very good* in some respects

Productivity: *Good* with some *Insufficient* features

Uniqueness: *Good*

Relevance: *Very good*

Organization and research infrastructure: *Good*

Collaboration and networks: *Very good*

Future plans: *Good* with *Very good* features

Future potential and possibilities: *Very good*

Research activity and teaching: potentially *Very good*

Interactions with society: *Very good*

4B. THE DEPARTMENT OF FOOD, HEALTH AND ENVIRONMENT¹³

4B.1 General features

The Department of Food and Nutrition, and Sport Science was established on 1 July, 2010, and is a merger between the Department of Food, Health and Environment and the School of Sport Science. The new structure and ongoing recruitment of new academic staff makes it difficult to assess the new department. The documentation received prior to the site visit related to the old Department of Food, Health and Environment, and the assessment is therefore largely based on this department. Limited information regarding the other work of the new department – namely sport science – was gathered during the site visit. **The text below refers to the old department (the Department of Food, Health and Environment) unless otherwise stated.**

The old department was a very small unit, and it was without a professor (because of retirement) for some years. This old department consisted of 27 research and teaching staff as of September 2009, comprising eight senior lecturers/associate professors, one researcher, twelve 'other' members of staff and six PhD students¹⁴. The new department consists of 54 people, including 14 senior lecturers/associate professors, two researchers, one postdoc, 30 'other' staff members and seven PhD students¹⁵.

The number of PhD students has grown from one in 2004 to six in 2009, but is still very low. Between 2004 and 2009, only one doctoral degree and two licentiate degrees were awarded. In 2009, senior lecturers/associate professors only had 12% of their time for research and the one researcher had 100% research time but was only employed 20% at the department. There were no postdoc researchers.

4B.2 Overall assessment

In evaluating the old department prior to the site visit (as there was only information available on this department), the Panel made an overall assessment of *Good*, having taken into consideration the very small size and the limited resources devoted to research. However, this assessment only relates to one half of the new department.

¹³ From 1 July, 2010 the major part of the Department of Food and Nutrition, and Sport Science.

¹⁴ The source of this data is the Faculty's self-evaluation report and is correct as at September 2009 according to this document.

¹⁵ The source of this data is the University of Gothenburg personnel database (PA-datalagret) September 2010.

During the site visit, further details were received regarding the rest of the Department. The Department has set as research areas:

For Food and Nutrition

- health promotion
- sport nutrition
- food service management
- the school subject Family and Consumer Science

For Sport Science

- health promotion
- gender in sport
- leadership in sport
- the school subject Physical Education and Health

The new Department is bigger than the old one in terms of academic research-intensive staff. Nonetheless, it is still very small, with very few professors or senior researchers. It makes a strong contribution in the programmes in Food and Nutrition and Sport Science as well as in teacher education and school subjects, and much of its resources are needed for teaching. Taking into consideration these big responsibilities in teaching, huge societal needs and the wide range of research areas that the Department has identified, the Panel recognizes that the Department has had to operate in almost impossible circumstances. Being for a long time without any professor and now having one professor emeritus and one associate professor (docent) as resources makes it very hard to carry out high standard, internationally competitive research. The Panel recognizes the work that senior researchers have carried out in recent years in these very limiting conditions. Combining Sport with the Food and Nutrition units potentially opens up new opportunities, but there are no clear plans regarding how new research challenges will be addressed. The site visit provided evidence that senior staff are very committed but, without massive additional resources and much stronger networking with other disciplines in the University, the Department's future in research does not look very promising.

Assessment: *Insufficient*

4B.3 Research quality, productivity, uniqueness and relevance

Research quality

The old department's research profile was diverse – sustainability, food habits and craft. The research carried out within the unit has moved from a focus on sustaina-

bility to influences on food habits (with a focus on children and adolescents). Some of the research sits within food service management and relates to environmental issues. The research on craft is very limited (there was only one small project in the 1970s and now one project in collaboration with two other Swedish universities). However, it is understood that craft is now to be moved to another part of the University.

The material provided by the old department demonstrates a successful record of achieving publication of some of the unit's research in recognized international journals (for example, food habits publications in *Appetite*, *The American Journal of Clinical Nutrition*, *The International Journal of Obesity* and *The Journal of Adolescent Health*). But the unit itself also recognizes that its research cannot be considered to be highly recognized internationally and that international collaboration is very limited.

In terms of interdisciplinary research there are researchers participating in multi-disciplinary centres at the University of Gothenburg: the Centre for Consumer Science and the Swedish Council for Working Life and Social Research (FAS) supported centre EpiLife (the Sahlgrenska Academy).

Assessment: *Good*

Productivity

The Department of Food, Health and Environment was mainly focused on education and on getting its finances in balance, apparently leaving very little time or money for research. A few people in the unit were active in research – often through collaboration with other groups outside the Department. Much of the research output is based on the work by PhD-students.

In spite of very few permanent resources for research and a lack of clear leadership, the old Department has been successful in building a small research environment by integrating researchers from other units within the University of Gothenburg. For example, through collaboration with EpiLife, the Sahlgrenska Academy undertakes internationally recognized research in nutritional epidemiology and is involved in EU projects.

The Department had 15 articles in scientific peer-reviewed journals (in six years) – of these, ten are international (in English). Craft research is mainly published in Swedish. The outputs are mainly peer-reviewed conference papers (32) and chapters in monographs/books (27) and reports (21).

Assessment: *Insufficient*

Uniqueness

In spite of the limited resources for research in the old department, collaboration with other groups outside the Department resulted in some interdisciplinary research focusing on relationships between food patterns and health and on new fields such as children as co-researchers. A school-based intervention on diet, one of the studies in the Department, has been internationally recognized as high quality and being effective.

The new Department's agenda provides important potential scenarios for research, but the available resources make the work actually being carried out too narrow. Their work is unique in terms of the importance and relevance to society, but the limited size of the available research resources will make it very difficult for the Department to realize its promise.

Assessment: *Good*

Relevance

In terms of relevance, important health-related topics such as obesity and cardiovascular disease are the subject of research. The unit demonstrates an engagement in addressing societal problems emerging in the field of food habits and obesity.

The new department incorporates sport science and a focus on health, health promotion learning, education and leadership. These are highly relevant themes in today's society and for tackling growing health problems (for example obesity), which are related to both diet and physical activity.

The move towards integrating sport science with the Department appears to have potential for generating new and fruitful ways of addressing major contemporary health problems.

Assessment: *Very good*

4B.4 Organization and research infrastructure

The old department was small, with only eight senior lecturers/associate professors and, although the merger will double the size of the Department, its main focus is on teaching not research. In the old department there had not been a professor since 2007, when the only one retired.

There was only one newly employed researcher between 2004 and 2009, but more new academic staff are now being recruited (one professor and two assistant professors). This and the merger with sport science could improve the organization.

It appears that individual researchers have been the key units – i.e. there have not been research groups. Organizing activity into research groups would promote collaborative and interdisciplinary research. The new department should offer opportunities to establish research groups.

The new sports facilities currently under construction are a very exciting development, but it is unclear whether and how they will be used to develop research. The Panel also understands that the two components of the new Department may not be co-located, and this will add to the difficulties of developing meaningful synergies.

Assessment: *Poor*

4B.5 Collaboration and networks

The unit mainly collaborates with other departments at the University of Gothenburg. The unit has shown the ability to draw upon expertise in other departments within the University. The unit appears to have some international contacts, participate in international conferences and take part in international work on food advertising to children.

Many (42%) publications have only one author. Collaboration with at least one author outside the Department is 38%. Collaboration with at least one author outside the University is 21%.

In terms of international collaboration, the percentage of refereed journal articles published in collaboration with at least one author outside Sweden is 33%. There appears to be limited interdisciplinary collaboration.

The period in question (2004-2009) showed limited research visits abroad (2) and no guest researchers except one in regular guest programmes. The role of visiting scholars seems rather limited. The importance of exchanging students, teachers and researchers with other universities should be stressed.

Assessment: *Poor* with some *Good* features

4B.6 Future plans

The new department will be larger due to the integration with the School of Sport Science. In addition, they are also recruiting new academic staff to the new Department: one professor and two senior lecturers in Food and Nutrition, and five senior lectures in Sport Science. This is a promising step and creates potential for new and innovative interdisciplinary research related to both healthy diet and physical activity. Health promotion is seen as an area to be developed across the two parts of the Department.

If the Department is to capitalize on new opportunities, the Panel is of the view that it will need to focus on building multidisciplinary research groups, increasing collaboration between researchers and stakeholders, inviting and attracting guest researchers and establishing international research projects. In order to do this, there needs to be a clearer strategic plan and, in order to facilitate its implementation, incentives to undertake research and new quality control systems right across the new Department.

Assessment: *Poor*

4B.7 Future potentials and possibilities

It is difficult to estimate future possibilities and potentials based on the available information on the new department. The focus on health promotion (healthy food habits and physical activity) seems promising, and has both national and international relevance.

The Panel did not see much evidence of earlier research cooperation (or publications) between the former Department of Food, Health and Environment and the School of Sport Science. It is important to keep in mind that it many years and significant extra support are required in order to create a research environment where real synergy can be created. The size of the new department is increasing and there are also some exciting new facilities being developed for sport science, which could provide an impetus for new research activity. The Panel advises the Department to develop research groups with a minimum of two to three senior scientists – this is necessary for interaction – combining researchers from dietary and sport science.

For the new department to be able to achieve its goal of being a national centre for research on diet and physical activity, the number of senior scientists has to be sufficient to achieve critical mass. Stronger academic leadership and internalization are also important factors in achieving this.

Even though the staff at the Department are very committed in their work and see many future opportunities, the Panel considers the Department to be too small to achieve the ambitious goals related to its important research areas and to be successful in attracting highly competitive research funding. Critical mass is too limited and visions for the future are still diffuse. Without enough resources and real collaboration with other disciplines, which could deepen visions of the Department and provide larger research teams, it will be hard to survive.

4B.8 Research activity and teaching

The emphasis of the Department has tended to be on teaching, and education has influenced research rather than vice versa.

Not all topics feature good relationships between research and education (for example, restaurant management).

4B.9 Interactions with society

The research topics are highly relevant for society. However, during the period 2004 to 2009 only two researchers were considered to have taken part in a government or other social commission and only five wrote popular science articles. Considering the relevance of the areas covered, it seems that this should be increased somewhat.

4B.10 Gender and equal opportunity issues

Home economics is a traditionally female field, and this is still reflected in the proportions working and studying in this department. Here the integration of sport science will improve the overall gender balance by introducing a predominantly male workforce, but it will be important over time to improve the gender balance within both the food and sport science areas.

4B.11 Summary of assessments - the Department of Food, Health and Environment

Overall assessment: *Insufficient*

Research quality: *Good*

Productivity: *Insufficient*

Uniqueness: *Good*

Relevance: *Very good*

Organization and research infrastructure: *Poor*

Collaboration and networks: *Poor* with some *Good* features

Future plans: *Poor*

4C. THE DEPARTMENT OF WORK SCIENCE

4C.1 General features

The Department of Work Science was established in 2000. Its purpose is to focus on research related to working life. It is a highly interdisciplinary department, as researchers at the Department cooperate with researchers in disciplines such as pedagogy, sociology, social work, psychology, economics and medicine. The Department of Work Science is a very small department. Nevertheless, the research produced by the researchers within the Department, much of it in collaboration with researchers outside the Department and University, is of high quality.

According to the information provided to the Panel¹⁶, this department consists of 23 employees comprising three professors, seven researchers, seven ‘other’ members of staff, five PhD students and one member of affiliated staff.

4C.2 Overall assessment

Overall, our assessment is that the Department is *Excellent* in several areas, including research quality, productivity, uniqueness and relevance. These qualities are threatened, however, by its small size and inadequate organizational infrastructure.

Assessment: *Excellent*

4C.3 Research quality, productivity, uniqueness and relevance

Research quality

The scholarly work produced by members of the Department appears to be of very high quality, as judged by their efficiency in publishing in peer-refereed journals, their success in obtaining external funding for their projects, and the timeliness and importance of the research questions studied.

Assessment: *Excellent*

Productivity

The research productivity of the Department seems quite high when judged in relation to the number of full-time equivalents (FTE) researchers in the Department (i.e., 12.1 FTEs in 2004, 15.4 FTEs in 2009). During the period 2004-2009, for example, researchers at the Department published 44 peer-reviewed scientific journal articles, 64 peer-reviewed conference papers and 14 authored books.

Assessment: *Excellent*

Uniqueness

The Department appears to be unique in the world of science. For example, an internet search revealed that there are no other university departments anywhere in the world outside Sweden called ‘Work Science’. (Luleå University of Technology has a Department of Human Work Science.) The topics studied by the Department are of course widespread, but it appears that nowhere else is there a department by that name. This has both advantages (for example, the possibility of creating a unique resource in the world of science) and disadvantages (for example, difficulty

¹⁶ The source of this data is the Faculty’s self-evaluation report and is correct as at September 2009 according to this document.

in placing PhD students from the programme in similar programmes). The location of a department in Sweden devoted to the science of work and work life seems fortunate given the closure of the Swedish National Institute of Working Life.

Assessment: *Excellent*

Relevance

Research and teaching on work science is very important to the University, to Sweden and to the world of science. The topics studied by researchers at the Department are highly relevant to local, national and international developments in the science of work and working life. These topics include: patterns of labour market organization, work organization, governance, changes in employment relations (for example, the growth of temporary work) and demographic and structural changes. These topics are mainly related to social science issues, although there is also an emphasis on the relationships between social science and medical issues such as ergonomics, occupational rehabilitation and environment and health.

Assessment: *Excellent*

4C.4 Organization and research infrastructure

The Department is very small. The self-evaluation says that it 'engages' about 30 people with backgrounds in 13 disciplines. However, for 2009, there are only 23 persons listed as 'research personnel' (15.4 FTEs). This consists of: 15 people listed as academic staff consisting of three professors (2 FTEs), seven researchers (4.1 FTEs), and seven 'other' members of staff (4.5 FTEs). In addition, there are five PhD students and one affiliated staff member. The number of research personnel in 2004 was 16 (12.1 FTEs), so the Department has grown from 2004 to 2009. Nevertheless, the Department remains very small and researchers appear to operate largely as individual academics rather than through organized research groups.

Moreover, the Department has limited senior leadership: in 2009 there were three professors (with a mean age of 60). In addition, there were five PhD students in 2009 (with a mean age of 42) and only five doctoral degrees were awarded in the period 2005-9.

In view of this small size and limited number of professors, the organizational capacity of the Department (in terms of its internal structure) to initiate and successfully implement the work it has planned is questionable. It is hard to survive in a university as such a small department. Moreover, the fact that the Department is unique (at least outside Sweden) makes it difficult to establish itself as a major force in the world of science internationally (though perhaps not in Sweden).

Assessment: *Poor but worth developing*

4C.5 Collaboration and networks

The Department compensates somewhat for its small size by extensive participation in interdisciplinary and cross-disciplinary cooperative research efforts and networks, both within and outside the University. For example, 54% of publications were published in collaboration with at least one author outside the Department, 42% involved a collaboration with at least one author outside the University, and 67% of refereed journal articles were published in collaboration with at least one author outside Sweden (2004-2009).

The journals in which the Department's researchers published also reflect a broad interdisciplinary base, as they include journals on ergonomics, occupational rehabilitation, occupational and environmental medicine, environment and health, applied physiology, economic and industrial democracy and psychology.

Researchers at the Department participate in a variety of regional networks (Working Life Research in the West of Sweden), national networks (the Forum for Swedish Working Life), and international networks (the Nordic Network on Work Environment in the Healthcare Sector; the International School of Working Lives, ISWL).

Assessment: *Very good*

4C.6 Future plans

The future projects for researchers connected with the Department are well-chosen and reflect important issues for the science of work and working life (for example, the elderly workforce, management issues in public organizations, the spread of temporary work, and the physical and ergonomic impacts of changes in work organization). These are crucial questions for the international community as well as for Sweden.

The Department proposes to address these questions primarily through working with its networks of national and international researchers, and by establishing new ones. This seems to be the most realistic strategy, given the current small size of its internal research staff and infrastructure.

Assessment: *Very good*

4C.7 Future potentials and possibilities

The establishment of the Department sought to create synergies among researchers at the University who were studying the topic of working life, an area that has a long and strong tradition at the University and in Sweden generally. During the past decade, researchers at the Department have been active in producing high-quality research and in generating external funding.

The Department does not appear to have the internal organizational capacity needed in order to achieve its future goals and its potential, however. It is too small to develop the kinds of synergies within the Department and externally that it needs. Its financial situation is very fragile, as it is highly dependent on external funding, and failure to obtain such funding would be disastrous.

We see two main options for the future of the Department within the University. Firstly, the University could provide more basic funding to the Department. Researchers at the Department have demonstrated that they can carry out high-quality research with relatively little funding. However, extreme reliance on external funding is not a sustainable organizational model.

Secondly, the Department could be moved somewhere else within the University. Its placement within the larger Faculty of Education does not necessarily make organizational sense, nor is it particularly beneficial to either the Faculty of Education or the Department. Moving it to another unit, such as a social science unit, a business school or even an allied health department might be possibilities. On the other hand, if it is to stay within the Faculty of Education, more efforts should be made to exploit those synergies that do exist within the Faculty.

We do not think it is wise to disband the Department altogether, however. The issues it studies are too important not to capitalize on the synergies created by bringing researchers from different disciplines who are studying diverse aspects of working life together.

4C.8 Research activity and teaching

There seems to be a very good balance between research and teaching. All researchers at the Department teach on bachelor's courses within their area of research. Books and articles produced by researchers in the Department are used for required reading in the courses. Moreover, PhD students are integrated into research projects.

4C.9 Interactions with society

The interactions of the Department are substantial. This is both desirable and expected, given the practical problems related to work life that are the focus of the Department's researchers. Their aim, which appears to have been realized, is to play an active part in the public debate regarding work life, both nationally and internationally.

4C.10 Gender and equal opportunity issues

The Department has a good representation of women professors (2/3) and PhD students (3/5).

4C.11 Summary of assessments – the Department of Work Science

Overall assessment: *Excellent*

Research quality: *Excellent*

Productivity: *Excellent*

Uniqueness: *Excellent*

Relevance: *Excellent*

Organization and research infrastructure: *Poor* but worth developing

Collaboration and networks: *Very good*

Future plans: *Very good*

FINAL COMMENTS AND RECOMMENDATIONS

The Panel has made recommendations at two levels. The first recommendations concern the whole Faculty. The Panel then makes recommendations for each department.

Recommendations for the whole faculty

Strategic planning

The Panel wants to emphasize that long-term strategic planning is needed for a successful future. Researchers and teachers should identify themselves and commit to joint aims and visions in the new structure. Without jointly discussed and explicitly written plans for the next five years, for example, the enhancement of overall research quality is likely to prove difficult.

The Faculty is in a period of transition and facing many changes in its structure. The Panel recommends long-term strategic planning both at faculty and department levels. The Faculty must consider its role in a new situation:

- What services and infrastructure will the Faculty provide?
- Is there joint researcher training at faculty level? How do the departments contribute to it?
- How are research resources distributed within the Faculty and what are the main principles of this distribution?
- What kind of quality assurance system or method is used for ensuring quality in research?
- How is the Faculty responding to challenges in society through its research?

At faculty level there is a need to make more explicit how different departments are expected to work together, and the Faculty will need to provide leadership to make this happen. There is a great deal of potential in each department, but cross-

ing departmental boundaries is more important than ever in the new structure. The existing initiative in PhD training indicates that there is considerable potential for such collaboration between departments in the Faculty.

The Panel is of the view that the departments which previously made up the old Department of Education have a considerable amount in common, even though they have different profiles. Their potential contribution to educational issues in society will be best achieved when they combine their strengths and expertise. This requires that they also set jointly agreed strategic aims for their research work.

Updated, valid databases

The university and faculty level databases should provide consistent, reliable and relevant information for strategic planning and monitoring. It should consist of up-to-date changes in staff membership including retirements. The Panel recommends that databases of research resources in the Faculty be updated as soon as possible and re-formed to be more informative and useful for the purposes of leadership and management.

Relationship to teaching and contribution to teacher education

In the future it will be important to have a faculty level plan showing how teaching duties are divided between departments and especially how different departments contribute to teacher education. The departments are very different in terms of their size and profiles, but they all have expertise that is needed in teacher education as well as in relation to wider educational issues in society. It is important that there is a plan for what kind of contribution each department will provide to teacher education based on their special strengths, as well as how expertise is combined for meeting needs of education in society. The Panel sees that overlapping expertise is needed especially in didactics, special education and early childhood education, supporting learning in different learning settings including formal and non-formal environments.

Strengthening collaboration

At faculty level, and even at departmental level, it is unclear what processes and mechanisms are in place to incentivize and facilitate collaboration and interaction between programmes under the new structure. In the earlier structure there was a system of collegia as an important platform for collaboration. In the new structure, it should be evaluated how effective they are in providing a space for new scenarios of collaboration. The new Faculty needs different kinds of fora for strengthening collaboration, discussing ideas and creating innovative openings in research and teaching. The Panel suggests initiating an analysis to consider how effective current arrangements for cross-department working are and whether new tools are needed to promote and strengthen collaboration across programmes and departments.

There appears to be a lack of cooperation and collaboration within the Faculty – for example, there are two video labs with little apparent interaction between them.

More intensive interaction with stakeholders

The departments all have a certain level of engagement with external stakeholders – e.g. practitioners, policymakers, journalists, etc. – and also through the production of press articles and reports. The Panel could not find any specific evidence of impact in the self-evaluation document. The range of research topics covered appears to be relevant to a range of audiences, and it would therefore seem important to place more emphasis on disseminating findings and monitoring their impact. University-wide programmes, such as developing an electronic database of research reports, support this objective. The Panel suggests that interaction with stakeholders should be included as an important component in quality assurance methods in order to increase feedback from external partners. The Faculty should have methods and channels to evaluate how educational research in the departments impacts on the levels and types of engagement with policymakers, journalists and broader society.

Attracting research funding

The departments currently have such big differences in research resources and in their abilities to obtain external, competitive research grants that the existing gaps between departments could become wider. The new structure may also increase competition for resources between departments, so that collaboration and finding synergies across departments could become more difficult. Action needs to be taken by the Faculty to mitigate these risks and ensure that the departments work together to maximize overall research income.

Some further comments are perhaps less fundamental but may nevertheless be important in terms of public presentation of the work of the departments. The names of the new education departments are not very meaningful or distinctive, for example to funding agencies. As insiders in educational sciences we have some insight into the differences, but outsiders cannot easily discern what their focal points are, how the departments differ from each other and why they are separated. From a societal perspective it may also be difficult to understand why special education is seen as additional to, rather than part of, education or indeed why it is in a different department to pedagogical, curricular and professional studies.

Anticipating generation shift

The staffing profiles and age structures of some of the new departments are such that suggest that, unless action is taken, they will be severely lacking in research leadership in the coming years.

Stronger international contribution and interaction

The Faculty has strong expertise in many research areas. This should be more visible in the international research community. National publishing and developing national theoretical and practical foundations for education are absolutely necessary, but in addition a strategy is needed to encourage a strong international interaction. This should include at least the following modes in interactional cooperation:

More publishing internationally

Publishing in international languages in peer-reviewed journals needs researcher training and also support services, e.g. having language support or language checking from native speaker expert researchers, co-writing, counselling and training.

More international staff

Recruiting international researchers, both postdoc researchers and professors, will widen and deepen staff and student understandings of educational questions. Systematic and continuing interaction also provides younger researchers with more opportunities for international communication than they have had in recent conditions.

More students abroad

The exchange of researchers, including both PhD and postdocs, should be activated. It should be normal that Swedish researchers spend at least half a year or one year abroad. Taking into consideration the fact that the senior staff already have many international contacts, these exchange practices should not be difficult to arrange and organize.

More interdisciplinary work across the University

The Panel could see some signs of cross-disciplinary research and studies (e.g. gender studies, learning, etc.). Nonetheless, it seems that in the current period of transition the Faculty does not have a clear vision about how to support or encourage departments in creating stronger collaboration inside the University.

Many educational questions and issues related to learning and empowerment are cross-disciplinary, and there should be an analysis of what kinds of platforms are needed for collaboration between disciplines nationally and internationally.

External members in recruitment boards

A more transparent process is needed for inviting and recruiting international staff members, including guest lecturers and professors. External members on recruitment boards could help identify a wider field than seems to be the case at present, and thereby produce more open competition to get the best people.

Recommendations for individual departments

The Panel will summarize only a few of the most important recommendations for each department. The lack of balance between the departments in terms of size and research quality makes recommendations uneven and focused on very different aspects.

As a general view, the Panel sees that there is considerable potential in most of the departments, but their future plans do not elaborate or face up sufficiently to the huge challenges in education locally and/or globally. Their focus is more on their earlier work, which is also understandable in a light of the overall guidelines given in the RED10 evaluation. The Panel sees as very valuable all efforts that the departments presented to take a strong and active role in developing education locally and globally with a forward-looking perspective

The Department of Education and Special Education

The research areas covered by the Department are highly relevant for the development of education in schools, as well in society at large. These research areas can make a very valuable contribution to future developments in different educational settings. The Panel recognizes the value of the units' work, but also expresses as a concern that the units seem to work separately without strong synergies. More collaboration between research programmes could increase relevance to educational issues and challenges in society.

Strenuous efforts should be made to ensure that the Department's world-class longitudinal studies are continued and adequately funded.

The Department has a good record in publishing nationally, but international publishing in high-quality journals should be encouraged and supported.

The Department of Pedagogical, Curricular and Professional Studies

The Department has an important mission to advance practice-oriented research. Its work for developing teaching of different subjects is very much needed. The Panel recommends that the Department further develops its strategic plans and makes its own profile stronger and more visible. The plans need to be clarified in terms of what they will provide to pedagogical and curricular studies in the future.

Many goals and the strategy outlined by the Department are realistic in relation to the Department's current resources, but there needs to be more clarity about the resources that will be available in the future. The senior leadership of the Department needs to be enhanced, and the professional development of younger researchers should be more in focus throughout future plans.

Assistance and guidance is needed for those academics in the Department with no or very few publications, in order to help them become true members of the research community.

The Department of Education, Communication and Learning

The Department has two very strong research groups – LinCS and ECE. They both have very high profiles, and this provides the basis for further progress. The Panel recommends that these groups continue their high standard work and contribute even more in international forums, even though they already have a creditable record in this. The Panel also recommends that these groups increase active researcher exchange with high-level international research units and groups, in order to become even more international in their orientation.

The new work on youth studies needs to become fully integrated within the Department as soon as possible.

The infrastructure plans should be clarified and ensured. There is a video laboratory in LinCS and there are other facilities in the Department, but a departmental level plan seems to be lacking.

The Department of Food and Nutrition, and Sport Science

The Panel is very concerned about the Department. As a separate, relatively small unit it will have serious problems in competition for funding, even though it is bigger after combining the Department of Food, Nutrition and Environment with Sport Sciences. The size of the new department is increasing and there are also some exciting new facilities being developed for sport science, but there is little evidence that this will produce better integration of its different components. The Panel advises the Department to develop research groups with a minimum of two to three senior scientists – this is necessary for interaction – combining researchers from dietary and sport science.

The Panel recommends the consideration of different alternatives. Firstly, if the University can add significant new resources (up to five professors) and the Department can find real synergy with different research areas, it can progress in both the quantity and the quality of scientific productiveness. However, if extra resources are not possible, its position as an individual and independent department should be rethought and a new location sought in some other bigger department. Finally, the Department's activities could be reformed as a coordinated multidisciplinary network or a centre which has high synergetic collaboration with many faculties or departments within the University (e.g. medicine, education, social sciences, neurosciences, etc.) and also has connections with other universities in Sweden and abroad. In that case, its administrative structure would be located in some larger

department or a faculty with sufficient funding to support the necessary collaboration and coordination.

In any case, the Department leadership needs to identify more clearly how Food, Nutrition on the one hand and Sport Sciences the other are intended to work together and provide guidance on how to do so. This should include how to build multidisciplinary research groups, how to increase collaboration between researchers and stakeholders, how to attract and invite guest researchers and how to establish international research projects. Also, unified internal quality control systems are needed across the new departmental structure.

The Department of Work Science

During the past decade, researchers at the Department have been active in producing high-quality research and in generating external funding. Nevertheless, the Department does not appear to have the internal organizational capacity needed in order to achieve its future goals and realize its full potential. It is too small to develop the kinds of synergies within the Department and externally that it needs. Its financial situation is very fragile, as it is highly dependent on external funding, and any significant failure to obtain such funding would be disastrous.

The Panel sees two main options for the future of the Department within the University. Firstly, the University could provide more basic funding to the Department. Researchers at the Department have demonstrated that they can carry out high-quality research with relatively little funding. However, extreme reliance on external funding is not a sustainable organizational model.

Secondly, the Department could be moved somewhere else within the University. Its placement within the larger Faculty of Education should not be taken for granted. Moving it to another unit, such as a social science unit, a business school, or even an allied health department might be another possibility. On the other hand, if it is to stay in the Faculty of Education, more efforts should be made to exploit those synergies that do exist within the faculties.

PANEL 5 – MUSIC, DRAMA AND LITERATURE

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INTRODUCTORY REMARKS

The following comments are presented in an effort to address common issues that the panel regards as important if research is to develop into a broader and more purposeful activity in the departments. The comments address the following basic issues:

- The nature and documentation of “artistic research and development”
- The role of traditional research
- Research productivity, quality and strategy
- PhD students
- The RED10 process

Before we address these issues we will describe some differences and similarities between the departments.

Characteristics of the four departments

It is important to recognize differences and similarities between the departments in this report where we address issues that are important for all of them. The major differences that have an impact on research activity are:

- Research or teaching department: One department (Göteborg Organ Art Center, GOArt) is a research institute, while teaching is the main activity in the three other departments.
- Size: One department (The Academy of Music and Drama) is comparatively large, with more than 30 full-time equivalent (FTE) positions among the academic staff with more than 1% research, while the other three have 2 to 4.6 FTE academic positions.
- Activity in *traditional research* and in *artistic research and development*: In the Academy of Music and Drama and GOArt, traditional research in musicology, organology and music education was the dominant research activity in 2004-2009. In the other two departments there are some examples of artistic research and development and no publications of traditional research.
- History of research activity: the Academy of Music and Drama has a tradition of producing research that goes back to the 1970s for traditional research and the 1990s for artistic research and development, while GOArt has been active in producing traditional research from the mid-1990s. The other two departments have a shorter history of research activity addressing artistic research and development, mainly in the last 8-10 years.

There are also some similarities:

- A very small fraction of the researchers' time for carrying out research is funded by the departments.
- Those members of staff that carry out the majority of research projects are obviously strongly motivated and produce more than their research time supports.
- Some very good research projects have been identified, both published and ongoing.
- In three departments there have been a high number of publications in 2004-2009. However, few of them are research publications.

The nature and documentation of artistic research and development

All four departments are striving to carry out artistic research and development. However, they must develop a firmer framework and a shared (at least within the departments) understanding of what artistic research and development is or can be, and *how artistic research and development can be documented*. The self-evaluation reports had no clarifying discussion of the concept "artistic research and develop-

ment”, and frequent use of other concepts like “artistic research”, “artistic development projects” and “artistic work” told us that there is a state of conceptual confusion. We are of the opinion that the self-evaluation reports should have included a description/discussion of the departments’ understanding and *use* of these concepts, and we are convinced that such a clarification is necessary for further development to take place.

We find it necessary to state our respect for the position and the challenge of the departments and the Faculty in addressing what, at least in two departments, is a fairly new approach. However, several of the staff members in these departments are well informed about international trends within artistic research and development, and have contributed interesting articles about the nature of artistic research and development. The problem is not so much one of *understanding* as one of *implementing* this understanding, especially regarding *the requirements documenting artistic research and development*.

The role of traditional research

The concept of “traditional research” is not used in any of the self-evaluation reports, and we use it only to draw attention to research activity that is carried out in music education, musicology and organology, using well established research designs and methods in the social, humanistic and technical sciences. While the rhetoric in the self-evaluation reports (and at least partly in the report from the Faculty) gave us the impression that artistic research and development is the major and most important research activity in the departments, this was not substantiated in the lists of publications from three of them. From these lists we conclude that a large part of the research output was of a “traditional” nature. It is highly understandable that the Faculty and the departments want to establish artistic research and development as an important research approach, but so far there is still a way to go before this is the case.

This observation has three main consequences for the departments and the Faculty. They should discuss a research policy that:

- recognizes and includes traditional research as an important part of the departments’ and the Faculty’s self-descriptions and institutional identity,
- sees a potential role for traditional research in the small departments where traditional research approaches have not been used, and
- sees a potential for projects where traditional research and artistic research and development can address different issues within a common project framework.

Research productivity, quality and strategy

Research *productivity* is rated “*insufficient*” (one department) and “*good*” (three departments). The ratings of *quality* range from “*insufficient to good*” to “*very good*”.

These evaluations are made partly in accordance with the evaluation guideline that asks for an evaluation of the total volume of scientific reports in relation to the number of FTE researchers at the units. We have also included considerations about available time for research as well as developments in 2010 in the basis for this evaluation.

The evaluation of research productivity and quality must be viewed in light of the available funding for research. With the exception of GOArt and the professor at the School of Film directing, the staff members have only up to 10% of their time for competency maintenance and development in their respective areas *and* for research. In this situation, research is totally dependent on funding from the Faculty and from external sources, especially the Swedish Research Council. As long as the departments do not allocate more regular time for research to the staff members who are qualified for and interested in doing research, the departments cannot expect a higher level of research activity from staff members. Basically, this is a question of priorities in the departments’ financial policies, where the difficult question is: What shall we reduce in order to be able to expand in other areas?

Given that the researchers are provided with enough time to do their job, there are still obstacles that must be addressed. We have found that the following issues need consideration:

- The size of the departments. Two of the departments are extremely small: the Department of Literary Composition, Poetry and Prose employs five people (PhD-students not included), with a FTE of two positions, while the School of Film Directing has six people in four full-time positions. Research is expected from only two of the six. We are convinced that the Faculty and departments are well aware of the potentially negative aspects of having “research communities” that are so small.
- The organization of research within the departments. None of the departments has given information that indicates any form of research organization within the departments. The Faculty seems to be predominantly occupied with artistic research and development, and there is a Faculty committee where research projects from all departments are discussed and where funding is decided on. This is apparently a positive policy, but there is no indication of a relationship between the departments and this committee. The relationship between the departments and the Faculty must be clarified.

- The departments must develop and *implement* a research strategy. From the panel's perspective, the most relevant issues are to establish stronger leadership, organization and administration of research (there are positive developments on these issues in 2010) and decide on research areas that will be given priority for resources.
- They must also develop a policy for research publication. The small amount of international research publications must be viewed as a serious problem for the departments (except for GOArt). The low percentage of publications in refereed venues is also a matter for serious and urgent consideration.
- A quality assurance system for what is entered in the lists of publications is urgently needed. The lists were mostly found to be unreliable. We have found book chapters and other items belonging in other categories registered as “scientific journal article – peer reviewed”, articles in journals presented as “conference paper”, and book reviews presented as “journal articles”. The most significant confusion relates to artistic research and development: What is accepted as artistic research and development, and what is not? This confusion is manifest in the categories “artistic research and development” and “other”, where the panel observes similar activities reported in both categories. We have addressed this in the departmental reports, and have particularly questioned the inclusion of regular concerts and other performances without any lasting documentation and reflection as artistic research and development.

PhD students

PhD students are important contributors to research in the departments. Organizing the PhD programme and courses at Faculty level is obviously a sound policy because of the small research communities and the fragmentation of research issues within the Faculty.

The number of students who have finished their doctorates is fairly limited. This may have something to do with the proportion of PhD students in relation to staff with research. PhD students are full-time researchers for three to four years. In the Academy of Music and Drama there are three FTE research positions among the *regular* staff and 15 FTE *PhD students*. The School of Film Directing has two members of teaching staff in small proportions of positions with a 40% of full-time position for research, and this department will start with two PhD FTE students. We ask:

- Are there enough qualified researchers with enough time for supervision?
- What will be the long-time consequences of a situation where the regular staff has little or no time to carry out research, and where the departments must rely on a large (in relation to regular staff with research) body of PhD students to keep the departments on the research agenda? Should the University and Faculty spend much more money on research by regular staff and reduce the number of PhD students?

5A. THE ACADEMY OF MUSIC AND DRAMA

5A.1 Overall assessment

The Academy of Music and Drama offers Bachelor's and Master's programmes in music, theatre/acting and opera and musical theatre, a Master's programme in orchestra and four PhD programmes. The total number of students is approximately 700.

The research setting is a department with traditional research in music education, musicology, composition and technology, as well as artistic research and development. The self-evaluation report gives the impression that artistic research and development is the dominant activity, a description we question on the basis of the list of publications. We find that the output of research is much higher than that of artistic research and development.

An overall impression from the list of publications in 2004-2009 is that some of the staff members and PhD students have been engaged in a broad range of publication activities and have carried out or are currently working on several interesting projects. Viewed in relation to the extremely restricted time allocated to research in the Academy, the output is *good*.

The quality of the Academy's research output is evaluated as *insufficient* when it is understood as a measure of the international attention received by the Academy and its research. This is not an evaluation of the quality of individual publications but of the Academy's output. Since only a small part of the research is published internationally, it can hardly be expected that research from the Academy can receive international attention and recognition.

As for the other issues, some are not addressed in the self-evaluation report and are consequently not addressed in this evaluation. Other issues, e.g. uniqueness and relevance, are evaluated as *good*.

The panel has the following recommendations:

1. The Academy must develop a research strategy. From the panel's perspective, the most relevant issues are:
 - establishing stronger leadership, organization and administration of research within the Academy (there are positive developments on these issues in 2010),
 - setting priorities in interesting areas for research in relation to the Academy's overall strategy,

- deciding on how the Academy can allocate resources within its own budget as well as developing a long-term policy towards external funds,
 - developing a policy for publication, especially for international publication,
 - establishing a quality assurance system for what is entered in the lists of publications,
 - developing a strategy for how a larger proportion of the staff can engage in research,
 - developing a plan for the relationship between the subunits within the department (music, drama and opera) regarding interdisciplinary research.
2. The Academy must acknowledge that the main output of research in 2004-2009 is traditional research (i.e. in music education, composition and technology, and musicology) and not artistic research and development. If this is a situation that the Academy wants to support, it must have an impact on the Academy's identity and self-description.
 3. The Academy must clarify what it regards as artistic research and development. There can never be a definite description of what constitutes artistic research and development, but the Academy must strive to set some boundaries and describe some expectations for this activity. A decision on documentation is of particular importance. The panel regards it as a necessary requirement that artistic research and development features lasting documentation of some sort. In addition, it is necessary to decide what this documentation should tell us about the project. Several members of staff have contributed with interesting and important theoretical publications about the nature of artistic research and development. This gives the Academy a good foundation for decisions about a more definitive policy on artistic research and development and its documentation.
 4. If the Academy wants to see a higher level of artistic research and development activity from its staff, it must develop resources, know-how and venues for publication that can meet the needs of its staff.
 5. The Academy must discuss its PhD policy.
 6. The question of funding and resources is central to a policy for the future of research within the Academy. The policy at Faculty and University level is, of course, vital. However, the Academy has resources itself. Giving research a higher priority may result in other activities within the Academy having to be scaled down.

5A.2 Productivity

The panel was asked to evaluate the total volume of scientific reports in relation to the number of FTE researchers at the unit. In order to make such an evaluation, we have to distinguish between “traditional” research, i.e. research that is primarily published as a text in a research journal, and artistic research and development, where the choice of documentation medium is more dependent on the nature of the research, and where we find a combination of text and CD/DVD. We will also distinguish between the regular staff and PhD students, because the time allocated to research differs significantly between the two groups.

There were 45 persons in approximately 33 FTE positions among the regular staff whose positions included research in 2009. In the PhD programme, there were 19 students (approximately 15 FTEs) in 2009.

The two basic publication categories for an evaluation of productivity are “Scientific journal article – peer reviewed” and “Artistic research and development”. There are 15 peer-reviewed scientific journal articles listed. Three are by PhD students and will be addressed below. Of the 12 remaining publications, two are articles in the non-refereed *ArtMonitor* and two are chapters in books/reports published by the University. Accordingly, these publications do not belong in this category. Of the remaining eight articles in this category, six have one author. We conclude that six members of staff have produced six peer-refereed articles in the period 2004-2009, and two of the six are also co-authors of two other articles.

Even though we regard articles in refereed research journals as the main instalments of research publication, we will also include articles from the category “Scientific journal article – non-peer reviewed” in our evaluations. Here, we accept 4-5 articles which, together with the two articles in *ArtMonitor* mentioned above, add up to a total of 6-7 non-peer-reviewed articles. There is also a monograph on jazz, and approximately 15 book chapters that present original research or disseminate research reports and PhD theses, or that discuss the nature of artistic research and development.

Regarding the category “artistic research and development”, 49 publications by 11 persons are listed, two of them as co-workers. Of these 49 publications, 34 are from one person, all of them concerts (recitals) with no further documentation. Among the other 15 publications there are two that refer to concerts with no further documentation and four that refer to performances with no further documentation. Only three are documented by a CD and five by a DVD of a concert or a performance.

A basic requirement for all types of research is that there must be some sort of permanent documentation of the project. Consequently, the 40 concerts/recitals/performances where there is no permanent documentation are excluded from the evaluation. Of the remaining nine publications, there is an essay that is not published and has also been excluded. We are left with eight artistic research and development publications with permanent documentation on CD or DVD. Only three also include written material that presents and discusses research questions, etc.

Our conclusion on the quantity of research is that there are eight articles in refereed research journals, 4-5 research articles that are not peer reviewed, one book and approximately 15 book chapters that can be regarded as a basis for an evaluation of productivity. Furthermore, eight members of the staff are registered with products of artistic research and development that have permanent documentation.

PhD students are important contributors to the total research output. In 2004 there were eight PhD students in seven FTE positions, while in 2009 there were 19 PhD students in 15 FTE positions, according to the self-evaluation. This also tells us that only one student completed a thesis in 2006, two in 2008 and five in 2009. The PhD students have mainly contributed with a thesis in “traditional” research or a thesis and other types of documentation in artistic research and development projects. Two of them have published an article in a refereed research journal, and one of them has co-authored two articles.

The self-evaluation report does not describe any goals and strategies for the Academy’s research activities. Accordingly, we cannot evaluate research output in relation to the unit’s goals and strategies. Nor do we know how well the Academy has used internal funding and individual work plans to encourage research, how well the Academy has competed with other departments within the faculty for extra funding from the Faculty, or how they have worked to obtain funds from external (outside the University of Gothenburg) sources.

Our conclusion is that there are 25-35 research publications in 2004-2009 from the regular members of staff, depending on what characteristics we ask for in research, and there are 10 PhD dissertations. In relation to a staff of 33 FTE positions this may be evaluated as insufficient. However, the output must be evaluated in relation to how much time is allocated to research. Document 1A tells us that the professors in 11.4 FTE positions have a mean of 10% of their time to carry out research, that senior lecturers/associate professors in 19.8 FTE positions have a mean of 3%, and that there is one postdoc in a 100% research position. In total this gives fewer than three full-time positions for research from a staff of more than 30 FTE positions. Viewed in relation to the amount of time allocated to research within the Academy, the productivity is *good*.

5A.3 Quality

We related our evaluation to the list of research publications and information given in the self-evaluation. Attention received by a research community as well as its reputation and position relative to comparable communities elsewhere are dependent on how and where research is disseminated. Of the six articles in refereed research journals with one author, two are written in Swedish and published in a Swedish journal, one is written in Swedish and published in a Nordic journal, two are written in English and published in an international journal, and one is partly presented in English and partly in Japanese in an international journal. In the remaining two articles, two staff members are co-authors (none of them first author). These articles are also written in English and published in an international journal. Of the approximately 20 non-peer-reviewed articles and book chapters, a handful are published in English.

The projects the panel categorized as artistic development and research are almost exclusively disseminated in Swedish and for Swedish (mostly local) audiences. This can partly be explained by the difference in international publication opportunities for “traditional” research and artistic research and development. While “traditional” research has a wide variety of international journals for publication, the fairly recent phenomenon of “artistic research” had no international journal that concentrated on the dissemination of artistic research and development in 2004-2009. The Academy has, however, an opportunity to develop research documentation in English, not only in Swedish, and to publish through ArtMonitor.

Our conclusion from information in the list of publications is that a handful of (“traditional”) researchers have entered the international arena with their research articles. We find that they represent music education, musicology (aesthetics and history), and theatre and drama. In artistic research and development there is hardly any international publication.

The self-evaluation report describes ten research areas/projects that are regarded as most successful and with a strong national and international impact. The self-evaluation gives no substantiation of this claim, nor does it describe the conditions under which the projects might develop further. (Ongoing projects and finished projects are also mentioned where “future areas” are expected under the heading “Description of most promising research areas or research directions of the Department”.) Our impression from the information is that there are several finished and ongoing projects with interesting titles/issues, but that most of those who are finished lack research documentation. Consequently they have very little opportunity to make an international impact as research. The “promising research areas” are given no motivation in the self-evaluation report. Two projects are joint projects with other

institutions, a situation that presents both opportunities and challenges. These are not discussed in the self-evaluation.

It is hard to find a strategy behind this portfolio of concrete projects and plans for future projects. The projects appear to be developed by individual researchers or a small group of researchers. This is understandable and may be the outcome of a conscious strategy in a situation with much uncertainty relating to external funding, where agencies outside the Academy are those that decide the Academy's research profile through funding.

Two publications are presented as the “most important publications/documentations (any year)”. The self-evaluation gives no information about why these publications were selected. Neither of the publications is linked to any of the research areas presented as “most successful”. Furthermore, the publication presented as “best representing innovative research activities (any year)” is not published (at the time of writing of the self-evaluation), and the evaluation gives no information about why this manuscript was chosen as the best example of “the recent development and renewal of the research in the department”. (This is a description of the project about improvisation mentioned earlier.)

One publication “of special importance” accepted for publication is about composition and computers. There is no information about why it is regarded by the institution to be of special importance, and the issue is not mentioned among the most successful research areas earlier in the self-evaluation.

The section “other achievements of innovative significance (introduction of new fields etc.)” mentions that “a focus on methodology has been particularly successful” in drama, contributing to artistic research. The meaning of this information is not immediately clear for the panel”.

The panel can see that there are several issues included in research and research plans that are relevant and interesting, i.e. aesthetic learning in schools, improvisation and interpretation in music, the use of computer technology in composition, experimentation with body language and movement in drama and opera, etc. The small number of international publications in “traditional” research and the few authors makes it difficult for the Academy to have an international reputation or receive international attention.

For traditional research, the evaluation is that the quality of the Academy's research output is *good* (“... attracting mainly national attention but possessing international potential...”). In artistic research and development, the research has gained some national recognition, but publications are primarily known locally and have “not

gained wide circulation”. Our evaluation is *good to insufficient*. This evaluation is *not* an evaluation of individual publications (where we find good research quality), but an evaluation of *the Academy’s total national and international research output* of artistic research and development. For the Academy to reach international recognition for its artistic research and development work, resources and opportunities must be given to encourage and support international publication.

5A.4 Uniqueness

The panel had no information about research that would be unusual or unique. However, several of the research projects contribute to issues that are not addressed widely. The evaluation is *good*.

5A.5 Relevance

Many of the research projects have cultural and social relevance, and all of them are relevant in relation to the international development of the field of study. The evaluation is *good*.

5A.6 Organization and research infrastructure

The self-evaluation report did not give any information on how the unit functions and how effective and professional its leadership and administration are. We are not presented with explicit goals and strategies for the Academy’s research programme. Consequently, we cannot comment on how realistic it is in relation to resources and suggest in what ways these could be improved. In the site visit we learned that there have been some important changes in 2010, with a full-time position for a Coordinator of Research and a Research Council for the Academy, headed by the Principal of the Academy. Work on a research strategy has also started. All of this is good news for the development of research within the Academy.

Access to GOArt and the Lindblad Studio is obviously an asset to the Academy, and efforts to involve these studios more in research carried out at the Academy are to be encouraged. With the recent (2010) re-equipment and rebuilding of the Lindblad Studio, the Academy has an up-to-date venue with a broad range of research possibilities.

5A.7 Collaboration and networks

The self-evaluation report gives no information about specific networks, only a statement in the SWOT analysis about “well-developed national, Nordic and international research networks resulting in joint projects and research collaboration”. From the list of publications, the panel can see that some of the members of teaching staff contribute regularly to networks. Such contributions must be encouraged, since they give teaching staff an opportunity to disseminate the results of their

projects, as well as an opportunity to follow the international development in their field of work.

The virtues of multidisciplinary are praised several times in the self-evaluation report, and there are some examples of collaboration between different subject areas within the Academy as well as collaboration with other units in the University. Issues like “aesthetic education” and “improvisation” are well chosen for such cooperation, and the panel has the impression that interdisciplinarity and intradisciplinarity are encouraged in the Academy. Evaluation: *Good*.

5A.8 Future plans

The self-evaluation report presents no explicit plans for the future. Accordingly, the panel cannot comment on or evaluate the quality and uniqueness of the future research plans.

5A.9 Future potential and possibilities

The areas where there is research activity seem well chosen, both in relation to expertise within the Academy and in relation to internationally interesting issues.

5A.10 Research activity and teaching

The self-evaluation report describes no relationship between research and teaching, and comments in the SWOT category that one of the weaknesses is a lack of coordination with education. This is obviously an area with a high potential for improvement.

5A.11 Interactions with society

The self-evaluation report mentions some possibilities for contact with society (“some of the University’s research platforms”; Gothenburg Art Sounds Festival; “festivals”), but this is either something that is in the future or not explained in relation to research. The self-evaluation mentions 150 concerts and performances each year. However, most of them are regular student concerts and have nothing to do with research dissemination. The self-evaluation does not mention anything explicit about the dissemination of “traditional” research in relation to societal influence and interaction. There have been a handful of performances that have disseminated from artistic research and development in 2004-2009. This is not a high number, and the contact with society based on artistic research and development is modest.

This is an area that needs an explicit policy from the Academy. The research-related interaction with society is below the expected level for the field.

5A.12 Gender and equal opportunity issues

Gender is not commented on in the self-evaluation report, but is addressed in the Dean's document. There is a gender balance among PhD students, while there are more men than women among the regular staff. This is a well known situation in higher education and an issue that we are sure the Academy keeps an eye on.

5A.13 Other issues

We have selected the following issues for comments:

The PhD policy

In 2009 the mean age of PhD students was high (49 years), and the rate of finished students is questionable. These issues have consequences for recruitment. Furthermore, the panel questions the proportion of PhD students in relation to staff with research. PhD students are full-time researchers for three to four years. In the Academy there are three FTE research positions among the regular staff and 15 FTE PhD students. What will be the long-time consequences of a situation where the regular staff has little or no time to do research and where the Academy must rely on a large (in relation to regular staff with research) body of PhD students to keep it on the research agenda? The University and the Faculty can allocate more money for research to the regular staff and reduce the number of PhD students.

The funding of research

As long as the department does not allocate more regular time for research to the staff members who are qualified and interested in doing research, the department cannot expect a higher level of research activity from staff members. Basically, this is a question of priorities in the department's financial policies.

5A.14 Summary of assessments – the Academy of Music and Drama

Quality, traditional research: *Good*

Quality, artistic research and development: *Good to Insufficient*

Productivity: *Good*

Uniqueness: *Good*

Relevance: *Good*

Collaboration and networks: *Good*

5B. THE DEPARTMENT OF LITERARY COMPOSITION, POETRY AND PROSE

5B.1 Overall assessment

The Department of Literary Composition, Poetry and Prose was established in 1996. The department is the smallest at the Faculty of Fine, Applied and Performing Arts, with 17 students, two PhD students and five staff members in two full-time equivalent positions (2009).

The Department has been experimenting with artistic research and development since its foundation in 1996, and has registered five artistic research and development publications in 2004-2009. In this period, it produced no publications of traditional research. An examination of the publications listed indicates that there is a concern for excellence in Swedish writing and experimentation with form in order to achieve these goals. However, comprehension is dependent upon a ‘close reading’ of written texts and accompanying CDs/DVDs.

Many university Creative Writing departments have been struggling with the demands made by research granting bodies for getting the balance right between artistic excellence and inquiring research of an academic nature, since entering university sector some years ago. The common practice has been simply to allow the text to stand for research, as artists have not been willing to theorize about what they consider to be their artistic freedom. This brought the issue of what is meant by artistic research into question. The important step taken by the National Research School in the Arts in 2009, which defined research as “... documented artistic development work – in accordance with the Swedish Research Council’s definitions of artistic research and development and in line with the situation that exists in Finland and Norway”, has certainly eased the strain of trying to force artistic production to conform to the demands of the other sciences. However, it has not made the situation easier when evaluating research of an artistic nature whether it complies with the regulations laid down by traditional research or artistic research and development. The self-evaluation report did not give a reflection on how artistic research and development is understood and practised within the Department. The panel especially missed a discussion of the relationship between research production and literary production.

Research productivity within the Department is regarded as *good*, as is the quality of publications and their relevance. Cooperation in projects within the University is also *good*, but the panel recommends cooperation with even more artistic avenues within the Faculty. Cooperation and networks with international institutions are *poor but worth developing*. The future plans are *good*, and the relationship between

research activities and teaching seems to be very close. The largest obstacle for a higher level of research activity is the small number of staff members and their negligible amount of time for research. The critical mass of staff must be addressed.

5B.2 Productivity

There are five persons in two FTE positions, with a total of about 10% of an FTE position for research, and two registered PhD students in 2009 at the Department.

There are no peer-reviewed articles in scientific journals from the regular staff members. However, a three-page encyclopaedia article has been peer-reviewed. Three non-peer-reviewed articles have also been published by the regular staff, all of them discussing the relationship between art and science/research. In addition, two non-peer reviewed articles have been published by PhD-students. Two chapters in books and a handful of books have been published, and five publications in the “Autor” series are presented as artistic research and development. In relation to the very small amount of time allocated to research, we evaluate the productivity as *good*. In addition to these publications, staff members have published works of literature and text books in Swedish aimed at schools or the general public.

5B.3 Quality

According to their self-evaluation report, the Department of Literary Composition, Poetry and Prose enjoys a reputation as “the most significant, most requested and prestigious creative writing programme in Scandinavia”. It justified this claim (during the site visit) by referring to the fact that most of the staff and students are established authors – novelists or poets who work in the Department part-time and carry out their own artistic work in their private time. Nevertheless, it is important to realize that nearly all of their publications are in Swedish or other Scandinavian languages. Consequently, the international community has so far not been able to take advantage of their research outcomes. Even the multilingual publication *Ödeläggelse* (2009), which can be seen as an attempt to appeal to a broader international readership, has a restricted circulation. Although English translations are mostly supplied, the difficulty of marrying up the layout of the “written text” with the DVD, music and “voice-over” is most confusing, and the use of so many languages makes it difficult to understand. Some kind of research question or statement as an underpinning would have given the project a firmer artistic research and development identity. The overall evaluation is *good* (attracting mainly national attention but possessing international potential).

5B.4 Uniqueness

The published artistic research and development is in line with publications from similar Creative Writing departments, and does not stand out as particularly unique in the world of science. Evaluation: *Good*.

5B.5 Relevance

The research and literary output has had an impact on the discussions in the literary field in Sweden and Norway. Introducing technology to highlight the written texts, as demonstrated in Ödeläggelse, is an example of an approach that is in line with international trends in Creative Writing as the swing towards more multimedia artistic research has become apparent. In addition, staff members have engaged in the public discourse on important issues, as for example in the project “Lomonosovryggen”.

The overall evaluation is *good*.

5B.6 Organization and research infrastructure

We have no information about the internal organization of research within the department. The SWOT analysis mentions that there is too little time for discussions about principles and visions for research and that there are not enough administrative resources. Lacking further documentation, the panel can only conclude that this is an issue that must be addressed.

5B.7 Collaboration and networks

The “contact of the department with the rest of the world, including participation in interdisciplinary and cross-disciplinary co-operation research efforts and networks” is *good* in a Swedish context. International collaboration (at least outside Scandinavia) is, however, *poor but worth developing*.

5B.8 Future plans

The Department intends to continue with its participation in important literary events and festivals, e.g. the Gothenburg Book Fair. There is, however, no indication in the self-evaluation report of whether this represents dissemination of research or of literary products.

Development is expected to move in two directions:

- PhD education in close contact with other art forms
- Research conferences, publications in “Autor”

This development should be encouraged, but would be unrealistic with regard to the current staff, finances and infrastructure. It appears that there is a tension in the lack of understanding concerning matters of administration between the Department and the rest of the Faculty. Unless these tensions are aired and resolutions arrived at, the plans for future development will be impossible to implement.

Evaluation: *Good*.

5B.9 Future potential and possibilities

As we live in a multimedia world, the Panel recommends developing connections with the other art forms at the Faculty – not only music, but also drama and film, and even opera. Drama and performance has developed considerably over the past few years, with text, video projections, music and dance being combined to create exciting new performances. These ‘hybrid’ activities are becoming more frequent in universities, but require careful planning and organization, as well as supervision and documentation. The Department is obviously aware of these possibilities for their artistic practice, but it would seem that there are many more artistic avenues in the Faculty of Fine, Applied and Performing Arts which the Department could follow. Then there is the issue of the financial returns which such projects could stimulate if one considers the creative industries as possibilities which the University of Gothenburg could follow.

5B.10 Research activity and teaching

This area – the “complete academic environment”, where the teaching is reflected in the research activity – is obviously working very well in the seminar activity at the third-cycle level. The published outcomes bear witness to this. However, the panel does wonder how well it works for all 17 students per year. As there are so few staff and supervisors, it could be that it is the ideal where research is balanced with teaching as a norm, in which case it should be continued.

5B.11 Interactions with society

The Panel feels that interactions with society are in line with the expected level for the field in question, as demonstrated by the number of individuals who have been involved with the community at important literary events and festivals such as the Gothenburg Book Fair. There is not so much evidence of participation at scientific community meetings or conferences/seminars at other universities. Nevertheless, there is the involvement of Professor Hansson in the expedition to the North Pole and his subsequent participation at conferences and discussions on the future of the Arctic Sea. In addition, the text books aimed at the general public shows a direct relationship with society.

5B.12 Gender and equal opportunity issues

In terms of staffing it appears that there are more women than men employed at the Department (3 – 1). The same trend is obvious in the number of registered PhD students.

5B.13 Other issues

It is obvious that there are too few members of teaching staff at the Department with a reasonable percentage of employment. On the one hand, this arrangement allows time for the staff to pursue their own artistic practice and research (although

they feel that they do not have sufficient time for personal research and development). The critical mass of the Department must be addressed.

5B.14 Summary of assessments – the Department of Literary Composition, Poetry and Prose

Quality: *Good*

Productivity: *Good*

Uniqueness: *Good*

Relevance: *Good*

Collaboration and networks: *Good/poor but worth developing*

Future plans: *Good*

5C. GÖTEBORG ORGAN ART CENTER (GOART)

5C.1 Overall assessment

Göteborg Organ Art Center (GOArt) is a fairly small research centre that specializes in integrated studies of instruments (pipe organs and its related keyboard instruments) and performance. The centre had seven academic staff members in 4.6 full-time equivalent positions in 2009.

In the self-evaluation report GOArt describes its research profile as “a dialectic among the instrument, the builder, the performer and the music.” GOArt is well known internationally for its work on organ building and preservation. The research carried out within and in collaboration with GOArt has produced a great deal of information about historic organ building and organ music performance.

Organ building today is a very specialized art, which relies heavily on tradition and knowledge of organ history. In organ music and its performance, the relationship between the instrument and the performer is of the utmost importance and is constantly being reconsidered according to the features of the instrument in each case. The knowledge and skill of the organ builder and the know-how of the performer are both necessary in order to maintain and develop the art of organs and organ music, which had – and still have – a significant role in European culture and should therefore be preserved for future generations. In this respect GOArt is unique; to the best of our knowledge there are no other comparable research centres in the world.

Overall we find that the research productivity is *good*, and both quality and relevance are *very good*. GOArt now has an *excellent* infrastructure and *excellent* cooperation and network activity, and its future plans are realistic, as far as this is possible to evaluate in a volatile funding situation.

The self-evaluation report did not provide all the information the panel would have needed. We have therefore relied on the GOArt website, which for the most part is well made and informative. We were also provided with additional information during the site visit that clarified some of the issues.

The *research issues* that need the most urgent attention are:

- Publishing policy: A strategy for publishing in the most important journals, especially in peer-reviewed journals and contexts. In 2004-2009 only one peer-reviewed journal article written by one staff member was published, and two articles had staff members as the fourth and fifth authors.
- Better balance between traditional research and artistic research and development. In 2004-2009 the panel did not recognize a single artistic research and development document.

5C.2 Productivity

Staffing has risen slightly from 2004 to 2009, and the academic staff now (2009) consists of seven people with 4.6 FTE positions. The research time is 3.75 FTE positions.

In the list of publications we find that:

- *Scientific journal article, peer reviewed.* There are four publications in this category. One is the sole work of a staff member and in two cases the contributor is the fourth or fifth writer.
- *Scientific journal article, review article.* The publication belongs in the category *Journal/newspaper article*.
- *Scientific journal article, non-peer reviewed.* Of the 17 items included here, eight are published in a “scientific” journal. Consequently, about half of the journals cannot be considered such but represent a forum which is not directed to the research community, but to a limited field of experts or the general public. (Of the music journals, most of the “scientific” journals considered as such have the status of core or secondary journal according to RILM [*Répertoire International de Littérature Musicale*] standards, see below.) Of the 17 publications, the panel accepts four as representing research publication.
- *Journal/newspaper article.* 22 items (including the article wrongly listed as a review article, and nine wrongly listed as non-peer-reviewed scientific journal ar-

ticles). These are of varying subjects and importance, and often represent more general information drawn from earlier research carried out within GOArt or elsewhere. Some of them are of limited interest to the research community. Two of the publishers are RILM secondary journals. The panel accepts three of the publications as research publications.

- *Chapter in monograph/book*. 46 items: Twelve from a PhD student, 24 from one staff member and the rest (ten publications) from five other staff members. Many of the publications are short ones in encyclopaedias or dictionaries (“*Lexicon der Orgel*”) with descriptions of organs. Approximately 15 of the publications in this category can be regarded as research articles based on original research not published before.
- *Artistic research and development*. Here are 22 concerts with no lasting documentation. A basic requirement for all types of research is that there must be some sort of permanent documentation of the project. Consequently, the 22 concerts are excluded from the evaluation.
- There are four *book reviews*, three *monographs* (two *descriptions* of organs, one *guide for players*), one *doctoral thesis*, one *report* (a guidebook for organ documentation), five *conference papers, non-peer reviewed* and six *other items* (three recording sleeve notes, two descriptions of an instrument, and one other) correctly listed in their respective categories.

Our conclusion is that there are approximately three peer-reviewed articles, seven research articles published in non-peer-reviewed journals and approximately 15 chapters in books that present research not published before. There is also a PhD dissertation. There is no artistic research and development in 2004-2009.

In relation to a research resource of 3.75 FTE positions, this is (somewhat hesitantly) evaluated as *good*. The hesitation relates to the following concerns:

- The number of *research* publications is not impressive in relation to a six-year period (2004-2009).
- All except three publications are published in non-refereed contexts, and in two of these articles the major authors are from outside the institution. This is a too small number of refereed articles.
- The lack of artistic research and development is surprising and somewhat alarming. The listed items in this section obviously represent artistic *activity*, live recitals and concerts, which is a highly relevant activity in GOArt. However, without lasting documentation (audio or DVD recordings) and a clear reference to research issues and questions, this does not comply with the basic requirements for artistic research and development. Many of the concerts are probably related to written texts presented in the publication lists (especially texts about clavichords), but this is not explicitly demonstrated and woven

together in artistic research and development projects, and there is no information in the self-evaluation report that links the recitals to research papers.

However, the sheer number of publications of different types in different venues indicates that publishing has high priority in GOArt.

5C.3 Quality

Quality is a measure of “international comparability and innovative power” and “excellence and the attention received by the unit and its research”.

There can be no doubt that GOArt is well known and respected in other research institutions and among organ players. The publications cover a wide area of topics from technical (relating to organ building, materials and conservation) to performance practice and more general musical questions. The technical research is valuable to organ builders, organ restorers and conservators. This kind of empirical research has little support in other institutions, and it provides information and technical support instead of approximations. This kind of research is invaluable in preserving and conserving the heritage of European organs and organ culture, which is often difficult to appreciate and only vaguely understood outside the expert circles.

It is also obvious that the activities of GOArt can have a strong impact on organ performance practice. The potential is so strong that we would like to see even more widespread dissemination in this field. (It is highly possible that the organ culture community is very conservative and the dissemination should therefore be quite active.)

A majority of publications are in German and English, a fact that gives the publication an international reputation. The most often used publishing arenas and publishers show a wide variety, by nation (Sweden, the Netherlands, Belgium, the United Kingdom, Germany, Italy, Japan, the US) as well as by nature and by recipients. It could be argued that the dissemination should favour the English language, but it must be remembered that organ building has at least historically been most active in non-English speaking countries.

The overall assessment of quality is *very good*.

5C.4 Uniqueness

The research carried out at GOArt is unique in its field in the world. There are, to our knowledge, no other comparable research centres or research clusters in the world. Even though individual researchers and organ builders carrying out research in a specific field do exist, their influence is felt mainly within these projects and do

not usually carry automatically wider implications or produce widely disseminated reports.

The overall assessment of uniqueness is *very good*.

5C.5 Relevance

The research carried out at GOArt is beneficial to organ builders, organ restorers and conservators, organ owners, historians, organ players and other musicians, *in summa* the whole field of organ culture. The relevance is felt both in concrete organ building and restoration projects and in a wider understanding of the historical importance of organ culture. The relevance has been proved in a concrete and material manner in GOArt organ building projects (Örgryte and Casparini organs, numerous clavichords, etc.).

The assessment of relevance is *very good*.

5C.6 Organization and research infrastructure

GOArt has a Director and two administrative staff members to take care of secretarial functions and finances (both of them apparently in part-time positions). The centre is “supported by an advisory board”. The self-evaluation report gives very few details if any of how this organization functions. Consequently, the overall efficiency cannot be estimated accurately. However, the history of GOArt shows that there has been a good ability to initiate and organize large projects, and the site visit confirms this. Our evaluation is that the research organization of GOArt is *good*.

The organ at Örgryte Church is an invaluable asset, and GOArt’s location in a new building with many opportunities (including the availability of GOArt’s large library) gives the department working conditions and an infrastructure that must be regarded as *excellent*.

5C.7 Collaboration and networks

It is obvious that collaboration and networking is well represented in the activity of GOArt. The centre collaborates with the Academy of Music and Drama and the Department of Conservation in the University, as well as with a number of other universities and other bodies in Sweden, Germany, Denmark, Italy, the Netherlands, Lithuania, Latvia, the United Kingdom, Poland and Brazil.

In 2004-2009, the staff working at GOArt had 33% of their work published in collaboration with at least one author outside Sweden. They have also been well represented at international conferences, often as key-note or invited speakers (72 times), and at seminars at the University or other universities (17 times), and or-

ganized several international conferences. Some inward and outward research visits have also taken place.

The overall assessment of collaboration and networking is *excellent*.

5C.8 Future plans, potential and possibilities

The self-evaluation report mentions several projects or lines of research, of which the following have good potential and relevance:

- They will continue to utilize the Örgryte organ in investigating the role of a North-European organ in its contemporary conditions and its history and its implications in terms of organ music and performance. Although this line of activity will probably be most valuable to performers and musicians, i.e. the art of music, the implications are possible only through earlier original research.
- The project COLLAPSE is an investigation into the corrosion and conservation of lead and lead-tin organ pipes. It is almost finished, and a report will be published soon. A natural extension of this line of work will be the project SENSORGAN, which will provide an early warning system for detecting harmful environments for pipe organs. Some of the earliest and most valuable organs might be saved or at least partly saved and restored because of this highly valid research.
- Another ongoing project is the restoration of a unique organ built by Adam Gottlob Casparini in Vilnius. A copy of this organ was built at the Eastman School of Music in Rochester, New York, in 2008. The research carried out at GOArt has proved invaluable in both of these projects. The uniqueness of the instrument (and its copy) is proven by the fact that the Casparini organ is the only one extant by him and that it represents the style of organ that Johann Sebastian Bach was familiar with and most frequently played.
- Clavichord building and studying will continue. Obviously, earlier clavichords are beneficial to the organ and other keyboard students. This situation is comparable to the first situation mentioned above, as the benefit of earlier research can be put to use in the art of playing and performing.
- The organ documentation manual published in 2005 will be an important tool in future restoration projects. Organ descriptions and documentation are being produced at many locations, often somewhat haphazardly, and this manual will provide a much-needed methodology.

The assessment of the realism and substance of future plans is *good*.

5C.9 Research activity and teaching

GOArt is a research centre and has no education programme and no finances allocated to education. At least three members of staff have collaborated with other

departments in their education programmes, and two staff members taught at the Academy of Music and Drama in 2009. The cooperation with the Academy of Music and Drama must be regarded as especially important in terms of bringing research from GOArt to students.

5C.10 Interaction with society

The utilization of research results in interaction with other parties outside academia is obvious and of an impressive magnitude. The parties include the Swedish Church, the Gothenburg Organ Festival with its workshops and master classes, and numerous national and foreign organ communities, e.g. organ owners, organ builders, and organ players. The Örgryte organ has been an attractive medium for several organists, who have made public recordings on it, thereby bringing the art of organ music to the general public. Some of these have been initiated by GOArt. Sixteen government commissions have been carried out.

5C.11 Gender and equal opportunity issues

The self-evaluation report does not give much information on this issue, except where it is mentioned that the “understaffing has a parallel in our representation from a gender and age perspective”. The mean age of the personnel is 50.5 years and there are no women among the staff. The most immediate opportunity for changing this situation is through PhD students. Future recruiting efforts must be carried out from a strategy where age and gender are important variables, and where the recruiting process should ensure the definitive absence of involuntary or unconscious discrimination.

5C.12 Summary of assessments – Göteborg Organ Art Center (GOArt)

Quality: *Very good*

Productivity: *Good*

Uniqueness: *Very good*

Relevance: *Very good*

Research organization: *Good*

Infrastructure: *Excellent*

Collaboration and networks: *Excellent*

Future plans: *Good*

5D. THE SCHOOL OF FILM DIRECTING

5D.1 Overall assessment

The School of Film Directing was established in 1997, and represents the most recent film directing programme in Sweden.

The School organizes higher education in film directing (training of filmmakers) at Bachelor's (since 1997) and Master's levels (since 2006), and intends to admit the first doctoral students in the autumn of 2010.

The main subject at the School is “Independent filmmaking”. The School’s vision is “to train filmmakers who express themselves in a personal film language and who are well aware of what their approach is with regard to artistic production and artistic research”. The school’s core philosophy is “to be part of the new position film and moving image is taking in the development of our society”.

Artistic research and development and traditional research are relevant to the School of Film Directing. The panel recognizes the difficulty in establishing a new school with educational programmes while at the same time developing relevant and interesting research, especially when the size of the staff is as small as in this case. However, there could have been a clearer use of concepts in the self-evaluation report. The difference between “artistic research” and “artistic development work” is not made clear. The self-evaluation refers to two projects as “artistic research” and refers to the School’s website for information on six “Artistic development works”. Moreover, it is not made explicit how artistic research and its outcomes differ from mere artistic production. There is a statement on the School’s website that tells us

that “Artistic research is a concept that is undergoing constant development and redefinition at The Faculty of Fine, Applied and Performing Arts”. The panel’s opinion is that this statement should have been commented on in the self-evaluation in relation to the School’s policy.

There is no reference to a research plan in the self-evaluation report that explains strategic research goals and research objectives, and no description of actions to take in order to create a research environment that connects with the educational setting of the School. Accordingly, there is no clear link described between the school’s mission (training of filmmakers, with the main focus on “independent filmmaking”) and the school’s research objectives. However, during the site visit, the panel was given a written research strategy plan 2007-2012 for the School. This research strategy was presented to the faculty in 2007, but no further action was linked to this. (See “Other issues”.)

We can hardly speak about a research environment in the School of Film Directing, a department where only two people in minor positions have very little time allocated to research. There were no doctoral students or postdoc positions in 2004-2009. This is obviously connected with the University’s policy. However, for the School to be able to maintain both its teaching obligations and its research expectations, the research staff must be expanded, for example through post-doctoral staff. This is important in order to maintain the critical mass of highly qualified research talent necessary to fulfil future research ambitions.

A stronger focus on international cooperation and networks will also strengthen the research foundation for the school. Another aspect of internationalization is research dissemination in English. Increasing the international impact of the department can only be achieved if enough research output is disseminated in a more accessible language than Swedish. After the site visit, the panel was provided with an interesting strategy from January 2010 for the internalization of the school.

5D.2 Productivity

The self-evaluation reproduces the research personnel structure in 2004 and 2009. The situation is as follows:

- Whereas nine people were hired in September 2004 with 4.5 FTE positions, this was reduced to six people with 4.05 FTEs in September 2009.
- Meanwhile, the total budget of the School doubled between 2006 and 2009.
- The income spent on research increased in the period 2006-2009 by 550%, nonetheless still representing a rather modest absolute figure.
- In September 2009, only two people had a position that comprises research. Their fractions of research correspond to 0.4 FTEs.

PANEL 5 – MUSIC, DRAMA AND LITERATURE

- This means that for the whole School only 10% of the total 4.05 FTEs is assigned to research.
- There are no doctoral students, postdoc positions or research fellows.
- The senior lecturer/associate professor is not involved in research.
- The mean age for the two professors (professor and adjunct professor) is 64. As they are the only faculty engaged in research, some reflections on the future of research in the School might be necessary.

The list of publications shows nine publications over the last five years. One (a conference poster) is by a PhD student in another department. Among the eight from staff at the School of Film Directing, there is no publication of traditional research articles in refereed journals. Three projects are classified as “artistic research and development”, all of them by the same author from the non-research staff (!). One, “About quality”, is apparently fairly similar to traditional research. It is an interview study where the interview content has been analysed by an external researcher, and where a report has been presented. (The panel has not been able to retrieve the report from the reference, www.wift.se) Another publication in artistic research and development is a documentation of a filmmaker’s concern with “Our Time’s Fear of Seriousness”. The project is documented in the form of a film, but there is no explanation of what the filmmaker has contributed in order to make this an artistic research and development project. The third project is presented both as a book and as artistic research and development (a film?), but there is no description of the project in the text that can clarify the research nature of the project. Three of the last four publications are short texts with arguments in what is apparently running debates in Sweden (one article in a newspaper, one on a website and one in a periodical) and the last text is also a short one (three pages) in a Swedish newspaper/journal. All the publications mentioned are in Swedish. This inevitably affects international exposure.

Our conclusion is that in the period 2004-2009, one report has been published that may be classified as traditional research and one or two that are presented as artistic research and development. In relation to four FTE staff members (in 2009), representing 0.4 FTEs for research (in 2009), the productivity spread over the whole period must be regarded as *insufficient*.

This evaluation must be viewed in the context of developments in 2010, where the documentation of “The Shootings at Vasaplatsen” is published on DVD and on the internet, with an English-language version. This is obviously a project that has dominated research time for many years, and the publication is most welcome.

5D.3 Quality

Quality is a measure of “international comparability and innovative power” and “excellence and the attention received by the unit and its research”. This is an evaluation of the department’s output and quality, not of individual publications. Our evaluation is that the quality in 2004-2009 is *good to insufficient*. The motivation for this is that there is hardly any research output in the period and that the publications are in Swedish (which prevents international dissemination).

However, the research potential of the *ongoing* research can be considered commendable, and much of that research seems innovative. The most important research projects at the department are at present:

- An investigation of practical concepts in filmmaking, with the aim of finding new usable concepts for what film and the moving image constitutes today [“An Eye on Kopparmårna”]. This research project is funded by a substantial Swedish Research Council grant.
- The participation in a large interdisciplinary research project [“Passion for the Real”], also supported by the Swedish Research Council. The School of Film Directing leads the research related to film, investigating concrete guiding principles for handling an image in journalistic, historical and judicial processes (“The Shootings at Vasaplatsen”). The documentation (on DVD) of this project was not available at the time of the self-evaluation report, but was given to the panel immediately before the site visit.

The panel recognizes the importance and relevance of the above mentioned research projects, and sees the potential international impact these projects can generate for the School.

5D.4 Uniqueness

The research published in 2004-2009 cannot be regarded as “unusual or even unique in the world of science” (see guidelines for evaluators), while there is a potential for this in the ongoing projects mentioned above.

5D.5 Relevance

The relevance of what has been presented in 2004-2009 is *good*.

5D.6 Organization and research infrastructure

There is no information in the self-evaluation report regarding organization and research infrastructure, and there is no mentioning of a strategic research plan. However, as mentioned above, a research strategy plan from 2007 was given to the panel during the site visit.

5D.7 Collaboration and networks

Although the self-evaluation report does not explicitly give information on collaborations and networks, the research projects show us that collaboration (at least intra-university) and interdisciplinarity are highly valued. Evaluation: *good*.

The guidelines also ask for contacts and networks with “the rest of the world”. The self-evaluation report does not describe any such networks, and based on this the interactive validity is regarded as *insufficient*. However, the document “Filmhögskolans policy och handlingsplan för internationalisering 2010-2013” was presented to the panel after the site visit. This document gives a very good foundation for developing international cooperation and networks.

5D.8 Future plans

The self-evaluation report lacks concrete reference to future research plans. The small School does, however, have an extensive portfolio of projects from 2010 and onwards, and this may be an indirect demonstration of future plans.

In the SWOT analysis, the acceptance of the first doctoral students in the autumn of 2010 is mentioned, but not further contextualized.

5D.9 Future potential and possibilities

The panel sees opportunities in strengthening a partnership with the Gothenburg International Film Festival. This is an opportunity to disseminate information on the Department’s research activity.

5D.10 Research activity and teaching

There is no further explanation in the self-evaluation report on how the vision on research is/could be embedded in the school’s mission (“training of filmmakers”). The connection (and osmosis) between research and the educational environment should be cultivated more proactively.

5D.11 Interactions with society

The self-evaluation report does not address this topic. There are, however, obvious connections with society through the social and political issues addressed in previous and ongoing projects.

5D.12 Gender and equal opportunity issues

This topic is not addressed in the self-evaluation report.

5D.13 Other issues

The research strategy developed in 2007 (but not implemented) was a joint plan for the School of Film Directing and Theatre education at the Academy of Music

and Drama. The strategy is well written and presents interesting plans for research cooperation between the two institutions. The plan gives a fine overview of ongoing projects and future potential, and gives an interesting reflection on how these institutions regard and utilize the research concept and how they view the relationship between research and teaching. The institution is strongly encouraged to vitalize this plan in relation to the Faculty. The policy for internationalization from January 2010 is also a useful tool for future development.

5D.14 Summary of assessments – the School of Film Directing

Quality: *Good to Insufficient*

Productivity: *Insufficient*

Relevance: *Good*

Collaboration and networks: *Good/Insufficient*

PANEL 6 – FINE AND APPLIED ARTS

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GENERAL COMMENTS REGARDING THE ‘SCIENCE’ DESIGNATION AND ARTISTIC RESEARCH

Whilst it is recognized in the RED10 process that the terms ‘Science’ and ‘Scientist’ are used and intended to represent a broader academic constituency that includes the arts and humanities, there is a need to be aware of characteristics of research in the arts and design that require specific definition and the recognition of additional terms of reference. In particular, much research in the arts is practice related or practice led. Whilst this is an approach not exclusive to the arts, it remains a major focus that involves and relies on a range of outputs such as exhibitions, performances and events in the public domain that represent significant contributions to knowledge production and dissemination.

17 Steneby was part of the School of Design and Crafts in September 2009. From 2010 it is a separate department, Steneby - School of Craft and Design.

One of the key characteristics of the work being reviewed by Panel 6 is that it does not always easily fit into scientific-based terms of reference or measurement. The questioning and discourse around the definition, nature and purpose of research are, in fact, key concerns within the field of the arts and should be recognized. These are appropriate and relevant to the stated aims of the research, and are considered within the broader field of cultural practice. These aspects will be included and further commented on in the Panel's evaluation.

In various ways, the three departments define themselves as being more or less in the initial stages of developing their focus on research (in contrast to many of the other departments at the University of Gothenburg, which have been engaged in research for decades). We respect this position and understand the challenges faced by the departments and the Faculty in addressing a fairly new approach. Establishing a new discourse for these environments is parallel to the development of many art educations internationally, and represents a huge potential for the fields involved. The Panel's intention is to relate precisely to this stage for the departments being evaluated, and to contribute and encourage with constructive support for their future development.

ISSUES RELATING TO ALL THREE DEPARTMENTS AND THE FACULTY

There are several positive impressions from the work being done at the three departments and the Faculty, including:

- Dedicated, engaged and highly qualified staff delivering far more than their formal allocated research time;
- Some excellent research projects;
- A high level and a broad range of research activity;
- A high level of social engagement;
- High quality publications;
- Emerging research strategies in areas that are not yet well established;
- Good support structures for research students;
- Well established allocation of research project funds and project development at faculty level;
- The Faculty has a good record of external funding in relation to other Swedish art and design education providers.

There are, however, some common critical issues that need to be addressed for all three areas and at faculty level. There are also important variations between the de-

partments – these will be described in the specific chapters and roughly visualized in the grades.

Visions, strategies and leadership – the Faculty and departments

The Panel regards the Faculty's statements on research in the self-evaluation as well worked out and relevant. The Dean presents a picture of an energetic, internationally focused faculty which is fully cognizant of and engaged with artistic research practice. The research strategy from 2007 and the ongoing work for visions for 2020 as presented in the additional information from the Dean also seem relevant and well thought out. However, from the site visit, the Panel feels a need to question the transparency and efficiency of the research organization at faculty level in relation to departmental level, according to the following points:

- While the Faculty presents itself as the coordinating and supporting level and the main site for the PhD organization, the departments very seldom refer to the Faculty as a resource, academic mass or meeting place;
- As the Faculty has been playing an important role as research coordinator and has been the unit providing critical mass, it seems strange that the departments' self-evaluations have not been worked out in collaboration with the Faculty;
- The departments do not clarify their understanding of artistic research in their self-evaluations;
- The role of the research school(s) and their impact on the general development of the research seems not to be fully integrated and contextualized. This is underlined by the fact that the leader of the research school was not designated to meet the Panel;
- The guidelines and criteria for funding for the Board for Artistic Research and Development and the role of the Research Secretary seem to have much influence on the departments' research activity, but the remit of the role has not been clearly represented to the Panel;
- Convincing systems for consistent evaluation and performance monitoring of research staff have not been presented, either at Faculty or departmental level;
- A lack of critical mass in most areas limits the range of discourse and common research agendas.

It is difficult to reconcile the departments' rather diffidently written self-evaluations with the confidence of the Faculty's self-evaluation. There is a strong need for explicit strategies for research from each department, in tune with and in collaboration with the Faculty. The various statements and productions listed in the self-evaluations need to be framed within a wider perspective. Subject specific challenges need to be worked through and articulated. The three departments are at different stages: the School of Photography has – after the initial self-evaluation was produced –

delivered a more comprehensive strategy document and a more concrete action plan related to this. HDK has started the process, but requires stronger ownership and leadership. Valand appears to be in the early stages of forming a coherent strategy against the background of some significant commitment and critical thinking about the nature of research in relation to the creation of bodies of knowledge. The approach and work of the School of Photography should be regarded as a model of good practice for other areas to refer to.

Visions, strategies and relevant actions depend on strong leadership. It is the Panel's impression that the awareness and responsibilities of research leadership need to be embedded more solidly all the way through the Faculty organization.

Research staff and research environment

The present staff resources seem to be based on teaching traditions and historical grounds, with the research school having been added on, rather than a well considered strategic overview. The many categories of competences and the many various conditions for research in the staff lists call for a more consistent and transparent restructuring of staff. Plans for staff recruitment should be integrated into the research strategies.

The mean age of the PhD students in all three departments is very high – 43, 41 and 50 years. To establish a more sustainable career line, the recruitment of PhDs should be directed towards younger academics. Also, the PhDs' obligations to participate in the environment on site need to be strengthened. Some younger research students were interviewed during the visit, and most seemed to consider their experience to be supportive. There are, however, questions about the level of academic rigour in terms of providing high level critical input by supervisors to ensure that high standards of development are achieved. This is particularly important where research students are already entering into a PhD with significant prior achievements.

One major problem for obtaining research quality in the present situation is the small amount of research time available. When adding research time from the self-evaluations, looking at full-time equivalents (FTE) for the different groups and their research percentages, the total research time available is alarming:

- HDK/Steneby 1.86 FTE + 7 PhDs/6.2 FTE
- The School of Photography 1.01 FTE + 5 PhDs/4.75 FTE
- Valand 1.57 FTE + 4 PhD/3.12 FTE

This impression is confirmed in the list of students and staff FTEs of the whole university provided by RED10. There are 44 departments listed with students. In

the “Ratio of student FTEs to senior academic staff FTEs” the best senior staff resources are at the Institute of Clinical Sciences, with the ratio 5.2, while our three departments are at the high (unfavourable) end:

- HDK is number **39** of 44 departments, with 40.3 students per senior staff
- The School of Photography is number **44** of 44, with 89.4 students per senior staff
- Valand is number **35** of 44, with 34.4 students per senior staff

It is obvious that staff with such a low amount of research time formally available will hardly be able to develop a sustainable research community within each department. Valand has a more stable practice than the other two for allocating a decent amount of research time (30%) to professors, but this does not help much when the total amount is so small. Especially at HDK, adjunct part-time professors have been carrying out their artistic work outside the Department, which counted as research, but not paid for by HDK. This may previously have been a good idea in order to strengthen professional links to the fields outside, but will not be sufficient to meet the future research challenge. The individual professional interests and activities of the staff are important drivers for motivating the work, but are not enough when it comes to forming sustainable strategies and remarkable results. This is mentioned in the self-evaluations, but there is no indication of any solutions. The challenge relating to the very little amount of research time/lack of critical mass/lack of research environment needs to be addressed at faculty/university level, in comparison with other departments at the University of Gothenburg.

Staff strategies must be linked to realistic funding potential – internal and external. External funding may make a difference to a certain extent, as may collaboration with other departments. However, externally funded temporary projects also need a solid home environment in order to be of optimal internal impact.

The number of undergraduate students in each department is low compared to international standards. Organising research and teaching in daily life in very close connection will be one of several means of strengthening both missions (see “The relationship between research and teaching” below).

Registration, documentation and dissemination of research production: Content and quality

The challenge of setting criteria for and finding ways of registering artistic research results in relevant formats for documentation in the university database – exhibitions, products and performances – seems not yet to have been sufficiently addressed or resolved. By clarifying this operational level in terms of valid production

and results, the departments' deeper understanding and framing of their research will have to be activated and reflected, and so be a constructive process in itself.

Written texts are the main format in the publication lists. The criteria for reporting into category *Artistic research and development* are not clear. When these are texts – articles, essays and books – what is the difference between these and the other categories? When these are exhibitions, what are the criteria for admission to the list? There is obviously a great deal of artistic activity that is not registered in the publication lists. The category *Other* is even more unclear. There is a gap between the departments' websites, where most of the artistic-related activities seem to be at the frontline, and the self-evaluations, where there is little integration between the University's publication lists and the department's listing of the most successful research.

Looking closely at the publication lists, stronger quality control should be exercised. It is not within the Panel's capacity to check upon the correctness of the specific contributions, but the list appears to be rather inaccurate, and therefore loses its authority. The same objects are sometimes reported several times and within several categories. The staff's understanding of the different publication categories may not be sufficiently developed. The listings of conference papers, peer reviewed or not, is so low for the School of Photography and Valand that the Panel assumes it is under-reported. According to the self-evaluation, few members of staff have verified their lists.

While all the departments demonstrate some publication activity, peer-reviewed articles are listed only from HDK. In relation to strategic development, a more conscious approach to potential dissemination media/channels should follow, both for written work and for other artistic expressions. Various qualities of different media/channels must be highlighted so that dissemination plans become an integrated part of the research planning. This applies both to text publications and forums/media for other means of expressions.

Whilst there is evidence of high quality published work, there is an over-reliance on "in-house" publications. The Art Monitor, which is edited at faculty level, is the most frequent publication channel. This is obviously an important and influential journal, and also internationally known as it is in English. The number of copies printed and distributed seems however to be surprisingly low. The Panel understands and appreciates the changes of format planned from 2011 towards more digital publishing. Still, not being peer reviewed, it will be viewed internationally as an "in-house" publication of less value. The introduction of peer review and/or external representation on the board should certainly be considered, and the criteria for evaluating submissions should be transparent.

The relationship between research and teaching

HDK/Steneby, the School of Photography and Valand are small departments, in both national and international terms. A dedicated strategy is required to integrate research and teaching, for several reasons. Members of staff are few, and their research and teaching need to be more unified. The departments cannot withstand an internal split into several communities. Undergraduate studies need to be informed by the research areas in order to be relevant. These gaps are recognized in the self-evaluations, but no actions are suggested.

In the self assessments, student projects seem to be listed as research several times. Student projects can count as research only when they are clearly defined and structured from the research obligation from beginning to end, and furnished with a sufficient amount of research staff, or have the status as a PhD project.

Quality as read from the self-evaluation versus quality estimated from the Panel's further knowledge about the departments and on-site experiences

The Panel is aware that there has not been a history of Research Assessment Exercises for art education in Scandinavia so far, and that the departments' professional experience of describing aims and reporting results may not really have been tested out before. Still, the self-evaluations were simply not sufficiently well worked out. The Panel finds an understatement of the current activity and professionalism of all three departments. From various encounters, the panel members know that these departments have much better contemporary connections and are much more active in research than can be read from their evaluations. Their best qualities come through only casually. The Panel questions whether all the heads of department and the staff involved have been sufficiently aware of the necessity to emphasize and highlight the research during this process. Some examples of missed opportunities are:

- The space available under the various headings in the RED10 template has not been fully used to explain activities and context;
- The departments' understanding of research quality, as demonstrated in the forwarded projects, seems to be inconsistent. Impressive artistic research is mixed up with mere student projects;
- Enthusiasm, commitment and confidence are not fully communicated in the reports;

This leads back to our initial notes about strategy and leadership.

Fortunately, the site visit made the strong elements and diversity of the research production more visible, and this is taken into account in the evaluation of the three schools.

6AB. THE SCHOOL OF DESIGN AND CRAFTS INCLUDING STENEBY

6AB.1 Overall assessment

During the timeframe for this evaluation, 2004-2009, the department HDK included the School of Design and Crafts as well as Steneby. From 2010, Steneby has the status of a separate department. The School of Design and Crafts and Steneby are partly presented as a single unit and partly as two or three units in the self-evaluation, which makes it difficult to read. The practical organization and interaction between design and crafts is not really explained in the documents presented. The site visit confirmed that they mainly operate as two specific units with different subject agendas – which may lead to the question of whether the present departmental organization is optimal. That, however, is not the Panel's task to evaluate. The Panel has chosen for some aspects to look at the three separately – this will be elaborated on later.

HDK is the largest of the three departments assessed by Panel 6, and is still a small department in terms of staff numbers reported as publishing research, and in terms of the percentage of time devoted to research. However, these statistics hide a much bigger picture of research activity, as described in the self-evaluation document and illustrated on the HDK website. The representation of research-active staff and staff categories and the percentage of staff time allocated to research bear no relation to the activity being undertaken. There appears to be staff with 0% of research time producing valid research outputs, whilst some with allocated research time seem to have low productivity.

From the self-evaluation, HDK is still grappling to understand what artistic research is and how to articulate it successfully within the wider University and the wider academic community to ensure their output is recognized. The statement in the self-evaluation on HDK's view on artistic research and the work of art claims to be straightforward and simple, but will need far more elaboration to connect to the ongoing international discourse. For artistic research there must be some significance and international relevance articulated alongside the work, and it needs to be grounded in the history/theory of artistic practice. However, the meeting with design staff left a much more positive impression, with contemporary relevant projects being presented – see below.

This is an emerging unit that needs to develop its research activity and develop it towards international level quality. There is a need to develop a more transparent research strategy with stronger leadership, and some more appropriate allocation of research time to those staff with the greatest potential.

Design

Design research is represented in the self-evaluation by a core group of active researchers (up to 13) who, although they have a low percentage of research time, are working in unique areas. There are interesting practice-based activities and some opportunities for innovation. The appearance on the international stage has not yet reached its potential, but the group's projects (some of them started up after the self-evaluation was delivered) certainly demonstrate an ability to connect activities to current relevant themes and collaborate in research projects with other professions, both nationally and internationally.

Crafts

Craft research within the Department consists mostly of “individual artistic production by our professors and lecturers outside the Department”. The website illustrates a small but good number of staff undertaking mostly craft/art practice through exhibitions and commissions, both nationally and internationally. Crafts were not represented in the site meetings, but according to the Head of Department they are involved in the Department's making of a research strategy.

Steneby

Steneby states in the self-evaluation that its research activity is in its very beginning stages, and there is no more information about this on the website. A few members of staff are recognized as internationally interesting artists/craftsmen who are active with exhibitions and workshops. Still, the Panel finds that on the basis of the small body of the total activity and the lack of specific information on strategy and resources, it does not make sense to evaluate this department on their research until this is better articulated.

Steneby is therefore not included in the further text and gradings.

6AB.2 Research quality, productivity, uniqueness and relevance

Design

There are some significant aspects of unique and good quality research in design, such as that related to design and business and urban design, and the work on Materiality of the Surface. Some projects are cross-disciplinary research projects and have led to significant and innovative interventions and publications, for example ‘Interventions’. Also, there are some good examples of innovative PhD research such as Von Busch's work on Fashion Hacktivism.

In general, the quality of the approach to the work and the quality of practice is high. Work finds its way into national, regional (i.e. Scandinavian) and a few international galleries. Some of the work, whilst valid as consultancy, is not research.

Publication in Art Monitor, although worthwhile, is disputable internationally as it is an in-house publication. Indeed, much of the work is locally or nationally published.

Presentations during the site visit convinced the Panel more than the self-evaluation that staff are actively focusing on relevant contemporary, and left the Panel with an impression of a vital environment concerned with the social aspects of design. Some of these, like the cooperation with Mistra Urban Futures in Gothenburg, started up after the self-evaluation had been written, but they are important to mention here as they seem to have a dynamic impact on the research culture in the Department.

Quality: *Very good*

Productivity: *Good*

Uniqueness: *Very good*

Relevance: *Very good*

Crafts

Artistic aspects of craft practice approach are not highly visible, until one refers to the web, where examples of interesting work are illustrated. There are individual exhibitions, as well as many group exhibitions. Most of the artistic activity on the web seems to be carried out during time “outside the Department” (see above), due to the policy/economics of adjunct professors as the main staff resource. It is a relevant formal and ethical question whether the Department really can promote this as HDK’s research. The Panel will strongly recommend that the framework for carrying out artistic research in this part of the Department is revised during the ongoing strategic planning.

In the publications listed, craft is represented in articles, etc., by one very active theoretical researcher, by technical investigation (especially in ceramics), and by some small representations from textiles. The project and publication “Tiden som är för handen” (2007) could represent a potential starting point for developing a field-specific meta reflection, but does not seem to have been developed further and is not mentioned in the self-evaluation.

All in all there are interesting artistic contributions from members of staff, but overall a more substantial approach to the notion of research, in relation to addressing relevant discourses of contemporary craft, is lacking.

Quality: *Good*

Productivity: *Insufficient, in terms of results belonging to HDK*

Uniqueness: *Good*

Relevance: *Good/Insufficient – a lack of an articulated, field-specific research approach*

6AB.3 Organization and research infrastructure

From the self-evaluation it is not clear what sort of internal incentives and support for research there are at the Department, and how the research community is being developed.

It appears from the SWOT analysis and the narrative that design has taken diverse paths and has not generally developed an appropriate structure or culture. However, a new management structure was introduced in 2010 and a structure to develop research and curricula in design has recently been developed in a more focused manner, especially with the opportunity opened up by Business Design lab. This is a good opportunity, and a reputation has already been recognized within the design management community. The site visit confirmed this as an important input and a strengthening of a new direction.

The craft research area does not appear to be well coordinated and has few PhD students. Lone practitioners/artists do tend to develop their own research trajectory, but this does need to be set within a philosophical framework in order to drive a culture of research and discourse.

The research organization should be mapped out and revised in connection with the elaboration of the research strategy.

Assessment: *Good/Poor but worth developing*

6AB.4 Collaboration and networks

Collaborations and networks are not articulated very well in the report, and are represented more by student projects than research. However, looking more into different projects, one sees relevant collaborations in various forms. There is a very interesting relationship between design and business (Business & Design Lab and the wider research community in this area). To the Panel, it is however somewhat disappointing that the main presentation of the lab is found on the website for the School of Business, Economics and Law, and one may ask whether the HDK gets enough credit for its various commitments.

From the information available, both design and craft seem to be well connected with some national and international networks of significance. The network experiences should be included in the ongoing strategic planning, to be continued and further developed.

Assessment: *Very good*

6AB.5 Future plans

Future plans are not well articulated in the report, although possibilities described in promising research areas (see below) do give an indication of the thinking. According to the Head of Department, a research strategy plan is due to be concluded within the next year, and this is absolutely necessary. The need to elaborate a stronger foundation for the art-based design research was underlined by the Department during the site meeting, and the same will be necessary for crafts. The SWOT analyses are realistic on some points, but seem to underestimate the threats and not focus clearly enough on the obstacles. Future plans need more focus on a view of how staff will continue to practice, publish and develop an international profile. This will require investment in both staff and time for research, as well as guidance and mentoring for the younger researchers and PhD students.

Design should strengthen the focus on themes that have been started, such as urban design and socially responsible design, as well as aspects of design management in relation to the Business Design lab. Some of the work presented in refereed conferences needs to be translated for international peer-reviewed journals.

For crafts, there are international debates and environments to connect to and contribute to, but these are hardly referred to here. There is a need to articulate challenges in the field, with references internationally.

Assessment: Good and worth developing

6AB.6 Future potentials and possibilities

The two areas suggested in the self-evaluation as having a good future potential are well chosen.

Socially responsible design (urban development, design and management) builds on a growing area internationally, and there are opportunities for international collaboration. The detailed areas seem to be grounded in individual staff resources and interests, and may need prioritizing independently of individuals.

Crafts and practical knowledge is a very broad headline which needs to be further elaborated and narrowed in order to make sense and to be relevant. However, there is interesting potential, especially from the point of departure of contemporary Swedish crafts, if the research can be framed in constructive ways and the role of skills and production in the artistic process is addressed and questioned. The mentioned link between ‘new roles of the designer, integrating crafts skills in product development, alternative ways of participation and activism’ is a very interesting direction with the potential for uniqueness.

6AB.7 Research activity and teaching

The self-assessment report states: ‘Discipline development in Design has unfortunately followed two separate paths since 2001, with the groundbreaking holistic educational programmes developed by teaching staff on the one hand and the research education developed by the adjunct professor on the other. The two never met.’ This is an important statement from Design in order to start reorganizing the activity. Much more consideration needs to be given to the relationship between research and teaching at all levels, otherwise a vibrant university culture will not be available for students and staff. Fortunately, the site visit confirmed that this development is on the right course.

6AB.8 Interaction with society

Much is going on generally through practice, seminars, talks and exhibitions, most of which are probably local or national. Activities as such are many, but the research aspects are not always clear. More effort should be made to record and articulate the research contribution, and to specify the most efficient dissemination and dialogue channels.

6AB.9 Gender and equal opportunity issues

See “Issues relating to all three departments and the Faculty” above.

6AB.10 Summary of assessments - the School of Design and Crafts

Design

Quality: *Very good*

Productivity: *Good*

Uniqueness: *Very good*

Relevance: *Very good*

Crafts

Quality: *Good*

Productivity: *Insufficient*, in terms of results belonging to HDK

Uniqueness: *Good*

Relevance: *Good/Insufficient* – a lack of an articulated, field-specific research approach

Organization and research infrastructure: *Good/Poor but worth developing*

Collaboration and networks: *Very good*

Future plans: *Good* – and worth developing

6C. THE SCHOOL OF PHOTOGRAPHY

6C.1 Overall assessment

It is recognized that the Department has a stated commitment to a research orientation that underpins its pedagogical position, and that it values research as a key driver in the development of the overall subject vitality and as a stimulus for curriculum and teaching development.

This is contained in a well-structured research strategy document (May 2010) and demonstrates a more progressive and mature approach than that taken by the other two departments evaluated by the Panel. The strategy includes specific and measurable targets for external income generation, an increase in research time for staff and subject development, and a detailed action plan. This commitment and the development of a research strategy have become clearer during the site visit to the Department, at which the value of research was articulated and shared by staff and researchers at all levels. There is good evidence of local research leadership, ambition and support and optimum use being made of a limited critical mass of researchers, teachers and doctoral students. The size of this is a cause for concern, although there appears to be an active clustering of research interests at doctoral level between several departments and evidence that photographic research is also considered and supported in other areas such as fine art and film. In this respect, there is some evidence of links with other areas within the University, with Chalmers University of Technology and with external institutions such as the Hasselblad Foundation.

Overall, the Department has a relatively mature approach to research and has clear strategies and future plans that are well supported by clear leadership and vision. The main limitations to the ambition for research are capacity and the potential restrictions of being the only significant provider of high level photographic education and research in the country, as well as the limitations of not being able to draw easily on a diverse constituency.

6C.2 Research quality, productivity, uniqueness and relevance

The fact that the Department is the only one of its kind in Sweden makes it difficult to measure in a critical context without taking in a broader European and international overview. Coupled with the issue of a small critical mass, there is a question of relevance and of how the Department sees itself in terms of its specific contribution to photographic research. Photography has the advantage of being a significantly theorized subject, and there are many reference points and specific agendas for photographic research that to the Department's research can be aligned with. The Department has quite sensibly limited itself to a small number of areas of focus, and has identified two main strands of research: 'Doing History' and 'Simulation'.

This provides the Department with a clear identity. There is also a strong commitment to social engagement, which is evidenced through individual projects. This is an area of interest and focus that has also been identified in other areas within the Faculty, and one that there could be more of a collective approach towards. There is evidence of high quality research in both of the main areas, at both staff and doctorate levels. Productivity is very good in relation to the formal allocated time available and, as with many other subject and departmental areas, there is evidence that staff undertake research at a level in excess of the time allocated. This does not always have a direct impact on teaching, though, as staff with fractional contracts often engage in research outside their contracted time.

Quality: *Very good*

Productivity: *Good*

Uniqueness: *Very good*

Relevance: *Good*

Overall score: *Very good*

6C.3 Organization and research infrastructure

A well articulated research strategy exists, and there is a clear commitment from the Head of Department to support research and create opportunities for staff where possible in order to deliver research projects and outcomes. The commitment to research does appear to come from an understanding and leadership at top level. As indicated in the overview, the infrastructure at departmental level is limited in terms of capacity.

Assessment: *Excellent – strong leadership but limited resources*

6C.4 Collaboration and networks

There is an indication of the importance of collaboration and networking contained in the research strategy for the Department, and it is proposed that an overview of research partnerships be created by the end of 2010. There is at present a healthy programme of visiting speakers on research that includes many internationally recognized figures from the world of photography, cultural theory and broader subject areas of science and technology. There are existing local links with Chalmers and regional cultural institutions including museums, galleries and institutions. The connection with the Hasselblad Foundation is particularly important here.

Assessment: *Very good*

6C.5 Future plans

There is considerable potential contained in the Department's ambitious research vision and strategy document, but this requires a significant commitment from

leadership and resource allocation if it is to be delivered. It is important, however, that there is a robust evaluation of the quality and relevance of research outcomes and activity, and that it is consistent with the aims and ambition of the strategy. There is good evidence of the quality of researchers and external partnerships and a focused research direction. The research vision contains measurable and deliverable aspects, but is dependent upon capacity and the integration of the research and teaching roles to create an integrated community of practice.

Assessment: *Excellent, with considerable potential*

6C.6 Future potentials and possibilities

As above

6C.7 Research activity and teaching

This has been identified as an area for concern, as is reflected in the Department's own self-analysis. In such a small department, it is difficult to see how the research culture fails to connect with the broader teaching and pedagogical work of the Department. This issue was explored during the site visit, and it was indicated that some progress had been made to address the issue, although no specific details were provided. There was an assertion that the Department is moving much more towards a research-led ethos, and this is reflected in its research strategy document. We understand that fractional and short-term appointments may be a problematic factor here, but the key issue is one of research leadership and organization, and should continue to be monitored.

6C.8 Interaction with society

The statement on social influence needs more specific focus. The 'term cultural institutions and media' is far too general, and there is a need to clarify the Department's thinking and approach to the way photography is used and contributes to the many different aspects of our complex societies. This is an important role given that the Department is in effect the only photographic school in Sweden. There is a broad sense that the Department is related primarily to the gallery and museum sector and to a generic fine art tradition, without a sense of how this contributes more precisely to the process of social interaction.

6C.9 Gender and equal opportunity issues

There is such a small pool of researchers, teachers and research support that it is difficult to address specific gender issues. It should be noted, however, that there is a high average age of research students and a male dominated staff base. The policies for recruiting teaching staff, professors and doctoral students should be reviewed. The Department is aware of these issues, and now has a more diverse programme of visiting professors and speakers.

6C.10 Summary of assessments - the School of Photography

Quality: *Very good*

Productivity: *Good*

Uniqueness: *Very good*

Relevance: *Good*

Overall score: *Very good*

Organization and research infrastructure: *Excellent*

Collaboration and networks: *Very good*

Future plans: *Excellent*

6D. VALAND SCHOOL OF FINE ARTS

6D.1 Overall assessment

As is the case with the other two departments we reviewed, Valand is small in terms of staff numbers reported as publishing research, and in terms of the percentage of staff time devoted to research. However, these statistics hide a much bigger picture of research activity, as described in the self-evaluation document and illustrated through connection to research on the University of Gothenburg/Valand website.

There are adjunct professors producing very good work, notably Hannula and Shalev Gerz. There is also good work produced by other members of the staff and the small PhD student team, and published PhD theses are legitimately presented as evidence of such research. However, there is no statement as to how individual staff work fits in with a departmental or faculty research strategy.

Entry to the research programme is extremely competitive, but we would question the productivity of enrolling just one student per annum into the programme, given the enormous potential in the applicant pool. On the other hand, there is the question of supervision capacity. There is no evidence of whether teaching and learning strategies are research driven. It was noted during the site visit that there was little indication of the way research students interacted with the School in terms of their attendance, with some living and working far away and, in some cases, outside the country.

The overall impression, based on the review of materials in the self-evaluation and more significantly on the school site visit, is mixed. There is a fundamental commitment to research, but this is not clearly articulated. There is evidence of high

quality research, artistic development work, professional practice and pedagogic development, but a lack of strategic collective exploitation of these aspects of the School's work. There must be some research issue of relevance to the discipline embodied in the work (a position that is very clearly articulated at faculty level). Any art school has a mix of practitioners and researchers, and it would be helpful to have this distinction more clearly set out. During the site visit, it was clear that there was a continuing discourse about the nature of research in relation to the creation of knowledge, but sadly this key issue was not expanded upon and there was no opportunity to engage the School in a critical discussion about the implications for research and how it was being developed. Overall, there was a feeling of lack of clarity, vision and leadership regarding the dynamic relationship between research, pedagogy and creative professional practice as aspects of knowledge production.

6D.2 Research quality, productivity, uniqueness and relevance

Valand staff have exhibited in international venues (Shalev Gerz at the Jeu de Paume in a solo show, Lundgren in a group show organized by the Hayward Gallery, London). Hannula's and Svensk's critical writings and editorial collections have been published abroad. In the absence of a departmental or faculty statement linking this work together, one might conclude that these are academics who pursue their own work while teaching at the art school. However, we know that the Faculty was instrumental in hosting a recent symposium as part of the ELIA conference in 2008 on artistic research, which departmental staff led and participated in. Indeed, the Gothenburg Faculty is seen – partly through the work of Art Monitor – as one of the internationally most recognized spaces in which fine art research is being investigated and theorized. So it is disappointing not to see these faculty strengths better articulated or reflected on in the departmental submission.

Equally, the Department and the Faculty are taking the lead in practice-led doctoral research, although there is no evidence of the passionate debates on this topic that have taken place in Sweden and more widely in European art school circles.

It is clear that some of the researchers are keenly involved in issues concerning social life (Svensk, Hannula) and the potential of influence in this area is considerable, but again lacks a contextualizing narrative to make a convincing case.

Quality: *Very good in some cases of individual research*

Productivity: *Good/Insufficient*

Uniqueness: *Good*

Relevance: *Good/Insufficient, affected by lack of strategy and leadership*

6D.3 Organization and research infrastructure

The SWOT analysis and narrative only broadly confirms the Department's research position, and it is only when one reads the Dean of Faculty's report that one gets a sense of how the Moscow-based 'Education Annex' PhD students might contribute to teaching and learning. The analysis points to staff workshops integrating research into the teaching environment. It would have been helpful to have a clearer sense of what is involved here. This area was not clarified during the departmental visit, and nor was there a clear sense of how projects and activity within the sphere of knowledge production are evaluated.

A research coordinator, who has recently completed a doctorate in the same faculty, has just been appointed – a strengthening of the Department which should help mitigate the difficulty in creating an integrated research teaching and learning environment, and should help focus a research strategy.

Assessment: *Good/Poor but worth developing*

6D.4 Collaboration and networks

There are a several examples of collaborations and networks, some of which have an international profile, such as those with California College of the Arts CCA and Tbilisi State Academy of Arts, which have a clear research focus. However, the submission is undermined by the inclusion of a number of activities such as master's summer courses which are clearly educational and recreational, but no evidence is presented as to their research component. The Department needs to focus on international research collaboration and make clearer distinctions between research and pedagogical activities.

Assessment: *Good – needs more articulated research focus*

Future plans

Several important initiatives are identified – The Land Art Course, The Masters in film and video curating, sculpture workshops and paintings in the public domain – but it is difficult to see at what point their pedagogy becomes research oriented. Overall it was not possible to identify clear future plans, as there was no specific research strategy document or cohesive articulation about strategic development.

Poor but worth developing: A lack of strategic vision and leadership, but worth developing in a key subject discipline within the arts and design area.

6D.5 Future potentials and possibilities

The potential for projects to be used as models for ways in which culture can stimulate growth is important, but this seems to be alongside the remit of an art academy concerned with interrogating the terms and conditions for artistic research practice.

The evidence of critical discourses on the role, definition and function of research within the Department is interesting and reflects a sector-wide process of questioning the definitions of research. However, this discourse should not cloud the issue of the urgent need for active engagement with research in terms of creating identifiable outcomes, evaluation processes and a dissemination strategy. Achieving this will enhance the Department's position as one that is making a positive contribution to the faculty research culture and an influence in the wider public domain. There is a widespread tendency for the discourses around research to be a substantially hermetic and over-theorized internal rhetoric, which adds to a potential weakening of the nature of research within the arts. In this context, it is vital for the continued support for artistic research that the broad institutional context of the University is recognized, and that it is seen to be an integral aspect of the institutional research culture and is able to be evaluated and measured accordingly.

6D.6 Research activity and teaching

The self-evaluation report indicates that research and teaching are now linked at all levels (BA, MA and PhD). It has not been possible to fully review how this materializes in practice. There are clearly important initiatives at faculty level (such as the University's involvement in the Swedish Research School in the Arts) which one would expect to see articulated and reflected on more fully within the department.

6D.7 Interaction with society

There are some important projects in the work of Hannula and Svensk which question the social place of the art school education, though these are not referred to in the narrative which, surprisingly, has a rather untheorized notion of society. The faculty narrative presents almost the reverse picture of focused social engagement.

6D.8 Gender and equal opportunity issues

A mean staff age of 47 in 2009 suggests that the Department is not recruiting enough younger staff members. It should also give consideration to recruiting younger doctoral candidates, as their mean age is higher than that of the staff group as a whole and much higher than the international average. (See "Issues relating to all three departments and the Faculty" above.)

6D.9 Summary of assessments – Valand School of Fine Arts

Quality: *Very good in some cases of individual research*

Productivity: *Good/Insufficient*

Uniqueness: *Good*

Relevance: *Good/Insufficient*

Organization and research infrastructure: *Good/Poor but worth developing*

Collaboration and networks: *Good*

Future plans: *Poor but worth developing*

SUMMARY AND RECOMMENDATIONS

Although several weak points have been described, the Panel would like to emphasise that all three departments obviously have strong and unique academic potential, and the Panel has no doubt about their ability to grow stronger through systematic strategic approaches and more focused leadership at all levels.

Recommendations

- Research leadership and strategy must be developed and followed up
 - Focus within and across the departments and the Faculty to create a clear framework for artistic research;
 - Articulate feasible and challenging aims and criteria for results;
 - Transparency of research funding allocations and monitoring;
 - Develop measurable medium-term research plans and milestones to allow for continuous monitoring and evaluation.
- Focus on building research environments in and across the departments
 - Secure more contracted time for research;
 - Promote more cross-disciplinary links to compensate for the lack of critical mass;
 - Identify and adopt best practice;
 - Clarify the role and volume of the PhDs in the departments and the supervisors' responsibilities and competence;
 - Systematic and consistent evaluation and performance monitoring of research staff.

PANEL 6 – FINE AND APPLIED ARTS

- Dissemination strategies must be integrated in strategy and project planning
 - More conscious and critical approaches to relevant dissemination media;
 - Art Monitor should be developed as an international journal – to include peer review, and increased distribution to create higher impact;
 - Develop consistent ways of reporting research results.
- Close relationships between research and teaching/learning should be elaborated
 - At the same time, distinctions between research and teaching activity must be clarified.
- **A grounded and systematic follow up of RED10 should be carried out within and across the departments to produce constructive outcomes.**

PANEL 7 – BIOLOGY

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INTRODUCTION AND OVERALL ASSESSMENT

The panel was impressed with the breadth of research carried out at the four biology departments, which ranges from marine biology to research into the model organisms yeast and *C. elegans*, ecotoxicology and plant phylogenetics. It was clear from the outset that the separate locations – sometimes geographically quite distant – of several of the research groups reduce the opportunities for scientific and technical synergies among the four departments (Cell and Molecular Biology (CMB), Marine Ecology, Plant and Environmental Sciences, and Zoology). One important point noted by the panel was the low number of PhD students per tenured member of staff; statistics provided to the panel by the RED10 organizers show that all the departments within Biology have around 1-1.5 PhD student per senior staff (professors and senior lecturers). One reason for these extremely low student/staff ratios appears to be the rigid Swedish system of financing PhD positions in which heads of departments guarantee financing for the whole duration of the student’s employment. Biology’s overall number of PhD students had dropped by 35% over

the past few years, partly because of less student interest in the sciences. The undergraduate intake for biology in 2010 is about 200-215 undergraduates. Additional explanations for the low numbers of PhD students given by the Vice Dean were that they are relatively expensive, making it more attractive to hire postdocs instead. The three performance indicators that will increasingly need to be kept in mind in the future are numbers of MSc and PhD students, publication quality and number, and outside funding.

The site visit by two of the panel members confirmed the full panel's assessment that Biology is a strong part of the Faculty of Science, although it is clear that in terms of the international visibility this is mainly due to the contributions from Marine Ecology and CMB.

The general view, both of the full panel and of the members of Biology staff that panel members talked to, is that it is necessary to increase recruitment of PhD students, postdocs and staff from outside Gothenburg. Statistics provided to the panel show that three of the departments within Biology recruit 55-73% of their staff from within the University of Gothenburg. Only CMB has recruited 80% of their recent hirings from other universities. To remedy the situation, the departments or Biology as a whole may want to make hiring packages for new staff more attractive by providing them with more PhD or postdoc positions that could be financed by delaying the filling of a professorship in an area that lacks the critical mass required for strong scientific performance and for obtaining outside funding (at least in the experimental and laboratory-dependent sciences). Given that there will be a significant number of retiring staff over the coming years, a few of these positions might not be filled and the money used instead to create attractive start-up packages to bring in stellar junior researchers, preferably recruited from outside Gothenburg or internationally.

Biology's current organization does not appear to lend itself to strong lines of leadership. There is great potential for improvement at both the administrative level and the level of strategy development. One model might be to pool all four departments into one entity, which might make it easier to move vacant positions and to permit the strategic distribution of departmental funds.

The overall ranking for Biology as a whole is "very good," with the potential to be "excellent" over the next few years, provided the vacant positions are used strategically, with the right balance between senior and junior staff.

We comment on research activity and teaching only here in the "general section", rather than for each of the four Biology departments. This is because an assessment of teaching was not part of the panel's mandate, and we had too little information

on the subject. Biology's four self-evaluations all noted that there was a strong link between teaching and research, but the panel had no metrics or observations with which to evaluate this aspect. However, the availability of many field stations in Biology is clearly a great asset within teaching.

7A. THE DEPARTMENT OF CELL AND MOLECULAR BIOLOGY

The overall assessment is *Very good*. The goal of the Department of Cell and Molecular Biology (CMB) is to explore important biological questions using a series of accessible model systems, including yeast, *C. elegans*, flies, bacteria, mice and mammalian cells. Research across these systems is unified through technology platforms for high-throughput genetics and cell biology. This type of organization is sensible, provides an outstanding training ground for students and is, perhaps, the best structure for successful interdisciplinary research in the life sciences.

While this general frame is excellent, the current department structure does not exploit the full potential of cell and molecular research at the University of Gothenburg. Some research groups in the CMB department are very good and arguably unique in Sweden (e.g. yeast functional genomics), while others may lack critical mass (e.g. developmental biology) and others still might be strengthened by primary affiliations with other units at the University (e.g. surface biophysics). During the site visit, the panel learned that developmental biology has the potential to be strengthened by the recent hiring of a developmental geneticist at the University of Gothenburg's medical faculty, with whom the CMB developmental biology group is expected to interact.

Conceivably, CMB may need to become more visible as a unique unit in the context of the Faculty of Science at the University of Gothenburg, which currently has a strong environmental and marine science profile. Indeed, some key members of CMB are unsure whether their department is best located within Biology. Based on what it found during the brief site visit, the panel felt that Biology as a whole depends on the continued presence of a strong CMB group. The research in the CMB area might be strengthened by broadening its focus towards model systems complementary to yeast, by upgrading its equipment, and by enhancing collabora-

tions with relevant units, perhaps through joint recruitment (for which there does not currently appear to be any strategy).

7A.1 Research quality, productivity, uniqueness and relevance

Quality

The Department identifies several research themes: Genetics (developmental biology); Microbiology (yeast cell biology and genomics, biofilms); Molecular Biology (signalling and cell cycle); and Surface Biophysics. The quality of the research varies across these themes. The Yeast Functional Genomics and Cell Biology group is highly interactive and has a research programme that is arguably unique in Sweden – very good to excellent in quality. For example, some of the recent work from the yeast group (for example, on the polarisome) is outstanding and of international importance. The quality of research on other model organisms is also good, but the quantity of publications is insufficient (developmental biology is a small, somewhat isolated group).

Assessment: *Very good*

Productivity

Productivity for six groups (of the twelve listed) is *Very good* to *Excellent* (largely reflecting the research activities of the yeast group); other groups are at best *Good*. There is a great deal of diversity between the groups reflecting, in part, the demographics of the academic staff, with a number of members approaching the end of their careers (the mandatory retirement age is 67). The fairly large yeast group publishes well, with high impact publications arising from important collaborative projects published in major journals. In some cases, modest productivity probably reflects the low number of graduate students per staff member compared with international standards in the field.

Uniqueness

Uniqueness of research is *mixed*. Cell biology and genetics are core disciplines, so they are not unique to Gothenburg. However, the concentration of yeast researchers doing systems-level analysis is unique in Sweden. The uniqueness of the yeast group's work is excellent, while other work in the department lacks uniqueness (e.g. signalling, developmental biology).

Relevance

The relevance of the research is *very good* to *excellent*. The microbiology component of the research (anti-fouling) is of immediate relevance to Gothenburg, while the yeast work is more basic but has a significant impact on the scientific community

and Sweden's status within the international community. The basic yeast molecular and cell biology research has potential biomedical implications.

7A.2 Organization and research infrastructure

Facilities and resources

The CMB department has the required resources for yeast functional genomics, including arrayed collections of yeast mutants and strains carrying tagged alleles of genes for systematic proteomics and cell biology (TAP and GFP). The strain collections are freely available in the yeast community – the Gothenburg groups have been involved in international collaborations with groups that are dedicated to the production of new reagents for yeast genomics, but that lack major in-house strain collections. The Blomberg research group has set up spectrophotometers for growth curve analysis, and the group has a RoTor robot for pinning yeast arrays. In combination, this is a reasonable setup for yeast functional genomics. To maintain an internationally competitive position, the University will need to invest in deep sequencing equipment for the department, which would allow the comparative genomics and competitive evolution experiments proposed by the department. In addition, added joint infrastructure should include microscopy for high-throughput screens (e.g. an Opera system) as well as fluorescence and confocal microscopes for state-of-the-art cell biological analyses.

CMB department organization: Unclear

The Panel saw no special links between CMB and the other departments and was unable to completely understand the department's organization. CMB's academic staff structure is presently skewed towards researchers focusing on yeast as a model system, which has created a strong group in this important area. However, the department now aims to carry out research with other model systems besides yeast, and to achieve this aim it needs to build critical mass. This would require hiring new staff, including a *C. elegans* researcher, a *Drosophila* researcher, a shRNA screening expert in mammalian cells, and an expert in electron microscopy. By strengthening research in other model organisms, approaches already developed in yeast could be transported to metazoan systems, broadening the overall impact of research and teaching in the department. The department has an excellent track record of sharing access to expensive technology, and this should be encouraged and continued – the value of having key equipment 'in-house' (i.e. in the department) cannot be overestimated.

The group should maintain its strong collaborations with statisticians and bioinformatics experts currently provided through EU partners and the University of Gothenburg's Department of Mathematics. Ways of strengthening these collaborations should be explored, since computational analysis is rapidly becoming the

bottleneck in making use of large-scale datasets. Collaborative recruitment of a computational biologist (perhaps with other departments) should be considered.

CMB's report states that: "Nationally funded initiatives in bioinformatics during the past decade have established CMB as a hub in this field." The impact of this initiative on computational biology in the department or at the University was not clear to the panel, and it was not easy to see how CMB was a hub in this key area of research.

7A.3 Collaboration and networks

Many of the CMB staff are involved in successful EU networks and collaborate extensively with first-rate researchers from around the world. The interdisciplinary science platforms for quantitative biology, chemical biology and marine chemical biology are coordinated by the department and are very successful. Long-standing collaborations exist with the Department of Physics and the Department of Mathematics to help visualize metabolites in whole animals (*C. elegans*) and to develop new techniques for single-cell analysis. (This seems like a good idea, but is largely unreflected in recent publications from the group.) Interactions with the chemical biology groups are highly active, and are an important area for future development. In addition, the newly offered EuroCore networks of the European Science Foundation (ESF) should be considered as a possible funding source. In summary, collaboration and networks are assessed as *Excellent*.

7A.4 Future plans, potentials and possibilities

CMB describes future plans that sensibly build on current strengths (e.g. expanding platforms for comparative genomics, large-scale genetics) or move into new areas of interdisciplinary biological research. The review team can offer several comments about the proposed future plans and their potential:

1. Every effort should be made to maintain and enhance the existing strength in yeast molecular cell biology. As noted earlier, this will require investment in equipment for deep-sequencing, imaging, functional genomics and cell biology. Given the strong record of collaborative interaction in the department, it would also be a logical place for a core facility for electron microscopy for all of Biology.
2. The strength in yeast genetics should be fully exploited by augmenting research activities in other model systems, such as fish, fly, worm, and mammalian cell biology. Crosscutting technologies available in the department could then be applied to more model systems.
3. The department should reconsider building strength in surface nanobiotechnology, particularly in the context of a unit that has considerable existing

strength in cell biology and genomics. Instead, it might be wise to move the surface biophysics research group to marine ecology, where the programme is more likely to thrive. The idea is not to eliminate algal defence/biofouling research, but it may be appropriate to look at relocating these efforts to another department within Biology.

4. It may be useful to add pharmacology and more clinically oriented applications to the department's collaborative chemical biology efforts through interaction with medical departments. The interface of chemistry and biology is a future area of considerable importance and would build on existing strengths within the department and at the University.
5. The University and the department should look for endowments to make newly advertised professor positions more attractive to applicants, especially internationally.
6. An effort should be made to attract more international students and postdoctoral fellows to the department. One measure could be to develop longstanding collaborations with first class universities that lack hands-on education and require mandatory internships abroad (such as Bilkent University and other top Turkish universities with rigorous selection procedures).

7A.5 Interactions with society

Interactions with society are *Excellent*. Members of the CMB department have organized large scientific conferences and are actively engaged in public outreach activities, such as the Science Discovery Centre. Also, the interaction with high school students shows the dedication of the department.

7A.6 Gender and equal opportunity issues

Assessment: *poor*. The department has no female professors. However, this problem is not unique to Gothenburg, particularly in the area of systems biology. CMB will have to take an aggressive approach to promoting and supporting junior women scientists.

7A.7 Summary of assessments – the Department of Cell and Molecular Biology

Overall assessment: *Very good*

Quality: *Very good*

Productivity: *Some groups are very good to excellent, other groups are at best good*

Uniqueness: *Mixed*

Relevance: *Very good to Excellent*

Department organization: *Unclear*

Collaboration and networks: *Excellent*

Interactions with society: *Excellent*

Gender and equal opportunity issues: *Poor*

7B. THE DEPARTMENT OF MARINE ECOLOGY

7B.1 Overall assessment

The Marine Ecology group is strong, diverse and well established nationally and internationally, and is producing strong, hypothesis-driven science and insightful laboratory and field experiments. Its published papers are of importance to both fundamental and applied sciences. The placement of full-time staff at the marine laboratories is especially productive and valuable in that they can conduct rigorous field experiments and observational studies that extend beyond the “visit and sample” approach that limits marine field stations without full-time, on-site researchers. The overall assessment is *Excellent to Outstanding*.

7B.2 Research quality, productivity, uniqueness and relevance

Quality

Research quality is assessed as *Excellent* for Marine Ecology as a whole and *outstanding* for Marine Chemical Ecology as a subdiscipline within this unit.

Productivity

Overall the ratio of publications/full-time equivalent of researcher/year seems a little low when viewed in an international context, given that there are approximately 40 researchers in the group. There is, however, some room for error due to our uncertainty of the role that the different types of researchers play and what therefore are reasonable publication rates. Article quality and impact are often high. As examples, recent publications from the Marine Chemical Ecology group have demonstrated the occurrence and ecological importance of chemically-cued induction of defences in response to different consumers attacking neighbouring conspecifics. This has been demonstrated in both benthic and pelagic systems and placed in a broad ecological and evolutionary context in terms of effects on consumer fitness, consequences for harmful algal blooms, etc. Our assessment of the quality of research by the Marine Ecology group is mirrored by the “crown index” of 1.39.¹⁸ The Marine Ecology self-evaluation reports this to be the highest among the Faculty of Science at the University of Gothenburg. We also ran a Web of Science search and analysis on each of the ten professors (including one associated professor) listed as active in the Department. Eight of the ten show citation patterns that are increasing (some steeply), and the other two are remaining steady rather than declining. This is the sign of a strong group that is still growing in prominence, and bodes well for the future.

The overall assessment is that productivity is *excellent*.

¹⁸ Within bibliometrics, the so called crown index indicates the relative number of citations of a group in comparison to the mean number of citations of the corresponding international field

Uniqueness

The uniqueness of the research is considered *outstanding*. The two marine labs are well known and valued at the international level. The labs are uniquely positioned within Europe in having direct access to high quality marine waters, easy access to near-shore deep waters, state-of-the-art mesocosms and advanced laboratories (biochemistry and molecular genetics), and the on-site location of full-time staff to conduct long-term experimentation and monitoring. The lab facilities were recently renamed the Sven Lovén Centre for Marine Sciences. The Centre includes several ships and other smaller boats as well as two stations for research and education, located in unique environments on the west coast of Sweden: Kristineberg by the Gullmar Fjord and Tjärnö by the Koster Fjord. The renaming partly reflects the University of Gothenburg's decision that Marine Ecology is one of its priority areas.

The self-evaluation materials provided by the Marine Ecology group were much better developed in terms of research foci, strategy for future development and organizational skills than those of other departments within Biology.

Relevance

The relevance of the research is *excellent*. The societal relevance of marine resources is high, and the University of Gothenburg laboratories' access to relatively unpolluted marine environments and biota is unusual within Europe. Marine Ecology staff have developed productive contacts with local authorities and boards (e.g. the Ministry of the Environment, SEPA, the Swedish Board of Fisheries, the Board of Water Delegation and the Water District of the Western Seas), with industry (e.g. fisheries, aquaculture, biotechnology and environmental consulting), and with schools and local stakeholders to convey important messages from their research. Some 7,000 people visit Tjärnö Aquarium each year, and Marine Ecology is active in its outreach with the media, appearing in about 40 items per year on TV, on radio or in the press.

Several research projects also bring together basic and applied science in an excellent way. These include research into fish population ecology and genomics, larval dispersal and marine reserves, the role of sea grass ecology in near-shore ecosystem function, and the ecology of chemical cues and their role in initiating harmful algal blooms. The new focus on the “ecological and evolutionary effects of global change” will further strengthen contributions to societal values.

7B.3 Department organization and research infrastructure

Marine Ecology department organization and research infrastructure is *excellent*. The department seems especially well organized and networked across campus (into various departments), and also to be well embedded into marine sciences in Europe

and throughout the world. There were some statements in the self-evaluation, however, that suggested some awkwardness between the department's scientific efforts (which need to be organized and administered locally) and decentralized administrative decision-making. During the site visit it became clear, however, that Marine Ecology has a steering committee that includes one person from each of the field stations and that the three members of the steering committee interact regularly via video conferencing. From panel members' own experiences working at marine field stations, we know that it can be difficult and inefficient if decisions about ship-use, equipment repair, etc. are made by distant administrative units, instead of on-site, where the research is conducted.

The University of Gothenburg has considerable talent in Marine Ecology but this is scattered among several departments and locations. From viewing the statements of the different departments, it appeared that the Marine Ecology group (despite being located at three separate locations) was more cohesive, more focused and strategic, and was better at developing plans to build to its strengths than some of the other departments with marine staff that were located at a single location. Having said this, we consider it unique and highly valuable that the research infrastructure, for example for biochemical and molecular genetic work, is located at the site of experimentation, i.e. in both field stations, and not at the central University of Gothenburg campus.

The University of Gothenburg is in the enviable position of having two strong, well-equipped and strategically located marine labs. Having both is an asset. However, it may be useful to consider the special strengths of each lab for focused development and ways to synergize the strengths at each lab so that the Marine Ecology effort at the University of Gothenburg is greater than the sum of its parts. As part of this effort, thought should be given to making the best use of the Marine staff that are presently located in Zoology and CMB. The fish group in zoology and the microbial and "biology at surfaces" groups might be better served by being located within Marine Ecology compared to their present placements, which seems more historic than strategic or synergistic. Alternatively, a single large Biology Department might be the way of the future.

7B.4 Collaboration and network

Collaboration and networks is assessed as *Excellent to Very good*. We would have chosen a clear excellent if there had been fewer internal hires of PhD students trained at the University of Gothenburg onto the permanent/tenured staff. We note that this pattern also occurred in the other biology departments (with the exception of CMB). This seems to be a national problem that needs to be addressed. Despite this tendency to "self-seed," Marine Ecology is collaborating at a high and enviable level with investigators throughout the University of Gothenburg, Sweden, Europe

and the world. Indeed, Marine Ecology seems to be a nucleus for collaboration at the University of Gothenburg: of the ten platforms at the University, Marine Ecology is involved in five and coordinates two.

7B.5 Future plans

The future plans are *Excellent*. Compared with the other three plans for the future that were reviewed by the panel, Marine Ecology's plan stood out. It seemed well thought-out and organized, and seemed to build on strategic strengths while retaining the flexibility to respond to future developments. The text given to the review team indicated that strategic planning and the development of research foci based on relative strengths are well developed within Marine Ecology relative to the three other groups in Biology. They identified two historic foci that were strong and should be continued (Functional and Structural Dynamics of Marine Benthos; and Marine Molecular Ecology, Evolution and Genomics), one that is recent but extremely strong (Marine Chemical Ecology), and two new ones that have some staff and infrastructure in place and that have high potential for future development (Theoretical Ecology and Modelling; and Functional, Ecological and Evolutionary Effects of Global Change). These last two foci may be exciting alone, but are especially exciting if developed to be synergistic with the existing foci that are already well developed.

For the two future efforts that are not yet well developed, the strengthening of Theoretical Ecology would be an important strategic step; so far, this unit is not very visible. In order to reach its full potential, this area may require additional staff. The global change effort is nationally and internationally critical, but may need new staffing or redirecting of current staff. To some extent the same applies to the marine molecular ecology, evolution and genomics research focus, where the relevant groups currently need to make the transition from more traditional molecular ecology to functional genetic and genomic studies. We note that these groups might make especially productive contributions by collaborating with the strong Marine Chemical Ecology group to address the molecular and genetic basis of chemical signalling and cuing. Chemical communication is a basic language of ecological interaction, but is poorly translated or understood in terms of marine systems. Working across the borders of chemical ecology and molecular functional genetics and genomics would be an especially exciting innovation that Marine Ecology at the University of Gothenburg is uniquely positioned to undertake.

Other foci listed in the report given to the panel included: Ecophysiology and Ecotoxicology, Fish Ecology and Aquaculture, Pelagic Ecology, and Integrated Coastal Zone Ecology and Management. These include some productive investigators, but appear to be partly replicated in the Zoology department (below), which again perhaps argues for a single integrated Biology Department.

7B.6 Future potentials and possibilities

See above for many comments that are also relevant to this section. The five focal areas identified in the self-evaluation seem strategic, well balanced between continuing established strengths and building new ones, and to be foci that build into new areas but also are synergistic with existing strengths.

We note that present external funding levels per member of Marine Ecology staff are about twice those for staff in the other biology departments. Clearly, well-funded researchers have greater potential for determining and following their own future plans (given that they are funding much of their effort). However, given their success in grant applications, it may be wise for the University of Gothenburg to provide greater research infrastructure in terms of technical staffing or equipment. There was no information on the current support for staff technicians, yet such basic funding is imperative when conducting marine biology experiments and/or for modern approaches within the life sciences (genetics/genomics/biochemistry/cell biology). Such investments can be productive in returning both research findings and financial benefits to the University of Gothenburg from outside sources. In summary, future potentials and possibilities are *Excellent*.

7B.7 Interactions with society

The interactions with society are *above the expected level*. Marine Ecology appears to be proactive in its outreach to the public and the community through media (TV, print and radio), Tjärnö Aquarium, serving on government advisory boards and presentations to school groups.

7B.8 Gender and equal opportunity issues

Excellent. Marine Ecology has done well in positioning women. Females represent 44% of professors, 40% of senior lecturers, 25% of researchers, 71% of research fellows, 86% of postdocs and 68% of PhD students.

7B.9 Summary of assessments – the Department of Marine Ecology

Overall assessment: *Excellent* to *Outstanding*

Quality: Marine Ecology – *Excellent*; subdiscipline Chemical Ecology – *Outstanding*

Productivity: *Excellent*

Uniqueness: *Outstanding*

Relevance: *Excellent*

Department organization and research infrastructure: *Excellent*

Collaboration and networks: *Excellent* to *Very good*

Future plans: *Excellent*

Future potentials and possibilities: *Excellent*

Interactions with society: *Above the expected level*

Gender and equal opportunity issues: *Excellent*

7C. THE DEPARTMENT OF PLANT AND ENVIRONMENTAL SCIENCES

7C.1 Overall assessment

The overall grading of the department is *Good*. The Department of Plant and Environmental Sciences (DPES) is extremely heterogeneous and has had a complicated history. Foci of research are ecotoxicology, biogeochemistry and gas fluxes, ozone impacts, chloroplast biology, plant and fungal systematics, biodiversity conservation and forest ecology. There is a relatively large number of professors who no longer publish very actively or in high-level journals (defined as having an impact factor of >5). The mean age of professors in 2009 was 57 years, the mean age of senior lecturers/associate professors was 50 years, and there appear to be relatively few research fellows/assistant professors. Based on the material provided to the Panel, the number of PhD students appeared to be declining (2004–2009), and the ratio of one PhD student per member of staff is low (as it is in the most other groups within Biology). The DPES's strengths include important contributions to the study of Swedish and world biodiversity in the form of floras and monographs about particular plant and fungus groups. The DPES also is associated with the Gothenburg Herbarium (one of the world's larger such collections), which constitutes an irreplaceable resource.

7C.2 Research quality, productivity, uniqueness and relevance

Quality

Overall, the quality of research performed at the DPES is *Good* and of potential international importance for other scientists in the same fields. There are important contributions especially in terms of the biodiversity and ecological roles of fungi and in terms of chloroplast function. The Ecology & Conservation group (which had nine members of staff in December 2009) did not appear to have a single postdoc, and only four PhD students. It is possible that funding is insufficient to attract and hire more postdocs and students. Note, however, that research funding has increased during the last four years. Although the diversity of DPES may bring strength to undergraduate teaching, such diversity can also become a problem as mentioned in the SWOT analysis of the department itself.

Productivity

Productivity is considered *Good*. The panel felt that the number of 73 papers published in 2009, that is, about one paper per person active in research, was good. There were some papers in top-ranking journals, such as *Plant Cell*, *PNAS* and *Systematic Biology* (some by staff from the Botanical Garden). The productivity of the professors and senior staff is also highly uneven.

Uniqueness

The uniqueness of the research activities is rated *Good to Insufficient*. The reason for this score lies in the heterogeneity of DPES. While some of the research (e.g. on chloroplasts) is not unique (although relevant), other research areas (e.g. arctic plant ecology; gas fluxes from boreonemoral forests) might be judged unique (although high-level publications from these areas are sparse or lacking). The panel also felt that the potential uniqueness should have been made clearer in the self-evaluation. For example, it is said that DPES is “unique nationally and strong internationally by having strong collaborating teams in ecophysiology and biogeochemistry”. These are hardly unique attributes.

Relevance

The relevance is considered *Excellent*. The topics that the DPES focuses on, such as environmental and climatic change, ecotoxicology, and biodiversity, are important for society. These topics do not have immediate technological or economical significance, but are extremely important to mankind.

7C.3 Organization and research infrastructure

Organization and research infrastructure are *Very good*. The infrastructure of the DPES includes access to or ownership of equipment at many field stations, such as the Sven Lovén Centre for Marine Sciences at Kristineberg and Tjärnö, Holmön, Hultaberg, Skogaryd, and the Arctic Research Station at Latnajaure. With the exception of Sven Lovén, these stations do not currently appear to be used to their full potential – at least as documented by internationally visible research output. The panel also felt that despite the DPES’s wish (expressed in the self-evaluation) to have a unified and strong research and teaching focus, it remains open to question whether the botanical groups’ composition should not be reconsidered again. However, 2010/11 is probably too soon for another restructuring, since the merger of the formerly independent groups only occurred in 2006. The link between plant molecular biology (which in Gothenburg focuses on photosynthesis, molecular chaperones, lipid trafficking and chemical signalling) and the remainder of DPES and Biology in particular appeared unclear.

7C.4 Collaboration and networks

National and international collaboration is extensive and assessed as *Very good*. The DPES is part of many Swedish and European collaboration networks, such as the EGO and MARICE platforms, and the Tellus interdisciplinary collaboration in the Baltic and Arctic/Subarctic regions. There also are interdepartmental collaborations and joint publications between the plant systematists and ecologists. Collaborations with breeding companies and the food industry were mentioned, but could not be

evaluated by the panel due to the lack of visible publication output. The theoretical biological platform is either insufficiently presented in the self-evaluation or is very weak.

7C.5 Future plans

The future plans of the DPES as described in the self-evaluation are unclear, and are rated as *Poor*. During the site visit, Panel members learned of an updated strategic plan, which was described as still preliminary. In the version seen by the full Panel, it was stated that the next step in the Department's development would be "to strengthen the theoretical part of risk analysis, which will develop environmental science at DPES and connect it to environmental social sciences". However, between 2004 and 2009, the DPES did not publish a single theoretical paper on risk analysis (and very few papers on any theoretical aspects). There may therefore be an insufficient basis on which to develop a real strength in a risk analysis. However, there is a plan to replace a professor in Aquatic Environmental Sciences with a professor in Environmental Risk Analysis, which may change the situation. In aspects other than risk analysis, the visions of the five research units within DPES also match poorly with the available expertise; for example, it is unclear how the systematic and biodiversity areas, which currently focus on tropical plants, basidiomycetes and the carnation family, can address questions of the well-being of urban residents (p. 107; the vision states that a multidisciplinary project on this topic is being developed).

7C.6 Future potentials and possibilities

The future potentials and possibilities of DPES are *potentially Excellent*. The DPES's current heterogeneous research foci, the age structure of the academic staff, and its low ability to attract postdocs (at least as documented in the material provided to the Panel) will make it very difficult to achieve excellence across the department. (The Panel was later informed that DPES currently has 15 postdocs (80% not Swedish) and 11 non-Swedish PhD students.) It might be beneficial to concentrate on environmental sciences, matching the ecological and environmental focus of most of the department. Ways of increasing cooperation between the different research groups should be considered further. The site visit showed that DPES is undergoing a self-finding process. The systematics section, with the associated herbarium, is strong, but it remained unclear from the self-evaluation how the large facilities, including a brand new phytotron (a state-of-the-art facility for plant cultivation), the arctic station, Skogaryd, and the herbarium, will be – or are being – utilized. During the site visit, it became clearer that the field stations are extremely important in the teaching of students. The research project(s) to be carried out at the phytotron are currently being planned. In the hiring of new staff, this facility may be a strong asset.

Research relying on the herbarium was not explicitly mentioned in the department's written materials or during the site visit, although some of the DPES's publications and teaching probably depends to some degree on herbarium material. The extent to which research into Swedish old-growth forest and arctic plant ecology is still ongoing or will be developed in the future is also unclear. For the plant molecular biology research group, the direction in which new recruitments (a professor and a lecturer?) are targeted remained unclear to the panel. It is also unclear whether the research group working on climate change will be strengthened and how its link to the other groups is envisioned. A well-planned recruitment strategy (including hiring from other institutes) is essential.

7C.7 Interactions with society

The DPES's interactions with society are *Excellent*. Its role for society is important because much of the research focuses on monitoring biodiversity, climate, water quality and biological indicator species. Researchers in the department collaborate with national authorities and undertake numerous educational activities for the public. They also work as editors for mycological volumes of the Encyclopaedia of the Swedish Flora and Fauna. The DPES also participates in a programme to educate PhD students from Rwanda, an excellent addition to the Swedish developmental aid activities in human capacity building.

7C.8 Gender and equal opportunity issues

The treatment of Gender and equal opportunity issues are judged as *Poor*. The gender ratio among the DPES's staff is highly unbalanced: only 12% are females. New recruitments between 2004 and 2009 have not changed this picture: only four of the 18 recruited were female.

7C.9 Summary of assessments – the Department of Plant and Environmental Sciences

Overall assessment: *Good*

Quality: *Good*

Productivity: *Good*

Uniqueness: *Good to Insufficient*

Relevance: *Excellent*

Organization and research infrastructure: *Very good*

Collaboration and networks: *Very good*

Future plans: *Poor*, as developed in self evaluation

Future potentials and possibilities: *Potentially Excellent*

Interactions with society: *Excellent*

Gender and equal opportunity issues: *Poor*

7D. THE DEPARTMENT OF ZOOLOGY

7D.1 Overall assessment

Overall, the Department of Zoology is assessed as *Very good*. The Department is traditional in having research strengths associated with the three axes of animal ecology, systematics and biodiversity, and zoophysiology. With 39 research staff including 18 professors, the department has the critical mass to support these research areas. The productivity of the staff is high, with an average of about 80 peer-reviewed papers per year, transcending the three research axes. The department currently supports 21 PhD students, although it is troubling that the number of graduates has declined over the last six-year period. The department envisages a future in which its strengths in ecology and physiology will be used in translational research into issues of societal relevance, especially within the areas of aquaculture, ecotoxicology and conservation biology. Unfortunately, the strategic plan does not articulate how these goals will be achieved. In aquaculture, however, the site visit showed that plans to exploit new funding sources (from the Västra Götaland regional government) for an Aquaculture Centre West are at an advanced stage.

The lack of a clear and focused overall strategy for the Department of Zoology is troubling, in that there is a need to move quickly as the average ages of the professors and adjunct professors/senior lecturers is above 56. It is also of concern that the department has failed to articulate how its current research activities and hiring goals will shape the future directions of zoological research at the University of Gothenburg. The contributions that are listed in the self-evaluation as most important and innovative are dated, and in some cases have had a limited impact, as evident from the low numbers of citations.

7D.2 Quality and productivity

Quality and productivity are considered *Very good*. The Department of Zoology has a strong reputation for producing high quality research, and the department scores highly in terms of two important metrics: the proportion of staff receiving grants from national and international granting councils and the number of peer-reviewed publications. That being said, the contributions of the academic staff are heterogeneous. Some of the recently retired staff and older members of the staff are outstanding contributors to the department's output, but it is less clear whether the younger staff are having a sustained impact on the research front. There is also concern that the age profile of the department is decidedly old and that there is limited recruitment of staff. Of the eight members of staff recruited since 2004, six have come from Zoology itself, i.e. from the University of Gothenburg, raising concerns about the possibly limited influx of new research ideas, new methods and new directions into the department.

7D.3 Uniqueness

Uniqueness of the research is *Very good*. Three major research fields have been identified in the department (see the first paragraph of the overall assessment, above). These are common to many Zoology/Biology departments, and there is evidence that complementary interests blur some of the boundaries of these groupings. Additionally, some of the groups seem to lack the critical mass needed to define a research area more comprehensively. For example, in a burgeoning area such as systematics and biodiversity sciences, the number of staff at the University of Gothenburg's Biology departments overall is low. The same could be said of the ecology area. One recommendation from the panel is that an amalgamation with other units within biology (and even the entire Faculty of Science) should be considered in order to achieve critical mass in key areas. Many of the broader issues in evolutionary biology and ecology transcend taxonomic divisions or the environments where organisms live. Based on the self-evaluation and brief site visit, the role of molecular tools and approaches in the Department of Zoology did not become clear.

The Department of Zoology is making significant contributions in what they have (fashionably) called translational research. This is reflected in the contributions of the salmonid ecology group, the fish endocrinology lab and the fish toxicology/ecotoxicology groups. These projects are high profile and have brought a significant amount of resource and attention to the University of Gothenburg, as the areas are topical and contribute to addressing societal and industrial needs. Maintaining leadership in these areas will necessitate further investment. As articulated in the self-evaluation documents, investment in infrastructure is needed (animal holding facilities; “omics” technologies; bioinformatics), as well as in maintaining/replacing a critical mass of staff. In some areas, current strength rests on a few researchers.

7D.4 Relevance

Relevance is judged *Very good*. The Department of Zoology has articulated that it sees its future in areas of: 1) Evolutionary Biology, 2) Whole Animal Physiology, 3) Systematics and Phylogeny and 4) Conservation Biology. These are important areas to the future of zoology and the biological sciences in general. However, it is not apparent that the department has described what it sees as being the great challenges that it hopes to address in the future. It is here that the department should be encouraged to do some long-range planning to address how it might contribute to some of the broader questions in biology. For example, there is discussion of having strengths in whole animal physiology, but it is not clear why expanding this area of research is critical to the discipline. Here the description builds on the past reputation, which was very strong, but there is limited indication of where this research might be in the next decade and beyond. Similarly, the systematics and phylogeny research builds on past achievements, but why is continuing this area of strategic importance to Gothenburg and the scientific community? By identifying critical

questions on the horizon (e.g. fast and global climate change; the sustainability and rapid evolution of animal populations) and the advances that have been made in all disciplines of Zoology (omics, systems biology, assessments of organisms in situ), the department may better define its direction and justify its path for the future.

7D.5 Organization and research infrastructure

The Department of Zoology has been a very strong and vibrant department for many years. The department's self-evaluation does not elaborate on the details of the departmental administrative structure in a manner that allows an assessment of whether the department is well positioned to meet future challenges. It is clear that the department has made wise investments in developing research infrastructure (core facilities in omics technologies, animal holding facilities and equipment at field stations for marine research and avian studies). The department has positioned itself to take advantage of various research platforms for interdisciplinary research and it has been highly effective in obtaining external funding. It is also clear from its SWOT analysis that the department has identified its strengths and weaknesses.

That being said, the self-evaluation failed to provide a clear vision of how the Department sees itself evolving over the next decade. Given that there will be a significant turnover of staff in the next few years, it would be critical to identify more clearly how the Department might evolve. While there is mention that the formation of a Department of Integrated Biology may strengthen the biological sciences at the University of Gothenburg, the documentation does not go far enough to describe the nature of the unit or areas of the zoological sciences that are critical to that future vision. The "vision for the future" section indicates that the formation of a larger departmental unit may best support its translational research, but a strategic hiring plan does not appear to be in place, suggesting weaknesses in the department's organization.

In summary, organization and research infrastructure are judged as *Good*.

7D.6 Collaboration and networks

Collaboration and networks are *Very good*. The Department of Zoology has had an impact through its many interdisciplinary and multidisciplinary projects. The societal relevance of its research in the areas of aquaculture, biodiversity sciences and ecotoxicology merits special recognition. Similarly, the department is highly effective in communicating its research to regulators and to the broader community.

7D.7 Future plans

As mentioned several times already, the Department of Zoology has not articulated a well-defined plan for its future. Perhaps some of this is based on the fact that it sees the formation of a broader biological unit as a future event. There is a significant emphasis on the applied aspects of the discipline (ecotoxicology, conservation

research, aquaculture), with a limited connection to the basic science concepts underpinning zoology. Assessment of future plans: *Poor*.

7D.8 Gender issues

The Department of Zoology has a low proportion of women among its academic staff (28%; 11 out of 39 staff). Given that more than 50% of the PhD students are female, the Department would be well advised to increase the proportion of females in positions (to become role models for the next generation of scientists). During the period 2004-2009 there have been eight new hires, and four of these were women. It therefore seems that the Department is making a concerted effort to improve female representation.

7D.9 Research activity

The Department of Zoology has a broad base to its research activity. Apart from its discipline-based research, the Department is active in three of the major research platforms supported by the natural science (GRIP, EGO and Theoretical Biology). It is also a participant in major programmes supported by the Linnaeus Centre for Marine Evolutionary Biology. The staff have broad-based support from the Swedish Research Council, the EU, the Swedish Taxonomy Initiative, MISTRA, the Norwegian Research Council and the Swedish Environmental Protection Agency.

7D.10 Interactions

The Department of Zoology has reported an increase in the in-house interactions between research groupings. Over the period 2004-2009, cross-group publications increased from four to ten articles per year. This presumably reflects the increased opportunities for interdisciplinary research.

7D.11 Interactions with society

The Department of Zoology has been successful in bringing its research to the broader public using two strategies, one of which relates to natural history and the broad dissemination of research findings to the general public. The second strategy is to convey the research findings to public stakeholders and policy makers. The breadth and range of these activities is extensive and engages school age children, the general public and policy makers.

7D.12 Summary of assessments – the Department of Zoology

Overall assessment: *Very good*

Quality and productivity: *Very good*

Uniqueness: *Very good*

Relevance: *Very good*

Organization and research infrastructure: *Good*

Collaboration and networks: *Very good*

Future plans: *Poor*

COOPERATION OF BIOLOGY WITH OTHER HIGHER EDUCATION INSTITUTIONS

Overall assessment

The overall intensity of the biology departments' interactions with other institutions, such as universities and research institutes, is generally very good for the national level and very good to excellent for the international efforts.

National interactions

Several of the biology departments coordinate large national research programs (Marine Ecology, DPES) and research platforms (Cellular & Molecular Biology, Plant & Environmental Sciences, Department of Zoology). On a project level, collaborations exist with many other Swedish institutes. Particularly strong ties have been developed with Chalmers University of Technology and Lund University. The collaborations with Chalmers University of Technology seem to be predominantly in IT, mathematics, physics and environmental and urban development. It appears that the largely complementary focus of Chalmers University of Technology and the University of Gothenburg in combination with the small physical distance between them could be used even more effectively, however. The interactions with Lund University are excellent in cancer research (via the Department of Medicine) as well as in ecological and climate modelling. Especially in light of the suggested strengthening of work with higher model organisms in cell biology (see the first section of this panel's report), additional collaborations with other universities in Sweden would be beneficial.

International interactions

All four biology departments are involved in research consortia funded by the European Commission, demonstrating strong international activities. In this category, the Department of Cellular and Molecular Biology is successful, as it also coordinates consortia (as does the Department of Zoology). In addition, panel members are aware of several international applications initiated by staff from the biology departments. In Zoology, an impressive 60% of all publications have international co-authors. Likewise, the Department of Marine Ecology and the Department of Zoology have a large number of international guest visitors.

In summary, at an international level, the interactions of Biology at the University of Gothenburg with other institutions are very strong. Nevertheless, even more efforts in participating in European networks would strengthen the possibility of recruiting international predocs and postdocs. In this respect, bilateral agreements, for example, via Stint or Erasmus Mundus applications and at the educational level with universities lacking a strong hands-on education scheme would be desirable.

PANEL 7 - BIOLOGY

Apart from further efforts to obtain funding from international consortia, foreign predoc and postdoc candidates should be encouraged to apply for EMBO or Marie Curie fellowships in order to come to Gothenburg. Their future careers would help develop new collaborations worldwide, which in the longer term would lead to a more international environment in the Biology groups and ultimately increase research quality, innovativeness, and visibility.

PANEL 8 – CHEMISTRY AND EARTH SCIENCES

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INTRODUCTORY REMARKS

Panel 8 (Chemistry and Earth Sciences) of the RED10 Team had the task of evaluating the Department of Earth Sciences, the Department of Chemistry and the Swedish NMR Centre, all belonging to the Faculty of Science at the University of Gothenburg. The Panel also commented on the University as a whole and the University's Faculty of Science where this seemed appropriate. This document reflects the opinion of the entire panel.

The combination of research fields to be considered by this panel was somewhat problematic, because research at the Department of Earth Sciences, with its modern direction towards Earth System Research, cannot be understood without considering “biology” in its widest sense. The same applies to the Department of Chemistry with its close links to physics and biology.

The Panel had been prepared for its task with documents containing e.g. statistical data on finances, personnel, publications, descriptions of the research work, self-evaluations and plans for the future. The documentation provided was very helpful, but it was also of variable quality in terms of its completeness, its detail and – to some degree – the lack of information about the collaborative networks within the University, with Chalmers University of Technology and with many institutions outside Gothenburg or even Sweden.

There was virtually no information about teaching programmes, and the Panel therefore largely refrained from commenting on this aspect of the academic duties of the departments concerned. The documents also contained very limited information on “centres” and “platforms” (mostly interdisciplinary, cross-cutting, virtual networks).

None of the institutions evaluated by this panel had submitted a visionary statement on their future development, even though some information about future plans could be found in the reports provided. The Panel therefore requested a “vision statement” (approx. 1-2 pages in length) at its panel meeting. Additional materials were supplied at the site visit, and many of the questions relating to overarching issues, localities/placement of the institutions and the relationship with Chalmers University of Technology were then able to be clarified.

Concern had previously been expressed by panel members that only the Chair and Vice-Chair of the Panel, rather than the Panel as a whole, had been invited to the site visit in Gothenburg. It was quite clear that many of the structural problems could only be evaluated by the Panel based on substantial knowledge of details of the placement/governance of the institutions in Gothenburg.

Gender and equal opportunity issues

One clear area of concern is the low number of women occupying senior academic posts within the Department of Chemistry and the Department of Earth Sciences compared to their representation in more junior positions. This is very worrying, since scientists in many other countries tend to look to Sweden as a beacon of equality. What are the issues preventing women from making the step into a permanent academic post? The Dean’s report acknowledges the problem, but does not come to any conclusions about the issues behind the inequality and, staggeringly,

his only action based on this is to perform a similar analysis to that which has already been carried out within the Faculty of Education. Rather than spending money on more analysis, can't the results of this study be applied to the Faculty of Science? There seems to be a complete lack of ideas about how to attract and retain high quality female scientists. This is a major loss to Swedish tertiary education and scientific research. Below we offer some recommendations that might be considered in order to combat some of these issues.

Recommendations for the gender issue

- The continued gender imbalance at the higher academic levels requires urgent attention and action from the University's leadership at all levels;
- Establish a culture of family-friendly working conditions, nursery/child care facilities, etc., which allow women to compete on equal terms;
- Establish mechanisms whereby high quality female staff are identified early in their career and encouraged to apply for national and international fellowships (e.g. EMBO) and academic positions;
- Establish a specific female academic mentoring programme which helps women make their voices heard within the Faculty, build up networks, develop positive communication skills and build a world-class CV when they are unable to spend much time away from home;
- Identify talented female junior faculty members and encourage them to apply for promotion to senior faculty positions, as well as occupying the positions of Heads of Departments and Deans. These in turn will represent positive role models for junior scientists;
- Establish a fund that facilitates movement back into science after a career break to have children, e.g. short-term research only positions which allow women to focus on building up a research career;
- Develop a programme (or memorandum of understanding) for the recruitment of double career couples in close cooperation with other academic/public institutions in Gothenburg.

8A. THE DEPARTMENT OF CHEMISTRY

8A.1 Overall assessment

Research of a high standard is being carried out in several research groups within the Department of Chemistry. However, the small size of many groups does not provide the critical mass needed for international visibility. To ensure that the scien-

tific environment is as conducive as possible to future competitiveness, it is recommended that the Department unify some existing small groups working in closely related areas. In addition, the plans to form a joint entity between the Department of Chemistry at the University of Gothenburg and that at Chalmers University of Technology are warmly encouraged in order to strengthen the Department's strategic plans, and to form a more solid infrastructure. Because new research areas need, in addition to successful recruitment, substantial investment in infrastructure and personnel, the Department should take care that the present top research groups do not suffer financially from the new research initiatives.

Fundamental research areas within chemistry have a low profile within the Department. They need to be strengthened internally unless they are closely complemented by equivalent expertise at Chalmers. Presently, the entire Department of Chemistry appears to lack focus, even though areas of outstanding research can easily be identified.

8A.2 Research quality, productivity, uniqueness and relevance

Research at the Department of Chemistry is divided into a number of research groups. Research quality, productivity, uniqueness and relevance will be commented on separately for each group below, while remaining issues will be discussed for the Department as a whole.

Analytical Chemistry

A new professor in Analytical Chemistry, recruited in 2007 (who first came as a prestigious Marie Curie Chair guest professor), transferred his outstanding pioneering research on small-volume chemical analysis and measurements on single cells from Penn State University, USA to the University of Gothenburg, and at the same time established strong international links between the University and Penn State University. The studies have achieved worldwide recognition and awards, and resulted in high impact peer-reviewed papers published in internationally highly ranked journals. In addition to successful international cooperation, the group has great potential to establish fruitful collaboration at the University of Gothenburg and at Chalmers as a result of this recruitment.

The specific goals of the analytical chemistry group are to develop new analytical techniques and methods that enable the understanding of exocytosis and the development of an artificial model of Parkinson's disease. This frontier research topic needs multidisciplinary expertise to achieve these important goals.

Biochemistry

Membrane proteins remain one of the last frontiers of structural biology and, despite some significant successes in this area in recent years, our understanding of membrane protein structure-function relationships remains poor. Membrane protein research has traditionally been strong in Sweden. The Biochemistry team at the Department of Chemistry is establishing an outstanding world-class research grouping in this area focusing on the structural characterization of some key classes of membrane proteins including (and most notably) aquaporins and photosynthetic reaction centres. One major success of the Biochemistry team has been high resolution X-ray crystallographic studies on the aquaporins, a fundamentally important group of water-conducting channels, from a range of different sources including plants, humans and yeast. There are only a handful of groups this successful in determining membrane structure-function relationships, and most of those are based in North America. As a result, they have access to a much greater funding base than researchers in Europe including Sweden.

One group in the Department has also been involved in the development of lipidic sponge phase methods for membrane protein crystallization, and this has been successfully applied to structure determination of a photosynthetic reaction centre. The really exciting outstanding developments by the University of Gothenburg group are in the area of membrane protein conformational change, both in terms of method development and application. They have made tremendous progress in the development of time-resolved Laue diffraction and wide-angle X-ray scattering. This, together with their reported involvement with the development of Free Electron Laser facilities, puts them firmly at the forefront of research on membrane protein dynamics. The large number of high impact publications from the group is testament to the outstanding research being carried out.

In summary, the Biochemistry group has developed a world-leading reputation in the area of membrane protein structural biology, and the group members have placed themselves in an excellent position to take advantage of the new technologies which will take our understanding of membrane protein function up a level. There is significant interaction with industry, as witnessed by the publication of papers co-authored by scientists at Astra-Zeneca.

The Biochemistry group is, together with the Biophysics group, located at Medicinarberget, sharing the Lundberg Laboratory with the Department of Cell and Molecular Biology. The Swedish NMR Centre is also located nearby. The Panel considered that there is significant potential for greater interactions between the Biochemistry and Biophysics groups, and members of the Department of Cell and Molecular Biology, given their shared research interests (see discussion of the Swedish NMR Centre below).

Biophysics

The Biophysics grouping comprises two staff members who are very productive in terms of numbers of papers. The quality and relevance of the research outlined in the papers produced by the researchers is evident by the numbers of citations each has received. The grouping is located, along with the Biochemistry section, at Medicinarberget, close to the Swedish NMR Centre. From the researchers' individual webpages and the publication lists this seems a highly appropriate location, as much of the work seems to be dependent on the NMR facility, although other techniques including EPR and laser induced optical spectroscopy are also used. Biophysics is not one of the areas described under section 4.3 of the submission document, so it is difficult to say any more about this grouping.

Dermatochemistry and Medicinal Chemistry

The Medicinal Chemistry group at the University is a comparatively newly established grouping (2001). It has been very successful in attracting funding from a variety of sources, both national and international, in order to focus on the synthesis and characterization of a range of potential drug molecules. A clear set of molecule types are being studied, including the urotensin receptor inhibitors for use in the treatment of cardiovascular disease and protease inhibitors as antibacterial agents. In addition, the group has also made significant and highly valuable technological advances, in particular in the development of compounds as tools for live-cell imaging. The research produced has resulted in a very large number of publications in high impact journals.

A number of techniques are used for the synthesis of the potential drugs, with specific focus being on peptidomimetics and enzyme inhibitors. The group is proactive in publishing its findings, and it is also positive that it holds a number of patents. It would be interesting to know whether any of the targets they have developed are being taken further by a pharmaceutical company.

The Medicinal Chemistry group seems to have a number of internal collaborations within the University, funded through the Faculty of Science research platforms, although it is not clear exactly what the nature of these internal collaborations is. There are, moreover, active intra-Departmental collaborations, for example with the Physical Chemistry group, and also a number of external collaborations with both academia and industry, which seems a logical extension of the work being carried out by the Medicinal Chemistry group. The group has clear visions for its future research, based on extensive collaborations within the framework of the Skin Research Centre, between the Faculty of Science and the Sahlgrenska Academy (both at the University) and the Department of Chemical and Biological Engineering at Chalmers University of Technology, where the Dermatochemistry group at the University of Gothenburg is in a central position. It is pleasing to see that a

senior, academic level appointment was underway at the time of the submission of the paperwork in order to build on the success of the current grouping.

The Dermatochemistry group focuses on a molecular level understanding of allergic contact dermatitis. The documentation states that “the field of dermatochemistry is new and internationally unique”. Indeed, there is only one dermatochemistry group besides the one at the University of Gothenburg. The Gothenburg group has made an impact in the area of understanding which everyday products, e.g. lavender oil, produce allergens and how they do this. These results have implications for the widespread use of such agents, and are of major relevance to society. The grouping has established internal collaborations within the University, funded by one of the platform grants, and it would appear that there has been significant governmental funding for skin research earmarked for the University of Gothenburg as part of a professor’s move from Stockholm. This grouping has been identified by the Department as an area for expansion. However, the earmarked funds will stop within the next couple of years and more external research funds are required. In an attempt to maintain the critical mass of the grouping and the research momentum, funds have been set aside for the recruitment of a senior replacement for the present holder of the professorship.

Environmental Chemistry – Marine Chemistry, Atmospheric Science and Environmental Nanochemistry

Approximately 35% of the total academic staff of the Department of Chemistry is in the section called ‘Environmental Chemistry’. The largest sub-part of the Environmental Chemistry section is listed under the title ‘Marine Chemistry’, with four members under the heading ‘Atmospheric Science’ and one person working on ‘Nanochemistry’. The strength of the Environmental Chemistry grouping derives from a solid background in fundamental chemistry fields, in particular in analytical and physical chemistry.

Marine Chemistry. Research within the Department of Chemistry is largely concerned with Polar (especially Arctic) studies. It comprises a very strong group in environmental and marine chemistry, which is internationally highly visible. It deals with the biogeochemistry of carbon, particularly air-sea exchange of carbon dioxide, as part of the overall oceanic carbon budget. Another strong research theme is the study of volatile organo-halogen gases and their importance on evasion from the ocean for the oxidative capacity of the polar marine atmosphere. More recently, research in the group has focused on the importance of reactions at ice surfaces for organo-halogen production. Other excellent projects address the concentration and particularly the speciation of trace metals such as iron because of their importance for marine primary production.

All the work involves substantial fieldwork (which Sweden, with its research ice-breaker ODEN, provides excellent conditions for), but laboratory studies, particularly for instrumental development, and some modelling, are also significant components. In all these areas the researchers have established reputations and are well known internationally (including two members of the Swedish Academy, one of whom works in the Department of Earth Sciences). Publications are in high-impact journals.

An obvious question for the above group is the relationship to the physical oceanographic research carried out in the University's Department of Earth Sciences. This is of high quality, but the level of interaction (if any) between the biogeochemists in the Department of Chemistry and the physical oceanographers in the Department of Earth Sciences remained unclear to the Panel. In our view there would be considerable intellectual benefit to be gained from such a synergistic relationship. We are not necessarily suggesting that there be a wholesale transfer of academic staff between these two departments (although this could be considered), more that the potential for mutually beneficial co-working should receive serious consideration.

Atmospheric Science at the Department of Chemistry appears to have developed from previous emphasis on combustion processes and technology, and is now much more focussed on pollutant and natural atmospheric particles. This is an important area because of our lack of knowledge of the role of particles in climate change, both in the formation of clouds and in cooling large areas of the industrialized northern hemisphere. This is in addition to the human health implications of increased particulate loadings on air quality.

From the paperwork provided (which is thin for this section of the Department), it seems that at least some of the research being pursued is concerned with local pollution effects produced by vehicle emissions. This involves roadside measurements of particles in the Gothenburg area using more sophisticated instrumentation than is generally used elsewhere. There also appears to be significant effort in laboratory studies into particle formation and properties. The quality of the research appears good, and it is published in well recognized journals.

The group seems to be well located in the Department of Chemistry. Although it could be re-located in a revised Department of Earth Sciences, there would not seem to be a compelling logic for such a change, i.e. there are no obvious synergies in such a move and probably some loss would result from the separation from analytical chemistry developments in the Department of Chemistry.

Environmental Nanochemistry. Nanometrology appears to encompass the measurement of species or events on a nanoscale. The measurement of nanoparticles is essen-

tial not only for technological development purposes, but also for the elucidation of their possible environmental risks including studies on the fate of nanoparticles in biological systems. The relatively newly established Environmental Nanochemistry group is focused at present mainly on the development of techniques applicable to the monitoring of nanoparticles, assisting the development of accurate metrology for the environment, health and safety. Even though the study is of excellent scientific quality and has merits in its specific field, widening the focus the group needs critical mass to create a strong research environment that can tackle the important issues related to the fate of nanoparticles.

Fundamental Chemistry – Physical Chemistry, Electrochemistry and Inorganic Chemistry

The Fundamental Chemistry grouping has, in general, a strong desire to base its research not only on laboratory experiments but also on observations, theoretical calculations, modelling and simulations. Among the fundamental chemistry fields, the *Physical Chemistry* group is the largest and strongest at the moment. The group has been working on e.g. colloidal particle gels from theoretical, experimental and computer simulation points of view, and have its own unique custom-built equipment for the research. The work has gained both excellent national and international recognition. Another highlighted and highly interesting research topic is related to behaviours of molecular clouds in interstellar space.

In the Physical Chemistry group, the retirements of two senior members of academic staff are imminent. Here there is an opportunity for strategic planning of the future directions of research. The Panel feels that it might be productive to combine the tiny and thus less visible *Electrochemistry* group more closely with the Physical Chemistry group. Currently, the Electrochemistry group suffers from a lack of critical mass to carry out high visibility research alone. At the same time, expertise in electrochemistry is vitally important in many fields of modern material chemistry related to e.g. future energy technologies (fuel cells, batteries, etc.) which are on the agenda of the Department of Chemistry. Apparently, there is no relevant expertise at Chalmers, and accordingly active research in electrochemistry would be a highly valued asset in collaboration with the materials chemists at Chalmers. The strength of the University of Gothenburg's Electrochemistry group is that, despite its small size, it is quite interdisciplinary and collaborative, and deals not only with solution but also with surface and solid-state chemistries and even biomaterials.

The *Inorganic Chemistry* group consists of one senior researcher (professor) only. The research of the group has focused on bioinorganics rather than on pure inorganics. The Panel sees potential future synergy benefits by tightening the relationship with the Electrochemistry group, both in research and teaching. There are many potential topics of common interest, particularly in the field of materials chemistry.

Through enhanced collaborations, and probably with more comprehensive research projects within the fundamental chemistry fields, the research profile of the fundamental chemistry community as a whole could be sharpened and improved.

Organic Chemistry

Except for its gender imbalance and age profile, the Organic Chemistry group seems to perform well. It can point to a high number of excellent publications, and the total number of citations and the number of citations per paper are relatively high for the field. The research on samarium-mediated synthesis has produced a number of high impact publications. There is also an active research programme in the development of rapid force field models for the prediction of stereo-selectivity in asymmetric catalysis. This has led to several applied and other very high impact papers. There are good external collaborations, and some of these have resulted in high quality papers on copper catalysis. Researchers in this group seem to have a very high teaching load.

There is a young scientist working in the field between Organic and Medical Chemistry, who recently received an ERC grant. He has a rather unique multidisciplinary background and research profile, and also a highly competitive collaboration network. The work of this still tiny but highly promising group is centred around the bonding characteristics of halogen in N-X-N type systems; it is of high academic interest and seems to have some future applications as well. The group is one of the rare active users of the NMR Centre.

8A.3 Organization and research infrastructure

The Department of Chemistry has an extensive meeting structure in place. This is very impressive, as it allows all members of the Department to have a voice. The Panel is particularly impressed that the three directors of undergraduate and graduate studies meet with the Deputy Head of Department once a week. In principle, the close association with the Departments of Chemistry at the University and Chalmers is a sensible one based on shared research interests, equipment, PhD students and premises and a seminar series to provide a strong teaching and research environment. The clear problem identified by the Panel and also recognized by the academic staff at the University of Gothenburg's Department of Chemistry itself is that most of the credit for activities is easily assigned to Chalmers, due to the fact that the University of Gothenburg staff in the building are by far outnumbered by the Chalmers staff. The Johanneberg Campus where the Department of Chemistry is located is dominated by Chalmers. Biochemistry and Biophysics are geographically separate from the rest of the Department of Chemistry, and their research interests would also seem to overlap with the Department of Cell and Molecular Biology.

The external funding – mainly coming from public sources, but with significant amounts from the EU – has increased considerably since 2004, which can be considered as a very positive development. This demonstrates the Department's ability to attract a wide range of external funding, reflecting the high quality research. On the negative side is the fact that there is no tenure track system and no sabbaticals, which limits the influx of new ideas.

The Department aims at modest but continuous growth through strategic recruitments, where a thoroughly considered balance between senior and junior hires is an important prerequisite for success in these recruitments. For instance, the electrochemistry grouping is very small and there is no equivalent expertise at Chalmers. Given that the head of this group is heavily loaded with teaching, the Panel suggests that this research area be strengthened by targeted recruitment and perhaps the formation of a new unit with inorganic chemistry and/or incorporation into the Physical Chemistry grouping. One of the problems seen in the recruitment process is that it seems to take too long; with a more flexible process, it would be easier to get the best and most-suitable candidate.

8A.4 Collaboration and networks

There are very good external collaborations at both national and international levels, but probably less in the way of intra-departmental collaborations. Many strong groups or collaborations seem to arise between the University and Chalmers. This may be due in part to the geographical closeness of some of the groupings within the Department of Chemistry. A small number of publications come from interdisciplinary collaborations both within the Faculty and within the University – stimulated by cross-disciplinary funding. Platforms seem to be a good initiative to encourage multidisciplinary research; they seem to be acting as a substantial amount of seed funding for specific activities. It is to be hoped that these will kick start projects and lead to substantial levels of external funding.

8A.5 Future plans

A vision statement has been supplied by the Department of Chemistry after a specific request by the Panel following its initial plenary meeting in London. The Panel, however, found the vision statement that was now supplied to be very bland and lacking in strategic thought, other than in generalities. It is almost impossible to disagree with anything it says.

Some good strategic recruitment has been planned, e.g. an associate professorship has been advertised for Atmospheric Chemistry. Two new staff members working with membrane protein grouping have been appointed. For the polar and marine chemistry grouping, the recruitment of a new professor is underway. Two retirements in Physical Chemistry have been identified. There is recognition that the

administrative loads of faculty members must be kept to a minimum so that they can carry out research effectively.

Substantial amounts of infrastructure need to be maintained. Clearly these resources are essential for the work carried out within the Department, but they represent a major financial undertaking in terms of maintenance and replacement. How is the Department going to address this?

The possibility of forming a joint entity between the Departments of Chemistry at the University of Gothenburg and Chalmers University of Technology should be seriously considered. The importance of close and easy collaboration is recognized by both parties. The strengths on the University of Gothenburg side are in analytical and medicinal chemistry, dermatochemistry, biochemistry and electrochemistry, while Chalmers would bring strengths in materials and nanochemistry, as well as expertise in biophysical chemistry and various energy technologies.

8A.6 Future potentials and possibilities

The recruitment of world-leading scientists will improve the profile of chemistry at the University of Gothenburg. There is already wide expertise within the Department. Further development of highly successful research groupings including industrial partners, particularly in analytical chemistry, is necessary. Rationalization of groups should be carried out. Interaction with the Department of Chemistry at Chalmers should be improved and greater links with the Swedish NMR Centre developed. Links should be improved to other marine science activities at the University (e.g. at the Swedish Institute for the Marine Environment, and the Sven Lovén Centre and its marine stations which should not be considered only as infrastructures).

The Department should have detailed plans to further develop highly successful research groups, such as the Analytical Chemistry group working on single cell analysis. The work has great potential and should be able to produce results that would be beneficial in medical chemistry and in several fields of medicine. The group already has very strong international connections and has great potential to establish fruitful collaborations at the University of Gothenburg as well. The new position in analytical chemistry at Chalmers will hopefully increase research collaboration opportunities further.

The research group focusing on environmental nanochemistry has great opportunities to provide information on the risk assessment of nanoparticles in the environment. However, well planned strategies and critical mass are needed to take advantage of this worldwide important research topic, which requires not only multidisciplinary approaches, but also knowledge in several fields of chemistry in-

cluding marine chemistry, since marine research is an important platform in these studies. Moreover, research activities of the atmospheric science group carried out on aerosol particles at molecular level might be very useful for the environmental nanochemistry group.

8A.7 Research activity and teaching

Good use of active researchers as teachers is essential. 40% of chemistry students in Sweden attend the University of Gothenburg, which is a credit to the teaching and reputation in this area. 90% of students obtain suitable employment within three months, demonstrating the high standard of teaching and students. The Department states that it has one of the largest PhD programmes within the University (78 registered PhD students, of which 64 are employed by the Department); however, one worry is the dramatic reduction over the period 2004-2009 in the completion of PhD theses. Does this reflect a reduction of funding or a reduction in the number of students willing to carry out a research degree in this discipline? No clear strategy appears to exist for dealing with this. Perhaps one solution would be to attract students from developing countries. For upper level courses, practical exercises are carried out in research labs; is this a source of undue pressure on them? Could it polarize the choice of topics for Master's theses?

The target teaching load ideal of 10-25% per academic post is good, but the document states that this is not always possible. Perhaps more effort should be put into this? One further concern is the number (not stated) of researchers who have no external funding. Does this mean they have small groups with small levels of research output, or does it mean that they are totally non-research active? What strategy is there for getting these research groups going? E.g. by mentoring or focusing on multidisciplinary activities.

Not much is mentioned in the Department's self-evaluation about the interactions between research and teaching. Apparently most of the research-active staff participate in teaching. This is essential to guarantee the highest academic level of teaching and for educating potential PhD students and researchers for the Department (mainly for later stage students). At the same time, some of the professors/researchers may be overwhelmed with teaching duties. In order to attract the best students and enhance their motivation in chemistry studies, it is important to introduce the Department's research topics to the students and continuously expose them to cutting-edge research, possibly during their early study years, but certainly at the last stage of their studies.

8A.8 Interactions with society

There are good popular science articles and books written by the staff of the Department. Some directly relevant research is described in the documentation provided.

The newly established (January 2010) Innovation Council will serve to further strengthen and coordinate the already strong interactions between the Department of Chemistry and society. The actions of the Innovation Council include popularizing the Department, increasing its visibility in the media, as well as enhancing the interactions between the Department of Chemistry and high school chemistry teachers and collaborations with industry. For the latter task, the Department has traditionally been successful in recruiting several part-time adjunct professors from industry. Moreover, the Department Board has two industry representatives. Innovation is slow, but the Panel noted positively that patents have been acquired. (But how many?) The Department also encourages faculty members to enrol in assignments with strong societal impact. Maybe a higher involvement with the Univer-seum Science Discovery Center would also help.

8A.9 The Panel's recommendations for the Department of Chemistry

- Consider a merger with Chalmers to form a joint unit from the chemistry departments of the two universities;
- Put strategies in place for mentoring staff currently without external research funds;
- Further enhance intra-departmental research collaborative interactions;
- Look for ways to strengthen the collaboration between the Membrane Protein grouping with the Swedish NMR Centre and the Department of Cell and Molecular Biology. This makes sense in terms of physical location and research interest;
- Rationalize/strengthen some of the smaller groupings in the building shared between the University of Gothenburg and Chalmers;
- Fundamental Chemistry research areas have a somewhat low profile within the Department. These need to be strengthened internally unless they are closely complemented by equivalent expertise at Chalmers. It might be productive to combine the tiny and thus less visible electrochemistry group more closely with the physical chemistry group and/or strengthen it through new recruitment in inorganic chemistry with a related research profile;
- In our view there would be considerable intellectual benefit to be gained from the development of a synergistic relationship between oceanography in the Department of Earth Sciences and Polar Chemistry. We are not necessarily suggesting that there be a wholesale transfer of staff between these two departments (although this could be considered), more that the potential for mutually beneficial co-working should receive serious consideration;
- Even though the study of nanoparticles is of high scientific quality and merit in its specific field, in order to widen its focus the group needs to have a critical mass to create a strong research environment that can tackle the important issues related to the fate of nanoparticles.

- One clear area of concern is the low number of women occupying senior academic posts within the Department of Chemistry compared to their representation in more junior positions. Here, the Department should rather look towards the future and put efforts into attracting and retaining the most capable and promising young female academic staff, and arrange continuous mentoring and support for them.

8A.10 Summary of assessments – the Department of Chemistry

Overall grading: *Very good*

Quality: *Excellent*

Productivity: *Very good*

Uniqueness: *Very good*

Relevance: *Excellent*

Organization and research infrastructure: *Very good*

Collaboration and networking: *Very good*

Future plans: *Good*

Future potential: *Excellent*

8B. THE DEPARTMENT OF EARTH SCIENCES

8B.1 Overall assessment

The Department of Earth Sciences claims to study the planet we live on, its air, soil, rocks, sea bed and land formations, the causes of earthquakes and volcanic eruptions, earth surface processes and the origin and behaviour of the oceans and the atmosphere – in fact, too broad an area for such a small department. The Department's research profile is claimed to be strong in three main themes: Climate, Marine Environment and Geological Resources and Risks. Theme leaders (professors at the Department) are responsible for the research work within these themes. This subdivision is the result of a recent restructuring (2007). One pronounced excellent specialty seems to be the Department's strength in polar research (mainly in oceanography). Two (Climate and Marine Environment) of the three major research themes are clearly linked and are traditionally not part of the classic solid earth sciences – which makes the Department's profile notably different to other Swedish earth sciences departments. This distinctiveness could be an asset. On the

other hand, it also incorporates research topics which do not seem to be important, one of them being wine sciences (even though it may be fun to explore such areas).

Overall, therefore, the Department, while having areas of real excellent strength within each of its three themes, lacks focus and vision. There is therefore a critical need to take a strategic view of activities, and to use the opportunity to recruit new staff to generate areas of critical mass that are not vulnerable to the loss of key high profile individuals. There is also a need to establish a clear relationship with other parts of the University that conduct research in major environmental science themes. This may require some strong strategic input from higher up the university structure.

8B.2 Research quality, productivity, uniqueness and relevance

Research quality, productivity, uniqueness and relevance will be evaluated separately for each of the three research areas below, while remaining issues will be discussed for the Department as a whole.

Climate

The climate theme is an area of major activity, with particularly excellent qualities evident in some aspects of climate modelling, although these have been especially dependant on one senior staff member who is currently on leave (seconded elsewhere for an extended period). A further area of international standing relates to work using tree ring data as a proxy for climate change and variability. At national level, there is a carry-over of research strength among the physical geographers in the areas of road and urban climate. There has been marked success in gaining project funding from Swedish and EU sources, but again there has been an element of dependency for some of this on an individual who is currently not present in the Department. It is not clear how his absence is being addressed. Output levels are very good (170 peer reviewed items since 2004 is quoted, and many are in major international journals). Contributions to IPCC (Intergovernmental Panel on Climate Change) reports are provided as evidence of publication strength and impact, although the pieces provided are multi-authored and the Gothenburg contribution is not easy to identify.

Marine Environment

The recent (2007) restructuring of the Department of Earth Sciences led to the formation the Marine Environment research theme, which is of high relevance for a coastal location like Gothenburg, with its easy access to the open ocean. This field of science has a long tradition in Gothenburg, but has continuously taken up new themes so that its present research approach can be considered up-to-date and of

very high quality. It has to be considered as one of the unique traits of the University's research profile, with several outstanding scientists involved.

This group currently deals with five major themes which focus on physical and chemical processes in the water column and sediments as an environmental archive (sometimes in close collaboration with the Department's Climate research theme). The four research groups for this theme all address modern topics of high relevance; they are well embedded in international networks, as documented through their participation in international projects like BALTEX, BONUS, HYPOX and DAMOCLES. The research topics are considered excellent, even unique, and through their relationship to the new field of geoengineering are highly relevant. The staff involved with these themes generate very strong academic outputs.

The organization of the entire Department of Earth Sciences leaves much to be desired, and it is not easy to see why closely related research topics (for example marine paleoenvironmental studies) are taken up separately in each of the Department's three research themes. There is also some overlap with research groups in the Department of Chemistry. It is one of the recommendations of the Panel that, despite the 2007 restructuring, the Department needs a strategic new structure to allow for the proper allocation of human resources, funding, space and infrastructure.

The research topics and projects of this theme are an invitation for close collaboration with other groups within the Department, as well as with the biological and chemical marine disciplines of the University of Gothenburg. This is evidenced through the international activities they are involved in (including the participation in international marine expeditions) and the establishment of the BALPAL database. Participation in the BALTEX and BONUS projects and the establishment of modelling expertise in the Department (as well as the links to modelling groups at other locations) are considered important, and in part outstanding to very good. The efforts in polar research, concentrating on mixing processes in the ocean, are excellent. Of particular importance and societal relevance are studies on the origin and dynamics of the Baltic Sea anoxia and the geoengineering attempts to manage them (BOX and HYPOX projects); these will also lead to important research activities in the future.

Many of the topics addressed by this theme have significant potential for future research and teaching activities. They are also considered to be suitable for an intense interaction with society at large. However, the fragmented nature of the marine disciplines at the University of Gothenburg, spread over several departments and institutions, is considered to potentially seriously inhibit the most efficient exploitation of talent and facilities. The Panel therefore recommends a substantial restructuring, associated with a parallel strengthening of the marine disciplines.

Since detailed justifications for the academic staffing strategy are not provided in the self-evaluation, the Panel refrains from commenting on these plans. Rather, it is recommended that the nature of these posts to be filled is only seriously considered after a possible restructuring of the marine science disciplines has been decided. If a special focus is put on marine sciences in general, modern infrastructure is also urgently needed for the Sven Lovén Centre, as the present larger research vessel is now showing signs of age.

Geological Resources and Risks

Research in this theme falls under four stated areas: ‘Mineral Geochemistry’, ‘Geophysics’, ‘Quaternary and Environmental Geology’ and ‘Precambrian Geology, Crustal Evolution, Ore Deposits and Geochemistry’. Given the number of sub-themes, it is doubtful, and certainly not clear, that critical mass for effective research exists in all these areas. To the outside eye, some of the subthemes appear to be legacies from a more traditional earth science past, and this is reflected in their lack of inclusion of some areas in future plans (see section below). It is noted that two of the three listed ‘most important publications’ in the self-evaluation are from work in this area, but that these outputs are old (publication years 1992 and 1998), leading to the conclusion that significant outputs may have been lacking in recent years.

In Quaternary Geology, key activity appears to lie in the area of stratigraphy of glacial deposits and, in some cases, in socially relevant work on quaternary clay stability. Several key publications have been published in major journals, including *Boreas* and *Geology*, and this work is of international quality.

Most project funding for the work in this theme since 2004 has come from Swedish sources, and there are excellent links and collaborations with the Swedish Geological Survey. Some of this work has been conducted in Africa, but there are also more recent developments and activities in the USA. Postgraduate students are well integrated into this research, although it is difficult to establish the linkages that occur and the outcomes, as the data supplied is insufficiently detailed. Mineral geochemistry has been an area of staffing and infrastructure investment in recent years.

8B.3 Organization and research infrastructure

The Department of Earth Sciences is a small department and became smaller between 2004 and 2009. In 2004 the academic staff comprised 31 (+11 others) full time equivalents (FTEs) (37 +16 individuals); in 2009 there were 29 (+5 others) FTEs (37 + 7 individuals). In addition, there were 25 employed doctoral students in 2004 and 20 in 2009.

It is noted in the self-evaluation that the staffing profile is aging. A recruitment strategy includes five planned appointments in 2010 (one professor and five lectur-

ers, two of which are new appointments, three to replace retiring staff) and a further seven in 2011-2012 (two professors, three lecturers and one assistant lecturer, five of which are new appointments). If made, these appointments would result in a small net increase in size compared to 2004. We have already commented on the issue of the strategy that lies behind the proposed filling of posts, and the need to reconsider this if a restructuring occurs. It needs to be reconsidered even more if significant restructuring does not take place!

Managerially, the Department was reorganized in 2007, with four semi-autonomous sections at that time (Geology, Marine Geology, Oceanography, and Physical Geography/Geography) conflated to a single structure. It is noted in the self-evaluation that this facilitates increasing interactions across disciplinary boundaries. Research is now organized into three themes: Climate, Marine Environment, and Geological Risks and Resources. Within each of these a number of sub-themes exist and, although these may be multidisciplinary, a net result is that each area of activity appears to involve a relatively small number of staff, and the organization is complex. There are, for example, marked differences in presentation in the self-evaluation and on the website, while it is not always clear which personnel take the lead in each activity. Other areas of activity (e.g. GIS) are also flagged in the self-evaluation, but again there is a lack of clarity with regard to how this fits with the research themes.

8B.4 Collaboration and networks

The TELLUS platform for Earth System Science could be an important area of engagement and a major opportunity for the Department of Earth Sciences. There is already staffing diversity within the Department, reflected in the many subthemes of activities, and in some areas it is perhaps only through opportunities such as TELLUS that critical mass to address major topics can be achieved. In particular, the climate group should benefit from collaborations via TELLUS. There is significant and long-standing collaboration with the Swedish Geological Survey, including research that has a practical relevance.

8B.5 Future plans

A vision statement for the Department of Earth Sciences was requested by the Panel. When this was supplied the Panel found the vision statement interesting, but not sufficiently far reaching; although it considers some new initiatives, it does not consider the overall context of the relevant institutions in Gothenburg.

Geological Resources and Risks: It is not clear how all the areas of future plans map on to recent strategic investments. Quaternary research is an area of recent strength, but is not directly explored in the future developments that are considered. The ap-

pointment of a professor with a natural resources profile is identified as a need, but again, how this maps on to research plans is not at all clear.

8B.6 Future potentials and possibilities

The Department is in urgent need of restructuring/refocusing. It currently consists of several rather disparate entities which do not constitute a coherent whole. Some of the work is of excellent quality, some less so. A significant loss of a key faculty member has occurred in the Climate section, and a plan to deal with this loss should be treated as a matter of urgency.

Elsewhere we have commented on better linkage with the Marine Chemistry section in the Department of Chemistry. However, the reorganization we propose should not be carried through such piecemeal small changes. What the Department of Earth Sciences currently appears to lack is a strategic vision. Little is strategic vision is detailed in the paperwork provided to the Panel. Some ideas are promising, but the descriptions are too brief to be assessable. In any case, they represent some good ideas for the future but do not constitute the strategic vision that the Department so badly needs.

It is therefore vital that developments for the future include a greater focussing of activity on core strengths, in order to create groups with a critical mass that can then gain international standing. In this regard, it is important that hard decisions are taken when replacing staff that retire or leave.

It may even be that the best approach is to develop a larger school or department that integrates activities currently spread across several departments. It is not evident that this hard-nosed approach has yet been considered, and thus the recruitment strategy which appears diffuse and lacking sufficient strategic planning could then be set in a wider context. It is essential that a greater clarity of goals, group structuring and group critical mass is presented, implemented and achieved. If a new structure for the departments/faculty is developed, a principle decision will have to be taken on whether or not to maintain the classical scientific disciplines, and ways of serving cross-cutting themes (like marine sciences) via a matrix will have to be considered.

The Panel could not see how many of the structural problems can be solved without a major restructuring of Earth Sciences in their widest sense. The University of Gothenburg considers itself as the leading Swedish centre for research and education in marine sciences, and it considers environmental sciences another high profile field. The Panel invites colleagues in Gothenburg to entertain the idea of forming a new Department of Earth and Environmental Sciences covering the following fields: geology including quaternary geology, atmosphere and climate,

geoengineering, marine and polar sciences (including marine chemistry, marine geology and paleoclimatology, the Sven Lovén Centre and marine biology). If a decision is made to do so, it will be essential to examine the issue of how an adequate modern infrastructure can be funded (i.e. a modern medium-size research vessel as a replacement for the present aged one).

It is also noted that the Department of Earth Sciences itself identifies a small technical staff base as a weakness. In conjunction with considering more focussed academic goals, identifying how best to develop and maintain the support base (both infrastructure and staffing) is essential.

8B.7 Interactions with society

There are some good ideas for future societal interactions in the self-evaluation. In particular, geoengineering for re-oxygenation of water in the Baltic, ground stability and volcanic hazards all seem like suitable topics, but are not developed at a sufficient level of detail for proper evaluation.

8B.8 Recommendations for the Department of Earth Sciences

- The organization of the entire Department of Earth Sciences leaves much to be desired. It is not easy to see why closely related research topics (for example marine paleoenvironmental studies) are dealt with separately in all of the Department's three research themes. The Panel recommends that, despite recent restructuring, the Department needs a stringent new structure to allow for the proper allocation of human resources, funding, space and infrastructure. The Department currently consists of several rather disparate entities which do not constitute a coherent whole;
- A substantial restructuring, with the aim of strengthening marine disciplines as one of the University's highlights; it is then only logical also to consider the acquisition of a modern research vessel for the Sven Lovén Centre;
- That filling vacant or new posts is discussed when a possible restructuring of the marine science disciplines is considered, with the aim of sharpening and focusing their research profile;
- It may even be that the best approach is to develop a larger school or department that integrates activities that are currently spread across several departments;
- The Panel invites the colleagues in Gothenburg to entertain the idea of forming a new Department of Earth and Environmental Sciences covering the following fields: Geology including quaternary geology, atmosphere and climate, geoengineering, marine and polar sciences (including chemistry, marine geology, paleoclimatology, the Sven Lovén Centre and marine biology), including the acquisition of a modern, medium-size ocean-going research vessel;

- It is also noted that the Department of Earth Sciences itself identifies the small technical staff base as a weakness. In conjunction with considering more focussed academic goals, identifying how to best develop and maintain the support base (both infrastructure and staffing) is essential.

8B.9 Summary of assessments – the Department of Earth Sciences

Overall grading: *Good*

Quality: *Good to Excellent*

Productivity: *Very good*

Uniqueness: *Very good*

Relevance: *Excellent*

Organization and research infrastructure: *Good*

Collaboration and networking: *Good to Very good*

Future plans: *Good*

Future potential: *Excellent*

8C. THE SWEDISH NMR CENTRE

The Panel commended the quality of the Swedish NMR Centre, as well as the University and the Director for its development. It provides an excellent facility in modern purpose-built buildings with instruments at a range of suitable field strengths (between 500 and 900 MHz). The expertise currently provided by the Centre is outstanding, with two groups internationally recognized for their work in the development of state-of-the-art NMR methodology.

Approximately half the instrument time is available to research groups within the University and half to groups from elsewhere in Sweden. This appears to be a good arrangement. The NMR Centre thus provides a major resource (in terms of the building, equipment and expertise), but the University is not currently making good use of this. If the situation persists, the NMR Centre will inevitably decline. The Panel believes that it is essential that the University strengthens structural biology by recruiting further staff. With a strong medical faculty, and outstanding internationally competitive research in membrane protein structure and medicinal chemistry, there is an exciting opportunity to create a truly interdisciplinary environment with a set of research groups focussed on structural/chemical biology and early stage drug design.

We noted that groups at the NMR Centre have been attempting to express membrane proteins for NMR studies, which would facilitate collaborative projects with the other groups. However, until recently this has been very difficult due to the intrinsic lack of stability of membrane proteins. The recent development of approaches to create thermostable mutants of membrane proteins for structural studies is now transforming the situation, and NMR studies of such stabilised G protein-coupled receptors (GPCRs) are proving to be much more tractable. It is now going to be much more feasible to carry out structural studies (both X-ray crystallography and NMR spectroscopy) of these hitherto difficult, but pharmaceutically crucial, targets. In addition to structural studies, both NMR spectroscopy (in particular) and X-ray crystallography offer the means to carry out fragment-based screening to identify lead compounds that might be developed for use in chemical biology and drug design.

The University of Gothenburg is extremely well placed to take advantage of these developments, with the Biochemistry and Biophysics groups co-located with the Department of Cell and Molecular Biology in the Lundberg Laboratory. It is difficult to assess this from afar, but the University might consider whether interactions between the Biochemistry and Biophysics groups (which are currently part of the Department of Chemistry) and the biologists might be strengthened if all the relevant groups were brought together administratively in the same department (the Department of Cell and Molecular Biology?). Most importantly, however, the Panel believes that the development of a much stronger portfolio of “in-house” research that employs NMR spectroscopy will be crucial for the long term prospects of the NMR Centre. Firstly, the University will not want to invest in staff and updating the current equipment unless they can see that there is a real prospect of achievement in this area and of continuing to gain outside funding. Secondly, a strong portfolio of “in-house” research will be crucial if the National Centre is to justify continuing investment by the funding bodies for state-of-the-art higher field instruments (1 GHz and above) as they become available. (NB – outside research groups are only going to want to come and use the higher field instruments (900 MHz and above) that are not available in their own Universities.)

It is therefore crucial that the University recruits further structural biology groups (one or more groups focused on a particular biological problem) which can take advantage of the excellent facilities and environment. Nowadays, structural biology groups focus on particular biological problems and they need to apply the whole range of techniques (electron microscopy, X-ray crystallography and NMR spectroscopy, etc.) to their problem of interest. At present, there is a lack of critical mass in terms of numbers of research groups using the structural biology facilities to justify the provision and upkeep of such a wide range of equipment, and it is crucial that this is addressed. Clearly, such strategic recruitment should involve the Department of Cell and Molecular Biology.

8C.1 Recommendations for the Swedish NMR Centre

- That it is essential that the University strengthens structural biology research by recruiting further groups (one or more groups focused on a particular biological problem) which can take advantage of the excellent facilities and environment;
- That the Swedish NMR Centre develops plans for the further expansion (next generation) of its unique instrumentation;
- That the NMR Centre undertakes all possible efforts to offer its services as a national centre, potentially expanding into a Nordic NMR Centre.

8C.2 Summary of assessments – the Swedish NMR Centre

Overall grading: *Excellent*

Quality: *Excellent*

Productivity: *Very good*

Uniqueness: *Excellent*

Relevance: *Excellent*

Organization and research infrastructure: *Very good*

Collaboration and networking: *Good*

Future plans: *Good*

Future potential: *Excellent*

THE FACULTY OF SCIENCE AT THE UNIVERSITY OF GOTHENBURG, COMPARED TO ITS SWEDISH/SCANDINAVIAN COMPETITORS

Compared to its domestic and Scandinavian competitors, the Faculty of Science at the University of Gothenburg is probably of medium size but has a rather widespread focus. It covers in principle all the major subject areas in the fields of mathematics and natural sciences, the very high profile areas being marine, environmental and life sciences, possibly at the expense of more fundamental disciplines of natural sciences (such as basic chemistry). The choice of marine research as one of the focus fields is of course well justified because of the maritime location of Gothenburg and the fact that the city serves as the largest port in Scandinavia.

Parallel to the situations at other Scandinavian universities, research funding for the Faculty of Science at the University of Gothenburg is roughly evenly divided between internal and external sources. In addition to the stiff competition for research funding, the Faculty needs to compete for the best students and for the best research and teaching staff. The number of qualified applicants in natural sciences has been continuously declining in recent years in Sweden, making the recruitment of the best students to these disciplines ever more challenging. The Panel sees the lack of international mobility – both inbound and outbound – as a major problem in the Faculty’s difficulties in recruiting the best-qualified teaching and research staff. Current academic staff are mostly Swedish and, moreover, have little experience from foreign/other Swedish universities.

A rather unusual situation arises from the fact that several departments of the Faculty of Science are intimately linked with the relevant units at the Chalmers University of Technology. This is naturally an advantage and an opportunity for close collaboration, student co-supervision, equipment sharing, etc. But at the same time it may also be a disadvantage in the sense that credit for University of Gothenburg activities may be given to Chalmers. The Faculty has identified its present departmental structure as one of the key issues to be addressed in near future. The Panel agrees with the Faculty’s own view that the present structure may not be optimal.

The Panel was also disappointed in the lack of innovation, daring new proposals/ideas beyond the present institutional boundaries/premises or large-scale infrastructure which would reflect the uniqueness of the scientific institutions in Gothenburg.

Recommendations for the Faculty of Science

- That the Faculty takes all possible measures to attract the best scientists and students and to enhance international mobility (both inbound and outbound);
- That the Faculty seriously and innovatively looks for the most beneficial ways to co-exist with Chalmers. The relevant faculties of both universities should have in-depth discussions on how to optimize their co-location in Gothenburg (either through joint departments or through concentrating specific fields/disciplines at one of them);
- That the Faculty considers critically its present departmental structure;
- That the institutions of the Faculty be motivated to consider daring proposals/ideas for innovation, new initiatives beyond the present institutional boundaries or premises and new large-scale infrastructure.

THE POSITION OF THE UNIVERSITY OF GOTHENBURG IN A SWEDISH/EUROPEAN CONTEXT

Of the natural science departments, the Department of Chemistry, the Department of Mathematical Sciences and the Department of Physics of the University of Gothenburg share the locality with Chalmers University of Technology. This provides special opportunities for the natural sciences at both universities. The two universities are very different, however, as is apparent from the ratio of students to employees (37,000 students – many part-time – and more than 5,300 employees at the University of Gothenburg; 10,000 students – mostly full-time – and 2,300 employees at Chalmers). Within the fields of natural sciences there is some overlap, and there are joint activities that range from mathematics (one department owned by both universities), to chemistry (formally separate, but linked through joint activities and their placement in the same premises), to physics and the various fields of engineering. The relationship between the University of Gothenburg and Chalmers appeared complicated to the panel members, for various reasons, but there are clearly many areas with the potential to develop synergies and critical mass. The opinions within the Panel ranged from merging departments (see above for chemistry) to proposing to establish a new Faculty for Science and Technology as part of the University of Gothenburg, which would include the entire (?) Chalmers University of Technology. Even a merger of both universities was contemplated – without a final recommendation, because the Panel did not feel sufficiently informed about the political situation around two universities and their legal structures. However, it became very clear that both universities should conduct in-depth discussions on how to optimally exploit the unique synergistic opportunities that being located in close physical proximity in the same city bring, while preserving their individual advantageous properties and strengths.

The Panel considered that, situated in this way, the profile of the University of Gothenburg is insufficient for a contemporary context. Today, a university of the size and importance of the University of Gothenburg has to give itself a modern and scientifically aggressive image in the continuous search for scientific excellence, new research problems, approaches and societal challenges (RED10 may be an example if successful). Fierce national and international competition in all academic fields requires excellent scientific staff, but also competitive and family-friendly working conditions. The latter require close cooperation with the responsible authorities in the university's hometown.

While the Panel is not well-informed about many of the relevant boundary conditions at and around the University of Gothenburg, the continued gender imbalance

at the higher academic levels is obvious and requires attention and action from the University's leadership at all levels. They should include a programme for double career couples to be developed in close cooperation with other academic institutions in Gothenburg. Modern universities also require a well balanced mix of local, national and international recruits at all levels, from students to professors.

In all probability (this has not been investigated by the Panel), the University is one of the biggest employers in Gothenburg, resulting in a substantial and many-faceted economic impact – the University should ensure that it has corresponding visibility at local, regional and national levels.

The boundaries between the University of Gothenburg's faculties/entities/departments/etc. are not always clearly identifiable, but there may be reasons for this in the history of the University's growth. The themes of the University of Gothenburg's centres/platforms of expertise and research often cut across traditional boundaries, which the Panel considered important; three or four of them fall within the sphere of interest of this panel and will be dealt with briefly under the respective departments, even though the Panel was supplied with very limited information on them.

GU Holding is a holding company and helps university employees in promoting commercial projects in their widest sense.

The University of Gothenburg also acts as host for four national entities, of which the Swedish Institute for the Marine Environment (run in cooperation with three other Swedish universities) and the Swedish NMR Centre were of substantial interest to this panel.

However, this broadness and interest in many scientific disciplines comes at a cost, namely in terms of an identifiable scientific profile and scientific prominence. This is clearly reflected in the University of Gothenburg's position in international and national rankings (such as web ranking, QS ranking or international rankings in the natural sciences). Even in Sweden, the University of Gothenburg is usually ranked below its closest national competitors, namely the universities of Lund, Uppsala and Stockholm.

Panel 8 of RED10 recommends for the University of Gothenburg in general

- That a university of the size and importance of the University of Gothenburg has to give itself a modern and scientifically aggressive image in the continuous search for excellent scientific staff, new research problems, approaches and societal challenges;

- That the University cultivates competitive and family-friendly working conditions, the latter also in close cooperation with the responsible authorities of the University's hometown;
- That University policies aim at a good mix of local, national and international recruits at all levels, from students to professors;
- That the University of Gothenburg and Chalmers University of Technology should conduct in-depth discussions on how to optimally exploit the unique synergistic opportunities that being located in close physical proximity in the same city bring;
- That the University of Gothenburg explores an extension of the existing cooperation with Chalmers University of Technology, e.g. in the fields of chemistry and cell and molecular biology.

PANEL 9 – MATHEMATICS AND PHYSICS

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INTRODUCTORY REMARKS

The departments of Mathematical Sciences and Physics at the University of Gothenburg have had a history that makes them different from other departments at the University, except for the Department of Chemistry. Over the years, research and teaching staff in the two departments have been totally intertwined with those at Chalmers University of Technology. About five years ago, an administrative decision was made to create separate departments for the two universities. The Department of Physics, following the guideline, created a stand-alone department consisting of those whose salaries were paid by the University of Gothenburg, while Mathematical Sciences colleagues opted to continue as a unit with those who were on the payroll of Chalmers. There is thus a structural and operational difference between the two departments. In some ways, the Department of Mathematical Sciences has remained more cohesive and constitutes the largest department in the field in the Nordic countries. The Department of Physics, on the other hand, is faced with the challenge of either competing with Chalmers or working with it,

albeit from a different financial structure. To its credit, the Department of Physics has decided to work with Chalmers. The Panel finds this decision to be the logical one, since the two universities can only benefit if they work together.

For the above reasons, it is not possible to present a uniform evaluation of the two departments that Panel 9 was asked to consider. Both departments have a high national and international profile overall. Both departments have a number of very enthusiastic researchers and teachers who are competitive, both nationally and internationally. Both departments suffer from low numbers of PhD students: the Department of Mathematics may have been hit harder by the recent financial schemes at the University of Gothenburg, and its staff seem to have higher teaching loads. Both departments are seeking internal and external collaborations. Due to the special structure of the Department of Mathematical Sciences described above and the information given to the Panel, it is impossible to assess the quality of the whole department or the University of Gothenburg component. The following statements therefore apply to the Department of Physics only. The quality of the research is *Excellent*, as judged more from the scientific presentations made during the site visit than from the self-evaluations. The Department can be rated between *Excellent* and *Very good* in productivity (some members have outstanding productivity). The relevance of the research topics ranges from *Outstanding* to *Very good*. The same can be said about the uniqueness. It is, of course, difficult to rate the whole department as a unit in this regard, since there are bound to be some very high profile programmes and some that are no longer so.

The overall impression that one gets from the material provided is that the two departments have respectable research and teaching agendas, that they are aware of recent developments in their respective fields and subfields, and that they are deserving of resources, which will help sustain their high international reputation in several programmes and strengthen those that are operating below critical mass as a result of recent departures due to either retirement or resignation. Both departments would also benefit from more direct interactions with the University's administration as they set their respective future agendas for research and teaching excellence.

9A. THE DEPARTMENT OF MATHEMATICAL SCIENCES

9A.1 Introduction and overall assessment

The Department of Mathematical Sciences at the University of Gothenburg is a shared department, consisting of staff who hold positions at the University of Gothenburg and staff who hold positions at Chalmers University of Technology.

The activities of the two groups of staff appear to be completely intertwined, and this makes our commission – which is to evaluate only the University of Gothenburg component – meaningless. The self-evaluation did not make the task any simpler, as it consisted of a rather arbitrary and inconsistent selection of various activities carried out by the Department. The quality control of the document, for instance concerning the background data, was insufficient.

However, it should be stated clearly that the Department appears from the outside to be a vital and vibrant department on a high international level, and the fact that it consists of two quite different institutions is invisible to the outside. Furthermore, it is the largest department of mathematical sciences in the Nordic countries, and this fact gives the Department a multitude of opportunities unavailable to most other departments. The Panel was not given adequate information to produce an overall assessment of the whole department or any of its research groups. However, it should be clearly stated that Department has a number of outstanding mathematicians¹⁹ who are world class in their area. They publish in the premier journals, and their research has considerable impact. In addition, the Department has a number of excellent mathematicians whose activity has considerable impact internationally. The active researchers in the Department have a wide international network and participate internationally. In addition, the Department is actively engaged in local research activities with external partners. It may be obvious, but it should be stated clearly that while the collaboration in many cases is local, the results are international, and where relevant, are published internationally.

Furthermore, it is the clear opinion of the Panel that a joint Department with no internal boundaries between the University of Gothenburg and Chalmers is a prerequisite in order to have a Department of the quality it presently has.

¹⁹ For reasons of brevity we will in the following use the term “mathematician” to describe an employee of the Department, rather than “mathematician or statistician”.

9A.2 Research quality, productivity, uniqueness and relevance

As has been stated above, it is impossible for the Panel to assess the research quality of the whole Department, or indeed the University of Gothenburg component. The same applies to the individual research groups. The self-evaluation document provided by the Department makes it impossible to make an assessment of the University of Gothenburg employees separately. Indeed, since there is no distinct strategy for the University of Gothenburg and Chalmers in mathematics, and hence no internal University of Gothenburg or Chalmers structure, an assessment one of the nature that we have been requested to carry out would amount to making an assessment of an arbitrary 20% of the employees – the University of Gothenburg portion – of the Department. But it should be repeated that the Department has a number of outstanding world-class mathematicians. The quality of the Department is illustrated by the rather high success rate for individual grants from the Swedish Research Council.

The Department is engaged in a number of external activities. A rather unique example of that is the presence of the Fraunhofer-Chalmers Research Centre for Industrial Mathematics, the only Fraunhofer institute outside Germany. It provides the Department with a unique vehicle for real applied research. The creation of this institute is quite an accomplishment, and shows the high level of research in Gothenburg.

9A.3 Organization and research infrastructure

The different structures of the University of Gothenburg and Chalmers create many challenges for an institution like the present one. Here, we only mention different salary structures, different ways in which to calculate the compensation for teaching and different ways of handling overheads. These problems have been overcome to the extent that there appear to be few or no internal conflicts based on the underlying distinct institutions. Indeed, the difference in salaries has been nullified by an internal decision to have no salary difference between University of Gothenburg and Chalmers permanent employees. For PhD students there still is a salary difference. Furthermore, it has been agreed by the Department to use both affiliations on all publications. A quick test by the Panel reveals that this is indeed followed in practice by the vast majority of employees. On all the Department's webpages there is no distinction between the University of Gothenburg and Chalmers. The Department runs a regular colloquium that is open to the whole Department. It appears to be well attended, and it strengthens the impression of a unified Department.

The Department is organized into two large divisions: Mathematics and Mathematical Statistics. Within each division, there are smaller entities which are, denoted as research groups, most of them centered around a seminar series. While it

is quite common in mathematics and statistics to form loose groups, and indeed individuals may be active members in several groups, the organization of the Department appears to be without structure, and an overall strategy for the formation, purpose and size of these research groups is lacking. The appearance of the research groups on the Department's website adds considerably to the confusion. It is quite common to organize a research group around a regular seminar, and active members will be those individuals who can and will actively take part in the seminars. It is recommended by the Panel that the Department overhauls its research group structure. The internal structure of the Department as it appears to an outsider is rather confusing. Each research group should have its own website that clearly lists all its members and the ongoing activities, in particular the seminar.

The presence of the Department on the web is below what is to be expected. The appearance is inconsistent; links are not active or outdated. Each employee should have an active and updated webpage. A certain uniformity in individual webpages is advisable. A complete overhaul of the whole website is required.

9A.4 Collaboration and networks

As mentioned above, the Department is the biggest department in mathematical science in the Nordic countries. This provides the Department with opportunities that are not easily available to other Nordic departments. In addition, the proximity of major industries in the Gothenburg area opens up the possibility of working on real-world applications. The Department has been able to take advantage of its size in several ways; it covers a wider range of disciplines in mathematics and statistics than other departments in the Nordic countries. This is a considerable advantage in the sense that department members have a huge number of colleagues with which to discuss issues. Furthermore, it makes it easier to engage in external activities. The Department is very active in this respect and has many collaborators at other departments at the University and Chalmers, as well as in industry and research institutes. This is impressive. In addition, the Department has established a number of centres, most notably the Gothenburg Mathematical Modelling Centre, a centre that includes a number of highly valuable activities. These are too numerous to mention here, except for the Fraunhofer-Chalmers Research Centre for Industrial Mathematics (mentioned above). Without a joint department it would have been very hard, if not impossible, to establish and maintain this activity. The Department is engaged in several platforms that have turned out to be very helpful in creating and maintaining interdisciplinary research.

The active mathematicians maintain an active international network, as is to be expected.

9A.5 Future potentials and possibilities

A number of mathematicians will retire from the Department in the next few years. This provides an excellent opportunity to rejuvenate the Department, and offers a chance to focus the research in a direction where further enhancement is needed. Except for the next position, a professorship in financial mathematics, it was not clear to the Panel that the Department has a strategy for future hires. There were indications that the department may opt for open calls where one picks the “best mathematician”. Although this is quite a common strategy in many mathematics departments, the Panel considers this to be too passive a strategy. Indeed, a Department of such a size and quality as the one in Gothenburg should expect to be attractive enough to good applicants in most strong areas of the Department to warrant a more focused call.

The Department has a vision and a strategy for future activities. However, it appeared to the Panel that neither the vision nor the strategy played a significant role in the decisions of the Department. It is only meaningful to have a vision and a strategy if the employees are fully aware of them and they are an integrated part of the decision-making process within the Department.

The funding situation in the Department appears to be reasonably good. As noted above, the Department has been able to acquire a fair share of individual grants from the Swedish Research Council. However, the situation appears fragile. Every year, the Department has to struggle to obtain grants. While grants in mathematics and statistics are relatively small, they are vital to the wellbeing of the Department. For obvious reasons, this affects the more theoretical parts of the Department most, because there are few sources for funding for pure research. However, there is one notable exception, namely the Gothenburg Mathematical Modelling Centre, which is at a critical junction, and requires support on a large scale. The Centre is vital for several of the Department’s activities, and the Centre is at a point where new funding must be sought. It is important that the Faculty at the University of Gothenburg and Chalmers do their utmost to help the Department to secure the continued existence of the Gothenburg Mathematical Modelling Centre.

9A.6 Research activity and teaching

Mathematical sciences are teaching intensive. The Department offers a wide variety of courses for the engineers at Chalmers, as well as for the students of natural sciences at the University. This means that a considerable portion of the activities at the Department are justified by this service teaching. It is absolutely vital for the existence of a high-level research department that the resources provided for teaching do indeed cover the real expenses of teaching in order that there is no subsidizing of teaching with resources intended for research. The Panel is of the opinion that the teaching is not fully financed in the present situation. A solution to this

problem would be to hire senior high school teachers (*gymnasielärare*), who are less expensive. However, the Panel does not recommend this option, as it would violate the basic principle that all teaching at university level should be research based. Furthermore, it would be in conflict with the University strategy, stating that research and teaching should be integrated.

It is important to introduce pre-research university students to the joy of research in mathematical sciences, and to introduce them to the opportunities for candidates with a master's degree or a PhD degree in mathematical sciences. Some activities in this direction do exist within the Department. The Panel considers this activity to be important, and the Panel encourages the Department to strengthen its efforts in this direction.

There is a shortage of PhD students in the Department. This is not due to a lack of talented candidates for PhD positions, but rather a lack of funds. It is imperative that additional funds are provided to increase the number of PhD candidates. It has to be stressed that the calls for new PhD candidates financed by internal funds should be open to attract the best candidates.

9A.7 Interactions with society

The Department has had a special outreach centre called *Resurscentrum Matematik*. Furthermore, the Department is active in the Gothenburg Science Festival. Finally, the Department is active in offering training for teachers, in conjunction with other departments. The wide range of mathematical sciences covered by the Department places it in an excellent position to offer courses that may stimulate the interest in mathematical sciences and the importance of mathematical sciences in our society.

9A.8 Gender and equal opportunity issues

The discussion of gender issues is closely connected with the recruitment situation, and the working conditions offered to young scientists immediately after graduating with a PhD. It is unavoidable that this situation appears difficult, and is associated with considerable uncertainty. An assignment for a period of 2-4 years as a research fellow (*forskarassistent*) is too short to obtain an independent research career, and the unreasonable insecurity when it comes to the teaching load for young senior scientists (*universitetslektorer*) adds to the insecurity. It is not unreasonable to associate this insecure work condition with the insufficient recruitment of females in mathematics. The possibility of introducing a tenure track system should be considered.

9A.9 Other issues

The site visit revealed a rather inconsistent view of the relationship between the Faculty of Science and the Department, as presented by the two parties. The Panel

is unaware of what this relationship actually is or what it ideally should be, but the Panel wants to emphasize that the relationship, whatever it is, should be clarified to both parties.

9A.10 Summary and recommendations

The Department of Mathematical Sciences appears as one unified department, albeit funded by two quite different institutions, the University of Gothenburg and Chalmers. The result is an active research department with high international visibility and research at a high international level. Several individual researchers are outstanding.

The Panel wants to state very clearly that the present situation with a joint department has to continue, as a separation into two departments would make them under-critical and would reduce the ability to carry out all the different collaborative activities that the Department is currently engaged in. Furthermore, two departments would easily engage in unconstructive competition. The Panel would like to stress that it is important that the Faculty of Science at the University of Gothenburg and Chalmers do their utmost to simplify the bureaucratic constraints within the limits of each institution to make the everyday running of the joint department as smooth as possible.

The Panel recommends that the Department rethinks its research group structure and overhauls its website completely. The Panel also recommends that the Department seek an active approach in the recruitment of new faculty members, and take advantage of the strategic opportunities that appear when replacing older faculty members with young researchers.

The Department is engaged in an impressive number of high-level activities over a wide range of areas and with many external partners. The Panel wants to encourage the Department to continue this activity.

9A.11 Summary of assessments – the Department of Mathematical Sciences

The panel has refrained from using the set assessment scale.

9B. THE DEPARTMENT OF PHYSICS

9B.1 Introduction and overall assessment

To the physics community, Gothenburg has had a strong tradition for decades. They have pioneered research in several areas of atomic physics, condensed matter physics, liquids, and astronomy. Many examples of seminal work in these areas have helped place Gothenburg as one of the prime locations for physics research, particularly in the 1970s and 1980s. Until a few years ago, the physicists from Chalmers University of Technology and the University of Gothenburg worked as a single unit, and the distinction was not apparent to the world at large. Together they formed an impressive collection of physicists who competed well not only in Sweden but also worldwide. In the past decade, some administrative changes have taken place, and one of the previous units (Physics and Engineering Physics) has split into three departments: two at Chalmers (Applied Physics, Fundamental Physics) and one at the University of Gothenburg (Physics). In addition, physics-related research is carried out at Chalmers within the Department of Microtechnology and Nanoscience.

The point here is that it takes decades for institutions and departments to build their reputations. It is thus not possible to evaluate the track record of the Department of Physics at the University of Gothenburg in isolation, particularly since it is not clear how the distinction was made as to who belonged to the University of Gothenburg and who belonged to Chalmers before the split occurred. It should also be noted that several physicists from Gothenburg who were world leaders in their respective fields have recently (in the past five years) retired, leaving a rich legacy that should be nurtured. It is therefore important to know the nature of the relationship with the physics-related faculty at Chalmers as we undertake the process of evaluation and recommendations for future directions and growth for the University of Gothenburg Department of Physics. While this subject is mentioned in the report, a clear strategy for straddling the course is not apparent. The website for the Department of Applied Physics at Chalmers actually lists the participating academic staff from the University of Gothenburg in some of the sub-divisions. This is a good sign, as synergistic interactions should always be facilitated and not discouraged.

For the task at hand, the list of professors, senior lecturers and researchers listed under the University of Gothenburg Department of Physics is impressive and compares well in size with that of a mid-sized university in the USA. Since the teaching of undergraduate and graduate courses is shared with Chalmers, the size of the Faculty (in full time equivalents 12 professors, 10.5 senior lecturers/associate professors and two assistant professors) appears to be reasonable, assuming that these are permanent positions, funded by the University. Since several senior faculty

members have recently retired or left for other institutions, the number of junior people hired does not appear to be commensurate with the number of leavers. The Panel strongly urges that the University of Gothenburg administrators and members of the Department of Physics work out a hiring plan, so that in five years or so the number of permanent staff (teaching and research) is no less than what it was five years ago. The same can be said of the number of PhD students, which appears to have gone down. It is important that ways be found of increasing the number of PhD students while at the same time making the process competitive in order to attract excellent students.

The Panel found the issue of permanent positions that are fully funded by the University confusing, as the answer depended on who was asked. In most countries, the salaries of professors (full, associate and assistant, in American parlance) are fully funded by the university. The number of professors is roughly correlated with teaching responsibilities (student credit hours): larger sized universities have larger numbers of professors. There are arrangements by which a professor may buy out his/her time. Research universities (such as the University of Gothenburg) also employ research scientists (sometimes with professorial ranks) whose salary may come from research funds and hence without university guarantee. It appears that at the University of Gothenburg, professors at all levels need to obtain part of their own salary from external sources (outside the University). A newly hired faculty member, for example, may be guaranteed 100% of his/her salary for the first 3-4 years, but beyond that there would be demands to obtain research funding in order to pay part of his/her own salary and not just the salaries of associated graduate students and post-doctoral associates. Such an arrangement sets the University of Gothenburg (and other Swedish Universities) at a disadvantage when hiring top quality faculty members, who expect to receive their full salaries from university sources for the duration of their employment.

9B.2 Research quality, productivity, uniqueness and relevance

Overall, the Department is productive and strives to maintain a high profile. By and large, the Department is engaged in research that is very timely, relevant and of high quality. The total number of invited talks is impressive. Several groups have long-term collaborators in other countries. There appears to be a significant number of visitors to the Department. The production of PhDs, however, appears to be rather low. It was circa 12 per year back in 2004-2005, but in the last two years it has been less than half that rate (less than one PhD per four years per tenured faculty member). The current number of postdocs also seems small. This is probably because of a lack of external funds, which are, of course, related to the priorities set by funding agencies such as the Swedish Foundation for Strategic Research and the Swedish Research Council. If these agencies are no longer funding fundamental research in

various areas of physics, this is indeed a short-sighted approach. The Panel would like to point out that a healthy research community needs healthy research groups, and PhD students and postdocs are an indispensable part of these. The Panel also finds the number of junior faculty members (research fellows; just two, in both 2004 and 2009) to be anomalously small.

Below, we provide an assessment of the research quality, productivity, uniqueness and relevance of the sub-divisions within the Department of Physics.

Astronomy and Astro physics

This group has one professor, two senior lecturers and one “other member of academic staff”. The two senior lecturers are mid-way through their careers (~44 years old), and the other two members are approaching retirement. Research fractions vary between 25% and 55%. The rates of publication show that two members are research active and two are not. One of the research-inactive members is active in outreach, but from the submitted material the extent to which this activity goes beyond what is normal for a professional astronomer is unclear. The work of these researchers is internationally competitive and its quality is *Very good*.

The published work lies in the area of accretion onto compact objects (black holes, neutron stars and white dwarfs). Even for an astrophysics group with only two research-active members, this makes for rather a narrow intellectual range.

In its present state, the Astronomy group is functioning below critical mass. It appears that teaching and other responsibilities are taking a toll on research productivity. It is important that proper consideration be given to rejuvenating this group. There are three clear reasons why astronomy should be an essential part of the Department of Physics: (i) Astronomy is perhaps the most accessible branch of physics for lay-people and attracts undergraduates; (ii) Physics started with astronomy, and in the last 25 years astronomy has returned to the heart of physics through its connections with high-energy and mathematical physics and its propensity to drive detector technology; (iii) The Department of Physics should endeavour to complement Chalmers, which does not cover astronomy; (iv) Sweden subscribes to the European Southern Observatory and the European Space Agency, and Swedish university departments should capitalize on this investment.

Atomic and Molecular Physics

The quality of research in the AMO group is *Very good/Excellent* considering the limited size of the group (only three members are active within the field). Much more could be achieved with a few more members of permanent staff. Experimental research in fullerenes and clusters, atmospheric science, storage ring physics, femtosecond spectroscopy and theoretical research in finite size thermodynamics is

of excellent quality. The group has reasonable publication frequency. The research is often at the forefront of science, and is very relevant – which can be concluded from the close collaboration with prestigious research groups in other countries. Experimental work in electron correlation and negative ions in space and storage rings is also of excellent quality and at the forefront with respect to research into negative ions. The overall productivity is *Good*. Theoretical research on the connection between many-body theory and QED is also rated as *Good*.

It should be noted that prior research in the area of gas phase fullerenes, cluster ions and cluster ion implantation and deposition using the cluster ion beam facility was excellent. The facility is still world class, and has been used with success. The productivity was very high and the quality of the research was innovative and excellent. However, the main person responsible for the effort has left the University. The Panel recommends that a proper replacement be found in order to take advantage of the infrastructure and reputation in the field that already exists. Adding another high profile researcher to the group, particular one with the ability to interact with other relevant groups, will also allow AMO at the University of Gothenburg to reach critical mass in the near future.

The relevance of the work is *Excellent* and the uniqueness is *Very good/Excellent*.

Condensed Matter Physics

Condensed Matter Physics is by far the largest group in the Department. This is not surprising, since it continues to be the fastest growing area worldwide, broadening its horizons by opening its borders to a number of areas of physics and other related disciplines. As a reminder, this field began as solid state physics, slowly incorporating the areas of surfaces, interfaces, liquids and other condensed phases, materials, nano-scale physics and the physics of biological systems, to name just a few. Sweden has produced some excellent physicists in the area whose impact has been global. The University of Gothenburg itself has been the centre for many key developments in the field. The Panel hopes that the University will continue to provide the environment and resources for physicists to maintain their world-class reputation in the area. Within condensed matter physics, two of the subgroups carry out research focused in strongly correlated quantum systems and surface and nanoscale physics. The emphasis is on theory, but there have been some excellent recent recruitments of experimentalists.

The members of the group working on the theory of strongly correlated quantum systems are prominent national leaders (arguably the strongest group in this field in Sweden) and important international figures, despite the group's relatively small size (two professors and one untenured junior faculty member). The systems studied exhibit a huge variety of striking and exotic collective effects, due to the combi-

nation of strong interactions and quantum mechanics. These have consequences for phenomena such as high-temperature superconductivity or future devices such as quantum computers. The main (but not exclusive) focus of the group's work is on low- (1- or 2-) dimensional materials, where a variety of techniques sometimes make exact solutions possible, and where mathematical transformations can be made that map one problem into another. The new problem may still not be soluble, but the transformation can give a radically different view of it, permitting insight into the difficult quantum correlations. This work is technically and intellectually demanding. Like pure mathematics, it does not lend itself to the high “productivity” of papers possible in some areas. Nevertheless, the group has produced a steady stream of high-quality papers on a wide spectrum of problems in this field.

The groups working in condensed matter physics are strongly connected with other groups within the Department and at Chalmers' Department of Applied Physics. There are particularly strong ties with statistical physics (studied in the complex systems/biophysics group). These interactions between groups help to create a viable and effective research community, although the individual groups are small. This is a key advantage of the close coupling to Chalmers. It gives the departments together a greater visibility on the international scene (where researchers are generally not aware of which university particular scientists belong to). However, the small group size remains a problem, because the small number of PhD students and postdocs limits the potential productivity. Getting more PhD students would also increase the coupling between teaching and research, which is vital to a productive research environment. Overall, the research quality in strongly correlated quantum systems is *Excellent*, productivity is *Very good*, uniqueness is *Very good* and relevance is *Excellent*.

The University of Gothenburg and Chalmers have a long tradition of outstanding research in surface physics. They have excelled both in the development of theoretical techniques such as density functional theory and in several experimental innovations. Three of these pioneers have recently retired, and there is a great need to fill their positions with active junior scientists. Several of the present researchers continue to maintain their prominence in the field and are internationally well known. Present theoretical work in the area focuses on understanding the dynamics of electrons, phonons and other excitations on surfaces and on the nature of the binding of molecules with surfaces. There is also the effort in the timely area of liquid/solid interfaces, particularly on the characteristics of water molecules on solid surfaces. The researchers have very good track records of working with experimentalists in their fields. The overall research quality is *Excellent* and the productivity ranges from *Excellent* to *Very good*. The relevance of the work is *Outstanding* and uniqueness is *Very good*.

Experimental photoemission studies of layered materials intercalated *in situ* has led to new knowledge about the electronic structure of intercalation compounds, and has emphasized the importance of layered transition metal dichalcogenides as test beds for various physical phenomena. Work in the above areas also has overlap with work at Chalmers.

The work on liquid crystals is focused on solid surface/liquid crystal interactions, and has led to a number of discoveries and patents. The group has a long history of successful knowledge transfer to start-up companies, such as Ecsibeo AB, which was established 2001 and sold to LC Tec Holding AB in 2007.

Experimental research on Spin Torque Nano-Oscillators (STNOs) is a new and rapidly growing effort at the Department. Highly promising directions of research in this group are developing STNOs for THz applications, carbon and graphene spintronics. The research has resulted in two patents and a spin-off company that is growing. This research group is very well funded and has a large number of students and postdocs stemming from diverse backgrounds. The quality of research is *Outstanding*, as is the productivity of the group, as testified by a large number of publications in high impact journals. The relevance of this work can also be rated as *Outstanding* because of its potential industrial applications. It is also *Outstanding* in its uniqueness, because of the expertise and qualifications of the group leader.

The work in the areas of quantum nanoelectromechanics and optoelectro-mechanics is of both fundamental and applied nature, and is of *Excellent* quality, *Excellent* relevance and *Very good* productivity.

Complex Systems and Biophysics

The area of Complex systems and Biophysics is a vital and growing part of the Department. The groups in this area are led by one professor, one associate professor and two research fellows (“forskarassistenten”). The work is strongly interdisciplinary: members of the group are associated with five of the ten interdisciplinary research platforms recently established within the Faculty of Science. Two international master’s degree programmes are also connected with this research activity. The number of licentiates and PhDs produced is rather low, however: just one of each in the period 2006-2009.

The theoretical work spans a variety of problem areas, which are too numerous to describe here. All of it is creative and innovative. It is associated with three of the faculty research platforms (Theoretical Biology, the Mathematics-Physics Platform, and Nanoparticles in Interactive Environments). We have selected two areas for comment: turbulent dynamics and statistical genetics.

The work on turbulent aerosols is particularly noteworthy. This problem area is not a fashionable one in contemporary theoretical statistical physics, but it is important for the understanding of key processes in many parts of science and even everyday life in Gothenburg. (How do rain showers start?) The work of the group here combines sophisticated mathematical tools with physical insight in order to begin to answer such questions. This may have an important impact on developments in atmospheric science, some of which will be pursued in the University of Gothenburg research platforms.

The statistical genetics work has been carried out in collaboration with biologists and mathematicians. It seeks to extend existing population models to include effects such as recombination rate fluctuations and variable population size. This work lies at the current frontiers of its field. Overall, the research quality is *Outstanding*, productivity is *Excellent*, uniqueness is *Outstanding* and relevance is *Excellent*.

The experimental work is carried out in three groups (labelled Biophotonics, Biomedical Photonics and Single molecule biophysics on the Department's website). All of these deal with applying state-of-the-art physical measurement techniques to probe cellular processes.

The Biophotonics group is the most fully developed of these. In addition to the group leader, there is a junior staff member and about 5-6 postdocs and students. One PhD student in the group defended her thesis in 2009. The group is also involved in the Quantitative Biology Research Platform. The focus of activity in the last 3-4 years has been on developing measurement techniques and systems (rather than their use in specific biological problems). They maintain a facility for the Faculty, the Centre for Biophysical Imaging, based on a scanning confocal microscope and optical tweezers. The group also uses microfluidic systems together with these techniques – part of the “lab-on-a-chip” movement. This combination of powerful methods (and people who know how to use them) is a valuable resource for the biological research community in Gothenburg and beyond. The outlook for pay-offs in understanding cellular processes from these investments in techniques and equipment is promising, though not yet fulfilled.

The research fellow-led *Biomedical Photonics group* has, in addition to the group leader, a postdoc and a PhD student within the Department, plus three PhD students from other departments within the University. It is involved in the Centre for Skin Research Gothenburg. The physics in its work lies in the refinement of advanced optical techniques, notably two-photon microscopy. The application is to processes in epithelial and skin cells, with a particular interest in cancer therapy, carried out in collaboration with clinicians at the Sahlgrenska Hospital. The group has produced many papers in the last 3-4 years. The potentially exciting payoff of

this work will be in the clinical applications, rather than in physics or even fundamental biology per se. In fact, two-photon microscopy is now widely used in many biomedical fields, so it is hard for us to see why this group should be in the Department of Physics, at least in the long term. They have international cooperation with the Norwegian Cancer Institute at Norwegian Radium Hospital Oslo and with the University of Texas, Austin, USA. The work is interesting and of high quality.

The Single molecule biophysics group, also led by a research fellow, is apparently the most recent of the experimental groups to be established. It has a clear biological focus, on DNA repair processes, and uses a wide range of advanced physical methods – quartz crystal microbalance, microfluidics and total internal reflectance fluorescence microscopy. Some of this work has involved collaborations with the Biophotonics group. We have not been informed of any papers published by the PI since 2007, so it is difficult for us to judge how successful this work is or will be.

The research quality of experimental effort in the area of Complex systems and Biophysics is *Good*, productivity is also *Good*, uniqueness is *Very good* and relevance is *Excellent*.

Physics Education Research

According to the self-assessment, “Physics education research is an emerging research field, combining methods from many different disciplines, enabling teachers to apply a scientific approach also to their teaching. Of particular interest for the Gothenburg group is learning in informal contexts, such as science centres, amusement parks, competitions and collaborations outside schools.”

Furthermore, “The physics education effort has provided diagnosis instruments as tools for teachers to monitor students’ conceptual development, and sharing this knowledge with other teachers.” There are a number of similar statements in the self-assessment, but no precise facts or references that would have helped their evaluation.

The effort seems to be much like similar efforts undertaken at any teaching institution. The effort seems to be adequate, but not outstanding in any way. Apart from one professor, on 10% research, no-one seems to be involved with physics education research as their main topic. In short, the departmental effort in PER is confined to one individual who is nationally and internationally known and has published six papers in international peer-reviewed journals and many articles in Swedish on the subject. This individual is a member of the International Committee for Physics Education (ICPE) and the International Advisory board for Physics Education, and is the director of the National Resource Center for Physics Educa-

tion. The research quality is *Very good*, productivity is also *Very good*, uniqueness is *Good* and relevance is *Excellent*.

There is always room for improvement in the field of physics education. The effort is small at the University of Gothenburg as it involves only one person, part-time. This individual has pioneered much activity within the sciences education field and has started the “Amusement park project”, in which young people learn about mechanics in a fun way. In this and other ways, the physics education effort overlaps with the Department’s general public outreach programme.

9B.3 Organization and research infrastructure

Observations by the Astronomy group are carried out at radio telescopes at Onsala Space Observatory, in Chile and in Australia, and members of the group have access to the world-class facilities of the European Southern Observatory and the European Space Agency. The group is small and has a strong theoretical bias, so it does not exploit most of these facilities. Hiring one or two research active astronomers who could benefit from the excellent observatories would help strengthen the research environment.

The AMO group presently consists of two subgroups. They have excellent experimental facilities and realistic goals for the future. These goals would be even more realistic if each group were given one more permanent staff member. It is hard to run a group single-handed, and this poses difficulties for the continuation of any group’s work. The theory subgroup has one permanent staff member and is not very innovative. There is apparently not much overlap between the theory and experimental groups.

The condensed matter theory group consists of about nine permanent senior personnel who have been able to develop good synergy amongst themselves and also with colleagues at Chalmers. They are cognizant of the need for collaborative work and interdisciplinary activities. Several of them are participating in Platform activities. They also have access to the necessary computational resources. Their organization and research infrastructure is very good. Experimental effort in condensed matter physics is small (most of this is based at Chalmers). The facilities are, nevertheless, adequate as they are shared with Chalmers. The Nanofabrication Laboratory and a high-level clean room are particularly important for attracting young scientists of high calibre to the University of Gothenburg. The highly successful recent effort in Applied Spintronics speaks to the outstanding research infrastructure for such activities. Experimentalists also have access to large-scale facilities such as Max Lab in Lund, Advance Light Source at Berkeley, and the heavy ion storage rings at the Universities in Stockholm, Aarhus and Tokyo.

The organization and research infrastructure for the complex systems/biophysics group is also excellent. Both experimental and theoretical efforts in the area reflect a number of internal and external collaborations. The facilities at the Centre for Biophysical Imaging are excellent for the experimental work carried out by this group.

Overall, the organization and research infrastructure for the Department of Physics can be rated as *Excellent/Very good*. The small number of PhD students and post-docs, however, is a negative factor when assessing the infrastructure for theorists.

9B.4 Collaboration and networks

Almost all the members of the Department of Physics are engaged in collaborative activities of one form or the other. Within the University they are engaged through the Faculty's platform initiative with several departments, such as the “*Nanoparticles in Interactive Environments*” with the Department of Chemistry and the “*Mathematics-Physics-Platform*” with the Department of Mathematical Sciences. They are also actively involved in the platforms “*Centre for Skin Research Gothenburg*”, “*The Center for Quantitative Biology*” and “*Theoretical Biology*”. Additionally, several groups are closely involved in joint research activities with colleagues at Chalmers.

Most researchers also have extensive collaborations with scientists outside Sweden. Some have collaborations in China, Ukraine and Japan. Naturally, there are also collaborations with colleagues in the USA and Europe. As an example, the two experimental AMO groups have excellent extended and intensive international collaboration. In particular, they work intensively with a group at Aarhus University in the field of cluster dynamics and benefit from the experimental apparatus needed for this work. They also work with the AMS laboratory in Vienna, as well as with many other groups and laboratories around the world. Another example is that of the condensed matter theorists, whose extensive collaborations with physicists in China and Spain have led to several publications in high impact journals and to a cross-fertilization of ideas in the development of methodologies. The small effort in PER also engages in collaborations and formal networks. Most of the publications of the astronomy group involve external co-authors, particularly from Warsaw. The number of papers published jointly with external collaborators is impressive.

The Panel rates the overall departmental effort in collaboration and networks as *Excellent*.

9B.5 Future plans

Two members of the astronomy group are approaching retirement, so the Department should be considering how to rejuvenate the group. Paragraph 4.4.2 on the future of work in astronomy is unimpressive. Consideration should be given to:

(i) The balance to be struck between theory and observation; (ii) How to achieve a

reasonable coverage of astronomy with a small faculty; (iii) Whether synergies can be achieved by choosing areas cognate to ones covered by Chalmers (possibilities include instrumentation, cosmology and nuclear physics).

The two experimental AMO groups plan to build a table-top storage ring, which will make facilitate a great deal of future research in the field. This facility will support the work to be performed at the DESIREE storage ring in Stockholm. They also plan to expand work in accelerator mass spectroscopy (AMS), where the sensitivity can be enhanced via the use of laser photo detachment. This work supports the facilities at ORNL and Vienna. These plans seem well based and feasible with the current support of the groups. The plans of the AMO theory group seem to be “more of the same”.

The condensed matter physics and complex systems/biophysics groups are both engaged in very timely problems and are working, with few exceptions, at the cutting edge of research in the field. Their trajectory is positive and their future plans, which include a number of interdisciplinary activities, are excellent.

9B.6 Future potentials and possibilities

The two experimental AMO groups have high potential for the future, and clearly should continue to follow front-line research within negative ions and clusters. These fields can be attacked without great investment in apparatus and manpower.

The AMO theoretical programme seems to be stuck in one, rather narrow subject. In the self-assessment it is stated: “The question is for which processes combined many-body-QED effects are significant”. The group should consider the likelihood of a positive answer to this question and take notice thereof.

The condensed matter and complex systems/biophysics groups have outstanding potential and should continue to move forward with their plans. They have already engaged in several high profile interdisciplinary activities and are encouraged to continue to pursue them. It would be beneficial to the Department to hire a few more experimentalists in condensed matter physics who could interact directly with the theorists. Of course, such hiring should be done in conjunction with Chalmers so as to not duplicate efforts. Close collaborations and almost seamless interactions with Chalmers would, of course, be beneficial to both sides.

9B.7 Research activity and teaching

Most permanent staff teach, and the teaching for all University of Gothenburg and Chalmers students is conducted jointly. This allows both universities to offer a good number of elective courses for both undergraduate and graduate students. Students also benefit from the large number of research-active scientists available for teach-

ing. The joint teaching with Chalmers also appears to have created some issues, since the two universities have different financial structure and count teaching and research funding differently. Also, at times there may not be enough courses to go around. There is also the issue of funds for teaching. There were complaints about how the University was not providing the full cost of teaching. The Panel recommends that the University be responsible for covering 100% of teaching expenses.

Physics education research (PER) performed within the Department uses research-validated diagnoses for pre- and post-testing. In addition, research-based and research-validated textbooks are used, together with other teaching materials, and research-based techniques, such as peer instruction, are conducted. Physics college teachers are trained by departmental professors. In principle, these are excellent practices. However, neither the departmental self-evaluation nor the site visit revealed that PER is a serious departmental effort. In fact, it is not clear if junior faculty and graduate students receive formal mentoring for teaching. While departmental resources and priorities may not allow a noticeable effort in PER, mentoring of junior professors and graduate students should be taken seriously by the Department.

The Panel also recommends that rewards be given to those who make special efforts to integrate research and education.

9B.8 Interactions with society

Departmental members are actively engaged in governmental committees. They seek patents for their innovations and write books and articles for public consumption. These activities are important, and the Department is to be commended for promoting them; we hope it rewards the individuals who engage in it. Outreach activities to the local community appears to be a mission of the Department, although not many examples of activities were provided, except for “amusement park” physics educational material, which is based on results from physics education research. The Department is encouraged to have a more active outreach programme.

9B.9 Gender and equal opportunity issues

The University of Gothenburg has set itself the goal of increasing the number of female professional physicists. The Department of Physics has a number of female PhD students and female professors, but the numbers are still very low. Of the 22 people with PhDs recruited by the Department in the past five years, only two are women. Women in these positions pointed to the negative impact that the working conditions have on recruitment and retention of women in the field. Since jobs are not secure, particularly for junior scientists, and the rather long probationary period coincides for most with child bearing age, women are more likely to either opt out of this career path or go to other countries where job security is better.

Concern was also expressed that there was very little mentoring of junior scientists, and this again hurts women more than men because of the lack of role models. Women who join departments like the Department of Physics with a five-year or so research grant may find themselves pretty much on their own because of the lack of a mentoring plan that would help integrate people. These issues are ironic, given that the social conditions and the societal structure in Sweden are far more supportive of professional women than most countries in the world. It would seem that a little more attention to the recruitment, retention and integration of women would go a long way towards the University attaining its goal of 40% women in the professorial ranks in the near future.

9B.10 Other issues

The site visit made it clear that financial issues were problematic for a number of reasons. There was the general complaint that not enough money was available for hiring PhD students and that the funding scheme at the University had changed so that teaching was not funded at a level of 100%. The other point was the lack of transparency in how the budget was handled and how decisions were made. There was also the concern that departmental staff did not have much say in who was to be hired if a position were to become available. Apparently, a committee at faculty level is responsible for short listing and choosing the candidate for a position advertised in the Department.

The Panel recommends that financial matters and decision-making processes be made as transparent as possible, as this would take away the confusion and lack of trust that may ensue when information is not readily available. The Panel is also of the opinion that responsible University administrators should help the Department make a realistic evaluation of its teaching obligations and the personnel needed to fulfil this obligation. Such an evaluation will lead both sides to a concrete understanding of the meaning of 100% funding for teaching. It will also make the expectations clearer for funding agencies. The number of PhDs has to increase if the Department is to retain its competitive edge.

From the material presented to us and from discussions at the site visit, it appears that the recruitment of PhD students is not carried out at the broadest level so as to invite applications from a diverse population. In fact, diversity did not appear to be a concern in hiring at any stage. While the commitment to hiring more women is to be commended, it is also important in the present global economy and circumstances that universities like the University of Gothenburg aspire to enhance diversity both among students and among its permanent staff.

9B.11 Summary of recommendations

To its credit, the Department of Physics at the University of Gothenburg has been able to carve a niche for itself after the forced break with Chalmers University. Its members have focused their research interests in a few areas and maintained their high profile at international level through collaborations both within and outside the University of Gothenburg. Their productivity is impressive and their choice of research problems is on the whole timely, interesting and relevant to national and international needs. However, several leading figures have either retired or departed in the last five years, and a clear commitment to rejuvenation is essential if the Department is to maintain its standing. The Panel is concerned that the failure of the University of Gothenburg to guarantee the full salaries of academic staff will make it uncompetitive in its efforts to recruit internationally recognized researchers. The Panel strongly recommends that appropriate funding be provided to the Department of Physics so as to ensure that its teaching responsibilities are self-supporting rather than being subsidized by research funds.

The separation of the University of Gothenburg and Chalmers physicists is artificial and does not benefit either side. In several areas the University of Gothenburg staff could do much better if they were working together with Physics-related activities at Chalmers. Condensed matter theory is large enough to be effective, but at the University of Gothenburg the other subfields of physics and astronomy are currently below optimal size, and will have difficulty maintaining a competitive edge in the long term.

For a number of reasons, the number of PhD students has diminished in the past five years; a situation that alarms the Panel. It recommends that this issue be addressed as a matter of urgency. A stronger, jointly supported physics programme at the University of Gothenburg and Chalmers would be more attractive to graduate students, both at national level and international level. Such an umbrella would also be more attractive to the junior scientists that the University of Gothenburg should be hiring. The Panel recommends that the University administration be proactive in facilitating joint ventures and programmes of the Department of Physics with its counterpart at Chalmers.

The Department of Physics appears to be aware of the importance of gender and ethnic diversity, and strives to hire individuals with a broad background. Establishing some guidelines and policies would help it achieve a higher level of diversity in its membership.

The Panel is aware of some strategic planning that the Department has undertaken. The results are, however, not easy to find. The departmental website would be a good place for such information, as well as the Department's mission and vision

statements. The departmental website can be a very useful tool for recruiting and advertising purposes. The Panel recommends that the website be actively used for such purposes.

9B.12 Summary of assessments – the Department of Physics

Research quality: *Excellent*

Productivity: *Excellent to Very good*

Uniqueness: *Outstanding to Very good*

Relevance: *Outstanding to Very good*

Organization and research infrastructure: *Excellent to Very good*

Collaboration and networks: *Excellent*

PANEL 10 – SOCIAL SCIENCES

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INTRODUCTORY REMARKS

The RED10 evaluation exercise is the first ever attempt by the University of Gothenburg to obtain a comprehensive international view on the quality and relevance of its research and its national and international outreach activities. This assessment takes place at a time when higher education institutions everywhere – including Sweden – are facing entirely new political, legislative and financial challenges.

This assignment has not been easy. The panel utilized written self-assessments produced by the departments and other available material. Only the chair and the vice-chair of the evaluation team had an opportunity to make a site visit to Gothen-

burg. During its two-day meeting in Copenhagen and in subsequent consultations, the panel prepared a set of messages and questions that were sent in advance of the site visit to the departments and schools for further clarification. Because of the large number of departments involved, the schedule only permitted each chair to be interviewed for half an hour, which was clearly inadequate.

The quality of departmental self-evaluations was mixed. Many of the reports contained pertinent and useful information, but they often described the activities rather than providing self-reflective considerations on the present state of affairs and future plans. The evaluation team feels that the self-evaluations could have been more explicit and ambitious about future plans for development. For instance, the process of research planning was outlined in most reports in rather a sketchy manner. A real problem was that the departmental self-evaluations often contained contradictory information on staff numbers, numbers of PhD students, budgets, and other important factors. Brief meetings during the site visit did not allow the assessors to check the reliability of all the information.

The overall impression that we gained is that while some of the units within the Faculty of Social Sciences have been doing outstanding work, there is considerable room for improvement. This aim concerns several aspects of the Faculty and its units; in some cases there is a need to reconsider the current organizational structure, address the challenge of stronger internationalization in research, and invest in greater diversity in gender, nationality and other social aspects of the research and teaching staff. At present, the vast majority of staff have been recruited from within the department itself or, at most, from other units at the University of Gothenburg.

It appears that the current organization of the Faculty includes a strong degree of path dependency. The present structure has emerged from a variety of starting points; professional schools in journalism, social work, and public administration have been converted into new academic units and, in the case of the School of Global Studies, formerly independent units have been merged into a new cross-disciplinary entity. It is obvious that such processes of organizational transformation have resulted in a structure that is not entirely coherent and effective.

For instance, there is a fair amount of overlap in the research programmes of various units in areas such as risk research, nuclear energy, the environment, and other issues. The benefit is obviously that these themes can tie various departments together and promote interdisciplinary research. To attain this goal, there is, however, a need to develop more systematic educational programmes across various disciplines and units. Interdisciplinary research is practiced well in many parts of the Faculty, but there does not seem to be a systematic framework in which institutional and methodological boundaries can be crossed.

One pervasive trend in practically all the departments is the shrinkage of PhD programmes. Several departments are able to hire, for example, only four PhD students every other year. This seems to be due to the requirement that all doctoral students must be employed through either internal or external funding. As the sources of funds for PhD students have been drying up in recent years, the result has been smaller programmes which may not always be viable. In some units there is a legitimate concern about the completion rate and the duration of doctoral studies.

When the total number of PhD students in a department is as low as ten, the choice of graduate courses becomes limited and the quality of educational experience will suffer. The situation is somewhat ameliorated by the practice whereby students can rather freely take courses in other departments. In the opinion of most members of the panel, one possibility for expanding this practice would be to establish a Graduate School for the entire Faculty that would make course planning and the sharing of resources more systematic. Such an arrangement does not eliminate the need to organize core graduate courses within individual departments. The PhD students should also have the freedom to take relevant courses in other faculties.

The overhead policies (indirect costs) established by the University have created widespread concern in the Faculty. It was repeatedly pointed out that the present system is too mechanical and non-transparent, and treats individual units in an unequal manner. It was claimed that the present overhead system rewards those units that have little external funding for research and punishes those which are active in this regard. At worst, it was argued, the overhead policy becomes an obstacle to raising external research funding. No doubt the situation is in reality more complicated and the approach has been applied nationwide, but the grievances seemed serious and honest.

There was a constant complaint in the self-evaluations and in the discussions during the site visit that the faculty members have too little time for research, as teaching – and, in some cases, administration – takes up too much time and energy. In some fields, this may be a genuine problem, but the team could not escape the conclusion that the teaching load is also used as an excuse for not being more actively engaged in research.

Yet it is often the case that the only possibility to buy out time from teaching for research is to obtain external funding whereby another person steps in to take care of teaching duties. This may provide opportunities to others for short-term employment, but at the same time the department would lose the talent and experience of a good scholar in teaching. In extreme cases, a scholar with strong fund-raising capacity would be away from teaching for an extended period of time.

In research policy, the Faculty should pay particular attention to how it could better support and reward outstanding research activities. This suggestion does not concern only prominent individual scholars, but should also relate to the development of creative research environments which would foster high-quality teams within departments and across disciplinary and national boundaries.

Strong research environments can only be created from the bottom up; the departments and faculties should identify those areas in which research teams have the strongest potential for progress. Such a competitive process of selection is never easy, but its implementation is necessary in order to enhance the quality of research. The priority areas selected by the university leadership should be built upon these bottom-up initiatives. One can say that centres of excellence are not established, they emerge from active research work.

The evaluation panel could not avoid the impression that, in many respects, social sciences at the University of Gothenburg are rather inward-looking. In some fields – especially political science, psychology, and to some extent global studies – there is an active record of publishing internationally in peer-reviewed journals and through respectable academic publishing houses. However, in most fields the Faculty's publication record is concentrated on in-house departmental reports and other publication outlets within the University. At best, research results are communicated through Swedish academic publications.

The inward-looking character of the Faculty is also revealed in its recruitment policies, in which local candidates often appear to be given priority over external candidates. While this is understandable to a point, the Faculty should develop a more active and transparent recruitment policy. This is particularly important now that senior faculty members are on the verge of retirement in many departments. Thus, there is an opportunity to renew and restructure the research and teaching staff to move to the next level of excellence. On the other hand, there were cases in which external announcements of positions were made, but they were not competitive enough to attract strong candidates from outside.

The panel's considerations and the experiences of the site visit suggested that, despite problems, there are visible signs in the Faculty of Social Sciences of rethinking and renewal. Some self-evaluations and most interviews left the impression that the departments have started the adjustment and the transition to the new environment in which universities find themselves; there is a readiness to publish more in international peer-reviewed journals and other competitive fora, and to start developing international cooperation in a systematic manner.

Most members of the evaluation panel felt that the participation of the entire group in the site visit to Gothenburg would have given a better basis to form a systematic and consistent view of the strengths and weaknesses of individual departments. Many members found it difficult to “calibrate” the gradings across the departments and, despite best efforts, the panel may not have been able to be entirely consistent. In part, this is no doubt due to different academic character of the individual departments and the publication and policy practices they have adopted.

10A. THE CENTER FOR PUBLIC SECTOR RESEARCH, CEFOS

The Center for Public Sector Research (CEFOS) was established in 1991 as a part of an effort by the Swedish Government to promote long-term research in the public sector. It is an independent research unit under the auspices of the Faculty of Social Sciences. Its researchers represent multiple disciplines and its steering committee includes members from five different faculties. In 2009, external funding accounted for about 70% of the total research budget; most of the external funds came either from Swedish research councils or commissioned research.

CEFOS employs some persons on a full-time basis and there are, in addition, some 30 researchers who either have offices at the Center or who participate more peripherally in its activities. The administrative core of the Center is very small, as the Director has a half-time position and only the Research Administrator has a full-time appointment. CEFOS does not have a doctoral programme and thus it does not have any PhD students of its own. In other words, the Center is a loosely organized multidisciplinary community of researchers dealing with various public sector issues. Its high degree of dependence on external funds creates problems both in designing long-term research programmes and in dealing with the fluctuations in funding and administrative overhead fees.

The Center focuses mainly on research dealing with areas entitled *Risk and Society* and *Democratic and Innovative Governance in Transition*, which is divided into studies on local governance and organizational aspects of working life. The publication record shows rather active engagement in research, and the limited teaching load permits reasonably high productivity (although the decentralized character of the Center makes it difficult to assess the real level of productivity of its researchers).

Over one hundred articles in monographs and close to 50 peer-reviewed articles in this six-year period under review is, however, a decent result for a small unit.

It is striking that practically all the publishers of CEFOS' research output are associated with the University of Gothenburg or various Swedish agencies. In this regard, Springer Verlag and Earthscan are the main international exceptions. The same comment applies also to journal articles, though the international Journal of Risk Research is number one among the most frequently used journals. This indicates the prominence that the field of risk research has gained within the Center. In reality, most publications in this area seem to have been produced by a single researcher.

The organization of CEFOS is highly decentralized, which obviously creates challenges in initiating, coordinating and finalizing research projects. On the other hand, the current structure opens up opportunities for multidisciplinary work, as the development of gambling studies within the Center shows. Limited administrative resources obviously pose infrastructural problems.

CEFOS is by its very nature a network organization, as it brings together researchers from several departments and faculties. Collaboration with the external world is, however, limited; in 2004-2009, only a couple of CEFOS researchers carried out visits abroad for more than three months, and the number of foreign visitors is even smaller. Due to its very character, CEFOS is closely connected with the public sector organizations in Sweden. It works closely with both national governmental and local administrative agencies. This is a mixed blessing, as it brings in additional resources to the Center but also erodes efforts to create a coherent research profile.

Similar tendencies are observable in the extent of jointly authored publications; only 5-7% have at least one international co-author or Swedish co-author from outside the University of Gothenburg. In terms of research collaboration and networking this is clearly inadmissible, although national and international networking may in reality be more extensive than what the statistics show.

The future plans of the Center are not spelled out very clearly in the self-evaluation. Nuclear waste management, gambling studies and the management of national and cultural heritage are mentioned as the main emerging areas of research. The substantive and methodological diversity of these fields indicates how indeterminate the future plans of CEFOS are. In some sense, CEFOS may be a victim of its own history, organizational structure and funding patterns. Against these odds, the Center seems to have performed as well as one can expect in these circumstances.

CEFOS is a leading centre in the field of public sector studies in Sweden. It is difficult to see, however, how it could move in its present structure to the next level

of excellence and relevance. Moreover, the ongoing structural transformation of public administration, and its interface with the private sector, may reduce the need for the kind of research for which CEFOS was originally established.

On the other hand, this very transformation of public administration may create new research needs on entirely different issues. Against this backdrop, one could raise the question of whether the Faculty could respond to these challenges more effectively as a part of a larger institutional entity. For instance, a merger of CEFOS and the School of Public Administration would create a department whose joint budget, at around SEK 55 million, would still be the second smallest in the Faculty.

Summary of assessments – the Center for Public Sector Research, CEFOS

Quality: *Good* (few international publications)

Productivity: *Good* (active national publication record)

Uniqueness: *Very good* (one of three main research centres in Sweden within the field of public sector studies)

Relevance: *Very good* (carries out relevant research, but the work programme is incoherent and driven by individual research interests)

Organizational capacity: *Insufficient* (very limited budget and administrative resources)

Collaboration: *Good* (actively networked within the University and nationally, but few international contacts)

Future plans: *Insufficient*

10B. THE DEPARTMENT OF JOURNALISM, MEDIA AND COMMUNICATION

The Department of Journalism, Media and Communication (JMG) is one of the two main journalism education institutions in Sweden. The merger of the Unit of Mass Communication (previously part of the Department of Political Science) and the School of Journalism in 1990 brought together two quite different academic traditions and approaches. On the one hand, there was a tradition of media research, leaning strongly toward political science and especially election studies, and on the other a practical professional education with characteristics of polytechnic training and strong ties with the media industry.

Both JMG's journalism and media and communication studies programmes are very popular among the students. JMG did well in the national evaluation of journalism education in 2007. In the previous evaluation, JMG was criticized for the weak link between professional courses and research. According to the 2007 evaluation, the situation had improved considerably and PhD education in particular had been intensified.

However, the number of PhD students remains very small, at only five salaried students in 2009. The scarcity of resources for the PhD programme places obvious limits on the recruitment of new teachers and researchers, and this problem is compounded by the virtual absence of any postdoc programme.

The research profile is typical for large journalism education institutions; they tend to focus on two dimensions – media and democracy – and questions surrounding professional identity and praxis. The political science orientation is still visible in the strong interest in research dealing with a variety of time series data, especially election coverage, opinion measurements and studies of media use.

This type of research is often carried out in collaboration with other departments and the numerous research units at the University of Gothenburg. Two of these centres are affiliated with JMG: the Society, Opinion and Media (SOM) Institute and the University of Gothenburg Television Centre. The Department is also affiliated with Nordicom, which is a knowledge centre for media and communication research that operates under the auspices of the Nordic Council of Ministers. Nordicom was not on the agenda of RED10, but it is rightly mentioned by the Department as a strength.

The polytechnic trait within JMG has clearly been “academized”, especially in research into journalistic professionalism and journalistic genres. The media culture approach, otherwise very popular in Sweden since the 1990s, has not received much attention at JMG. Overall, the JMG research profile is characterized by empirical research.

All journalism education institutions have a tendency to load their staff with extensive teaching. In contrast with other departments, it appears that in JMG senior academic staff especially are loaded heavily with teaching obligations (35 student FTEs per senior member). JMG staff can therefore rarely devote themselves to research alone, and the only way to do so is to obtain external funding to buy research time.

Good contacts with the media industry have a long tradition, and today the Department's expertise is frequently used in the public forum, for instance by providing analyses for media policy preparation and for media regulation mechanisms. It

can be said that JMG is the most frequently used institution for applied research in the field of media studies in Sweden. Commissioned research, accounting for one third of the total research budget, has an established role in the JMG activities.

Overall, JMG can be characterized as a well-established, small or medium-sized department with a strong teaching – especially undergraduate – component and a research profile that can perhaps be called solid but conventional and narrow. The eternal dilemma of journalism education is the balance between professional and academic education. This has become even more of a burning issue in recent decades and needs to be addressed in the further development of the department. The Department's publication record is very local and, at best, national. Although the departmental culture may now be changing, the academic staff has shown little interest in international publishing and networking activities. Among the journals used, the only one that is properly peer reviewed is *Nordicom Review*. Most frequently used peer-reviewed journal is *Nordicom Review*, but the staff has also published in a limited way in European and North American periodicals and publishing houses of the field. An example of the lack of international interest is provided by the fact that, in the 1980s, a research group at the Department developed the concept of *mediatization* of public life as part of the project on Sweden's referendum on nuclear power. Some ten years later, several international researchers "re-invented" the concept, but nobody from the Department has participated in the international debate. There is now an effort to revitalize the concept of *mediatization*, although it is probably difficult to claim the "firstborn rights" for a concept that has been put aside for 25 years.

The self-evaluation of the Department is very descriptive and provides little reflection on present realities and future plans. The most promising fields listed are the same as its present research activities and there is little innovation for the future. It is true that the report admits that the present approach – with few international and peer-reviewed publications – has outlived its usefulness, but the reorientation seems to be progressing slowly. The Department has now started to create incentives to participate in international conferences, which might also result in more demanding publications. The number of international visits remains very low.

The description of the strategy for societal influence and interaction is absolutely the best part of the self-evaluation, and it shows how deep the contacts between JMG and Swedish society are. This is no doubt a strong side of the activity within the Department, including in obtaining external funding. Strong contacts with society are more of a strength than a weakness, although dependence on governmental grants may limit the research agenda to the detriment of basic research.

Summary of assessments – the Department of Journalism, Media and Communication

Quality: *Insufficient* (the lack of international and peer-reviewed publications)

Productivity: *Good* (active local and national publication record)

Uniqueness: *Very good* (one of the two main institutions in the field in Sweden)

Relevance: *Excellent* (lots of contacts with the media industry and public bodies)

Organizational capability: *Good* (resources exist for teaching, but are limited in research)

Collaboration and networking: *Insufficient* (especially international collaboration)

Future plans: *Insufficient*

10C THE DEPARTMENT OF POLITICAL SCIENCE

The Department is a top-heavy institution, with eleven professors and ten senior lecturers/associate professors, in addition to dozens of junior staff. Measured by budget, it is one of the largest departments in the Faculty of Social Sciences, together with the Department of Psychology. In terms of student FTEs, it is a medium-size department. It excels particularly in the amount of research funding obtained from both University sources and the competitive funding provided by the Swedish research councils. In 2009, funds obtained from the Swedish research councils amounted to about SEK 16 million and show a slightly rising trend.

In earlier evaluations, the Department has been doing very well. In the nationwide assessment conducted by the National Research Council in 2002, it was ranked as the most prominent research environment for political science in Sweden. The evaluation pointed then out that “the Department has transcended its traditional focus on electoral studies, integrating other subfields of political science... with this branching out, the Department has achieved a synthesis between its widely-acknowledged methodological approaches and creative approaches to cutting-edge problems in political science”. Two of the leading members of the Department have received high honours within the national scientific community.

A major challenge for the Department is to maintain the high public profile and active research record that it has been able to develop in recent decades. A positive sign is that the number of international peer-reviewed articles is considerable, and is growing. This may be due to the consistent effort by the Department to develop an internal quality assurance system for the research conducted there.

The Department is strongly networked across national boundaries, which is a result of both systematic departmental efforts and active contacts by some leading researchers. However, there is an imbalance between outgoing and incoming visitors. It is commendable that the Department has been active in encouraging its postdoc members to go abroad, but there should be more incoming postdoc fellows coming in order to Gothenburg to make it a genuinely international department.

The Department is suffering from two main weaknesses; the gender imbalance and the diminishing recruitment to the PhD programme. Only one of the eleven full professors is female, while the corresponding share among the senior lecturers is a high 70%. As professors approach retirement, the gender issue should be addressed effectively in the ensuing recruitment process. The future of PhD programmes in the Faculty of Social Sciences deserves university-wide attention.

Today, there is a total of 19 doctoral students, which puts the Department of Political Science in the middle range of all the departments in the Faculty. Even more alarming is the fact that the current rate of admission – four students every other year – would reduce, if we assume the average duration of studies to be four years, the number of PhD students to eight. This is clearly not viable at all for a department of this size. This problem may be a further reason to consider the establishment of a graduate school for the entire Faculty. The mean age of doctoral students, 32 years, is also rather high, although comparable with most other departments.

The Department's publication record is among the most active and international in the Faculty of Social Sciences. It reports over 1,100 published items during the period under evaluation, one hundred of which are peer-reviewed articles. The journals in which articles are published include some of the leading international political science journals, and several works have come out from prestigious outlets such as Oxford University Press and Blackwell.

Nevertheless, the bulk of the Department's publications have come out from within the University. One should take into account the fact that in Political Science, as in other departments, publications may have been counted more than once; first as an internal paper or conference paper and then as an external publication. It seems that there is a strong degree of differentiation in the publication record within the Department, as a few of its members are responsible for a considerable part of publications, especially the international ones.

The Department has three flagship programmes. The oldest one is the Swedish Election Studies (SNES) programme that was launched in 1954 to organize and collect information on the national parliamentary elections. The work, pursued in a systematic and comparable fashion over the years, has produced data sets which

have also been in demand for comparative research in Europe and beyond. The original effort has been branched out to several other areas of inquiry, such as the studies of media and political representation. In the latter area, the Swedish parliamentarians have now been investigated systematically for some four decades.

Another extension of the original programme has been to cover the national media reporting before and between national elections. The Society Opinion Media (SOM) Institute was established for this purpose in cooperation with the Department of Journalism, Media and Communication. Although we have not specifically evaluated SOM, it appears to be a very active cross-disciplinary institution, with an extensive publication record, but whose work agenda is defined in a rather narrow manner.

A new extension of the election studies programme is the recent launch of the Multidisciplinary Opinion and Democracy Research (MOD) Group that has started to apply new, especially innovative web-based methods in order to collect data on Swedish democratic opinions and processes. It is obvious that this initiative is wrought with methodological difficulties, but, if successful, it will add yet another dimension to the Gothenburg tradition of electoral studies.

The Gothenburg tradition has been to investigate not only individual opinions on elections and democracy, but also institutional factors and their impact on individual behaviour. This work has, since 2004, been institutionalized in the Quality of Government Institute (QoG), which is one of the largest social science programmes in Sweden. The programme deals in an ambitious manner both with theoretical and empirical aspects of its institutionalist agenda. Due to special arrangements, the University has committed to provide basic funding to the QoG until 2014.

Theoretically, the work of the QoG revolves around the concepts of social capital and social trust and their institutional manifestations. Empirically, the Institute is developing indicators and databases on the quality of governmental institutions, both diachronically and across countries. The main claim in the work is that the quality of these institutions is a central element in the trust between societal actors. The Institute involves some twenty scholars, and it has also branched out into issue areas that are not directly political. The results of the QoG's work have been published by leading international journals and academic publishing houses.

The third element of the Department's research agenda worth mentioning concerns European integration and governance. Its focus has been on the decision-making and policies pursued by the European Union institutions. Perhaps an even more important topic in the field of governance research is institutional adaptation of central government institutions to globalization and other structural changes in the

international environment. This research is carried out in collaboration with other political science departments in Sweden and beyond.

It should be mentioned that the Department seems to have been rather successful in striking a balance between research and teaching; practically all teaching is done by active researchers. In contrast with many other departments, political scientists are not complaining about the teaching load. The Department has also wanted to emphasize that, despite multiple methodological and theoretical perspectives pursued by its members, there are no major dividing lines among them and the working atmosphere is good.

The Department may be path-dependent on its past achievements. The challenge is to guarantee that the ambition and quality attained over the years will be maintained in the future when leaders of the main research areas leave. Continuity has to be well prepared in advance. On the other hand, the Department should try to diversify and expand beyond its traditional areas of excellence. In this effort, it would benefit from continuing support from the University.

Given the past successes, it would be reasonable to expect that the University supports such expansion (which is not really proposed by the Department itself at this stage). We recommend that the Department goes further by attracting more external visitors and, in particular, postdocs. To conclude, the short term issue is to secure the same quality level in the chosen areas of strength. In addition, both the Department and the University should develop a consistent and ambitious vision for the future, given that the Department is a point of strength within the Faculty of Social Sciences.

Summary of assessments – the Department of Political Science

Quality: *Excellent* (a very strong international publication record, but too many publications are still local and national, and the record is somewhat uneven)

Productivity: *Very good* (productivity among the faculty members is somewhat uneven)

Uniqueness: *Excellent* (houses some of the most prominent research programmes in Sweden, and has been recognized as a leading institution by its peers)

Relevance: *Very good* (election studies, governance and European integration have strong societal relevance)

Organization and research infrastructure: *Outstanding* (unique databases and a very effectively organized research system)

Collaboration and networks: *Very good* (active contacts both nationally and internationally, but perhaps a little too concentrated on the key members).

Future plans: *Good* (old successful programmes will be continued, but there is a need to look forward)

10D. THE DEPARTMENT OF PSYCHOLOGY

Psychology is the largest department at the Faculty of Social Sciences measured in terms of the number of professors (14), and has an overall full-time equivalent (FTE) of some 65 academic staff with research amounting to ca 32 FTE, excluding PhDs and clinical positions. In 2009, the Department's revenue amounted to SEK 106 million, and shows an increase especially between 2007 and 2008. The total research budget of the Department in 2009 was SEK 46 million of which external grants accounted for SEK 29 million and SEK 19 million came from the research councils. The importance of research councils in funding hints at the scientific competence of the Department.

The Department is organized into four major divisions, i.e. the Division of Cognition, Motivation and Social Psychology, the Division of Developmental Psychology and Personality, the Division of Health, Disability and Aging, and the Division of Work and Organisational Psychology. Research conducted at the Department is geared towards the international scientific community. The researchers have extensive international contacts, articles are published in high-quality journals, and the research is innovative and often of excellent quality, with some outstanding contributions.

Overall, the Department is very active in research and has been successful in attracting external funding. It admits about 900 undergraduates annually, and there are around 50 doctoral students who mostly graduate within the expected net study time frame. The Department's PhD programme was ranked in 2009 as excellent and as one of the most prominent by the Centre for Higher Education Development in Gütersloh, Germany.

The overall quality of the research carried out within the Department is *very good to excellent*, with substantial variability among individual researchers. The Division of Cognition, Motivation and Social Psychology reaches an excellent level. The Division of Developmental Psychology and Personality and the Division for Health, Disability and Aging perform overall at a good level, with some excellent research contributions. The Division of Work and Organisational Psychology performs overall at a good to insufficient level with respect to research. However, we note the wide-reaching societal impact of the work carried out in this field. The following research groups constitute excellent to outstanding exceptions: Legal Psychology, Environmental Psychology, Human Development and Addiction.

The productivity of the Department is overall *excellent*, with some 70 peer-reviewed international publications coming out each year. However, the variation in researchers' productivity is considerable, as are citations of their work. Some

researchers' production covers hundreds of papers and shows citation statistics in the thousands, whereas others have a much more modest output. We find that there are research teams that are very productive and conduct research which has a high international impact and is innovative in nature; the best examples are the research focusing on legal or forensic psychology (80 peer-reviewed articles) and the research on addiction (60 articles).

In terms of uniqueness, the Department as a whole qualifies as *very good*, with the Division of Cognition, Motivation and Social Psychology performing at an excellent to outstanding level. Unique contributions also emanate from research into addiction, developmental psychology, and disability. The relevance of research conducted at the Department is approaching *excellent*. This evaluation is based on researchers' contributions to specified research fields and extensive collaboration with colleagues and groups within and outside the University.

As mentioned above, research at the Department is organized into four divisions, each with specific research sub-units where researchers can be members of more than one unit and where the departmental policy encourages collaboration across units and divisions. The work in the Division of Cognition, Motivation and Social Psychology involves social cognition, judgement and decision-making, memory, metacognition, emotion and mood, legal psychology, environmental psychology, economic psychology and psychology of science studies.

The Unit for Criminal, Legal and Investigative Psychology (CLIP) was established in 2000 and includes twelve members (of which five are Ph.D. students). The research focuses on the interface between psychology and law. The Environmental Psychology Unit (EPU) includes nine people (including two PhD students) who study attitudes, values, norms, justice and well-being in relation to environmental issues and behavioural change. Research is also carried out into social dilemmas, including aspects of emotion, behaviour and decision-making.

The Economic Psychology Group (EPG) has seven members (including one PhD) focusing on judgement and decision-making in relation to investments and consumer choice.

The Division of Developmental Psychology and Personality is very large and include 37 people, of which 17 are PhD students. Their research deals with human development from infancy to adulthood with respect to a better understanding of the psychological health of children, adults, families and communities, as well as developmental disabilities.

The Division of Health, Disability and Aging has 36 members, of which 13 are PhD students, and focuses on the psychological aspects of health, disability and aging, as well as factors such as interaction with biological and social conditions. Many projects are multidisciplinary and deal with issues such as the psychological aspects of health, cognitive and social disabilities, mental health, and age-related cognitive and emotional health.

The Division of Work and Organisational Psychology has ten members, including one doctoral student, and reports four main topical, multidisciplinary areas of research. This group is regularly contracted for internal organization issues by the University of Gothenburg. The Division deals with work environment and work climate, teamwork, leadership and management issues, and promotes method development on, for example, work climate measurement and intervention.

In terms of infrastructure, the Department has both in-house laboratory equipment and collaborative contacts with more specialized external laboratories. It is not clear from the self-evaluation whether access to these facilities is sufficient for future developments in the relevant fields. We expect that a review of research infrastructure will be carried out as part of the forthcoming strategic planning. The organizational structure seems appropriate, but may not be optimal for achieving research excellence in the long term.

The Department has developed internal collaboration and networks with other departments within the University. The self-evaluation reports extensive international cooperation with several major universities. Clearly, the Department of Psychology is very active internationally, and it differs in that regard in a very positive way from most other departments in the Faculty. We conclude that all research groups have developed extensive national and international contacts whose results are highly visible in the research production. For instance, 57% of all publications involve at least one author from outside the Department.

The future plans of the Department emphasize high quality and international publications. It aims to achieve these goals by stressing the importance of internal and external reviews, supporting research applications and introducing the option of reduced teaching load when working on external funding. While the Department's quality work is commendable, it appears that there are no explicit standards for success and failure or an operational incentive system. We conclude that the future plans are underdeveloped and do not seem to result from concentrated strategic work to facilitate future research developments. However, there seems to be a departmental spirit that encourages original intellectual effort from the bottom up.

The future plans for excellence in research in the self-evaluation are short and vague. It would be advisable to recognize outstanding groups more clearly and concentrate

departmental resources on those, ensuring continued high quality in research. It also seems that some individuals and groups are disconnected from active research. The research strategy should clearly address this issue and identify how it can be corrected by the recruitment of the staff, outlining potentials and improvement needs, as well as clarifying central research goals. It would also be worth strengthening the research output in areas that currently have their main focus on teaching. Finally, a future strategic plan could put more emphasis on reviewing laboratory needs and potentials.

Overall, the Department is very active in research and has been successful in attracting external funding. There is a high volume of publication activity, with an emphasis on peer-reviewed articles (in 2004-2009 a total of 1099 publications, including 436 peer-reviewed scientific articles, 129 book chapters, 19 edited books and 262 conference presentations). The Department has developed two Master's Programmes (each 120 credits) apart from traditional Psychologist programme (300 credits) and the Psychoterapist programme (90 credits).

Interactions with society are above the expected level, and include close research contacts in widespread networks, conferences and seminars, long-term interactions with industry and local organizations, students' work and practices, popular books and media appearances. In terms of gender and equal opportunities issues there are no obvious problems. The self-evaluation report mentioned that there is a disconnection between clinical teaching and research, which is a general problem in the field.

Summary of assessments – the Department of Psychology

Quality: *Excellent* (a high level of international peer-reviewed publications and external research grants; excellent PhD programme)

Productivity: *Excellent* (over 70 peer-reviewed international publications published per year in addition to other types of publications)

Uniqueness: *Very good* overall (with a number of excellent or outstanding researchers in specified areas)

Relevance: *Approaching excellence*

Organization and research infrastructure: *Very good* (the organizational structure seems convenient, but may not be optimal for achieving research excellence; there are in-house laboratory equipment and collaborative contacts with more specialized laboratories outside the unit, but it is not clear whether access to these facilities is sufficient)

Collaboration and networks: *Excellent* (the Department has excellent national and international contacts)

Future plans: *Good* (however, the plans are underdeveloped and do not seem to be the result of concentrated strategic work)

10E. THE DEPARTMENT OF SOCIAL WORK

The Department of Social Work is one of the largest at the Faculty of Social Sciences, with more than 100 employees and around 1,400 students. The evaluation materials mention six professors and 45 senior lecturers, plus 35 persons in “other” employment categories. During the period evaluated here, 22 doctoral students were recruited and 19 graduated. In Sweden, social work has developed as an academic discipline in the last three decades, and it has been a multidisciplinary field of study geared towards the professional training of social workers. In fact, the first professorship in social work in Sweden was established at Gothenburg in 1979.

In the last two decades or so, social work in Sweden has expanded and is now found in many universities and colleges, and there has been a very strong push towards making the discipline more academic and research-oriented. Gothenburg has done very well in this process. In national evaluations, it is considered to have a very good professional training programme and good research, as well as connections between the two. Research revenues in 2009 were close to SEK 30 million, at least half of which was made up of external research grants (total revenue almost SEK 92 million).

The Department’s research areas are broad and linked to professional and policy interests within the field of social work. The Department has been known to be strong on family research, which has been directed by a very well-known but now retiring professor. It is important that the position is filled by a highly-qualified candidate. Another area of research with considerable impact, both nationally and internationally, focuses on poverty, income maintenance and social problems. Two additional areas of importance in the Department deal with social work in transition, which naturally is a central aspect of professional training, as well as gender, sexuality and social work. The latter area of research has been central to the Department for a long time, and in recent years it has expanded even further.

In listing the most promising new areas, the Department appears to be planning an expansion of its research agenda to include areas such as the everyday life of older people, formal and informal social support, and exclusion and control. These are certainly relevant areas, but one has to ask whether the Department is overreaching and whether it should focus research work more carefully on certain central areas of excellence. For instance, the role of migrant families and their social problems could be better integrated into the current research programme. It is clear that the needs of the large undergraduate body within the Department also shape the research agenda in the professional and policy direction. The Department has been a pioneer within the Faculty in setting up international master’s programmes. The MSc programme in Social Work was started in 1992, and two years ago a new international

master's programme in Social Work and Human Rights was launched. These are welcome initiatives and should provide opportunities for further collaboration with the School of Global Studies.

The PhD programme remains underdeveloped, although it has produced an average of three doctors per annum in the last few years. The lack of funding seems to be resulting in a further shrinking of the programme, as in the last three years only six new doctoral candidates were recruited. (This is, of course, a general problem at the University of Gothenburg and other Swedish universities.) Over time, the scarcity of PhD students will turn into a vicious circle which is compounded by the lack of a viable postdoc programme. It is difficult to see how the University could strengthen its research profile and international competitiveness in circumstances like these, especially as recruitment takes place mostly from within the department.

It turns out that practically all PhD students are female and often over the age of 40, which reflects the gender aspect of the entire field. Among the professors and other senior academic staff, the balance is more even, though not optimal. The self-evaluation does not discuss the issues of gender and diversity very much. The growing ethnic diversity in Sweden should raise the question of whether this should also be reflected in social work education and the student body.

The Department's publication record is respectable compared with the strong professional emphasis of the field. This is reflected in the number of peer-reviewed articles whose annual number has also grown over time. Also, the per capita share of such articles is reasonably high given the newness of social work as an academic field. However, the category "journal/newspaper articles" continues to dominate the list of publications. It should also be noted that the share of single-authored articles is over 60 per cent which can be regarded as a high figure. Moreover, the Department's academic staff has been only modestly successful in obtaining external research funding. The Department seems to have worked hard to promote international cooperation, including the two master's programmes. In our judgement, it is in this regard well above the average in the Swedish social work community. As to societal relevance, social work is a field that has strong contacts especially with local and national public administration. It appears that the Department has more policy contacts than the field on average. It has, for example, some interesting field sites in suburbs which show a creative way to combine research and teaching.

Generally speaking, the Department of Social Work is a well-functioning department. Teaching and research are effectively integrated, and the plans for the future are more explicit than in most other departments. All members of research staff teach, and there is an effort to involve each member in departmental research groups that function as academic and non-academic nodes within the organization.

The self-evaluation states that professors can use an average of half their time for research, senior staff some 40%, and “other” staff just 10%. This means that external funds are very important for research, and unless such funds are obtained, there is very little room for research. This pattern also means that the scientific productivity of professors and other senior staff is highly critical for the success of any department, as only they have significant time resources to be dedicated to research.

Summary of assessments – the Department of Social Work

Quality: *Good* (but in some areas very good)

Productivity: *Very good*

Uniqueness: *Very good* (the standing of the Department is strong in Sweden and it has a clear identity, but the professional requirements and the expansiveness of research agenda place constraints)

Relevance: *Excellent* (especially in education, but also in policy outreach)

Organization and research infrastructure: *Very good*

Collaboration and networking: *Very good* (excellent in international contacts)

Future plans: *Very good* (but alarming signs in the PhD programme)

10F. THE DEPARTMENT OF SOCIOLOGY

This is a medium-sized department with seven professors and 33 other research positions. It has produced an average of four doctoral degrees per year during the six-year period investigated. The total budget of the Department was a little over SEK 80 million in 2009, with the main income from undergraduate education and approximately SEK 38 million from research (of which external funding amounted to about SEK 23million).

The Department’s self-evaluation document is a description of the recent development of Sociology at Gothenburg rather than a reflective, critical self-evaluation. It seems that many good things have happened in recent years, but not necessarily in a planned way. For example, a Science and Technology Studies (STS) unit has developed, with good results, and it is intended to be strengthened in the future. However, any clear sense of strategic thinking is absent in the self-evaluation.

The Department’s key research areas are labour markets and working life, the family, gender and welfare, criminology and law, science and technology studies, and

social movements. There is a good deal of overlap between the first and second of these. The first seems to be a major source of external funding (although more data in this respect would have been helpful). The ‘family, gender and welfare’ and ‘science and technology’ strands of the Department’s work appear to be most important in terms of international collaborations.

There is, however, no serious discussion of ‘internationalization’, which is a lively topic elsewhere in Scandinavia at the moment. This can, of course, be defined in different ways, and we should be sensitive to local and national context. Most of the academic staff appears to be Swedish. Of 70 articles listed as published in the ‘most frequently used journals’, 58 were published in Scandinavian journals, with a high proportion in Swedish. Discounting *Archives of Gerontology and Geriatrics* (4), that leaves only eight articles in highly rated international sociology journals. The list of ‘most important publications’ itself acknowledges the relatively low number of citations these have attracted.

Ultimately, one has to ask what is the Department’s level of ambition in the context of the international sociology field? We recognise the value and importance of addressing regional and national audiences, and that there is, in fact, a responsibility to do so, but this should not be a distraction from the need to address international audiences, too. It should be noted, however, that in its quality assurance work the Department has stressed the importance of internationalizing its research and teaching.

The SWOT analysis creates a strong impression that all is not well in this Department, and this message may have been the intention of its author(s). We are told that:

- “Assistant and associate professors have no time for research and are thus unable to conduct research unless they obtain external funding.” This is borne out by the FTE statics, according to which the Department of Sociology has the second highest student ratio to senior academic staff and all academic staff in the entire Faculty. However, associate professors are able to devote 41% of their time to research, which means that the teaching burden falls heavily on assistant professors, who should be able to provide fresh resources for research activities.
- The Department is highly vulnerable to staff departures; this would underline the importance of continuity planning.
- “The University itself poses the major threat to the research environment” due to “excessive over-head costs”. This is a rather strong formulation of the issue which most departments consider to be a problem.

Alongside these problems, however, the “research capabilities and scientific productivity” of the “second generation scholars” and of doctoral students is seen as a noteworthy strength. Despite these issues, which should have been properly explored within the self-evaluation, the Department’s future plan emphasizes continuity rather than change: “A vision of the future is that the established research areas will continue to flourish and that new research fields will develop at the interfaces between them.” This might be more persuasive if the rest of the report had offered a stronger rationale for this *laissez-faire* approach and a plausible sense of progress.

This Department has produced some internationally recognized excellent work (such as a book by the Duke University Press on mail order husbands). There is much that is very good, but oriented towards pragmatic policy-oriented Swedish agendas rather than adventurous intellectual debates. Research in the area of the labour market and working life, for example, appears to be rigorous and nationally significant. There are some interesting scholarly developments: the work on nuclear regulation and transboundary pollution, in particular, is innovative and marks out the STS group as competitive internationally. We note their involvement in projects funded by the European Union.

According to the bibliometric summary, between 2004 and 2009 the unit published 23 authored books, 32 edited books, 154 book chapters, 121 refereed journal articles and 51 reports. This gives a rough annual average of four authored books, 5-6 edited collections and 20 refereed journal articles, in a unit of between 6-7 professors and 19-21 senior lecturers. To approach this from another direction, it appears that 40 people are employed as academic staff, discounting PhD students. This group produced 47 peer-reviewed articles and three monographs in 2008-2009.

These are crude figures, but they raise an obvious issue: this is well below the rate of productivity that one could realistically expect from a top rank department. What is more, productivity is uneven. There are some members of staff whose productivity is very good indeed, and a middle ground whose productivity is good; unfortunately, however, there are also too many whose output is insufficient with unimpressive publications profiles (and not all of these are junior). As already discussed, the most frequently used journals are overwhelmingly Swedish or Scandinavian, and while two international publishers are well represented, the book publishers used are, again, predominantly Swedish or Scandinavian and, in fact, from within the University of Gothenburg itself.

Organization and research infrastructure are hard to assess, given the information provided. However, it is interesting that external research funds are identified both as a success factor and as a threat (in terms of the overhead issue, and in creating a

polarized situation between senior and junior staff). There is no information about how teaching is organized or about the possibility of reorganizing it in order to allow for research leave. Nor are we told about the Department's policy on employing its own PhDs or encouraging research students to spend part of their time abroad. There is no information about how PhDs are recruited or about the organization of research student training, supervision and support.

There seems to be considerable collaboration within the Department – writing jointly authored textbooks, for example – and also outside it, generally within Sweden. Internationally, the available data indicates that probably half of the staff receive invitations to international conferences as plenary speakers, chairs or organizers. The fact that the 2010 ISA Congress was held in Gothenburg might appear to indicate good international connections, although this seems to have been largely the achievement of one senior member of staff.

In addition to maintaining existing strengths, the Department also wants to develop new strengths in the future in research into health and medicine, and governance and governmentality. The implication in the self-evaluation is that these two areas could serve to 'bridge' across research fields within the Department; such moves are very much to be encouraged and could considerably strengthen the Department's research standing. With respect to health and medicine, it is perhaps asking a great deal of one non-professorial member of staff to expect her to develop this on her own; more resources may be needed.

Pending staff departures should be seen as an opportunity for a fresh direction, rather than a problem. This will of course depend on the Department's ability to self-evaluate and set clear strategic priorities for the future. The encouragement of cross-linkages within the Department could also present some exciting opportunities. Such linkages could also be encouraged in research connections with cognate departments.

There is a broad and varied array of knowledge transfer activities to the rest of the society. The self-evaluation document itself treats this issue in rather conventional terms, as a matter of external influence rather than the drawing in of new ideas and capacities.

The self-evaluation document does not discuss gender and equal opportunities issues. Of the PhD students, 56% are women, of the professors 29%, and of the senior lectures/associate professors 38%. None of the researchers are women, although both postdocs are. However, it is not difficult to imagine what kind of message the gender composition of senior staff sends to aspirant sociologists. In general, equal

opportunities and diversity should be taken more seriously than its absence from the self-evaluation document suggests.

We are curious about the drafting process for this document and the level of inclusiveness across the Department during the process. The document does not read like the outcome of a full and open self-appraisal by the Department as a whole. The field visit revealed concern about the low competitiveness of Swedish academic salaries, and this problem may be more serious at the University of Gothenburg than at other universities. We were told that some remedies have been introduced to enhance the attractiveness of new positions to highly qualified persons.

Summary of assessments – the Department of Sociology

Research quality: *Very good* (labour market, family and welfare, STS), but *Good* overall.

Research productivity: Some *Very good*, most *Good* or *Insufficient*

Research uniqueness: STS is distinctive within Scandinavia, particularly in terms of its policy interface and its work on nuclear issues.

Research relevance: *Very good* (within Sweden, but insufficient internationally).

Organization and research infrastructure: *Insufficient* (There are major challenges in the departmental governance and the management of the teaching-research interface).

Collaboration and networks: *Good* (witness the ISA conference and the STS group, but too dependent on a relatively small number of people).

Future plans: *Poor*, and need to be developed in detail.

10F. THE SCHOOL OF GLOBAL STUDIES

The School of Global Studies was established in 2005 as the result of the merger of five different areas of research and teaching: Peace and Development Research, Social Anthropology, Human Ecology, Human Rights, and Regional Studies covering Africa, Asia, Latin America, and the Middle East. There is a common thread among these institutions, as they all deal with humanities and social sciences, and are rather internationally oriented. Together with the School of Social Work, the School is the only department that has a genuine interest in developing countries..

No doubt, the original units have many commonalities, but they need to be further developed. This task presupposes effective organizational integration and strong

leadership within the School. So far this has not been entirely successful which is understandable for the reason that the original institutional merger happened only a half of dozen years ago and the organization was seriously restructured only in 2007-2008. Now there should conditions in place to formulate and implement a comprehensive and coherent research agenda as the School is now doing.

The School's self-evaluation meets the standard requirements, but it is deficient in some important regards. The report would have benefited from a deeper discussion on the shared research agenda of previously independent institutions and their common understanding, if any, of what they mean by global studies. It would also have been useful to get more information on the separate Centre for Globalization and Development that the University has established as the node for coordinating global and development studies (as these two institutions seem to have a somewhat overlapping agenda).

The School now has seven professors, 24 senior lecturers, 14 researchers and 16 other staff members, which together produce about 50 FTEs. The proportion of women among the research and teaching staff is over 50% except among the full professors, where only two out of seven professors are female. The average age of all people employed by the School is over 50 years, which is rather high and portends major changes in the foreseeable future. The self-evaluation makes several references to heavy teaching loads which cramp time and energy for research, but it does not discuss potential alternatives to solve this dilemma. A look at the statistics – the ratio of student FTEs to senior and all academic staff FTEs – shows that the School has roughly the average teaching load within the Faculty. The reference to a “stressful working environment” is not specified.

The School has a rather strong PhD programme with over 30 doctoral students, which in 2009 resulted in the graduation of nine students with the doctor's degree (during the period the average number of doctors per year has been 5.4). In comparison with other departments of a similar size in the Faculty, this is an accomplishment that deserves recognition. It is a hopeful sign that, out of the recent 60 applications to the School's PhD programme, as many as 50 came from non-locals.

However, as in other departments, there seem to be fewer resources than before for recruiting PhD students, which naturally threatens the future research potential. One challenge that the School clearly faces is the need to cut back significantly the mean duration of PhD studies, which is now as high as eight years. The goal of graduating PhD students in four years should be pursued vigorously by the School, as the attainment of this goal would compensate for the reduction in their number.

Undergraduate education absorbs close to half of the School's budget, which leaves a little over half of the money for doctoral training and research activities. It is worth noting that the funding received by the School from the Swedish research councils and the European Union is relatively modest, and that the bulk of external funding comes from Sida. This is a sign of the quality and relevance of the policy-oriented multidisciplinary research pursued at the School, but it also raises the question of whether external funding diverts efforts away from the School's academic development. While significant external funding is an indicator of success, it also adds an element of vulnerability to the viability of the institution.

The School has been highly productive in terms of research, producing over 800 publications during the six-year period under scrutiny. As in most departments at the Faculty of Social Sciences, the dominant mode of publication has been in-house reports and books. As noted elsewhere, this is partly due to the categorization of conference papers, even international ones, as inhouse publications, while many of the core publications have appeared on competitive fora. However, it is not desirable that only 7 percent of the interdisciplinary publications have been co-authored with scholars working outside the School.

A more positive note concerns the co-authors of peer-reviewed articles, of whom a fifth come from outside Sweden. It should also be noted that the School's staff members have used respectable international journals and publishing houses more often than those in almost any other department at the Faculty. Likewise, the School has shown very commendable activity in the international exchange of researchers; the figures are well above the Faculty's average. The School also has a programme of one-year visiting professors that has brought highly recognized international scholars to Gothenburg. In recruitment, the local bias prevails, however; out of 20 PhDs employed by the School in the six-year period, 17 came from within the School.

The School has a few flagship areas of research where it has been able to become a national leader in Sweden and even an international hub. These flagships include the study of regionalism, in which the School is one of the international leaders, and the study of reconstruction and intervention in post-conflict societies. RE-INVENTION is the largest research programme within the School, and it also appears to be quite interdisciplinary in character.

Other major research programmes include Migration and Diaspora, which has a strong international publication record, and another dealing with resources, conflict and sustainable development which, as a theme, appears to be on the rise at the School. It has plans for some interesting initiatives, such as indigenous studies and sustainable urban future, an area in which external collaboration appears to be strong. (The Mistra centre for sustainable urban development has been co-founded

with Chalmers University of Technology, and has stable basic funding until 2020.) At the same time, the School is facing the challenge of maintaining and strengthening the position of its old flagships, especially the study of regionalism where the leading senior scholar has retired.

In our judgment, the average quality of publications is reasonably good, but it is uneven and depends on whether they have been peer-reviewed at international standards. There is a departmental commitment to publishing more internationally, and there has been some success in this regard, but the promise still remains to be delivered. The relevance of the research carried out at the School is excellent, as it touches upon many of the central issues in global political and social development, and is actively connected with Swedish policies and the Swedish research environment.

The organization of the School is undergoing a reform that would make it more systematic and effective. Separate committees for teaching and research planning have been established recently, there is a new emphasis on the need for strategic leadership, and contacts are cultivated across the disciplines existing in the School. Perhaps the situation can be characterized by saying that in the past all the flowers were let to bloom, but now the effort is to enhance coherence and consistency in the internal work and external contacts.

Summary of assessments – the School of Global Studies

Quality: *Very good* (but uneven)

Productivity: *Very good* (but publications should be more international)

Uniqueness: *Excellent* (the only interdisciplinary institution of its kind in Sweden)

Relevance: *Excellent* (deals with vital global issues)

Organization and infrastructure: *Good* (but the organization needs further reintegration and restructuring)

Collaboration and networks: *Excellent* (in comparison with other departments within the Faculty, especially in terms of international contacts)

Future plans: *Good* (the self-evaluation lists important new fields, but it does not specify the rationale for their choice and their relationship with the current programmes)

10G. THE SCHOOL OF PUBLIC ADMINISTRATION

The origins of the School of Public Administration can be traced back to the predecessor of today's School of Social Work, which was set up in the 1940s to provide professional training for the expanding national welfare bureaucracy in Sweden. This was the main focus of the School until the mid-1990s, when the PhD programme was established and efforts were made to give research a more prominent role in its activities. This institutional history has to be kept in mind when assessing the School's academic performance.

The School's self-evaluation is rather superficial and provides only limited information to permit the assessment of its performance. Research conducted by the School has been divided into six main elements, ranging from local government studies to leadership and organization and the welfare state. It appears that the research agenda covers the key issues facing public administration these days reasonably well. In the future, the School plans to focus its development efforts on three "platforms" – local government, administrative control and public management – in which teaching, research and doctoral training will be integrated. Such an integrated effort is commendable.

The School itself argues that the teaching staff does not have enough time for research, which does indeed seem to be the case. The School has highest number of student FTEs in relation to both senior academic staff and especially all academic staff. The ratio is roughly 35 student FTEs to one academic staff FTE. It is clear that many faculty members have only very limited opportunities for research. For this reason, external funding is critical for research. Moreover, without external grants the School would not be able to employ all the teachers. In 2009, external grants for research (not including commissioned research) amounted to only approximately SEK 5 million, of which SEK 3.8 million came as an annual lump sum from the municipalities in the Gothenburg region. Strong connections with the local communities appear to be vital for the future existence of the School.

The level of the School's international engagement is, in general, low. In 2004-2009 there were only four research visits lasting more than three months from Gothenburg and no visits from abroad. However, there were two dozen visits lasting less than three months. In the self-evaluation, this and other problems are attributed primarily to the low priority of social sciences in the University's strategy. This cannot be the full answer, however.

Looking at the performance of the School, it can be noted that in 2004-2009 it produced 16 PhDs. This is a reasonable figure given the relatively small size of the School. The doctoral education seems likely to face increasing problems in the

future, as during the last three years it has been able to recruit only four new PhD students compared with ten students in the three previous years.

Since 2005, the number of doctors has increased by one half compared with the previous five-year period which is largely due to the active completion of their studies by female students. This can be contrasted with the fact that out of three full professors only one is a woman, while among the senior lecturers the ratio is more balanced. In the future recruitments, the gender aspect should receive adequate attention as well as the capacity to recruit new doctoral students.

During the six-year period under examination, the School has published 417 units of research. A major part of the research output has appeared either locally at the University or through Swedish publishing houses. This is reflected in the fact that over a quarter of the publications are labelled as reports and obviously many of the book chapters, which account for another quarter of the total output, are published locally. Only 8% of the publications have appeared in peer-reviewed journals, which is a very low figure. According to the School, a change has been brewing in recent years whereby it has been paying more attention to international networking and publishing.

The strong local and national orientation of the School can perhaps be defended by the societal and policy relevance of public administration research, which at the same time tends to define the audience and the language of publication. The pattern is reinforced by the relatively low number of publications produced in collaboration with partners outside the University, either nationally or internationally, and the limited contribution of the staff at international conferences. Clearly, the School's performance is weak according to these criteria. Furthermore, the self-evaluation leaves the impression that publication and other international activities are concentrated to just a few members of the School.

It should also be noted that in research funding awarded to the School by the Swedish research councils and the European Union is almost non-existent. As the level of commissioned research is also quite modest for an institution like this, the fact remains that the annual financial contribution, provided by the regional actors regularly since 1995, remains critical for the functioning of the School. Moreover, the School is very internally-oriented; out of 13 members of staff with a PhD degree hired in 2004-2009, none came from outside the University of Gothenburg and eight were hired from within the Department.

The School is a small department with an emphasis on undergraduate education. CEFOS, assessed elsewhere in this report, is even smaller and is purely a research outfit. As they both deal with public administration, their merger should be seri-

ously contemplated. It is true that the School is a normal department, while CE-FOS is rather a multidisciplinary network of scholars who reach out from their small hub to several faculties and departments. Despite this difference, however, a merger of these two institutions should not be ruled out. These two institutions also have substantive connections with other departments, especially the Department of Political Science and the Department of Social Work.

Overall, one cannot avoid the conclusion that the School does not have any strong academic and international ambitions, although its leadership wants the institution to move in this direction. Its current research performance still seems to reflect the old status as a training institution for public servants, in which regard it has obviously been providing a valuable service.

The self-evaluation is so general and devoid of details that it is not easy to assess the quality and productivity of research. A closer look at the publications suggests that the academic quality of the research work is not impressive. The relatively high number of publications cannot compensate for the obvious lack of academic ambition. The self-evaluation suggests that regulation and auditing, in addition to risk research, are the most promising areas of its research activities. It should be noted, however, that the School is the only university department in Sweden that provides postgraduate education in public administration.

The School collaborates actively with local, regional and national players in the domain of public administration. It interacts closely with the public sphere of society, which is manifested in joint research projects, evaluation exercises, conferences and workshops. The School also organizes a large annual conference for practitioners in public administration. It seems to collaborate quite extensively with researchers in other Nordic countries, but participation in international networks, with some European exceptions, appears to be limited at best. However, there has been growing investment in collaboration and networking in recent years.

The self-evaluation says practically nothing about the School's future plans. It only refers to the growing importance of and commitment to evaluation research and the focus on regulation and auditing, which both have a strong practical dimension. In the ongoing transformation of public administration, in which the productivity and the quality of output matter more than the input in the form of public spending, this research emphasis may contain some promise. During the site visit, it transpired that the School is planning to create three "platforms" to consolidate its teaching and research efforts to a few key programmes.

Despite some positive tendencies and plans for the gradual transition to a stronger research role, it is difficult to see how the School could become an internationally

strong academic institution in the field while its importance as a teaching institution remains. The future viability of the PhD programme and a bolder recruitment strategy from outside the Department and the University would obviously serve to improve the quality and internationalization of research.

The School's activities are quite heavily biased in favour of teaching at the expense of research. This is understandable, due to the training-oriented field in which it operates, but the academic staff feels that the opportunities for carrying out research are too constrained. It may be that the departmental culture and the nature of incentives need a profound change before higher standards can be reached.

Summary of assessments – the School of Public Administration

Quality: *Insufficient* (few international peer-reviewed publications)

Productivity: *Good* (a fair number of local and national publications)

Uniqueness: *Very good* (an important training institution in Sweden)

Relevance: *Excellent* (active contacts with national bodies and regional communities)

Organizational capacity: *Insufficient* (limited resources, too small a PhD programme)

Collaboration and networking: *Good* (national networking active, poor international collaboration)

Future plans: *Insufficient*

CONCLUSION

The Faculty of Social Sciences at the University of Gothenburg can be divided in three departmental categories on the basis of the size of their budget and staff. The large departments are the Department of Political Science and the Department of Psychology, which both have well over ten full professors and a total budget of SEK 100 million. The medium-sized departments include the Department of Social Work, the Department of Sociology, and the School of Global Studies, with 6-7 professors and a budget in the range of SEK 80-90 million. Finally, the small departments are the Department of Journalism, Media and Mass Communication and the School of Public Administration, which have 3-4 professors and a total budget of approximately SEK 40 million. CEFOS is a special case, as it has neither its own professorial staff nor a PhD programme. Its unique feature is the opportunity to concentrate on research. If the number of student FTEs is used as the criterion, the Department of Social Work ranks as the largest.

The statistical information provided by the departments suggests that the largest departments also produce the most PhDs; as indeed they should, because of the higher number of PhD students. The two largest departments are also clearly more internationally oriented and publish much more on international fora, including peer-reviewed publications. The Department of Political Science and the Department of Psychology are, without any doubt, the flagships of the Faculty, including in terms of their research quality and international commitment.

The pattern is not that simple, however. Among the medium-sized departments, the School of Global Studies has produced more PhDs than the Department of Political Science, which seems to be due to the high number – the highest of all departments – of doctoral students at the School. In terms of the effectiveness of doctoral education, measured by the ratio of PhD students to degrees obtained, the Department of Psychology is clearly in the lead, followed by the School of Public Administration, the Department of Sociology and the Department of Political Science. In many departments, the time needed to obtain a doctorate and the average age of graduation is rather high.

One way to compare the departments is to relate their spending on research to the total revenue and check the share of external funding within the research budget. This comparison is based on the assumption that a high share of research funding, and especially its external component, are approximations of research intensity. It turns out that the most research-intensive departments are the School of Global Studies and the Department of Psychology, followed by the Department of Sociology, and the Department of Political Science. The difference is that the Department of Psychology and the Department of Political Science, and to some extent the De-

partment of Social Work, have been able to obtain more funding than others from research councils and other competitive sources, while the School of Global Studies is heavily dependent on Sida.

These comparisons should be taken *cum granum salis* because of the unreliability of statistical information provided by self-evaluations and the difficulties in making meaningful comparisons. We have repeatedly noted that most departments within the Faculty have a high degree of in-house publications. This no doubt reflects the prevalent publication culture, but may also be a statistical artefact, as conference papers appear to have been considered in-house publications. However, it must be stressed how far most departments have to go before becoming truly international in their publication activities, research projects and funding, and in the exchange of scholars.

Traditionally, the University of Gothenburg has, in social sciences, been oriented towards meeting the practical and professional needs of the Swedish society. This has been and still is a valuable task, which has ensured strong societal relevance, especially in relation to local and national public administration. On the other hand, this history is not always easy to reconcile with the aspirations of research excellence and international visibility. However, even in less research-intensive departments there seems to be a genuine effort to rethink the current, somewhat outdated practices in research and publication policies. The Faculty should use all available means to encourage and support this development, including the introduction of new incentive systems.

Perhaps the most important precondition for a vibrant academic research community is a strong PhD programme and a postdoc system to facilitate the transition to the full-fledged research career. In this regard, the trend within the Faculty of Social Sciences should be attended to, being largely dependent on national policies and standards, and outside the control of the Faculty. The declining admission to PhD programmes threatens the future viability of the entire social science community at the University of Gothenburg. The University should take resolute measures to change this course and start reinvesting in doctoral education. In the same vein, it should be pointed out that the Faculty needs to reconsider its recruitment policies and create conditions that would attract serious external candidates to various positions in the departments.

PANEL 11 – BIOMEDICINE

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11. THE INSTITUTE OF BIOMEDICINE

The Institute of Biomedicine is a virtual institute, with research being carried out primarily in several units within the Sahlgrenska Academy (at Medicinareberget) and at the adjacent Sahlgrenska Hospital. The organization is, thus, similar to that of Biomedicine in Stockholm (Karolinska Institutet *vs* the Karolinska Hospital).

The local scientists themselves have proposed that the biomedicine research area at the University of Gothenburg be divided into six main subdivisions²⁰ relevant to the main focus in Gothenburg: Bacteriology and Immunology, Virology, Glycobiology, Mitochondria and Metabolism, Molecular Cell Biology, and Cancer. Several of the divisions cover research fields where Gothenburg has a long-standing interna-

²⁰ these divisions are not identical to the current departments at the Institute, see homepage

tional reputation, such as glycobiology, mucosal immunology and vaccine research, and herpesvirus research. This is complemented by exciting new developments in energy metabolism and cancer research.

11.1 BACTERIOLOGY AND IMMUNOLOGY

11.1.1 Overall assessment

Most of the research within the field Bacteriology and Immunology is performed at the Department of Microbiology and Immunology. The research has long had a high profile in the international research community in the areas of mucosal immunology and vaccine development. The current reputation is based largely on a substantial and ongoing body of work on the bacterial agents of diarrheal diseases, with a focus on *V. cholerae* and enterotoxigenic *E. coli*. These are of great impact worldwide, especially with regard to third world problems. In addition, in recent decades they have made important advances in the fundamental understanding of mucosal immune responses to these agents and their toxins, and have applied knowledge gained in experimental animals directly to vaccine development and evaluation in humans. The Department of Microbiology and Immunology is well known internationally in these areas.

11.1.2 Quality

A review of the recent publications indicates that the quality of the research conducted at within the field of Bacteriology and Immunology is very high by international standards. Papers are scholarly and well written, and many have been published in excellent journals appropriate for the field, most commonly the Journal of Immunology. In addition, many papers have appeared in journals that are not as highly selective but that are widely read and appropriate, such as Vaccine and Infection & Immunity. However, there is a preponderance of papers in journals of lower impact and more limited readership.

11.1.3 Productivity (scientific productivity)

Productivity measured by the quantity, quality and impact of scientific publications over the past five years has been very good overall. However, the output of individual investigators has varied widely, with some being highly productive and others having relatively low output. For example, the programme in B cell immunobiology, although highlighted in the self-evaluation, has produced few recent publications, and some of the labs studying innate immune responses and intestinal inflammation have shown relatively low productivity. In contrast, excellent productivity is maintained by an integrated group whose work includes basic aspects of cholera toxin and its complex effects on mucosal cells and their interactions, detailed analysis of mucosal immune responses and tolerance in animals and humans,

and practical aspects of mucosal vaccine design. The cholera group in particular has been able to be extremely productive scientifically while also developing a human vaccine. This is perhaps a rationale for the MIVAC Development AB, which provides a strategy of moving entities further downstream towards applications in the context of applied clinical work. Younger investigators studying the immunobiology of mucosal dendritic cells face stiff competition from abroad, but they have identified important and novel aspects of mucosal dendritic cell biology, they are adept at *in vivo* studies, and their productivity is good.

11.1.4 Uniqueness

Few research institutions in the world have such a long and consistent record of contributions to the understanding of mucosal immune protection and tolerance. The work of a subset of scientists from the University of Gothenburg's Department of Microbiology and Immunology has had several unique aspects: they developed a successful mucosal vaccine, and they are continuing to build on that success and on their basic immunology work to develop additional vaccines that could have a worldwide impact. They have gained key insights into the actions of cholera and related toxins in the complex mucosal environment, and have exploited this to design rational and effective adjuvants that could have a broad impact on the entire field of mucosal vaccine development. At present, however, the entire field of mucosal immunology research is accelerating and expanding rapidly. The unique strengths of research at the University of Gothenburg will need to be maintained by recruiting and supporting young faculty members in selected areas of strength in mucosal immunology. To continue to compete internationally, wider outside collaborations will be important. For example, it will be crucial to support the excellent basic and translational work on mucosal adjuvants that are unique to Gothenburg, while encouraging new international collaborations in this area. While the mucosal adjuvant work is strong because of the depth of expertise in the group, the large amount of effort needed for the expansion into clinical trials needs to be carefully managed vis-à-vis the capacity and focus of an academic group. The unique information gained on the nature and establishment of commensal flora in newborn humans also would benefit from collaborations to keep up with advanced DNA sequencing and systems approaches being developed elsewhere.

11.1.5 Relevance (scientific, social and socioeconomic significance)

The application of basic knowledge on mucosal immunity gained in experimental animals relates directly to the extensive work on vaccine development and evaluation in humans. Because of the heavy emphasis on mucosal immunology and gastrointestinal and genito-urinal infections, the applications to global health and resource-poor populations have particular socioeconomic significance.

11.1.6 Organizational capacity (flexibility, control and leadership)

The Department of Microbiology and Immunology is the only one of the current six departments within the Institute of Biomedicine where the reviewers detect a serious problem of succession, which needs attention. The eminent and internationally well-known leader, Professor Jan Holmgren, is about to retire. The reviewers are pleased to learn that he plans to continue his own important research for the next several years and to support this emeritus development, especially as Professor Holmgren is well funded by international grants. However, in our opinion he should not continue as the leader of the entire section after retirement. A reasonable and effective short-term solution might be that his long-term partner, Professor Ann-Mari Svennerholm, could take over as leader of Bacteriology and Immunology. However, she will also retire in a couple of years, so the long-term direction of this important section requires attention. During our site visit, we met other tenured staff, but it seems unclear whether one of them could take over from Jan Holmgren in the long run. Alternatively, there might be a possibility here to strengthen the section with a prestigious external appointment.

11.1.7 Interactive vitality

Advances in the cellular and molecular basis of innate and adaptive immune responses are exploding worldwide, and technological innovations continue to open new avenues of progress within this field. It is impossible for a single laboratory or department, or even one institution, to incorporate the diverse expertise and expensive equipment required to stay abreast of developments. The ability and willingness to collaborate with investigators in other disciplines and departments, and with investigators in other Swedish and foreign institutions, may thus be considered a predictor of future research excellence on an international scale. The collaborative activities of University of Gothenburg scientists in the areas of basic bacteriology and immunology range from minimal to highly interactive. The wealth of clinical groups, international networks and core facilities (including the transgenic mouse facility) within the Institute of Biomedicine provide resources and opportunities for collaborations. More groups including younger investigators are now involved in the international projects and are attracting international funding in addition to the well-known cholera researchers.

The Department has made a concerted effort to foster international collaborations through the formation of MIVAC, launched in 2008 with a very successful, high-profile international conference on basic mucosal immunobiology held in Gothenburg. The conference attracted leading mucosal immunologists from abroad and also showcased new work by established and young investigators at Gothenburg, including some from the glycobiology group. The ongoing activities of MIVAC

need to be encouraged and supported, especially those that provide exposure of foreign scientists to possible collaborative projects in Gothenburg.

11.1.8 Summary of assessments – Bacteriology and Immunology

Overall assessment: *Excellent*

Research quality: *Excellent*

Research productivity: *Excellent*

Research uniqueness: *Excellent*

Research relevance: *Outstanding*

Organizational capacity: *Excellent* (but needs attention)

Interactive vitality: *Outstanding*

11.2 VIROLOGY

11.2.1 Overall assessment

Virological research has two clear nuclei of expertise, as well as strong interactions with Glycobiology. The theme of glycobiology in virological research is highly unique for the University of Gothenburg. The University's virology research teams have been pioneers in the field of glycovirology, organizing the first international meetings of the field and leading the international network.

11.2.2 Institutional organization

The departmental organization of the Institute seems unclear. The self-evaluation documents introduce six departments or subsections. The virology research groups are partially divided into subsections, but only on the Swedish website. Apparently most, but not all, virologists are part of the Department of Infectious Diseases. The authors do not cite their affiliations uniformly in publications. Moreover, the relationship with hospital laboratories is not fully clear on the website or in the self-evaluation. Apparently, there is also a Department/Clinic of Infectious Diseases at the hospital. The Institute's website should also present the research groups by subsections in English. In general, the proximity to clinical and diagnostic virology is an advantage.

11.2.3 Research Quality

The Laboratory of Clinical Virology is a large centre of virology, including clinical virology research and diagnostics. The laboratory coordinates several national and international networks and trials, and receives clinical samples from Sweden and abroad (see below). The unit represents strong patient-centred research, which is one of the University's priority research areas (Styrkeområden). The majority of the PIs are in their 50s, in a phase of high productivity, with H indexes at the

level of 30-40. There are some experienced emeritus PIs who are very productive. The majority of PIs receive funding from the Swedish Research Council. Some promising younger PIs are mentioned. Future study lines include the development of novel antiviral therapies and virus vaccines. A good number of these are completed: between 2007 and 2010, 15 virological PhD theses can be found, plus some from closely related fields such as gene therapy and virus vaccines. The affiliations/sub-departments of some of the supervisors are difficult to trace. The groups publish in leading journals of virology (Journal of Virology, Virology, Journal of General Virology, etc.), the important J.Virol. being equal to the Journal of Biological Chemistry in terms of impact. Leading clinical journals of infectious diseases are also favoured.

Virology research topics

The research deals with chronic or long-term virus infections. Two foci of expertise are evident:

1. Groups with an interest in chronic viral hepatitis (mainly hepatitis B and C). The research is translational; on therapy, prognosis and immune monitoring of viral hepatitis. Several postdocs, PhD students and clinical collaborators are involved. The PIs lead international phase II-IV therapy trials of hepatitis C. They have a high level of productivity, publishing frequently in good journals of clinical virology and hepatology (e.g. Hepatology; J. Clin. Microbiol. and Clinical Inf. Dis.). The PIs attract an impressive amount of external funding. The number of completed PhD theses in the groups is difficult to trace from the Institute's website, and there is no subject of hepatitis viruses or viral hepatitis on the search list. Some theses are mentioned in the group abstracts. Adjacent to the topic, there is HIV research together with the Department of Infectious Diseases. The topic is persistence and reservoirs of HIV. This is an active team with three postdocs, five PhD students and five graduated PhDs. The team publishes in general journals (PLoS ONE, Journal of Infectious Diseases) and in major HIV/AIDS special journals. Sufficient critical mass is present in the research branch.
2. Herpesvirology. Several large research groups are active in the field of herpesvirology and related glycobiology. The research branch has sufficient critical mass. The teams are pioneers in "glycovirology", which they coordinate on an international scale. This is remarkably unique for the University of Gothenburg. Internationally, Virology at the University of Gothenburg is a strong and long-standing centre of expertise in the herpesvirus glycoprotein field.

One aim is developing antiviral chemotherapy, targeting the herpesvirus-receptor-interactions. There is also interesting work on herpesviral evolution.

11.2.4 Interaction with society

The virology groups host an annual national virology meeting (Smögen symposium), featuring international speakers and participants well known in other Nordic countries. The effort of organizing it regularly is an activity for the benefit of the research field and the society. They also organize other meetings, such as the international glycovirology meeting and host the glycovirology network, as well as participating frequently in organizing international microbiology/virology meetings.

The Virology unit carries out virological diagnostics and clinical virology research. They have a comprehensive biobank of clinical virology samples from all over the nation, providing a promising basis for (emerging) pathogen searches. The laboratory is the largest in the nation and is also a reference laboratory. The clinical virology research is an essential branch of viral pathogenesis studies. It is also an important interaction with society, providing expertise on viral infections, epidemics and how to counteract them. The test panel is up-to-date, including numerous real-time viral qPCR assays. The diagnostic viral laboratory has been accredited since 1997. Based on the presented documents, it is difficult to assess the extent and function or any economical effect of the virus diagnostics laboratories in greater detail.

11.2.5 Summary of assessments – Virology

Overall assessment: *Very good*

Research quality: *Very good*

Research productivity: *Excellent*

Research uniqueness: *Good*

Research relevance: *Very good*

Organizational capacity: *Good*

Interactive vitality: *Very good*

11.3 GLYCOBIOLOGY

11.3.1 Overall assessment

Glycobiology encompasses the elucidation of the structure, biosynthesis and biological roles of oligosaccharides and glycoconjugates. Glycobiology has long been an area of excellence in Gothenburg based on the initial discovery of gangliosides, along with the determination of novel glycan structures, the identification of carbohydrate ligands on host cells and the roles of glycans in diseases. Historically it has sometimes been considered a challenging “specialist” research area, in part due to oligosaccharide structural complexity/diversity, the unavailability of defined oligosaccharides and databases, and the requirements for advanced mass spectrometry and NMR for analytical glycomics – all of which have been overcome in Gothenburg. While glycobiology impinges on the work of numerous researchers in the In-

stitute of Biomedicine, there are three “hard core” established glycobiology groups, as well as glycovirology groups that are also discussed under “Virology”. The age and gender distribution seem fine.

11.3.2 Research quality

A major project concerns the determination of the structures of carbohydrates on host cells that are recognized by microbes including *H. pylori*, enterogenic *E. coli*, *Borreliae* and microbial toxins, such as cholera toxin and *E. coli* heat labile toxin. Compounds that interfere with binding have the potential for novel anti-adhesive therapeutic compounds. These studies rely on access to microbes/toxins and a unique collection of defined ligands from host cells, generally glycolipids, which have been prepared locally. Novel ligand identification has also been possible with advanced mass spectrometry and NMR methods, analytical glycomics. Structural studies on ligand/toxin complexes and mutagenesis of toxins to characterize binding epitopes are carried out, and glycolipid antigens for natural killer T cells are also a topic of research. The group is a member of MIVAC. It is highly productive, publishing in wide range of journals including Science, Immunity, PNAS, JBC, Glycobiology, and collaborates extensively within the Institute.

There is also collaboration with the Department of Clinical Chemistry and Transfusion Medicine on the carbohydrate binding specificity of Norovirus, the effects of Herpes simplex type 1 virus infection on glycosyltransferase expression levels in host cells, and on analytical glycomics methods for glycan characterization, especially sialylated glycoproteins. While the recognition of sialic acids on hosts by influenza virus is well studied, the characterization of other saccharides on hosts such as blood group antigen receptors for Norovirus is an emerging area in glycovirology. Collaboration takes place with computational drug discovery programmes to screen for inhibitors of viral binding and the dynamics of virus binding. Furthermore, the induction of glycosyltransferases in latent Herpes simplex 1 (HSV-1) infection and the structural characterization of glycoproteins of HSV-1 are also studied. There is a solid publication record in numerous journals, such as Nature Methods, Nature Medicine, PloSOne and Glycobiology. The HSV-1 project has important collaborations with Per Elias, who provides relevant expertise on nucleic acids and molecular biology.

A key section focuses on mucin structure, function and biology. This important work has been directed for over three decades by Professor Gunnar C. Hansson's group. Mucins are highly O-glycosylated proteins that play a major role in the protection of the intestine from resident bacteria. The group has demonstrated recently that bacteria do not reach the inner of two layers of mucin in the colon. In cases where MUC2, the major mucin in the GI tract, is not present in the inner layer, bacteria can come into contact with the epithelium, triggering inflammation and

later colon cancer analogous to ulcerative colitis. These are major discoveries which have led to excellent funding (via MIVAC and other external grants) to better understand the molecular basis of mucus organization and how mucin abnormalities contribute to ulcerative colitis. Since MUC2 is produced by goblet cells and mucin expansion is dependent on ion channels, there are also possible links between the CFTR, mucin abnormalities and cystic fibrosis.

A very large and international group (about 15 group members) is involved in analytical glycomics, mass spectrometry and the mucin database. This is a highly productive group, with publications in a wide range of journals including PNAS, Nature Struct. Mol. Biol., Analytical Chemistry, J. Proteome Research, J. Biol. Chem., Biochemical J., Glycobiology.

A recent promising programme concerns mucins in infection and cancer, with investigations of *H. pylori* infection and gastric cancer development, and it has been shown that MUC1 can bind *H. pylori* concomitant with the shedding of MUC1 from gastric epithelial cells. The group also works on *C. jejuni*, enteropathogenic *E. coli* and enterohaemorrhagic *E. coli* infection of the intestine.

The long-term structural investigations by mass spectrometry in this field are continuing, following new recruitment. A recent promising development is a translational medicine programme for the discovery and evaluation of antivirally active compounds including sulfated/sialylated polysaccharides. This is a highly productive group, with publications in a wide range of journals including J. Virology, J. Biol. Chem., Virology, J. Immunol. and Glycobiology.

Another productive research line concerns the role of natural killer T lymphocytes in murine models for cancer, infection and autoimmune diseases. The glycobiology component is focused on determining the nature of carbohydrate antigens, glycolipid ligands including sulfatides of NKT cells.

The work of the group under Dr. Anne Uv (Assoc. Prof. Drosophila Laboratory, Department of Medical Genetics) is considered under Molecular Cell Biology and Clinical Genetics. The group uses *Drosophila* as a developmental model for the tracheal system, and has discovered that tracheal tubes deposit a temporary intraluminal chitin layer that models the lumen size during tube growth. It has also identified a mucin-like protein that behaves in a similar manner, which is required to shape the hind gut. This represents a new biological finding, where a temporary luminal scaffold models tube shape. The group has published in PLoSOne, Development, J. Cell.Sci., Eur. J. Cell Biol. and Developmental Cell.

11.3.3 Positive aspects of glycobiology

The academic researchers' productivity is impressive, given their teaching and administrative commitments. They have an outstanding ability and facilities to determine the structures of glycans and discover new glycans, as well as access to a unique library of defined glycolipids. Many researchers are involved in establishing the roles of specific glycans in infectious diseases, inflammation, cancer and development. There is therapeutic potential by interference with glycans.

11.3.4 Disappointing aspects

It is difficult to evaluate group size and funding. We would expect more national and international recognition given the quality of work. There is no mention of patents.

What is the progress in the broad Swedish post-translational initiative with the focus on glycomics in Gothenburg?

11.3.5 Summary of assessments – Glycobiology

Overall assessment: *Excellent*

Research quality: *Excellent*

Research productivity: *Excellent*

Research uniqueness: *Outstanding*

Research relevance: *Excellent*

Organization and research infrastructure: *Excellent*

Collaboration and networks: *Excellent*

11.4 MITOCHONDRIA AND METABOLISM

11.4.1 Overall assessment

“Mitochondria and metabolism” comprises individuals drawn from different departments within the Institute of Biomedicine. The field of research is large, but three main areas of focus are identified: *basic aspects of mitochondrial function*, which can be broadly classified as work on (mitochondrial) replication and transcription, and the consequences of its disruption; *brown adipocytes and their regulation*, which involves the work to define the control of adipocyte differentiation and how this may be used to generate novel treatments for obesity and its related disorders; and *disease mechanisms*, comprising work that seeks to identify the molecular and cellular basis for mitochondrial and other types of neuromuscular disease.

All three groupings contain world-leading scientists, each with his or her own group. Collaboration between individuals within these three groupings is growing, which is a promising development. It is noted that two key group leaders are relatively

new to the Institute of Biomedicine. It is clear that the Institute of Biomedicine is investing a great deal in the quality of these three main areas. This is reflected by the degree to which they have been highlighted and how many of their publications have been chosen in the sections of most important publications/documentations (7 of 16 biomedicine publications). Three out of eight biomedicine publications in 2010 or formally accepted for publication are of special importance.

Mitochondrial biology is an important field and one that impinges on many different aspects of health, from disease caused by mutations of mtDNA itself or genes encoding proteins involved in its homeostasis, to neurodegenerative disease such as Parkinson's disease, metabolic diseases (obesity and diabetes) and even ageing.

The recent development of this department represents major progress in biomedicine in Gothenburg. The astute recruitment of the Maria Falkenberg and Claes Gustafsson groups from Karolinska Institutet, Stockholm, together with the impressive, original and complementary research by the Sven Enerbäck group in Gothenburg over the last ten-year period sets the stage for a major international contribution to our understanding of energy metabolism and obesity. It is noteworthy that the scientists are relatively young, which promises well for the long-term success of this field of research in Gothenburg.

11.4.2 Research quality, productivity, uniqueness and relevance

1. Basic aspects of mitochondrial function

The work shares a common focus, namely DNA replication and transcription with a particular focus on mitochondrial DNA. The results are of the highest international standard. Several of the elements required for mitochondria transcription, and how these participate in the regulation and termination of transcription, have been identified. Moreover, the work has shed new light on the minimum unit of mtDNA replication and the role of the mitochondrial RNA polymerase in initiating/priming DNA replication. Through these efforts, we now have a better understanding of basic mitochondrial biology.

The work on these topics has been published in top flight journals including *Cell* and its sub-specialized variants, *Nature Genetics* and *PNAS*. The output is high and, based on the citation index, highly relevant to the field. In addition, Falkenberg and Gustafsson have received prestigious prizes, including the Anders Jahre Prize for Medical Research, the Fernström Prize, the Göran Gustafsson Prize in Chemistry and the Sven & Ebba-Christina Hagberg Prize in Biochemistry, and Gustafsson has also been elected to the Swedish Royal Academy of Sciences.

This work relates to the goals/strategies of the unit, as defined by the Sahlgrenska Academy, to be a “Leader in Health Sciences”. A greater understanding of how replication and transcription function normally is essential for progress toward clarifying how these may be corrupted by disease. The proposed collaborative work on obesity mechanisms and inherited disease mechanisms will be patient centred and therefore within a defined priority area.

2. Brown adipocytes and their regulation

The Sven Enerbäck group is an international leader in the study of transcriptional regulation, particularly with respect to adipocytes. The group is responsible for identifying the role of forkhead transcription factors in the control of adipocyte function and differentiation. In addition, the group recently showed that adult humans unexpectedly retain a major component of metabolically active brown fat. These findings have significantly advanced our understanding of human cellular development, in particular adipocytes, and our understanding of common diseases, namely obesity and the related disorder maturity onset diabetes.

The work is of world class and is published in accordingly high impact journals, such as Cell, Nature, EMBO Journal and NEJM. The research production is excellent and relevant, as defined by the citation index. Enerbäck has been made the Söderberg Foundation’s endowed chair in experimental medicine, as well as being elected to the Swedish Royal Academy of Sciences.

The work fits well with the goals expressed by the Sahlgrenska Academy. The potential for therapeutic innovation makes the work highly translational and within the priority research area of patient-centred research.

3. Mitochondrial disease mechanisms

This part comprises the groups of professors Holme and Oldfors. Holme, a clinical biochemist, is interested in inborn errors and mitochondrial disease, while Oldfors is a distinguished pathologist interested in mitochondrial and other neuromuscular disorders. The overlap within mitochondrial disease has meant that they have been able to bring to bear a wide range of expertise, and this is reflected in the quality of their published work. As clinical scientists, the groups have been active in describing new diseases and exploring mechanisms of disease.

There are high quality publications in top flight journals including New England Journal of Medicine. They have been responsible for discovering new disorders involved in glycogen metabolism (defects of glycogen synthase and glycogenin-1), mitochondrial iron-sulphur metabolism (ISCU) and muscle myosin. They have also made major contributions to the mitochondrial field. The research is clinically

based, is directly relevant to patients being either diagnostic or mechanistic, and shows excellent citation indexes.

The output from these groups is large, as is often the case in clinically based areas, but importantly, the quality has remained high. They have created a niche within the metabolic field and exploited it well.

The work of both groups fits well with the goals of the Sahlgrenska Academy, being in the best tradition of medical, translational research, and at the forefront of the field.

11.4.3 Organization and research infrastructure

There is little information on the websites of either the Institute of Biomedicine or the Sahlgrenska Academy about how these research groups are organized or how much research money each has available. Access to facilities, as detailed under “core facilities”, is described as excellent.

1. Basic aspects of mitochondrial function

According to the personnel data received, Gustafsson has a permanent position while Falkenberg has a temporary one. Gustafsson indicates that 40% of his time is spent on research, while Falkenberg spends 80% of her time on research. Presumably, teaching and administration take up the rest. With a group based heavily around PhD students, this must ultimately mean less time at the bench.

Without middle level post-doctoral posts, there is some concern that the distance between group leader and PhD student may become too great and impair the excellence of these groups.

2. Adipocyte group

Enerbäck has a permanent position in the Department of Medical Genetics and Clinical Genetics. His project description (from the Sahlgrenska Academy/Biomedicine website) lists six postdocs and three PhD students. Enerbäck states that 55% of his time is spent on research. Presumably, teaching, clinical activities, and administration take up the rest. This division between research/teaching/administration in a well-established research worker appears appropriate, given that the number of postdocs remains as high as it is at present.

3. Mitochondrial disease grouping

Both Holme and Oldfors work within clinical departments and have clinical duties. Holme states that 60% of her time is spent on research, while Oldfors spends 30% of his time on research. Holme apparently has one associate, whereas Oldfors lists

ten in his group, including one assistant professor, two postdocs, two PhD students, four technicians and another MD.

11.4.4 Collaboration and networks

Internal: There are well described future plans for collaboration between the basic mitochondrial function groups and the adipocyte group. This work will investigate brown adipose tissue in humans and examine its role in weight maintenance and predisposition to diabetes. This is an exciting area, and one with major public health implications. The work has already received funding from the Swedish Science Council.

Interactions between the Oldfors and Holme groups, and the basic mitochondrial function groups, appear to be still at the planning stage. The laboratories intend to establish a “mitochondrial disease centre” to study the molecular genetic background for disorders with no known genetic cause. Collaboration between the disease group and other clinical departments, particularly paediatrics, is well established and highly productive.

External: The disease mechanism group mentions external collaboration with the Science and Life Laboratory, Stockholm, with a view to obtaining exon sequencing. They have already employed a bioinformatics person, but little information is given about how this work will be structured. Most similar research groups (i.e. disease-based) may be doing competitive work. Gustafsson and Falkenberg have a long established and productive collaboration with the Max Planck Institute, Cologne (Director: Professor Nils-Göran Larsson), where both also have honorary positions. The Enerbäck group mentions important collaboration with scientists from Turku, Finland.

Evaluation: The groups are all individually excellent, and plans for internal collaboration appear realistic and appropriate to the expertise each brings. External collaborations are not yet as well described, but appear appropriate to the need of each group's development.

11.4.5 Future plans

The collaborative projects on mitochondrial replication energy metabolism, adipocytes and mitochondrial disease suggest the basis for a very fruitful research future. The adipocyte group is world leading in research into brown fat regulation and life-style disease; the disease mechanism group is very well placed with novel clinical material to fuel future research work.

The overall impression is that these three groupings have great potential and, while not entirely overlapping (e.g. disease/adipocyte groups), core funding should be

seriously considered to ensure that the work continues to be of the highest standard and, where appropriate, enable the group leaders to maintain their close proximity to active bench research.

11.4.6 Future potentials and possibilities

The collaboration between the basic mitochondrial function groups and the adipocyte group suggests a strategy that has already been well worked out. They plan to investigate gene expression in brown adipose tissue from normal and obese individuals to establish how cellular networks regulate mitochondrial biogenesis and brown adipose tissue activity. Plans to establish a mitochondrial disease centre are commendable, but are not yet sufficiently focussed if the long-term goal is to attract the best scientists and sufficient funding.

11.4.7 Interactions with society

The Enerbäck group's discoveries in the field of brown fat and obesity have been widely publicized.

11.4.8 Summary of assessments – Mitochondria and Metabolism

Overall: *Outstanding*

Research quality: *Outstanding*

Research productivity: *Outstanding*

Research uniqueness: *Excellent*

Research relevance: *Outstanding*

Organizational capacity: *Excellent*

Interactive vitality: *Outstanding*

11.5 MOLECULAR CELL BIOLOGY

This area is relatively small, but contains some excellent research although it is lacking the distinct focus of several of the other fields covered in this review. The topic comprises two main subjects: *nucleic acid biochemistry* and *cell and developmental biology*. So far, there is little common ground between the two main subjects of molecular cell biology, and this leaves scope for improvement. On the other hand, there are already good interactions with several other key fields, such as virology, glycobiology, and mitochondria and metabolism.

A key effort in nucleic acid biochemistry is the in-depth long-term study of the mechanism of DNA replication of *Herpes simplex* virus; this work is carried out by Per Elias and his co-workers. There is also intriguing and promising stem cell research by Anders Lindahl and his associates. Another important component here

is the impressive work of Claes Gustafsson, which differs from his studies on mitochondria and concerns transcription mechanisms and chromatin structure in eukaryotic cell nuclei. Cell and developmental biology also covers diverse activities. A particularly interesting topic is the growth and formation of epithelial tubes with a key role for a mucin-like large glycosylated protein, performed by Anne Uv and her collaborators with the *Drosophila* model system. This developmental biology project for the tracheal system has shown that tracheal tubes deposit a temporary intra-luminal chitin layer that models the lumen size during tube growth. The group has also identified a mucin-like protein that behaves in a similar manner, and which is required to shape the hind gut. This represents a new biological finding where a temporary luminal scaffold models tube shape. There have been notable publications in PLoSOne, Development, and Eur.J. Cell Biol.

11.5.1 Overall assessment

This subdivision has not yet emerged with a distinct profile, and may require reassessment within a few years. Much of the best work appears to belong with some of the other fields discussed above, i.e. Bacteriology and Immunology, Virology, Glycobiology, Mitochondria and Metabolism, or Cancer. However, one can sympathize with these scientists who perform first-class work that does not always readily fit with the present novel divisions (albeit proposed by the majority researchers themselves). The problem is likely to diminish with time, when the most successful fields within biomedicine may absorb some of the relevant key players.

Nucleic acid biochemistry

1. Herpes simplex virus replication

The consistent production of elegant work in this area by the Per Elias group is internationally well known in the field. Key viral replication factors were first defined in the Gothenburg laboratory, sometimes in collaboration with Stanford University, California. The reconstitution of the herpesvirus replisome with purified proteins is making progress, revealing the enzymatic functions involved and pointing to possible targets for antiviral drugs. Distinct differences between the DNA replication machinery of the intracellular herpesvirus *vs* that of the host cell have been clarified. Furthermore, it has been shown that only one of the three essential DNA ligases in mammalian cells, ligase IV, is active in herpesvirus replication (the virus does not encode its own ligase). Recently, the Elias group has also investigated the role of conserved C-terminal domains of herpesvirus glycoproteins in the assembly of infectious virions, a new topic that suggests collaborations with the glycobiology and clinical virology fields.

Assessment: *Excellent*

2. DNA repair

More limited studies in the internationally competitive area of the repair of DNA double-strand breaks have been performed by a small group at the Department. The work is promising but somewhat preliminary in nature, although some new aspects have been unravelled of the large key factor, cellular DNA-dependent protein kinase, in the process.

Assessment: *Good*

3. Mediator and eukaryotic transcription

Claes Gustafsson made a sterling contribution as a postdoctoral fellow in the laboratory of Roger Kornberg, Stanford University (who received a Nobel Prize in 2008). Gustafsson continued with important aspects of this work in his own laboratory at Karolinska Institutet, and recently in Gothenburg. The work has focussed on an essential cofactor of transcription in the cell nucleus, the large Mediator. Elegant cryo-EM studies, combined with biochemistry, have clarified the overall 3-D structure of Mediator, and contribute greatly towards explaining the intracellular activation of transcription by RNA polymerase II. An exciting new development is the previously unsuspected role of Mediator in defining boundaries between active and inactive chromatin.

This work serves to keep Gustafsson in the top group of scientists investigating gene transcription in the eukaryotic cell nucleus. It may be assumed that he can continue these taxing studies in parallel with the exciting work on the mitochondrial transcription mechanism, and new departures together with Enerbäck and Falkenberg.

4. Developmental biology

There are two small groups representing traditional developmental biology. One is using *Drosophila* as model the other one is working with *Xenopus*. The University of Gothenburg has no long-standing tradition in developmental biology. If the University intends to create a programme of developmental biology at an international top level, new recruitments will be needed to achieve the critical mass required to be competitive.

The *Drosophila* group has a reasonable level of overall productivity, with some novel innovations. In particular, the impact of fly mucins on the formation of tubes in *Drosophila* is groundbreaking and has bearing on embryonic morphogenesis and on biology in general. The group on its own appears isolated, but it has ongoing promising collaboration with the glycobiology research programme that has given the University of Gothenburg an international reputation for decades.

The head of the *Xenopus* group has received post-doctoral training in the laboratory of John Gurdon, who is one of the internationally best renowned scientists in the field of development biology. As with the *Drosophila* research, the tradition in *Xenopus* research at the University of Gothenburg is not very strong. The small group has recently published several papers on embryonic stem cells and in particular on stem cell reprogramming. This concept is now at the frontline of regenerative medicine. It is a rapidly expanding and highly competitive field. Collaboration with the strong stem cell research group headed by Professor Anders Lindahl would undoubtedly bring mutual benefit.

The overall quality and productivity of the research conducted by the small developmental biology groups is *Very good*. The organization as an independent developmental biology programme is, however, very thin in its present form and must be regarded *Poor*.

The future potential and possibilities are largely dependent on collaboration with existing strong, well-established areas. Despite a presently good scientific output, the future of developmental biology at the University of Gothenburg does not appear secure in its present form.

11.5.2 Summary of assessments – Molecular Cell Biology

Overall assessment: *Good to Excellent*

Research quality: *Good to Excellent*

Research productivity: *Good to Excellent*

Research uniqueness: *Good to Excellent*

Research relevance: *Good to Excellent*

Organizational capacity: *Good to Excellent*

Interactive vitality: *Good to Excellent*

11.6 CANCER

11.6.1 Overall assessment

Cancer research at the University of Gothenburg ranks between *Excellent* and *Very good*. The University has a couple of research groups at the international forefront within their fields, and several other groups of high international standard. The area of chromosome translocations and cancer genetics is strong at the University, and the University also has good activity within cancer cell biology, cancer immunology and tumour biology. Some of the research at the University has strong translational aspects and has already impacted on current cancer therapy. A potential problem faced by cancer researchers at the University was that the research was divided over

as many as five departments. This would make joint initiatives more difficult to implement. However, the decision to move much of the cancer research into the impressive new Sahlgrenska Cancer Center offers great opportunities for interdisciplinary collaborations and focused efforts.

11.6.2 Research quality, productivity, uniqueness and relevance

Quality

Overall, the quality of cancer research at the University of Gothenburg is ranked as *Very good* to *Excellent*. In some areas, especially those related to cancer genetics, researchers from the University of Gothenburg perform research that is clearly cutting-edge. Several cancer researchers at the University have received national and Nordic prizes for their work. The strongest impact has been made by Göran Stenman's group (the Department of Pathology), which has used state-of-the-art cytogenetic and genomic technologies to study mechanisms underlying chromosomal rearrangements in cancer, and to identify novel fusion oncogenes in carcinomas of the breast, skin, head and neck. This group publishes regularly in journals of very high reputation. Important work on fusion oncogenes and deletions is also performed by the groups of Pierre Åman and Tommy Martinsson. The analyses have mapped amplicons and deletions in neuroblastomas, and have identified several candidate tumour suppressor genes. There is also a strong environment for tumour immunology, with successful characterization of interactions of inflammatory cells adjacent to tumours, including NK cells and T lymphocytes. The group has made an impact in tumour immunotherapy and has completed a large phase III study with histamine as an adjuvant to IL-2 against relapse in acute myeloid leukaemia. This study has formed the basis of a drug (Ceplene), which is currently undergoing a phase IV study for use in acute myeloid leukaemia. There is also strong tumour biology research at the University of Gothenburg, represented by Gunnar Hansson's group (the Department of Medical Chemistry and Cell Biology), which has been studying the role of mucins in tumourigenesis (see above, under "Glycobiology"). A potential weakness of the cancer research at the University of Gothenburg is that almost all of the high-profile research is led by very established researchers, typically in their fifties. Even though the University has several younger cancer researchers, these have yet to make major impacts in the field. The recruitment of young researchers to the new Cancer Center could improve this situation.

Productivity

The productivity of the cancer research groups at the University of Gothenburg is ranked as *Very good*. Most of the groups publish, on average, 1-4 papers in international research journals per year, and, naturally, the largest groups have the highest production. Likewise, the production of PhD degrees is very good when taking the number of employees into account.

Uniqueness

In general, the cancer research at the University of Gothenburg follows the main paths of international cancer research. This does not mean that the research is not original, but the overall strategies and concepts remain the same as those found in many laboratories worldwide.

Relevance

The relevance of cancer research at the University of Gothenburg is ranked as *Excellent*. The identification of novel biomarkers is likely to have a great impact on the diagnosis, prognosis and treatment of cancer. In this regard, researchers at the University of Gothenburg are making an impact internationally, especially through their identification and characterization of novel fusion oncogenes, but also through their analyses of copy number variations, expression aberrations and methylation changes. The research themes explored by the University's cancer researchers are generally up-to-date, and state-of-the-art methodology is implemented to a large extent. The Genomics Core Facility is important in this respect, and the acquisition of a platform for deep sequencing during 2010/2011 will be instrumental to further developments for many of the projects that involve genome or transcriptome analyses.

11.6.3 Organization and research infrastructure

The organization and research infrastructure of cancer research at the University of Gothenburg is ranked as *Very good*. Cancer research at the University is performed at five different Departments (Pathology, Medical Chemistry & Cell Biology, Medical Genetics & Clinical Genetics, Clinical Chemistry & Transfusion Medicine, and Infectious Diseases & Hematology). This scattered localization reflects to some extent the wide scope of cancer research at the University of Gothenburg, ranging from cell biology to tumour biology, cancer immunology and genetics. Nevertheless, a concentration of the University's cancer research on fewer affiliations could potentially promote stronger research environments, better exploitation of research infrastructure, and more joint efforts. The Lundberg Laboratory for Cancer (located at the Department of Pathology) offers technologies for microarray analyses of genomes and transcriptomes. Core facilities for genomics and mouse xenograft models are also available. A deep sequencing platform will shortly be installed at the Genomics Core Facility. In addition, a skilled systems biologist will join the Cancer Center and is likely to strengthen the cancer systems biology research at the University of Gothenburg. It is a strength of the cancer research at the University that several of the leading professors have shared positions as consultants in medicine or dentistry, since this provides an excellent portal for translating basic research into clinical applications.

11.6.4 Collaboration and networks

The collaboration and networks within cancer research at the University of Gothenburg are ranked as *Very good*. Most of the groups have, in addition to their local collaborations, active bilateral collaborations with leading research laboratories in Europe and the USA. Only a few groups participate actively in research funded by the EU framework programmes and other international large-scale collaborative networks, and cancer research at the University of Gothenburg would benefit from increased participation in such networks.

11.6.5 Future plans

The future plans for cancer research at the University of Gothenburg are ranked as *Excellent*. Cancer is one of 20 research areas that have recently been allocated extra funding from the Swedish Government. Importantly, the University of Gothenburg – together with Lund University – has received funding for the cancer programme BioCARE (Biomarkers in Cancer Medicine Improving Health Care), Education and Innovation 2010-2014. The University of Gothenburg will receive about SEK 20 million of this funding, and the research area of cancer has additionally been allocated 50% of the funds from the Vice-Chancellor of the University. Organizationally, BioCARE is part of the Institute of Biomedicine. The Vice-Chancellor of the University has appointed Professor Göran Stenman (Department of Pathology, Institute of Biomedicine) as the coordinator for the strategic area of cancer at the University of Gothenburg, which will also include the new Sahlgrenska Cancer Center. The rationale for this strategic area is to create the critical mass of scientists necessary to perform internationally competitive cancer research. A systems biologist, a former EMBO long-term fellow at Memorial Sloan-Kettering Cancer Center, is one of the young scientists due to join the Cancer Center. Another young scientist recently recruited to the Cancer Center has experience with stem cell research. Given the somewhat scattered localization of the current cancer research at the University of Gothenburg, the new Cancer Center has great potential for strengthening this research area by creating a strong research environment that stimulates interdisciplinary collaborations.

11.6.6 Summary of assessments – Cancer Research

Overall: *Excellent/Very good*

Research quality: *Very good*

Research productivity: *Very good*

Research uniqueness: *Very good*

Research relevance: *Outstanding*

Organizational capacity: *Excellent*

Interactive vitality: *Outstanding*

FINAL REMARKS AND SUMMARY

Biomedicine appears to be a strong area, made up of several of the topics for which Gothenburg has traditionally been, and is, internationally well known. Many of the best scientists are young and promising. Age is perhaps only an issue within Bacteriology and Immunology, where the arguably most famous scientists, Jan Holmgren and Ann-Mari Svennerholm, are close to retirement. It is not clear from the self-evaluation documents who might be considered to replace them while retaining the very high research standard and reputation in this field.

The remarkably successful recent investigations of energy metabolism, especially with regard to the deposit and consumption of fatty tissue, promises to be a major and unique contribution from the Institute of Biomedicine at the University of Gothenburg in order to elucidate and counteract an increasing health problem in the Western world, obesity. This work seems to fit exactly with the desire of the University to identify areas “where research of the highest international standard is done”, including “research areas where the University has a particularly good potential to develop unique and excellent research activities”. From this point of view, it is then disappointing to have to note that these novel developments in the Institute of Biomedicine have not been included in the current broad strategic plan from the University Management Council/Vice-Chancellor, which aims to pinpoint eight priority research areas at the University, although aspects of the new findings could be included in the broad assignment to “patient-centred research”. In the opinion of this Panel, the University of Gothenburg now has an opportunity to establish itself as an international leader in a very important aspect of biomedicine, but this favourable situation may not remain unless positive action is taken in the near future.

The thoughtful tentative assignments of the research groups into six subdivisions in the self-evaluation document were helpful to the Panel. In general, such subdivision of the very large biomedicine area seems to be needed. The new Cancer Center looks likely to get off to a flying start under excellent leadership and should be a distinct division. Similarly, the Mitochondria and Metabolism division is highly impressive, dynamic and promising, and should definitely be a division. Bacteriology and Immunology includes an important, broad international programme and should be a prestigious division, especially if a suitable long-term replacement for Professor Jan Holmgren can be identified. Glycobiology has been a very strong field in Gothenburg for several decades. There is much overlap with the productive Virology division, and the nonconventional term “Glycovirology” appears in several of the documents. In order to obtain a good critical mass, we recommend that the Glycobiology and Virology divisions be merged, as has already been done for Bacteriology and Immunology.

The Molecular Cell Biology division, in our opinion, appears too small and diverse to merit being a distinct division. We recommend that the key researchers in this group be integrated into other divisions, in particular Cancer, Mitochondria and Metabolism, or Glycobiology and Virology.

A difficulty during our evaluations was that there was no clear defined line management structure at the Institute of Biomedicine. There was a friendly, helpful and interactive atmosphere, but it would be very useful in the long run to have a better defined leadership structure rather than relying on preliminary and informal contacts. From our discussions during the site visit and the written documents, we recommend the following arrangement, which largely coincides with the present informal arrangements in sub-divisions (as stated in the self-evaluation) for Biomedicine.

- Head of Institute (Director) of Biomedicine: Anders Oldfors
- Head of Cancer Center: Göran Stenman
- Head of Glycobiology and Virology: Gunnar C. Hansson
- Head of Bacteriology and Immunology: Ann-Mari Svennerholm
- Head of Mitochondria and Metabolism: Claes Gustafsson (or Sven Enerbäck, or Maria Falkenberg)

In conclusion, the Panel recommends Mitochondria and Metabolism as a Priority Research Area at the University of Gothenburg, and general good support for the research carried out within the entire area of biomedicine.

Summary of assessments – the Institute of Biomedicine

Bacteriology and Immunology: overall assessment and research quality *Excellent*

Virology: overall assessment and research quality *Very good*

Glycobiology: overall assessment and research quality *Excellent*

Mitochondria and Metabolism: overall assessment and research quality *Outstanding*

Molecular Cell Biology: overall assessment and research quality *Good to Excellent*

Cancer: overall assessment *Excellent/Very good*, research quality *Very good*

PANEL 12 – CLINICAL SCIENCES

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12. THE INSTITUTE OF CLINICAL SCIENCES

GENERAL REFLECTIONS ON THE INSTITUTE OF CLINICAL SCIENCES

The Institute of Clinical Sciences is an essential and large part of the University of Gothenburg and in particular its health science units, integrated with the community it serves. It has a few leading areas of excellence with major potential for continued development at an international level, departments or units that match with comparable high-standard units in Europe and some that fall below this standard. The task of the Panel 12 RED10 evaluation committee was to assess the performance and standing of all these units that make up the Institute of Clinical Sciences within the last five years. This evaluation was in part based on the supplied material, but committee members have endeavoured to obtain additional information and use the site visit to get a comprehensive view of the Institute. Additional information received from the Head of the Institute in September 2010 was valuable. The committee considers the Strategic Plan 2009-12 for the University of Gothenburg to be ambitious and progressive in its overall aim. Increased competitiveness appears as a major goal. Key areas there include:

- increased international recognition of the research performed
- promotion of innovative and interdisciplinary projects of a high standard
- a readiness to form strategic alliance with other institutes of higher education
- work to improve a common infrastructure for research.

It is against this background that the evaluation should be read.

In the *General report from the Sahlgrenska Academy*, the Dean presents the vision for the academy and its allied institutions to be a “leader in health sciences” and described “exceptionally favourable conditions for developing translational research” as a key factor for competitiveness. Hence, translation, where basic science findings have been carried through clinical evaluation phases or clinical questions have been brought back to the laboratory for further studies, should be exemplified. Research that has changed the way we understand or treat diseases should be highlighted. This aspect was not dealt with to the degree expected in the written presentation, which instead described existing programmes, some core facilities and infrastructure. During the site visit this came somewhat stronger to the fore. “Patient-centred research” was reported as a priority area. This requires a definition of successful collaboration and joint strategic discussions with health care representatives. Collaboration and definition of priority areas to which health care can direct resources

and allocating strategic resources aimed at clinical research, and joining primary care and medical education (Avtal om Läkarutbildning och Forskning, ALF), are central to strengthening clinical research.

The *report from the Institute of Clinical Sciences* also mentions aiming “at excellence” and hereunder “not only to be leading in all of its disciplines, but also in health sciences as a whole”. To lead entails both to become g “one of the main players in the world within health sciences” in all the Institute’s activities and also to “test the limits of science”. This is very ambitious, but at the same time not realistic except for a few key areas which the Institute must identify as outstanding in a clear way. If the principal strategy is to support the Institute’s strengths, then priorities must be applied based on performance, standing and marketability, while reallocation and restructuring have to be used for supporting weaker aspects. Key areas should attract postdoc researchers and PhD students, and strategic recruitment should be applied there to attract the best people. Other areas should also aim for high standards, but may not expect to receive priority in resource allocation or advancement possibilities.

The Institute’s goals converge with those of the Faculty/University as regards “systematic identification of success factors”. The Institute does have a commitment to not be inhibited by traditional interdisciplinary boundaries, and there is a wish to interact with society. It recognizes the need for good undergraduate education as a means for future recruitment of staff, as well as the importance of high level postgraduate academic training and an active partnership with key health sectors for continuous medical education of a high standard. It applies this to some extent at a national and international level, by targetted courses and seminars, conferences and links within the Nordic sphere and internationally among its staff. The importance of strategic recruitment is mentioned as a key matter, but proposals on how this will be achieved are not clear.

With regard to the University’s main aim of promoting interdisciplinary research, the Institute does describe research activities in a way that could promote this perspective. This was clarified better during the site visit. Several research groups combine knowledge and technologies from basic model systems up to clinical application, which indeed qualify for being termed interdisciplinary and translational.

Research personnel

Document 1A shows that between 2004 and late 2009 there was a shift from full-time professorships to postdoctoral positions. There was a 14% reduction in number of full-time professors (the leaders of research with 39% research time required), their mean age has increased to 59 years, and only one fifth are women. The two women among the six associate professors (docents) have left, leaving four

associate professors, with a mean age of 57 years. Junior staff are also relatively older than might be expected (mean age 50). Post-doctoral fellows are the new addition by 2009, with a good gender balance and mean age (37 years), and the number of PhD students is on the increase (see below) with women in a majority. The affiliated staff (30 to 100) are relatively advanced in years, and only a third are women. The contribution from allied staff in the hospitals is unclear, and might possibly be made greater, not least with respect to training of junior medical staff not yet entered into formal PhD programmes.

Facilities

The University of Gothenburg and the Sahlgrenska University Hospital are two separate organizations, but have very close cooperation through the Sahlgrenska Academy, where infrastructure and joint appointments favour good use of resources, particularly for clinical research. Good facilities and possibilities for local/regional collaboration, particularly with primary and secondary health care and with Chalmers University of Technology, are described and are an integral part of future plans. Core facilities, such as technical back-up, biobanks, relations with national and local databases and the University's frontline new venture firms of the University, are described in detail in the letter from the Head of Institute (letter from September 2010, in reply to specific questions from the Panel).

Stronger central coordination and guidance from both the University and the University Hospital should be anticipated and is needed. Such an approach is widely expected elsewhere in the long run to provide a more productive output and a higher citation ranking of the output. This has been the experience in the last ten years and even longer in other western/continental university medical centres, where the medical faculty and the university hospital have merged their organizations. This has also been happening in the Sahlgrenska Academy. Particular emphasis is rightly placed on interaction with the general health services in the region, helped by the centralization of services. This should give a good grounding for bench-clinic re-back translational research. Biobanks, national and specific hospital-based databases, good biostatistics and bioinformatics, bioimaging and bioengineering, and genetic, molecular and other biological laboratory facilities are available. In this the University appears well equipped, such as with regard to animal experiments, cell biology and imaging, and -omics analyses on DNA/RNA/protein levels. There is emphasis on modern diagnostic imaging modalities in health care, which almost all of the Institute's sections will benefit from. Radiation Physics is equipped with e.g. whole body counters, gamma camera systems, neutron activation analysis and an alpha camera. There are plans for a new imaging centre.

PhD students

The Institute reports 22 PhD students employed in formal training programs in September 2009, and altogether 269 – two thirds of them part time – are registered at the Institute. The number of doctoral degrees are about 20-30 (44 in 2009) annually, a significant number, also compared to other parts of the University. The time to achieve a PhD degree is, however, long (mean eight years), and the mean age at dissertation for students with a medical background is high, at 46 years. Regarding the number of PhD students the goals should be clearly stated, in order to allow and facilitate evaluation of the PhD education from a broader perspective.

The Institute addresses the selection of PhD students, and reports an aim to promote internationalization in this regard. How this is to be achieved is not clear. Again, definition and promotion of strong educational programmes within key research areas (also including epidemiology and bioinformatics) are central for successful international recruitment. The methods used to recruit PhD students, within and from outside the University, must be examined, with a view to making the University's activities, programmes and opportunities more visible at national and international levels. There must be an aim to lower the graduation age of candidates, promote recruitment from elsewhere in the world and at the same time increase mobility of home students. The PhD programme leans heavily towards local graduates at present.

The lack of clinical PhD supervisors (and research group leaders from a broader perspective) is discussed and a specific, shortened MD programme has been established for students with PhDs in natural sciences. This initiative is perceived as novel and worth further presentation and discussion, not least against the background that many research-interested students may go into natural science programmes rather than medicine.

Collaboration and networks

Collaboration with the health care region is described as successful, with the shared vision “knowledge for the good life”. Region Västra Götaland “will put this knowledge into high-quality efficient care”. This aim implies commitment to translation and clinical applicability and, most importantly, an understanding of the long-term perspective needed for medical research to be implemented in improved health care. However, as in most western societies, clinicians have difficulties in finding time for research among their daily duties and increasing demand for more clinical output at the same time as clinical resources are being curtailed. It would be useful to develop the views from the Region on how clinical research should be specifically supported. The four-group system created within the region to promote this cooperation is probably helpful.

In addition the national databases, such as those on births, deaths, cancer, diabetes, rare diseases, operative procedures, asthma and allergy syndromes, craniofacial anomalies and other medical areas, as well as on social aspects and education, and the local databases on epidemiology in Western Sweden, have in general been generally well utilized. This is likely to continue as a major asset for some of the research lines pursued, not least because of the unique possibilities in Sweden and the Nordic countries for identifying and tracing individuals and cross-linking data through the national identity number system. This helps in creating research networks. Possibilities for follow-up from a young age and even from prenatal times are arousing considerable interest, and in this respect the Institute should be strategically placed.

The so-called FAS Centre (Forskningsrådet för arbetsliv och social vetenskap or the Swedish Council for Working Life and Social Research), allied to the Swedish Research Council, is a relatively new resource for supporting cohort studies in epidemiology and ties in with several researchers at the Institute.

A major new development is the Gothia Forum, i.e. an information bank for clinical research, where the regional higher learning institutions in conjunction with the pharmaceutical industry provide a way for reporting on clinical research and a means to create contacts within the region and towards industry. The goal is to make the region a central hub for clinical research (50% of clinical research in the country is already said to be located there). High-level technology for data storage is a major asset in the region. This also provides links to the Clinical Trials and Entrepreneurship units within the University's Institute of Medicine and School of Business, Economics and Law, and should thus be a major resource for translational research and for product development. Collaboration and networks appear outstanding in the region and within Sweden, and contacts abroad are growing within individual high-level research projects.

Finances

The Institute reports increasing “external” and “other important” funding. During the site visit it was specified how that this represents national and international funding, separately or through collaborative studies with the biomedical industry and at EU level. The Faculty has established a “grants office”, in order to help researchers with grant applications and managing funds. Dedicated fundraising activity seems currently not reported at any level at the University, and should be centrally registered in order to further ensure a positive financial development.

Besides approximately SEK 30 million in direct state research support, the Institute receives large project grants from the Swedish Research Council, the Swedish Cancer Society, the European Union and industry, as well as many smaller grant foun-

datations, totalling about SEK 150 million. This is reasonable, although European funds are noticeably modest. In 2010 the external funding increased considerably.

Future plans, potentials and possibilities

In the SWOT analysis for the whole Institute, the only specific research field mentioned was osseointegration, which is considered to be world-leading. This probably implies that other research areas are not at the same level of excellence. There are, however, other research fields that are in the same class, and areas with a potential to develop towards excellence could have been identified (such as under *opportunities*), particularly among the many research areas where the Institute is internationally competitive.

The Dean describes the identification and strategic recruitment of upcoming researchers. Here, it would be helpful to clarify how this process is carried out in the Institute, such as how many positions are available, within which areas recruitment will be prioritized and what the success has been achieved so far, also with regard to international, and not only national or local recruitment. Possibilities for careers in science need to be openly discussed. The Institute as well as and young researchers would benefit from clarified career plans that, for example, clearly define time frames for postdoctoral positions and junior research positions, and how further career choices within the University, such as staff scientist or faculty researcher, will depend on evaluation and open recruitment efforts.

Research activity and teaching

It is difficult to understand how the number of clinical professors can equal the number of full-term equivalents in the entire Institute of Clinical Sciences, where the majority of professors should have clinical duties of 30% as senior consultants. It also seems that an Institute of this size should have more research fellows/assistant professors and postdoctoral fellows, not least to secure succession in research group leadership. Further other senior staff employed by Region Västra Götaland, who often act as PhD co-supervisors and clinical researchers, are not included, but still form an important clinical academic resource.

Research output

According to the list provided to the Panel, about 20% of the articles are published in regional journals (eleven listed, but due to double reporting of *Acta Paediatr* and *Acta Obstet Gynecol Scand* representing nine). Information received during the site visit indicated possible errors in this part. Reasons for this and the opportunities for changing publication patterns would be interesting from a scientific point of view. While the Nordic international journals matter in terms of overall publication possibilities and need to be strengthened, and Swedish journals have their distinct place, the visibility of research depends on international publishing. An escape from

local and geographical politics is desirable. More effort should be given to increase the number of publications in higher ranking international journals.

It is also striking that 23% of articles are published without authors from outside the individual departments and 40% do not have authors outside of the University. The scientific output over five years appears to some extent to be limited to co-workers at the University of Gothenburg who are also based at the Sahlgrenska Hospital, i.e. only to those who had been on the paying lists of the University itself. Those who have contributed in their capacity of emeriti of the University/University Hospital, but who were still employed in some capacity by the University Hospital, are at least to some extent excluded in this evaluation. Besides this, it has been stated by the University of Gothenburg that only 4% of the scientific output has been authorized by the persons mentioned on the RED10 output data lists. During the preliminary meeting in Copenhagen, different members of the scientific research evaluation Panel 12 perceived that persons might be misplaced or even lacking on the lists from some departments.

Although topics of research have been listed and named, this process of coordination and integration at University/University Hospital level seemed insufficient. With the exception of the department of Health of Women and Children, neither the University nor the University Hospital could present annual scientific output lists regarding the University Hospital departments under investigation in RED10. This should be organized in the same manner for all. For a reviewer, the data provided may in some cases make it difficult to evaluate the research activity in these departments.

Translational strengths

The Panel 12 committee asked for information about this and the Head of the Institute replied with a detailed account (September 2010) giving several examples of this, e.g. in cancer research, such as on a collaborative project of the universities in Gothenburg and Lund within genomic research and aiming at creating personalized medical treatment modules (CREATE Health Center for Translational Cancer Research funded by the Swedish Foundation for Strategic Research), the Swegene genomics consortium, the biobanks in western and southern Swedish universities, with several international and national companies developing drugs and appliances (not least within the world-famous osseointegration sphere and hearing aids), the human resources and expertise in focused cancer research in Gothenburg, and a research school for young investigators (already in operation) to strengthen the doctoral programmes. In this there is already European Union funding, where several key biomarkers are being studied to try to open up new possibilities for the detection and treatment of cancer. This is supported by sharing of facilities, such as in automated proteomics and bioinformatics high-throughput technology, at other

Swedish universities and in Gothenburg. Nordic biobanks are included. Several surgical research programmes translate directly into clinical operative work and thus patient benefit, while benefit for the University/Institute may accrue in the form of marketing bi-products such as training modules, computer programmes, novel treatment modules such as in transplant surgery and organ perfusion, radiotherapy methodology and implantation techniques in bone (osseointegration), within quality-of-life studies and related to public health measures. During the site visit the strengths of the transplant unit in this respect also became obvious.

Leadership

The leadership is well organized, from the Head of the Institute in relations with fellow staff and regular reports and meetings, to the Faculty Dean and the section leaders and their deputies, allowing information exchange and interaction in a dynamic structure.

12.1 THE SECTION FOR DERMATOLOGY, PLASTIC SURGERY AND OTORHINOLARYNGOLOGY

The section has, in between the section report from March 2010 and the site visit in November 2010, been split up and amalgamated into the other sections, taking Dermatology to the former Section for Oncology, Radiation Physics and Radiology and Urology, Plastic Surgery to the former Section for Gastrosurgical Research and Education, and Otorhinolaryngology to the former Section for Anesthesiology, Biomaterials and Orthopedics. As these comparatively small departments were among the weaker parts of the Institute and with limited coherence or relevance to each other in several aspects, it seemed logical to Panel members that such an amalgamation ought to be considered and it had actually been accomplished by the time of the visit. These three departments are therefore discussed in their present sections (marked 12.3, 12.4 and 12.5 below).

12.2 THE SECTION FOR THE HEALTH OF WOMEN AND CHILDREN

12.2.1 Self-evaluation

In the overview the general aims are stated for each department separately, not jointly as a holistic outlook on the field, which the section's name might imply. The reference to research activities in obstetrics and gynaecology is a brief and incomplete overview, but more detail is given on paediatrics, including laboratory facili-

ties (SELDI-TOFT and Dexa), lipid and proteomic analysis and a neonatal lung research laboratory, the national growth register, widespread links to other major university research groups such as in asthma and lung disease, diabetes, cardiovascular, allergy and childhood cancer research, and links to European and American research groups. One of the strong sides is the Krefting Research Centre, which studies asthma and allergies, at the Sahlgrenska Academy. The paediatric departments appear stronger, though this is probably due to both reproductive health and paediatric research being stronger in reality than reported. Thus there is little in obstetrics and gynaecology to indicate strengths and weaknesses, even though potential areas, such as on register use, are highlighted. The main indication of transdepartmental research and good outside links is in paediatrics. In terms of weaknesses, the division between the two or three hospitals for the obstetric and gynaecologic aspect is regarded as a drawback, but need not be so. There is a relatively low proportion of grants for obstetrics and gynaecology, while this is very good for paediatrics. The opportunities and threats are correctly stated, and the recruitment of young people is a particular area that needs to be addressed.

12.2.2 The Department of Obstetrics and Gynecology

Overall assessment

The Department has a strong traditional base at Sahlgrenska Hospital where some major aspects of gynaecology are now centred, including some key aspects of departmental activity such as reproductive medicine and assisted reproduction, sub-specialized gynaecology and cancer surgery, while general obstetrics and high-risk obstetrics are based at Östra Hospital and are allied to neonatology and paediatrics. Urogynaecology is also based there. A large low-risk delivery unit is in another part of the Gothenburg area, at Mölndal Hospital. There are close links to other surrounding areas where there are secondary units that relate to the Gothenburg hospitals as a tertiary university level referral centre.

Research activity, quality, productivity, uniqueness and relevance

When describing the most successful research in obstetrics and gynaecology, both nationally and internationally, only five of the most senior academics' research is mentioned, i.e. four professors and one associate professor. One of the professors is internationally renowned within birth asphyxia research, which is becoming more focused on molecular level in terms of mitochondrial stability, cell death and hypoxic ischemic encephalopathy. This is mentioned in one short paragraph, but where this is expected to lead and what external/internal cooperation exists is not stated, and is probably an understatement on a novel and important approach to understanding hypoxic brain damage. The fact that this is heading towards good international collaboration was emphasized during the site visit. The rating of this research would be *Excellent*.

The research on preterm labour has not yet had a major impact and the presented aim is without any special features that would set it apart from other groups working in the field. There is nothing about the methods that are supposed to be used. Searching for biomarkers is not new, and the long-term aims are unclear. (Rating: *Good*). The research activities on critical current areas of interest in relation to artificial reproduction are of international renown. Some of this is already within the wider knowledge base that is currently available, but follow-up studies in the field will be likely to result in some new evidence of importance. (Rating: *Excellent*).

Work on ovarian function and implantation in animals and humans, as well as on ovarian cancer, is, however, of high level importance and has the potential for a great deal of translational research. The new information that is being generated, and which is of world-wide significance, is the uterine transplantation programme, where the group is at the forefront of very few groups in the field and now has documented success in an experimental field. This work has been systematically built up, elucidating methodology that will be required for success in primates and ultimately humans. It has international links and researchers from outside the Gothenburg area and beyond Sweden. It will be translated to humans within a short time. (Rating: *Outstanding*).

The epidemiological and clinical studies within contraception and urogynaecology have also had an impact, but while they have resulted in new knowledge in these fields, they add to and emulate what has been done in other parts of the world. However, a very long-term follow-up of a well defined group of women is providing – and will continue to provide – valuable data. (Rating: *Very good*). There are other researchers in the Department, but no information on this other research and researchers was described for a widespread and rather large department. Many of the publications are in relatively high impact journals, others in average impact publications within the field.

Assessment scale rating for the whole department: *Very good*, 4/6²¹

Organization and research infrastructure

There are some strong links to paediatrics and to the transplantation surgery unit. The way in which researchers in the Department have actual links to the large national databases, such as the Swedish Medical Birth Registry, is not clear in terms of how contacts are organized or in the collaborative projects that have been recently carried out or are current. The assisted reproduction unit is a high level unit – the first of its kind in the Nordic countries – and still holds a position of eminence there and internationally, as does other reproductive medicine/research, such as ovarian function and epidemiology. The animal research in ovarian physiology is well

²¹ x/6 indicates that the six-graded scale outstanding – excellent - very good – good – insufficient – poor has been used.

organized. The uterine transplantation programme is a small and very select area of research, but is part of the strong surgical transplant programme that exists in Gothenburg. Thus there is interdisciplinary research, but this is more limited with regard to other Swedish/Nordic departments/institutions, and mainly in the small uterus transplant work on a wider scale.

Rating: *Very good*, 3/4²²

Collaboration and networks

The Department could work to strengthen regional as well as national networks. International collaborations should be actively sought and pursued.

Rating: *Good*, 2/4

Future plans, potentials and possibilities

These are not clearly set out and the plans for development in the area could be improved. There is however considerable potential in three of the five main research areas mentioned above (birth asphyxia, transplant and ovarian research, assisted reproduction issues), even towards world leadership, while others seem more traditional (urogynaecology and contraception) or not well defined as yet but with potential (preterm labour and delivery)

Rating: *Very good*, 3/4

Interactions with society

These relate largely to organization and research work in contraception, in maternity care and assisted reproduction, and in gynaecologic endocrinology, but areas like violence against women are less developed in terms of background for any existing community services. This is at the expected level and in some instances above.

Gender and equal opportunity issues

There is a male preponderance at senior level and, in line with current trends, a female majority at more junior levels. As reproductive health concerns both genders, care must be taken to strive for 50-75% female.

Other issues

There is an imbalance in the number of senior staff compared to the allied speciality of paediatrics. The Department hosts the editorial office of one international/Nordic journal.

²² x/4 indicates that the four-graded scale excellent - very good - good - poor (alternatively poor but insufficient) has been used.

Summary and recommendations

It is recommended that the Department of Obstetrics and Gynecology:

- Defines additional key research goals and future plans in a more distinct way.
- Demonstrates firm links to national databases.
- Deepens collaboration between key parts of the unit and the paediatric side.
- Actively seeks novel national and international collaboration based on international funding.
- Promotes interdisciplinary research (particularly related to epidemiology and side-effects from treatment).
- Strengthens group formation within major research areas.
- Updates its website, particularly in terms of the English version.

Overall rating: *Very good* 4/6

12.2.3 The Department of Pediatrics

Overall assessment

The self-evaluation given to the Panel was not well formulated and gave a limited picture of the research activity within the Department, for example on financial support, work within international networks and the number of doctoral students. During the site visit it became evident that, in patient-oriented research, (with the exception of transgenic mouse work in the studies on newborn lung diseases), separating work done in the University from that carried out at the Hospital is difficult and too artificial to be beneficial. Overall, there are many good research groups, mostly led by people with a University affiliation, and collaboration with a perinatologist in the Perinatal Center has given excellent results. There is overall much strength within the paediatric department and its close alignment to parts of the obstetric side, as well as to paediatric anaesthesia and this lends added weight to the Section.

Research activity, quality, productivity, uniqueness and relevance

There are 16 professors (two in biomedicine), three associated professors, and ten other academic and postdoctoral staff. The number of registered PhD students is nine (in biomedicine). There are several active research groups, whose work is financed by ALF or private foundations; seven groups are supported by the Swedish Research Council and three groups are involved in EU projects. In 2009 there were seven dissertations in paediatrics, three in paediatric neurology and one in paediatric surgery. According to the report from investigators, there are 35 persons – not just nine – working for a doctoral degree, so future prospects look bright in this respect.

The larger projects, which are supported by the Swedish Research Council, concern retinopathy of prematurity, bronchopulmonary dysplasia in preterm infants, allergy,

immunology, brain development, endocrinology and diabetes. These areas seem to have a research tradition, good output and the potential for growth. (Overall rating: *Very good*).

The study aiming to find protein markers for personalized medication in allergic diseases uses a common, easily definable disease, seasonal allergic rhinitis, as a model. Data on possible genetic markers that could be meaningful in choosing effective medication for individual patients is collected as a joint effort within a European network and analysed at the Unit for Clinical Systems Biology. The experience gained from this study can be used in studies of other pharmacologically treatable, complex diseases. (Overall rating: *Very good*).

The group dealing with asthma and allergy has recruited large cohorts of patients with follow-up through childhood into adulthood, with an emphasis on environmental and other risk factors. The study is linked to similar studies on adults in western and northern Sweden. The researchers have taken advantage of Nordic conditions with stable, cooperative populations and good public records. Results with significance for a large group of patients are to be expected with time. (Overall rating: *Very good*).

The relatively new growth centre offers very good facilities with reference to infrastructure for translational research. The group has been productive, but the spacious facilities could be used more efficiently by incorporating more groups, e.g. those looking for long-term outcome (adult) of children with various growth and developmental problems. (Overall rating: *Excellent*).

The research group working on regenerative capacity of the immature brain uses both cell cultures and animal models as tools. The aim is to find ways to enhance recovery after injury caused by irradiation, by hypoxia or chemically. It is hoped that the studies will provide answers to the many open questions around plasticity of the brain during early development. The other two projects dealing with problems related to prematurity, i.e. retinopathy and RDS, are also important clinically. (Overall rating: *Excellent*).

The group working with neuromuscular disorders is one of the leading clinical groups on mitochondrial diseases in children, and is also participating in several international treatment studies on muscular dystrophy. (Overall rating: *Excellent*).

The Department is known for its epidemiological studies on cerebral palsy, which are being continued within a Scandinavian and European framework. The importance of screening tests for children, particularly with relation to congenital heart disease and some rare diseases, on which there is a focus, may have direct relevance

for society. Many of the publications are in high impact journals, others in average impact publications within the field.

Assessment scale rating: *Very good*, 4/6

Organization and research infrastructure

Considerable active research is being carried out at the Department of Paediatrics. Around 40 groups publish papers in international journals, and it seems that all specialist groups are encouraged to publish. While this gives depth to the everyday work of the individuals, results with more impact could be achieved by concentrating these efforts. The Department could benefit from shifting resources onto selected groups, which could then reach excellence (various aspects of prematurity and close collaboration in the prenatal centre, full utilization of the resources of the growth centre).

Some of the Department’s publications have reached high impact journals, but the majority are in mid-range publications within the relevant specialist fields. Among these are the international Nordic journals, which is important as a means of support for the publication scene in these countries and necessary for academic viability within the doctoral programmes being run there.

Rating: *Very good*, 3/4

Collaboration and networks

Several groups are part of national and international networks, in which they make a leading contribution.

Rating: *Very good*, 3/4

Future plans, potentials and possibilities

Future plans have not been stated, but possibilities are very promising judging by the research conducted and general facilities and level of activity.

Rating: *Very good*, 3/4

Interactions with society

Several possibilities present themselves in this respect, not least towards child health and health protection. The extent to which this is taken advantage of is not altogether clear, but it should be above average.

Gender and equal opportunity issues

Appears adequate and balanced.

Other issues

None in particular.

Summary and recommendations

It is recommended that the Department of Pediatrics:

- Defines key research goals and future plans.
- Demonstrates integration between the research groups, including in relation to the other major part of the section (obstetrics, endocrinological and developmental gynaecology).
- Develops plans for succession related to current group leaders.
- Deepens collaboration with the clinic and the clinical trial unit and scrutinizes the research value obtained from the clinical trials.
- Actively seeks novel national and international collaboration.
- Promotes interdisciplinary research within the section (particularly related to epidemiology, endocrinology, neurology and major common diseases).
- Updates its website, particularly in terms of the English version.

Overall rating: *Very good*, 4/6 (may reach 5/6 in specific areas)

12.3 THE SECTION FOR ANESTHESIOLOGY, BIOMATERIALS, ORTHOPEDICS AND OTORHINOLARYNGOLOGY

12.3.1 Self-evaluation

An overview description of the Section was lacking and general aims described for each department separately. However, from the general description given by each department and the information on research and activities gained during the site visit some general aspects may be stated. This revealed on the one side moderate cohesion between parts of the section, but also considerable strength within the individual units. This is most evident in the Department of Biomaterials and in the Department of Orthopedics. These units appear nationally and internationally active in research and teaching, with academic staff of a high standing (lecturers and productive scientists). In the other departments such standing may also be seen. There are clear examples of translational research, such as on hip fractures and on biomaterials, where there is a strong link to transplant surgery. New appointments relating to tissue engineering and regeneration, the building of interdepartmental links through collaborative research, and excellent facilities have all meant that these departments must be among the University's leading areas in terms of

advances. Novel approaches to high level scientific teaching and visiting fellowships show a dynamic attitude and concern for the future.

There was least information from the Department of Anaesthesiology, where no one was representing the department during the site visit, and this also applied to otorhinolaryngology. In general terms the Section appears to have unifying elements, particularly with regard to the biomaterial research and production. This frontline research has had a world-wide impact, relating both to the biomaterials being produced and tested and to tissue-biomaterial interaction, a highly relevant research topic (regenerative medicine). Percolation to translational developments in orthopaedics and otorhinolaryngology seems reasonable entrenched, while the anaesthetic department seems from the presented material to be more in a supportive function within the Section, while it's relatively limited research is more connected to other parts of the university.

12.3.2 The Department of Anesthesiology and Intensive Care

Overall assessment

The Department's aims are generalistic, but there is a focus on some major areas such as lung disease and critical care, heart failure issues, gastrointestinal problems and renal vascular bed failure, neuro-intensive care, understanding pain and developing new treatment for acute and malignant situations, organ protection after transplantation, endothelial function and intensive care medicine. These aims are broader than desirable and quite diverse for a small number of academic staff (two professors, of which one is very active in research, and four adjunct professors (docents)), but the Department links to other sections within the Institute and inevitably the transplantation activity should place a heavy need for research on the Department. How well this is realized in practice could not be assessed from the self-evaluation. Renal and gastrointestinal transplant surgery, as well as neurosurgery and reproductive medicine, are of great relevance to the Department.

Research activity, quality, productivity, uniqueness and relevance

Judging by the publication list of the staff, most of the publications are associated to one of the professors and concern both animal and human research, work in myocardial function and ischemia, work in central and peripheral pain management and life-saving systems. This is mostly published in average international journals within the field. Other listed members of the department seem to have lesser activity, though good work within paediatric anaesthetics is seen.

Assessment scale rating: *Good, 3/6*

Organization and research infrastructure

No adequate information was given. Accessing PubMed shows considerable activity in relation to several of the above listed areas, including cooperation in the Scandinavian Critical Care Trials Group.

Rating: *Good*, 2/4

Collaboration and networks

This was not assessed. In general and from the research listed, the department should have good links to parts of the university dealing with human and animal physiology, biochemistry, cell biology, cardiology and pulmonology and in the Institute with the transplant surgery, which also seems to be the case.

Future plans, potentials and possibilities

Could not be assessed.

Interactions with society

These could not be assessed, but in general the nature of this department means that this is not prominent, except in relation to obstetric anaesthesia and pain management, especially chronic pain.

Gender and equal opportunity issues

Probably adequate.

Summary and recommendations

It is recommended that the Department of Anesthesiology and Intensive Care:

- Defines its goals and construct future plans with emphasis on collaboration within advanced departments of the Section/Institute.
- Demonstrates clear research plans.
- Seeks national and international collaboration.
- Promotes the interdisciplinary research which seems already present, i.a with collaboration within the transplant and biomaterials activities of the section.
- Updates the departmental website.

Overall rating: *Good*, 3/6

12.3.3 The Department of Biomaterials

Overall assessment

This is one of the most progressive parts of the Institute, with a very good international standing developed around the biological effects of non-biological material implanted in tissue. Thus it relates to all skeletal tissue, as well as prostheses, and

needs to exist in an environment of easy multidisciplinary approach. It is a prime example of how to combine basic science and clinical medicine in order to develop solutions for patients. The Department is thereby strategically placed for academic teaching in a novel way, and has had a considerable number of PhD students. A professorship in regenerative medicine is evidence of this novel trend in medicine, as is BIOMATCELL, a national and international centre of excellence on biomaterials and cell therapy in this field, established over the last decade between the University of Gothenburg and 12 other partner organizations. BIOMATCELL combines materials science with state-of-the-art and emerging knowledge of biological components, including stem cell research, for generating new scientific knowledge, product ideas and clinical therapies at the international forefront of regenerative medicine. The research profile spans from atomic scale synthesis and characterization of materials, via molecular and cell biology, to the clinical disciplines. Anodically oxidized implants have been demonstrated to increase bone anchorage in association with down-regulation of gene expression of pro-inflammatory markers and up-regulation of markers for bone formation and remodelling compared to machined implants. The combination of the *in vivo* experimental model, qPCR and removal torque analysis has provided a new tool for exploring the molecular mechanisms of osseointegration.

The centre has received awards, pursues an active teaching and course programme (BIOSUM joint venture with Chalmers University of Technology), and has widespread and established links to industry and other research groups worldwide. It should be of prime interest for development within the University and requires a major collaborative effort, with clear benefits in terms of finances and prestige for the University.

Research activity, quality, productivity, uniqueness and relevance

A significant publication list each year from between 25 to almost 50 articles per year in major journals – but also, out of necessity, some medium or smaller journals – in this specific field, demonstrates the rapidity of developments and the Department's capacity for producing high class research.

Assessment scale rating: *Excellent* 5/6 (may reach *Outstanding*, 6/6 in specific areas)

Organization and research infrastructure

This is highly developed through BIOMATCELL and other allied aspects of the University of Gothenburg such as GU Holding as a marketing foundation, through links with the bioengineering aspects of the University and at Chalmers, with industry and other partners, within a very well structured research programme.

Rating: *Excellent* 4/4

Collaboration and networks

See above. Wide ranging networking appears to exist, although it might perhaps be demonstrated to be stronger with regard to physiotherapy and national and international firms in the prosthetics industry.

Rating: *Very good*, 3/4

Future plans, potentials and possibilities

There is significant potential for developmental with benefit to the immediate society.

Rating: *Excellent* 4/4

Interactions with society

There are interactions in terms of the creation of jobs and opportunities, as well as direct health advantages for the population. The centre's website is very well constructed and useful.

Gender and equal opportunity issues

These appear adequate and in line with what might be expected for this field (some male preponderance).

Other issues

The importance for the University of strengthening this field in terms of resources and thereby allied activity is emphasized.

Summary and recommendations

It is recommended that the Department of Biomaterials:

- Demonstrates better integration with other university departments and with industry in this field, not least internationally.

Overall rating: *Excellent* 5/6 (may reach *Outstanding*, 6/6 in specific areas)

12.3.4 The Department of Orthopedics

Overall assessment

This is one of the most active spheres within the University and thus the Institute, presented in terms of its research resources rather than overall aims, with four research laboratories: one in orthopaedic research focussing on functional testing, histology, cell culture and biomechanical testing, the Lundberg laboratory for gait analysis with a focus on the lower extremities in adults and children, a laboratory for occupational orthopaedics and another for experimental surgery research for spinal and osteoporotic research. All this is connected to clearly stated international

networks and foreign postdoc programmes at eight listed universities in several countries, which must lend strength to the Department.

The Department states that clinical research makes up a large part of its activities, including several projects on knee problems, coupled with extensive teaching activities and a clinical load to support this. Hip fracture work and its effectiveness is also pursued as a major research and teaching exercise, and is an area in which the Department is known for its research input.

Research activity, quality, productivity, uniqueness and relevance

Spinal research of high standing, sports and traumatology work of international quality, all based on experimental and clinical research.

Assessment scale rating: *Very good*, 4/6 (may reach 5/6 in specific areas)

Organization and research infrastructure

Well organized departmental pathways for research with links with biomaterials, bioengineering, and other supportive research areas in the University.

Rating: *Very good*, 3/4

Collaboration and networks

Well established networks in Europe, North America and Japan.

Rating: *Very good*, 3/4

Future plans, potentials and possibilities

Not stated, but there is the potential to continue as a major European centre and be among global leaders.

Rating: *Very good*, 3/4

Interactions with society

The Department is of importance to society through several of its subdivisions, including trauma and sports medicine, with the potential for building up good relationships, not least with reference to older age problems in this field. While not stated in the presentation report, this came through in the site visit.

Gender and equal opportunity issues

Appear adequate, although women might be better represented in this traditionally male dominated speciality. An active senior female staff member reported good integration and opportunities.

Other issues

Well led and up-to-date part of the Institute.

Summary and recommendations

It is recommended that the Department of Orthopedics:

- Defines its goals and emphasis for the future.
- Demonstrates more integration with biomaterials and links to physiotherapy, rehabilitation and industry in the field of prostheses and allied appliances. Quality of life studies will also be relevant.
- Develops plans for such collaboration.
- Actively seeks added national and international collaboration opportunities.
- Promotes interdisciplinary research.

Overall rating: *Very good*, 4/6 (may reach 5/6 in specific areas)

12.3.5 The Department of Otorhinolaryngology

Overall assessment

This Department is still one of the leading centres in this field, which has great social relevance. It has guided research initiated by the original opportunity at the University of Gothenburg to start early with new osseointegration application and still has very valuable forthcoming new opportunities, including within audiology and Quality of Life studies, within the Department and jointly with their external partners, including in design and industry.

Research activity, quality, productivity, uniqueness and relevance

A more extensive view on the scientific annual output could be gained from other sources, as most of the clinical scientific output of this department was produced by co-workers not mentioned in the university lists. The annual output has been about 15 publications each year, but a doubling of this might have been more reasonable for this international and well-known department, and indeed the Head of Department has suggested that the listed publications are probably only 50% of the actual scientific output produced in these years. The Gothenburg Department of Otorhinolaryngology is known worldwide for its longstanding contributions to the concept of osseointegration, i.e. a way of providing access to the temporal bone and thereby incidentally to bone conduction of sound to the inner ear, – an enormous

research effort over time. The clinical indications for this application have been widened worldwide, including by other researchers. A great deal of clinical evaluation was needed and has been produced by a few clinical departments, mainly in Europe, to establish this percutaneous treatment and the upcoming transcutaneous way of providing hearing to those disabled by their hearing impairments who do not have sufficient alternative opportunities for an optimal hearing aid revalidation.

In the evaluation of these so-called Baha devices, it has been shown that the connection between the otology and audiology sections in this Department/the University Hospital has not been strong enough over time to obtain the full clinical audiological evaluation needed in Gothenburg for these new developments. Also, this field of quality of life studies have been approached, but never fully explored. Nevertheless, the Department of Otorhinolaryngology in Gothenburg is still in a unique position for the near future to reinforce this topic. Arguments for this include the proximity of the headquarters of the Baha/Cochlear company (for the Baha topic) in Gothenburg, cooperation on the mechanism of bone conduction and the upcoming new (semi-) implantable devices worldwide for bone conduction hearing aids. There will soon be new clinical applications in this field, and departments that are already experienced in the clinical application and evaluation of this will probably become the field leaders once again. The research output seen is mainly on the topics of head and neck oncology and bone-anchored hearing aids.

Assessment scale rating: *Good, 3/6*

Organization and research infrastructure

It is still uncertain whether the complete annual output has been identified. It is known that the quality of the Baha® (bone-anchored cochlear stimulator hearing aid) output is sufficiently good or even exceptionally good.

Rating: *Good, 2/4*

Collaboration and networks

Seems to be good within the University, with biomaterials and with industry.

Rating: *Good, 2/4*

Future plans, potentials and possibilities

Information is lacking, but should be allied to the further development of hearing aids, while esophageal research may also be promising in conjunction with surgery departments.

Rating : *Good, 2/4*

Interactions with society

Cannot be assessed.

Gender and equal opportunity issues

Cannot be assessed.

Summary and recommendations

It is recommended that the Department of Otolaryngology:

- Defines key research goals within the new section, including links to transplant surgery.
- Demonstrates integration in research activities.
- Develops plans for succession related to current group leaders.
- Actively seeks novel national and international collaboration, not least at local level.
- Promotes interdisciplinary research.
- Updates its website.

Overall rating: *Good*, 3/6

12.4 THE SECTION FOR ONCOLOGY, RADIATION PHYSICS, RADIOLOGY, UROLOGY AND DERMATOLOGY/VENEROLOGY

Self-evaluation

Directly under the section are one professor, three adjunct professors, three senior faculty members and an additional 19 staff who are presented. The research focus of this group is not clear, and an evaluation of its standards is therefore not possible. Two of the senior members report occasional publications, while the others are more active. The adjunct professors have limited publication lists (exception in dermatology). Among the senior researchers are a number of active researchers, e.g. within technical aspects and optimized imaging methods, whose contributions seem to be central. Others report a more limited number of publications in model systems and radioimmunotherapy.

The Department of Oncology mentions tumour biology, radiobiology, target nuclear medicine and cancer epidemiology as key areas.

The Department of Radiation Physics mainly presents facilities and collaborations as their strength, with a focus on novel tumour therapies.

The Department of Radiology also bases its strength on technical facilities and networking (within the Swedish Bioimaging Network).

The Department of Urology also describes broad aims, but chooses here to focus on prostate cancer, with research spanning from model systems for androgen-resistant prostate cancer to epidemiology and clinical trials.

The Department of Dermatology and Venerology is a new addition to this section but has a good track record in skin disease research, incl. molecular biology.

The general descriptions seem, however, to describe structures rather than common visions and the potential impact of the research performed. The site visit did not include good possibilities for assessment of this section.

Though a large number of experimental, translational and clinical are reported from these departments and several strong researchers can be identified, the overall picture of the key research aims remained blurred. The section seemed to be lacking in clear research agenda. Though bottom-up formulation of research questions may be feasible, not least from a clinical perspective, the current need for joint efforts, collective biobanks, updated and validated clinical data, necessitates more strategic planning.

The Section would benefit from forming priority areas/research initiatives, wherein present and upcoming group leaders could be harboured and advantage taken of their different skills. The proposed orientations are very broad for a smaller-size research center and the number of separate projects is large. This diminishes and dilutes the overall visibility of the research that is conducted in some of the teams. Focusing and promoting selected topics would most likely help to reach more visibility and higher publication impact. In certain ways the Section is a relevant organisational structure, but at the same time it is difficult to see the separation between for example Oncology and Radiation Physics. Also Radiology and Urology represent smaller units that could from a research perspective benefit from closer collaboration with researchers in imaging, oncology and surgery.

Several younger project leaders seem to have limited collaborations and would benefit from restructuring. For some researchers uniqueness and productivity could be promoted, whereas for others innovation or translation and clinical relevance are key factors. Novel priority areas could be defined.

The limited funding from national/international funding agencies is a serious issue that needs to be addressed. The unit faces three main challenges. One is to focus, promote and deepen the research conducted within the Institute, since this potential represents an important strength. A second challenge is to develop and strengthen the connections between different research areas and to take advantage of the possibilities for interdisciplinary research. A third key issue is the recruitment

of talented young scientists and the succession in several of the research groups currently led by senior investigators where plans for transition have not been identified.

Strengths and opportunities include the location close to Chalmers and the collaboration with health care in the region. The Institute benefits from an integrated network of facilities and platforms. Weaknesses and threats include the high number of discrete projects within the unit, which gives a heterogeneous and poorly connected impression of the research activities. The overall picture is made up from a collection of numerous projects that develop independently, even within groups. The added value of having these various projects running within a single institute is not clearly defined. Connections with the regional, national and international scientific communities could be improved.

12.4.1 The Department of Oncology

Overall assessment

The Department performs research within preclinical studies in tumour biology, radiobiology, translational research in target nuclear medicine, and cancer epidemiology. The four major research groups work in tumour biology-radiobiology and epidemiology-qualitative studies. These areas are not connected, their interdisciplinary potential not promoted and the overall research environment seems difficult to encompass. The Department is engaged in teaching and should hereby have excellent possibilities for the recruitment of young talented students. Moreover, collaborations with the clinical Department of Oncology and particularly the Clinical Trial Unit are central. Although the Department reports involvement in several clinical trials, their benefit to the Department's research output remains unclear.

Research activity, quality, productivity, uniqueness and relevance

Within the field of radio-immunotherapy there is a limited number (18) of publications. The group pursues studies of alpha-particle-emitting radionucleotides, and in this area presents model work and one published phase I trial. One recently retired member also presents a limited number of, mainly collaborative, publications in genetics and breast cancer.

A novel line of research combines an epidemiological approach with data related to symptoms and side-effects from treatment. This research is in many ways perceived as new, although the methods used have not yet been fully validated and accepted by other researchers, and the complexity of the data collected limits clinical applicability. There is a high level of activity with over 50 publications, many of which have been in leading medical journals. This research could be used to exemplify interdisciplinary studies within the Institute. However, this research group's website should come under the University of Gothenburg, not Karolinska Institute.

One of the adjunct professors reports a moderate number of publications, mainly in ovarian cancers with experimental links for the identification of novel biomarkers. Each of the senior faculty members presents a restricted number of papers within thyroid disorders, DNA damage and genetic profiles.

Assessment scale rating: *Good, 3/6*

Organization and research infrastructure

The research areas presented are disparate and the Department would benefit from synchronizing the research efforts and profiling leading research areas. Moreover, plans for succession need to be discussed. At present, the younger PIs may not be competitive enough to take on leading roles in these projects.

Rating: *Good, 2/4*

Collaboration and networks

The Department could promote interdisciplinary research (from preclinical animal models to qualitative issues) and could also work actively to strengthen regional as well as national networks. International collaborations should be actively sought and pursued.

Rating: *Good, 2/4*

Future plans, potentials and possibilities

For the future, open discussions on research focus and plans for new leadership are strongly encouraged.

Rating: *Good, 2/4*

Interactions with society

Not presented in sufficient detail, but could presumably be developed particularly in relation to one research group.

Gender and equal opportunity issues

Could not be assessed.

Summary and recommendations

It is recommended that the Department of Oncology:

- Defines key research goals.
- Demonstrates integration between the research. Develops plans for succession related to current group leaders.
- Deepens collaboration with the clinic and the clinical trial unit and scrutinizes the research value obtained from clinical trials.
- Actively seeks novel national and international collaborations.
- Promotes interdisciplinary research (particularly related to epidemiology and side-effects from treatment).
- Update its website, particularly with regard to the English version.

Overall rating: *Good, 3/6*

12.4.2 The Department of Radiation Physics

Overall assessment

The Department presents laboratory facilities and equipment for radionuclide analyses, but largely fails to integrate these into shared research aims and goals. Participation in five EU/European initiatives are presented, but the Department’s leading roles in these initiatives remain unclear.

Research quality, productivity, uniqueness and relevance

There is an active research group within radionuclide therapy, using refined methods and biodistribution. The group presents some 40 scientific papers where the professor clearly has a leading role. The other professor reports more limited research activity within the radio-immunotherapy field and probably collaborates closely with an oncology group, although this is not described. There is one senior faculty member with a large number of elegant publications in endocrine tumours, xenograft models and radionuclide therapy. His research activity and profile seem highly interesting and relevant for the Institute, although his role and possible plans for future leadership have not been clarified.

Assessment scale rating: *Very good, 4/6*

Organization and research infrastructure

Although strong researchers are identified, the research organization of the Department remains unclear. Perhaps this could be presented in themes or more preclinical/clinical research clusters.

Rating: *Good, 2/4*

Collaboration and networks

The Department is actively involved in a number of networks and collaborative projects.

Rating: *Very good*, 3/4

Future potentials and possibilities, and interactions with society

Considering the research activity in the radionuclide therapy research group, it is surprising that the Institute has not chosen to highlight this research, which is experimental and clearly translational with promising implications for clinical treatment. The Department promotes interdisciplinary work, which from the evaluation perspective is perceived to some extent as being multidisciplinary with the potential for improved demonstration of how the different perspectives contribute to the added value. The clinical tests that the Department actively works to develop could be outlined from a clinical development perspective and used to strengthen interactions with society, and could possibly also be used to strengthen commercial collaborations.

Collaborations with the Department of Oncology and the Clinical Trial Unit could also be strengthened, which would pave the way for increased interaction with society and the clinical implementation of research findings.

Rating: *Very good*, 3/4

Gender and equal opportunity issues

Not evaluated.

Summary and recommendations

It is recommended that the Department of Radiation Physics:

- Defines key research goals rather than platforms/technologies.
- Demonstrates how multidisciplinary researchers collaborate in interdisciplinary research and take advantage of their different backgrounds to achieve common research goals.
- Deepens collaboration with the clinical trial unit in order to achieve clinical implementation.
- Ensures that researchers and projects are presented on the Department's website.

Overall rating: *Very good*, 4/6

12.4.3 The Department of Radiology

Overall assessment

The Department of Radiology describes participation in several networks, but fails to present key areas of research or specific research goals. It seems, however, from the publications that research is performed relating to surgery, orthopaedics, medicine and technical developments in radiology.

Research quality, productivity, uniqueness and relevance

The Head of Department reports a high level of research activity, with 33 publications during the period, and has published in widely different aspects of radiology. Despite this high activity, the identification of a clear target for this research group would be beneficial. One senior faculty member at the Department also reports a relatively high level of research activity relating to vascular changes and obesity.

Assessment scale rating: *Good, 3/6*

Organization and research infrastructure

These perspectives cannot be commented on based on the information available.

Rating: Not given

Collaboration and networks

The Department reports participation in the Swedish Bioimaging Network, which was established by one of the staff members. However, whereas this network certainly is an important tool for sharing knowledge, its role in promoting research is not clear.

Rating: *Good, 2/4*

Future plans, potentials and possibilities

The Department of Radiology has access to a large number of state-of-the art techniques, but faces the task of making continued investments in expensive equipment and developments in bioimaging. Here, participation in research networks and close collaborations with e.g. the Departments of Oncology and Radiation Physics would be fruitful.

Rating: *Good, 2/4*

Interactions with society

On its website, the Department describes current courses and its place within health care, although there is a lack of research information (such as ongoing projects and research focus) on the site. This is clearly a weakness in relation to research profiling and the recruitment of research students/personnel.

Gender and equal opportunity issues

Not assessed.

Summary and recommendations

It is recommended that the Department of Radiology:

- Defines key research goals rather than platforms/technologies.
- Develops collaborations related to bioimaging.
- Updates its website with research information.
- Works towards a larger number of clinically active researchers, perhaps within new collaborations with basic scientists as well as with other clinical Departments.

Overall rating: *Good*, 3/6

12.4.4 The Department of Urology

Overall assessment

The Department of Urology seems to have been successful in integrating research based on clinical problems with scientific approaches. The Department has unique research possibilities in studies of model systems for androgen-independent prostate cancer and epidemiological studies based on Swedish registries. The research focus is clear and the researchers have managed to set up large-scale clinical studies, and have also received international recognition for their work.

Research quality, productivity, uniqueness and relevance

This Department has presumably incorrectly misplaced one researcher (Damber), who has been added to this section. He conducts leading clinical studies within prostate cancer linked to screening, biomarkers, tumour profiles, clinical studies and outcome measures. His role as a research leader in his field is evident; he reports some 50 articles and he collaborates within large, mainly national, networks. He represents a good example of a translational clinical researcher and could certainly be used as an example of the successful translational research towards which the University strives.

Of the two adjunct professors at the Department, one reports a limited number of publications within urological diseases, while the other reports close to 40 publications relating to early detection/prostate-specific antigen testing for prostate cancer. The one academic staff member studying urological issues has surprisingly limited collaboration with the prostate cancer research, judging from the publications, and combining forces could make Gothenburg one of the leading research clusters for prostate cancer. Another senior academic staff member has a moderate number of

publications in various aspects of urology. In this regard, clarification of the research focus would be relevant if this is an individual whose research should be promoted.

Assessment scale rating: *Very good*, 4/6

Organization and research infrastructure

Strong research focus on prostate cancer. Well-established networks.

Rating: *Very good*, 3/4

Collaboration and networks

Well-established within prostate cancer.

Rating: *Very good*, 3/4

Future plans, potentials and possibilities

The continued success of this research group will depend on identifying upcoming research leaders. It will be crucial for this group to focus on a couple of areas, e.g. epidemiology and clinical studies, and to establish strong collaborations related to e.g. model systems and hereditary causes of prostate cancer. This research group could also develop industrial collaborations related to novel treatment principles for androgen-resistant prostate cancer.

Interactions with society

Good through clinical studies and implementation, but could be better profiled as one of the leading national prostate cancer research centres.

Gender and equal opportunity issues

Not assessed.

Summary and recommendations

It is recommended that the Department of Urology:

- Promotes and develops its role as a leading centre for prostate cancer research, which in some areas is directly driven by the Department and in other areas would be an attractive research partner.
- Deepens collaboration within areas such as functional studies and hereditary causes of prostate cancer.
- Provides an overview of key aims and links between the groups (e.g. screening/ biomarkers and epidemiology/clinical studies).
- Develops an attractive, research-directed website.

Overall rating: *Very good*, 4/6

12.4.5 The Department of Dermatology and Venerology

Overall assessment

The Department has one full professor, an adjunct professor, 4-5 senior faculty members (docents), two other research staff members and one non-research staff member. It lists the Centre for Skin Research Gothenburg, which is easily located via a web search as an interdisciplinary centre with the remit of advancing fundamental understanding of molecular processes in the interaction between the skin and chemical compounds, particles and radiation. There is collaboration with physical, organic and medicinal chemistry, nanotechnology, biophysics, pharmaceuticals and clinical dermatology, with a focus on the prevention, diagnosis and treatment of skin cancer and allergic contact dermatitis, and on extending the use of the transdermal route for drug delivery. There is also some high level research on venereal disease (herpes).

Research activity, quality, productivity, uniqueness and relevance

Some 70 publications since 2006 and five PhD theses are listed for this centre, and the members of the Department seem to be involved in a substantial number of these publications. This appears as a strongpoint of the Department, which also has its own laboratories. The Department lists its facilities and collaboration with technical areas of the University and Chalmers in Gothenburg, as well as with three European universities. An overview of the quality and quantity of research needs to be provided. The research seems to be published largely in medium or higher regarded journals in the field, and there are highly active members of the team. The relation with the Centre for Skin Research Gothenburg is strong, as is the relation to the Department of Biomaterials.

Assessment scale rating: *Very good*, 4/6

Organization and research infrastructure

Information is lacking, especially regarding the nature of the links to the Centre for Skin Research Gothenburg.

Rating: *Good*, 2/4

Collaboration and networks

Information is needed, especially regarding the nature of the links to the Centre for Skin Research Gothenburg.

Rating: *Good*, 2/4

Future plans, potentials and possibilities

The future lies in deriving added strength through collaboration as defined in the Department's aims and in allying it to a larger unit on the medical side, such as the Department of Oncology. Links to the pharmaceutical and cosmetics industries might be needed.

Rating: *Very good*, 3/4

Interactions with society

There is a clear need for a department in this field to be active in advising the public on the rational use of heavily marketed skin substances. From the publication lists, this appears to be minimal.

Gender and equal opportunity issues

Not assessed.

Summary and recommendations

It is recommended that the Department of Dermatology and Venerology:

- Defines key research goals and its relationship with the Centre for Skin Research Gothenburg.
- Considers joining the Department of Oncology through links to skin cancer research.
- Actively seeks novel national and international collaborations.

Overall rating: *Very good*, 4/6

12.5 THE SECTION FOR SURGERY AND GASTROSURGICAL RESEARCH AND EDUCATION

12.5.1 Self-evaluation

The initial description of this section is somewhat confusing, particularly in terms of staff distribution. Under the 'Section' there is a total of 17 staff, of which four are adjunct professors, one is a senior faculty member and the others are graduate students, postdoctoral researchers and non-research staff. The activity and structure of the Section are not described, but from publications submitted and a literature search, the themes followed are transplantation, cancer cell biology (including prostate cancer work) and neurosciences. There appears to be no obvious cohesion between the groups. The level of publication is of combined national and international impact, but no stellar international leading output is seen.

The Department of Surgery mentions research in the areas of cell and organ transplantation, and tumour-host interactions in cancer. There are 25 members of staff including seven full professors, but it is not clear how many are surgeons and/or scientists. There are also two associate professors (docents), and the others are post-doctoral and non-research staff.

The Department of Gastrosurgical Research and Education mentions mainly gut surgical and basic science research, including neurophysiological and pharmacological studies, with a split affiliation between Sahlgrenska Hospital and the Sahlgrenska Academy. The Department consists of six staff, including one full professor. The others are senior and post-doctoral staff and graduate students.

The Department of Plastic Surgery is a new addition to this section. It has quite elevated goals and but in actuality its performance seems to have declined from a previously high level.

There are no described formal links between these sections and departments in terms of vision and strategy, apart from a SWOT analysis, and a two-line mention of societal impact by interest raised with pharmaceutical companies and industry.

12.5.2 The Department of Surgery

Overall assessment

The Department performs research through clinical and experimental studies on several aspects of surgery, including cell/organ transplantation and end-organ failure, which is helped considerably by the very strong transplant clinical activity at the hospital, which is extremely comprehensive and internationally leading. Research into tumour-host interaction in cancer, particularly in gastro-intestinal disease, is also carried out. There appears, however, not to be a well-described connection between the groups, although some activity and knowledge could be exploited further in view of their overlapping nature. Clinical research is not well described, and no specific strategy defines the direction of the Department.

Research activity, quality, productivity, uniqueness and relevance

One professor has a limited number of publications (25 – PubMed), mainly within the gastro-intestinal/carcinoid field. Another senior staff member has fewer publications (10 articles – PubMed) mostly on transplant cell biology, while another has published widely on nutrition and gastro-intestinal research as well as a cancer component, with excellent internationally competitive outputs, and is clearly an asset to the Department. There is also prolific output on colorectal disease and on transplantation biology; others publish well on vascular biology and disease. The transplant theme is the strongest, with a long-established track record and continuing output, both experimentally and clinically. Although the report mentions the ambition of the

group to expand the multidisciplinary nature of its activity, no details are included on how the group will achieve this. This was, however, evident at the site visit, where frontline developments and collaborative efforts were described. The cancer research work is very interesting and promising, but currently lacks stellar outputs, and there is little evidence of interaction with the Department of Oncology, or at least this is not apparent in the report, particularly with regard to translational research aims. The new Cancer Research Centre presented at the site visit, and in the process of being set up, is likely to alter this considerably for the better. For instance, there is one publication on prostate cancer by a Section member, but no reference to interactions with the Department of Urology, which has a strong prostate cancer theme.

Assessment scale rating: *Good*, 3/6

Organization and research infrastructure

The research areas are focused, but there are some apparently disjointed areas, although this impression may be related to the presentation of the document, and the visit by assessors may help to clarify this in due course. Succession and career development plans for academic staff are not mentioned.

Rating: *Good*, 2/4

Collaboration and networks

Although the transplantation theme is cohesive and appears well organized, the Department in general could promote further interdisciplinary research and could also actively work to strengthen regional and national networks. International collaborations should be actively sought and pursued.

Rating: *Good*, 2/4

Future plans, potentials and possibilities

The SWOT analysis submitted is very helpful, and outlines the potential areas for improvement in the future. These are, however, rather vague, and it would be very helpful to translate this into a five-year vision and strategy for the Department.

Rating: *Good*, 2/4

Interactions with society

Not presented in sufficient detail, but could presumably be developed particularly in relation to the transplantation theme.

Gender and equal opportunity issues

Not assessed.

Summary and recommendations

It is recommended that the Department of Surgery:

- Defines key research goals and strategy over the next five years.
- Demonstrates integration between the research groups and other departments, particularly with regard to Oncology.
- Develops plans for succession related to current group leaders.
- Deepens collaboration with the clinic and the clinical trial unit and scrutinizes the research value obtained from clinical trials.
- Actively seeks novel national and international collaborations.
- It was not possible to access an English version of the Department's website – this needs to be addressed urgently.

Overall rating: *Good*, 3/6

12.5.3 The Department of Gastrosurgical Research and Education

Overall assessment

This is a small department with six members, including one professor, two senior faculty members, one postdoc research assistant and two graduate students. The Department has a world-leading track record with the discovery and translation of proton pump inhibitors into a well utilized drug which is widely used for peptic ulcer disease in the upper gastro-intestinal tract. This has been a major success over the years, with much to be proud of for Gothenburg and its academic community. Research in this area continues. The Department is small in its present state, and is in much need of urgent expansion with new blood and recruits in strategic research areas of gastro-intestinal disease.

Research quality, productivity, uniqueness and relevance

There appears to be very effective group leadership and prolific production, with a high level of publications of international impact. The thrust of the research is on gastric acidity and this has been successful in strong translational research. More recently, new interests were developed in early esophageal carcinogenesis and bariatric surgery, which is of major topical importance in the western world. This will undoubtedly yield exciting results and outputs in a relatively short time, particularly on the metabolic side. The Department's focus and strategy are excellent and impressive. It will continue to be world-leading.

Assessment scale rating: *Excellent*, 5/6

Organization and research infrastructure

Details of the Department’s research organization remain unclear. This could not be fully clarified during the visit.

Rating: Not done

Collaboration and networks

The Department has strengths in accessing important cohorts, and has developed good cooperation with Chalmers University of Technology. There are no details of further national or international networks.

Rating: *Good, 2/4*

Future potentials and possibilities, and interactions with society

The future clearly lies in supporting the infrastructure, and the excellent evolving themes in upper gastro-intestinal and bariatric surgery research. Succession plans are missing, and the Department is in need of expansion.

Rating: *Good, 2/4*

Gender and equal opportunity issues

Not assessed.

Summary and recommendations

- Define a clear five-year strategy, which will provide a plan for expansion, new recruitment and an improvement in the departmental infrastructure.
- Foster multidisciplinary research.
- Engage more clinicians in the goals and aims of the Department.
- The Panel has not been able to access an English version of the Department website which would be informative about the academic activities and research undertaken within the Department. This needs to be addressed urgently.

Overall rating: *Very good, 4/6*

12.5.4 The Department of Plastic Surgery

Overall assessment

The present focus stated by this Department is to understand in a wide sense phenotype-genotype interactions of craniofacial disorders, a useful topic for a multidisciplinary clinical scientific approach including cooperation with orthodontics, maxillofacial surgery, otorhinolaryngology and clinical genetics. Palatoschisis and abnormal dentition and the many facial malformation syndromes might be a large topic for a common effort in the genomic field and an example of how to inte-

grate different clinical departments for translational research opportunities. Such an approach is lacking in the scientific output presented. Craniofacial surgery has a good basic history in craniofacial malformations at the Department (see Lauritzen and Tarnow, *Scand J Surgery* 2003; 92: 274–280), including stainless steel spring implantation for cranial synostosis and attempts to form a Nordic referral centre. This is only indirectly mentioned in attempts to use biodegradable material and silicone instead of springs. The Department lists wide interests and access to the largest existing body of material on people with craniofacial syndromes as well as an international influence; yet only one adjunct professor is listed in terms of staff. The activity must be carried out by staff belonging to the clinical side at Sahlgrenska Hospital.

Research activity, quality, productivity, uniqueness and relevance

From the publication list obtained, the Department's output seems small with only a few publications in medium to high ranking journals.

Assessment scale rating: *Insufficient*, 2/6

Organization and research infrastructure

Information on this is only found in overview form in the self-evaluation. The website of the one academic member does not provide information on current research activity.

Rating: *Poor*, 1/4

Collaboration and networks

Information on this is only in overview form.

Rating: *Poor*, 1/4

Future plans, potentials and possibilities

Given the academic weakness of the Department, albeit with a past history of more activity, its future placement must be with the much stronger section on surgery, where it has now been placed. The strong database on craniofacial anomalies and the need to use this in conjunction with advanced corrective surgery means that close connections with the Department of Biomaterials and the Transplantation Unit seem to be indicated, as well as considering at a nationwide and even Nordic Council level whether the centre should assume an earlier advocated role as a referral centre for a much larger population base.

Interactions with society

Information is lacking, but the Department should focus on advocating an understanding of the problems of craniofacial surgery for children.

Rating: *Insufficient*, 1/4

Gender and equal opportunity issues

Not assessed.

Summary and recommendations

It is recommended that the Department of Plastic Surgery:

- Defines better and more limited research goals for now.
- Considers integration with the main surgical sciences section.
- Deepens its collaboration with the University's Department of Biomaterials and Department of Orthodontics.
- Defines its relationship with private plastic surgery and develops a lead role in relation to this.
- Actively seeks novel national and international collaborations.
- Promotes interdisciplinary research (particularly in relation to genetics and the use of the craniofacial database in this, as well as the use of new biomaterials).
- Creates a website.

Overall rating: *Insufficient*, 2/6

SUMMARY COMMENTS ON THE INSTITUTE OF CLINICAL SCIENCES

The Institute of Clinical Sciences comes through as strong, with good and dynamic leadership, some excellent units are on a progression path, other units that are strong but relatively static, and a few that have declined and need strengthening. More must be done to ensure that all sections produce annual reports similar to those of Section I and to strengthen the reporting of research output to the University and identify all those who work on research within the Sahlgrenska Academy as belonging to the University in some way. Age and gender issues need to be addressed and younger recruitment with an emphasis on efforts to recruit from outside the Department and internationally must be carried out.

It is recommended that the Institute of Clinical Sciences:

- Defines key research aims and goals.
- Updates all webpages to include ongoing research, promote strong areas, and present all information also in English.
- Improves integration between the different projects and provide incentives for collaborations between teams.
- Promotes interdisciplinary research.
- Presents clear plans for succession with a process for the internal promotion of new team leaders in key research areas, in order to attract young scientists and
- Strengthens the external communications of the Institute.

Summary of assessments – the Institute of Clinical Sciences

Overall assessments

Department of Obstetrics and Gynecology – *Very Good*
 Department of Pediatrics – *Very Good*
 Department of Anesthesiology and Intensive Care – *Good*
 Department of Biomaterials – *Excellent even Outstanding*
 Department of Orthopedics – *Very good*
 Department of Otorhinolaryngology – *Good*
 Department of Oncology – *Good*
 Department of Radiation Physics – *Very good*
 Department of Radiology – *Good*
 Department of Urology – *Very Good*
 Department of Dermatology and Venerology – *Very good*
 Department of Surgery – *Good*
 Department of Gastrosurgical Research and Education – *Very good*
 Department of Plastic Surgery – *Insufficient*

Research activity, quality, productivity, uniqueness and relevance

Department of Obstetrics and Gynecology – *Very good*
 Department of Pediatrics – *Very good*
 Department of Anesthesiology and Intensive Care – *Good*
 Department of Biomaterials – *Excellent to Outstanding*
 Department of Orthopedics – *Very good*
 Department of Otorhinolaryngology – *Good*
 Department of Oncology – *Good*
 Department of Radiation Physics – *Very good*
 Department of Radiology – *Good*
 Department of Urology – *Very good*
 Department of Dermatology and Venerology – *Very good*
 Department of Surgery – *Very good*
 Department of Gastrosurgical Research and Education – *Excellent*
 Department of Plastic Surgery – *Insufficient*

PANEL 13 – HEALTH AND CARE SCIENCES

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13. THE INSTITUTE OF HEALTH AND CARE SCIENCES

13.1 Overall assessment

The Institute of Health and Care Sciences (IHCS) is one of six departments at the Sahlgrenska Academy. It was incorporated into the University of Gothenburg less than 13 years ago. IHCS has developed from a nursing school offering undergraduate degrees in nursing and allied sciences to become responsible for both first- and second-level education (equivalent to a master's degree) in nursing, radiography, midwifery and health care education and third-level education (PhD studies) in health and care sciences. In this period there has been a significant increase in the number of staff, PhD students and publications.

The number of academic staff (including PhD students) has increased from a total of 93 in 2004 to 136 in 2009, which amounts to a total increase of 43 research personnel in 2009. There has been a threefold increase in professors from two to seven. The number of adjunct professors and senior lecturers has also increased from 21 to 33. Eleven PhD students were employed by the University in 2004 compared to 16 in 2009, while a total of 55 PhD students were registered in 2009. In the same period 38 PhD students graduated. The mean age of staff and doctoral students has remained high during the assessment period. In 2009 it was 60 years, 57 years, 44 years and 45 years for professors, senior lecturers/associate professors, postdocs and employed PhD students respectively.

IHCS has had an impressive increase in international scientific publications. The number of publications in esteemed peer-reviewed scientific journals has increased from 27 in 2004 to 108 in 2009. An increase could be expected as the number of research staff has increased in the same period (including the number of PhD students). However, the result is impressive in view of the variation in the proportion of research time in the positions. Only a few of the personnel have a large research proportion in their position: two postdocs (100%), three research fellows/assistant professors (mean 73%) and seven professors (mean 41%). For the other groups (43 people), the research element of their position is on average 24%. When looking at the number of publications, the increasing number of the PhD students must be taken into consideration as well.

The research at IHCS covers a broad area, with the research profile framed within and guided by the concept of person-centred care. The following subdivisions were established during autumn 2009: 1) Symptoms, health and care, 2) The significance of the environment for health and care, and 3) Learning and leadership in health care and education. Within each of these subdivisions there is a combination

of staff including professor(s), senior faculty members, postdoctoral fellows, PhD students and other research and non-research staff.

The overall impression is that the research is highly relevant to society and health care. Some of it is also unique and innovative. Some of IHCS's researchers are excellent and internationally well renowned. As a whole, the research at IHCS is rated as very good, with great potential. Some of the research is excellent. This is particularly the case for some of the research within the subdivision "symptoms, health and care" and the subdivision "the significance of the environment for health and care".

International collaborations are reported, but do not appear to be very strong. Although there are good examples related to individual researchers and/or research projects, an overall strategy for different actions (including both education and research) related to internationalization seems to be missing.

The internal annual funding of SEK 5 million to promote and stimulate promising research projects is valuable. The amount of external funding, however, has been moderate in the period from 2004 to 2009. There are some variations over the years, but the general impression is that there must be a greater potential for external funding, including based on the annual internal funding. The internal funding should prepare for applications for external funding.

In that sense, it is of great significance that University of Gothenburg obtained a strategic government grant of SEK 90 million which was allocated to the IHCS together with an additional SEK 45 million in co-funding to establish a research centre for person-centred care: the University of Gothenburg Centre for Person-Centred Care (GPCC). The overall goal is to establish extensive multidisciplinary research collaboration within the University of Gothenburg, particularly within the Sahlgrenska Academy. The organization and research themes at the Institute and the new research centre for patient-centred care is in part overlapping and in part different, but the strategy behind these differences and how they actually relate to each other is not quite clear. This might be resolved in the near future, since the GPCC has only recently been established and not all leaders of the core projects have been decided on. However, the potential for high quality research seems to be great. It is also expected that there will be a synergy effect between the research activities at GPCC and the Institute. The opportunity to really make a difference seems to be great. Success will be dependent on how IHCS (and GPCC) deals with recruitment strategy, especially in relation to compensating for the high average staff age, and increasing career opportunities and recruitment from outside the University, both nationally and internationally. One might also expect that the establishment of GPCC will generate additional funding during the next few years.

13.2 Research quality, productivity, uniqueness and relevance

Seen as a whole, the research carried out at the Institute, as presented through an increasing number of publications in well-respected international journals, is judged to be of a high quality. The most frequently used journals are high-ranking nursing journals, but IHCS also has a substantial number of publications in good multi-professional journals. In addition to scientific publications, the Institute contributes a large number of publications aimed at disseminating its research findings through textbooks, book chapters and articles in professional journals.

In 2009, the research activity was reorganized into three sections (as mentioned above). Although staff are administratively assigned to one section, there seems to be a wide overlap between the sections in terms of actual research projects. The site visit confirmed that the sections are not consolidated research areas, but that the researchers expect that the profile of each of them will be developed and become clearer over time.

Symptoms, health and care

This research profile stands out as a strong theme with a clear focus, a good mix of investigators, evidence of good international collaboration and the potential for significant societal impact. It is led by a nationally and internationally esteemed researcher, who is also the leader of the newly established GPCC. It is judged to be *excellent* in terms of quality, uniqueness and relevance. The site visit strengthened the impression of research quality and productivity, highlighting the long-term investment and cumulative research within this area. Some of the researchers have demonstrated excellent research within their areas. The research productivity is high, with almost 100 publications and three national grants. With investment and strategic direction, this research theme may be increased to outstanding.

The significance of the environment for health and care

This is an important research theme covering a number of important research topics. It is led by a nationally and internationally esteemed researcher, and has a good mix of researchers at different levels of seniority. Some of the projects seem to have a very productive multidisciplinary foundation. Based on the self-evaluation and the site visit, it is not quite clear how the different ongoing research projects relate to each other and the overall theme. At this point, the research groups and studies seem to work in parallel, addressing a wide number of topics and contexts. It is also not clear how the concepts of time, place and space are addressed in the different projects. This theme is judged to be *very good* in terms of quality, with examples of unique and highly innovative projects. In terms of relevance, it is *excellent*. It has also shown high productivity, with about 100 publications and various national grants. The area has great potential, given strategic leadership aimed at clarifying

and unifying the theoretical, methodological and empirical foundations of its currently diverse research areas and groups.

Learning and leadership in health and education

This theme appears to be less developed and clear compared to the two others, but has individual productive researchers conducting high quality research. The short overall description of this research profile emphasizes learning generally. However, the presented research concentrates on distance learning and communication with patients/users in relation to health and illness issues. This is undoubtedly an important, highly relevant and innovative area in terms of applying new ICT techniques to provide educational support. The issue that the expert panel raises relates to the significant overlap of this theme with the two others. Learning, leadership and the application of new technology seem to be essential aspects across all the themes. From the self-evaluation and the site visit, one may question whether this area should have been better integrated with the two others, as it is closely associated with the person-centred care idea that is the foundation for all the themes and the new research centre (GPCC). It may also be understood as an overarching theme, similar to those of methodology and innovation/utilization (see below). This is substantiated by the fact that, under the heading of most promising research area or research direction, two substantive research areas are highlighted in addition to the methodology theme: symptoms research and ‘culture and learning’ research. The latter seems to be a merger of the environment, health and care theme and the learning and leadership theme. Despite the critical comments above, the *productivity* within this theme is also *very good*, with about 100 publications.

GPCC

Earlier this year, IHCS was awarded a total of SEK 135 million to establish the multidisciplinary and university-wide Centre for Person-Centred Care (GPCC) research centre. The funding awarded to this initiative is unusually large within the field of health and caring sciences, and this accomplishment is therefore judged to be *outstanding*.

The centre will focus on three core domains with two supporting domains. The core domains are: 1. Symptoms research, 2. Health care organizational research, and 3. Informational systems (communication/informatics). The three core themes are supported by two domains: methodology and innovation/utilization. The core themes of the centre are quite similar, but not identical, to the research profile themes of the three sections of the Institute. It is somewhat confusing that the research profiles of IHCS and GPCC are both very similar and overlapping, but still different, and it is not clear how they are actually linked. It is reasonable to assume that the multidisciplinary nature of the centre and its interaction with several of the University of Gothenburg’s faculties may explain the difference in focus of topic

areas. However, it would be useful when presenting the research profile of IHCS to explain the differences and links between GPCC and the existing sections, as GPCC is mainly anchored and led from within IHCS. Judging from its goals and plans and its close ties to the Institute's long-term and ongoing successful research, GPCC has great potential. It provides an opportunity for IHCS, the University of Gothenburg and its various partners to develop robust international collaborations, recruit new scholars from abroad and prepare for the next generation of researchers within this field. It will require strong and strategic leadership and good institutional support if it is to spend the allocated funds wisely during the next five years. There is no strategy in the self-evaluation report for how to realize the potential created by funding, either at IHCS, Faculty or University level. Although it is too early to judge the quality of any results, the relevance and uniqueness of the centre is *very high*. However, it was a striking and worrying observation at the site visit that the success of achieving the large grant for this centre was not mentioned either by the Vice-Chancellor or the Dean, despite the fact that this is one of the strategic areas identified in the University of Gothenburg's strategic plan. If this signals a lack of committed support from the Faculty and the University leadership, this might threaten the success of the newly established centre. We hope this omission does not indicate such a lack of commitment.

In summary, the research at IHCS is judged to be *very good*, with some research groups producing *excellent* research. The relevance is judged to be *excellent*. Productivity is *very good*. Most of the current research is multidisciplinary, which is considered to be a strength. It is not entirely clear how the caring sciences as such will be developed in this highly multidisciplinary research. This might be accomplished through articulating the theoretical foundations of person-centred care and other central disciplinary theoretical perspectives contributing to the research, a task that the site visit indicated is currently underway.

13.3 Organization and research infrastructure

The organization of IHCS into three sections based on research profile is a good way to make the profile clearer and to visualize the research. However, as mentioned above, there seems to be a substantial overlap between the different sections. It is suggested that IHCS evaluates the suitability of the sectional structure after a while to see whether this organization functions or not, including in relation to the research programmes at GPCC.

Stable and supportive research infrastructure is pointed out as a strength in the self-evaluation. IHCS has focused efforts in relation to strategic capital allocations to support research, important external funding, strategic recruitment and staff planning, and collaboration with the Sahlgrenska University Hospital and Region Västra Götaland. These efforts are important. However, there could have been a

more distinct plan for the future development of specific resources supporting research infrastructure. Strategic recruitment will be of the utmost importance in the years to come.

IHCS seems to be less dependent on heavy infrastructure. If there are such needs, these should be highlighted.

Regarding the organization of GPCC, it is described by an organization chart showing the structure, advisors and support systems. Even if the Programme Director of GPCC is employed at IHCS, GPCC is a centre for the whole University. The Vice-Chancellor, Dean and IHCS representatives all stated this. It is too early to say whether the organization of GPCC is the best way to accomplish its goals. This must be evaluated when the centre has been operating for some time.

At the site visit, we were introduced to GPCC's premises at the hospital. These premises, consisting of offices and other infrastructure, are judged to be very good. A place for researchers to meet and discuss and carry out research activities is valuable.

Based on IHCS's efforts to organize the research activity into three overall profiles and the future potential for the research in relation to GPCC, the organization of research is rated as *very good*. Regarding resources to support research infrastructure in terms of internal funding and recruitment, this is rated as *good*. In order to reach the goal stated in the self-evaluation report, a more detailed strategy is needed.

13.4 Collaboration and networks

IHCS reports extensive research collaboration with clinicians and researchers at Sahlgrenska University Hospital and with institutions and organizations within Region Västra Götaland. They also report international collaboration. This is evident in their publications. More than half of the publications in the period 2004-2009 are in collaboration with authors outside the University. About 25% of the refereed papers in the same period are in collaboration with international researchers.

Staff at IHCS are currently partners in two FP7 projects: Living Organ Donation in Europe (LODE) and Childbirth Cultures, Concerns, and Consequences: Creating a Dynamic EU Framework for Optimal Maternity Care (COST action). It is not clear what the partnership entails in terms of research.

Collaboration is also reported with several different international universities. However, although several of the staff members collaborate across their own institution and with other institutions, both nationally and internationally, the kind of collaboration taking place could have been described in more detail. It seems that

international collaboration could be improved. Strengthening the international collaboration in both education and research should be strongly emphasized in the next years. In building up GPCC, the recruitment of international researchers with high competency should be a main priority.

The staff at IHCS also participate in a number of research networks, but again the nature of these networks and how they contribute to IHCS's research capacity is unclear. Building networks strategically with researchers working within the area of person-centred care, both nationally and internationally, should be a high priority. Networks might make it easier to engage people both temporarily and permanently.

Looking at the numbers for international cooperation in terms of research visits abroad for more than three months and guest researchers visiting the University of Gothenburg for more than three months, the numbers are low. Only two members of staff have been abroad for more than three months, and there have not been any guest researchers visiting the University of Gothenburg for more than three months. Even though there have been visits of shorter durations, there must be the potential both for University of Gothenburg staff to go abroad for longer periods and for guest researchers to stay for longer periods at the University of Gothenburg.

The conclusion of the panel is that positive and important national and international collaborations are taking place, especially regarding publications in collaboration with international partners. However, regarding mobility, the panel considers international collaboration to be below what could be expected. Both involvement in projects and publications with international collaborators would have made the mobility of researchers, PhDs and postdocs possible if there was a strategy for this. Furthermore, if IHCS aims to apply for EU funding, arranging researcher and student exchanges is essential. An overall strategy for internationalization should be developed. Based on the lack of an explicit strategy for internationalization in general and the low level of international exchange and mobility in particular, collaboration and networks is rated as *good*.

13.5 Future plans

The site visit revealed strong optimism regarding the future. Quality in research was expressed as a main goal. At this point, the organization of IHCS in relation to GPCC should have a high priority. Even if there has been a reorganization of research at IHCS, the structure of IHCS does not correspond to the perceived structure of GPCC. The panel had problems finding out the structure of the research profiles, their overlap and their connection with GPCC. It is not clear which research activities are tied to GPCC and which are tied to IHCS. This might be due to the fact that the research areas at both IHCS and GPCC in general are too broad. This might be easier to sort out when GPCC's core projects are being established.

It will be of crucial importance for the future to consider the structure and overlapping areas so that research resources are used in an effective way.

The principal investigators (PIs) at IHCS are also involved in GPCC. This could be seen as an advantage in order to have an overview of the activities carried out by GPCC and the Institute. If this is taken advantage of, it will certainly strengthen the opportunities for collaboration and network building.

An overall strategy and more concrete action plans for the future are lacking. Action plans for internationalization and recruitment in particular will be essential if IHCS is to be capable of fulfilling its research ambitions. Therefore, the panel rates the future plans for *good*.

13.6 Future potential and possibilities

IHCS, in collaboration with GPCC, has an extraordinary opportunity for knowledge expansion within health and care sciences based on the amount of funding, which is quite unique. If IHCS manages to organize the collaboration with GPCC in an effective manner by recruiting good researchers and carrying out high quality research, they will have the potential to expand the knowledge within these areas and create knowledge that can make a difference. IHCS and GPCC will have a critical mass of researchers at different levels that will go far beyond many other universities in Europe and the rest of the world. The profile and the concretization of core projects will be crucial for a positive development. Increased interest in care science nationally and internationally might be a result of the research at the University of Gothenburg. However, that will require that the University of Gothenburg communicates to society and the research community what research is being carried out.

Another key to success is support from the leadership of the University of Gothenburg both to mobilize the different institutes (and disciplines) involved in the realization of GPCC and to communicate to society the importance of the research being done.

The panel rates the future potential and possibilities as *very positive*.

13.7 Research activity and teaching

In 2009, IHCS had 987.5 student full-time equivalents (FTE) with a student FTE to senior academic staff ratio of 26.7 and a student FTE to academic staff ratio of 10.8, which seems to be acceptable. At the site visit, it was stated that teaching and research activity go hand in hand at all levels. The self-evaluation report indicates that there is research-based education at all levels. Professors are educating both first- and second-level and PhD students.

Based on what has been reported both in the self-evaluation and during site visits, research activity and teaching are *very good*.

13.8 Interaction with society

The self-evaluation report states that IHCS has prioritized societal interaction and the implementation of research, and describes a close collaboration with Sahlgrenska University Hospital and Region Västra Götaland. More projects are linked to Sahlgrenska University Hospital. This is important, taking into account the profile of the research at both IHCS and GPCC: person-centred care. However, it is not clear whether this collaboration is based on individual contact or institutional collaboration.

Even though much that is positive is taking place, the panel rates interaction with society *as expected*. There is still the potential to increase this interaction, especially in relation to the establishment of GPCC.

13.9 Gender and equal opportunity issues

About 70% of professors, 90% of senior lectures and 80% of PhD students are female. These numbers are in accordance with health sciences in general, where women greatly outnumber men at all levels, including among research personnel.

Based on IHCS's description of this, the panel rates this as an area where there is a conscious agenda to try to balance gender if possible.

13.10 Other issues

Organization and strategies

The organization of research in the years to come must be seen in connection with the establishment of GPCC. Possible reconfigurations might be carried out to confirm the strong research areas at IHCS on the one hand and the collaboration within GPCC's core projects on the other hand.

Research groups within IHCS

In the description of the most successful research areas, the number of people involved is listed. How these people are organized is not described. Are they organized in a research group with regular meetings? The same can be said about the description of the most promising research areas. How are they planning to organize the research activity? It is not mentioned whether the research groups are the basic research unit. If there are research groups, no information is given of their size or function. A chart showing the different research groups (size and function) would make this issue clearer, including in connection with the recruitment of new PhD students, postdocs and senior researchers. International collaboration within each of the research groups should also be described.

Staff demography and working conditions

The mean age of both the professors (60 years) and senior lecturers/associate professors (57 years) is worrying. The same is true for the doctoral students (45 years) and the postdocs (44 years). The age of PhD students is also increasing. Of those employed by the University of Gothenburg, eight PhD students were born in the 1950s, four in the 1960s, two in the 1970s and two in the 1980s. Within the University of Gothenburg, the mean age at IHCS is estimated to be higher than average. The high age is also reflected in the age at which PhD exams were taken, which was 40+ for all students.

The Government grant of SEK 90 million and the additional SEK 45 million in co-funding by the University of Gothenburg for GPCC is a unique opportunity for IHCS to develop the knowledge base in person-centred care for the next five years. However, a large proportion of IHCS's permanent staff will be close to retirement age after the five year funding period. It is therefore crucial for the further development of IHCS that there is an active recruitment of younger staff, including doctoral students and postdocs, during the next five years.

Professors have about 40% research time and senior lecturers/associate professors have 20%. These numbers are worrying, as they may threaten the overall research capacity of IHCS.

Recruitment and mobility

Newly employed staff with a PhD degree are recruited primarily from the University of Gothenburg but outside IHCS. The grant to GPCC should also be seen as a possibility to attract international talent. Start-up funding for newly recruited researchers should be considered. Mobility within IHCS seems to be low. There should be an increased focus on mobility. As a response to this challenge, IHCS has launched what is known as an Amanuensis programme, aimed at recruiting young research talents and providing them with opportunities to get acquainted with research. The goal is to recruit students into PhD studies earlier in their careers. It is not clear whether this strategy has been successful.

PhD studies and graduation

Even though the mean age of the doctoral students can be characterized as high, the net study time has been about four years full-time from start to PhD examination. Of course, this is only the case if the net study time really reflects the whole PhD period; that means that the doctoral students are registered as doctoral students from day one. In contrast to the four year net study time reported by the University of Gothenburg, numbers from the Swedish National Agency for Higher Education indicate gross study time. Many PhD-students (39 out of 55) are registered at but

not employed by IHCS, and a gross study time of eight years might be related to the fact that most of these are employed/studying <50% than >50%.

The longer the total duration of PhD studies, the older the candidates. This is worrying because of future career possibilities. Strategic recruitment of young students will be important in the future. IHCS reports a strategic plan for PhD student recruitment and PhD education. Recruitment will be strategic in relation to GPCC's core projects and IHCS's areas of strength. The success of actions in relation to strategic recruitment and the shortened duration of total study time should be evaluated after a few years.

Forty-four PhD students have been admitted since 2004, with 18 being admitted in 2004. In the same period, 38 students received their degrees. In 2009, 55 PhD students were registered. Of the staff, seven professors, twelve associate professors and two senior lecturers are main supervisors, and eleven members of staff of various categories are co-supervisors.

Despite challenges in relation to recruitment, age and internationalization, the PhD students present at the site visit category meetings expressed general satisfaction. They were very optimistic. They reported regular follow-up, supervision and consciousness in relation to progression, and satisfaction with information. One activity that seemed to be non-existent was organized research or graduate schools. Furthermore, transferable skills as a part of their PhD studies did not seem to be recognized.

13.11 Self-evaluation

The documents in the self-evaluation written by the Vice-Chancellor and the Dean gave an overview of important information regarding the University of Gothenburg and Sahlgrenska University Hospital respectively. However, the presentations did not give an impression of an overall strategy, and the strategic plans were given little space in the documents, although the site visit made clear that they exist. Another issue is that the strategic areas described in the Vice-Chancellor's information, including person-centred care, were not emphasized in the Dean's report, either orally or in writing. Taking into consideration the large grant of SEK 90 million and the resulting opportunities to increase knowledge and expertise within this area, this poor attention seems strange.

The description and plans in the self-evaluation by IHCS are considered fairly poor by the panel members, especially since the University would not have been able to achieve the GPCC grant without good and convincing arguments about the ability of IHCS. The site visit was therefore very useful in terms of gaining a broader insight into the activities of IHCS.

13.12 Summary and recommendations

During the last 13 years, IHCS has demonstrated an impressive development in research productivity, documented through an increase in research staff at all levels, international publications in renowned peer-reviewed scientific journals and, last year, through a large external grant to establish a multidisciplinary research centre for person-centred care (GPCC). IHCS has great potential to achieve a unique position within person-centred care research, together with GPCC. The stable funding of GPCC for the next five years makes it possible to work strategically within the defined research areas. Success will depend on developing clear and sufficiently circumscribed core research themes to ensure cumulative, high quality research. This will require further work in order to clarify the organization of research at IHCS in relation to GPCC and define person-centred care more precisely. Furthermore, the strategic recruitment of highly competent researchers and the increased mobility of IHCS's own researchers will be required in order to develop the necessary research capacity and skills to use the extensive strategic government grant in the best way possible. Committed support from the leadership of the University of Gothenburg and Sahlgrenska University Hospital is required in order to succeed.

The panel's recommendations for success:

- Clarify the distinction between research areas at IHCS and GPCC, and continue to develop these research areas into more precise core research themes.
- Develop a clearer organization of the research activities in terms of research groups and research group activities within and across IHCS and GPCC.
- Develop a strategic plan and action plans for:
 - Internationalization
 - Research collaboration
 - Mobility
 - Guest lectures
 - Recruitment
 - Nationally and internationally
 - Search for talent
 - Interaction with society
- Carry out long-term planning for further external funding including, EU funding.

13.13 Summary of gradings – the Institute of Health and Care Sciences

Research quality: *Very good* (some Excellent)

Productivity: *Very good*

Relevance: *Excellent*

Organization: *Very good*

Research infrastructure: *Good*

Collaboration and networks: *Good*

Future plans: *Good*

Future potential and possibilities: *Very positive*

Research activity and teaching: *Very good*

Interaction with society: *As expected*

PANEL 14 – MEDICINE

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14. THE INSTITUTE OF MEDICINE

The Institute of Medicine is a kind of virtual institute based on six departments (and one unit) with different research objectives and geographical locations. The Institute employs around 250 researchers, of whom 46 currently have professorships. The number of professors has been stable for some years, and there are open chairs at present due to recruitment problems. Most professors have a shared position and use on average 52% of their time for research, while some use less and a few more than 80% of their time. The number of postdocs has increased in recent years and is now around 40. On the other hand, the number of PhD dissertations per year is falling and was last year down to 35. However, the number of registered PhD students currently is fairly high, at around 240, but most PhD students are part-time researchers and the average age for the dissertation is still high, at around 38. The number of publications has increased in recent years and was nearly 650 in 2009. Many papers appeared in Swedish journals, but several papers were published in the most prestigious international journals.

The total research budget 2009 was around SEK 260 million, and only 18% came from the University. Around 20% came from ALF funding, while the rest was obtained externally. About 50% of the grants from the Swedish Research Council awarded to the Sahlgrenska Academy were obtained by the Institute of Medicine. However, compared to Karolinska Institutet and Lund University the Gothenburg University Institute of Medicine seems to obtain a lower percentage of the Swedish Research Council grants.

Research quality

The overall evaluation of the research quality for the whole Institute is rated *Very good* to *Excellent*, with a significant variation between the groups ranging from *Insufficient* to *Outstanding*. The Department of Molecular and Clinical Medicine, together with some parts (osteoporosis) of the Department of Internal Medicine and of the Department of Rheumatology, are amongst the best performing departments, whereas the others are performing on a lower level (see below).

Organization, collaboration and infrastructure

Some departments are excellent with regard to national and even international collaboration, whereas the collaboration within the Institute of Medicine could improve considerably, specifically in respect of merging similar research areas from different departments. The infrastructure needs to be improved, and the Institute of Medicine argues for a new research building in order to achieve this improvement. Thus, the overall score in this area is rated *Good*.

Future plans and interaction with the society

The Institute of Medicine has developed its own strategy. Primarily it is aiming for the new research building mentioned above, but in general it will focus on comorbidities between diseases such as obesity, diabetes, osteoporosis, arthritis and cardiovascular diseases. The Institute of Medicine wants to build a large database/biobank with around 30,000 subjects from the geographical area that could be used for translational research, not just locally but also nationally and internationally, as this would be an invaluable resource. This strategy has been rated as *Excellent*.

Teaching and gender

Teaching is considered important and a natural part of conducting research. However, the quality cannot be evaluated as it was not part of our remit.

The gender problem is clarified in the general report, and there is nothing to add here. The professors are mainly men and the PhD students are mainly women.

14.1 THE DEPARTMENT OF MOLECULAR AND CLINICAL MEDICINE

The Department of Molecular and Clinical Medicine focuses on hypothesis-driven, translational research in cardiovascular and metabolic disorders exemplified by clinical studies and basic research in insulin resistance, obesity, cardiovascular and kidney diseases. Two groups work with cancer research. The majority of the research groups are located at the Sahlgrenska University Hospital, which forms the basis for close interaction with the relevant clinical sections. The Department aims to stimulate and develop highly innovative cross-disciplinary research and networks between basic medical and clinical sciences, bioinformatics, applied mathematics and industry. To create an infrastructure and environment that stimulate cooperation and synergies between scientists, research groups have been moved together and state-of-the-art equipment platforms that are shared by all groups have been established.

A strong aim is to attract, recruit and foster promising young basic medical and clinical scientists to launch successful careers in translational medicine.

14.1.1 Research quality, productivity, uniqueness and relevance

The quality of research is, in general, of a high standard and in some areas at the absolute forefront line internationally. The Department of Molecular and Clinical Medicine has a very strong background in the priority areas of cardiovascular and metabolic research. Different research groups within the field have established long-standing and fruitful interactions. A number of nationally and internationally recognized groups are brought together within the Sahlgrenska Center for Cardiovascular and Metabolic Research. This centre has created an excellent interdisciplinary environment and recruited a number of outstanding young scientists. The research is focused on the molecular mechanisms in the development of insulin resistance, type 2 diabetes, cardiovascular diseases and obesity. Well-characterized clinical studies have been performed and are ongoing, and biobanks have been established. The Swedish Obese Subject (SOS) study has become a landmark study on the effects of bariatric surgery on mortality and morbidity, and helped in the identification of genes for novel cause of obesity. The leader of this study, Professor Lena Carlsson, has also established networks and collaborations with a large number of primary health care centres in Sweden in an admirable manner.

The research by Jan Borén and Sven-Olof Olofsson has established a unique international position. The long-standing studies on complex lipid particles and the development of atherosclerosis, the assembly of “lipid droplets” and the recent identification of key proteins in this process as links between lipid accumulation and insulin resistance/type 2 diabetes are right at the international front line.

Other frontline research areas concern the regulation of adipogenesis, the role of Wnt signalling pathways and biological consequences, led by Professor Ulf Smith. The group is carrying out new and promising work on canonical Wnt activation. This group is also involved in a number of EU-funded projects analyzing the genetic predisposition for type 2 diabetes.

Another field – the role of tissue plasminogen activator (t-PA), the principal activator of the fibrinolytic system in the thromboprotective mechanism of vascular endothelium – has become increasingly interesting with the new and promising findings on epigenetic control mechanisms. The research group working on kidney diseases has presented very important data on glomerular permeability, and recently identified and patented a new agent with highly specific nephrotoxin that might be a future drug for renal cancer.

Notably, the Department of Molecular and Clinical Medicine is making efforts to develop new fields of research, including applications of mathematics in biosciences. Beyond this, some specific areas stand out:

- The research carried out by Fredrik Bäckhed includes several lines of development and is clearly at a very high level internationally. He has established a gnotobiotic unit that today contains ten lines of germ-free mice, and he occupies a unique position within the Department, Sweden and Europe. He has very elegantly demonstrated the importance of gut microbiota in the regulation of energy balance and its roles in obesity and insulin resistance. He has been able to attract substantial funding, including a large grant from the Swedish Research Council. He has an extensive international network and collaborates in two FP7 programmes. He has a high level of research activity, with publication in high impact journals, such as Nature, J Clinical Investigation, PNAS, etc. His projects are very innovative with high scientific medical relevance.
- The research carried out by Martin Bergö includes studies on the processing of a group of proteins belonging to the so-called CAAX protein family with clinical implications for different forms of cancer, progeria and inflammatory diseases. He has established a number of valuable mouse models that recapitulate human disease. Recently, a new and surprising mechanism for arthritis was observed. Research is ongoing concerning the relevance of this mechanism in human disease. He is unique in Sweden in this research area and has a broad international network. He was awarded a Starting Investigator Grant from the European Research Council. Activity is high, with publications in high impact journals such as PNAS, J Clin Invest and Blood. The clinical relevance is high.
- The research carried out by Per Lindahl follows several lines, and one of the projects focuses on the role of zinc finger protein 148 for oxygen homeostasis in cardiovascular disease and cancer. A new mouse model has been generated that will form a platform in forthcoming studies. He has also made important contributions in the field of smooth muscle cell and pericytes development, and very recently presented data on selective expression of different miRNA in microvascular endothelial cells and pericytes. He has established collaborations nationally and internationally with well recognized researchers. He publishes in high impact journals.
- Bäckhed and Bergö have received prestigious awards.

Assessment: *Excellent to Outstanding*

14.1.2 Organization and research infrastructure

The Department is chaired by Professor Jan Borén. His main role is to develop the short- and long-term research strategies for the Department. Three co-chairs have responsibility for financial, personnel and environmental issues. There are around 105 employees, including 14 professors, embedded in a clear organizational structure. The Department is mostly located within the Wallenberg and Lundberg laboratories.

The Department comprises three specific resources; the Wallenberg Laboratory for Cardiovascular Research, the Lundberg Laboratory for Diabetes Research and the Sahlgrenska Center for Cardiovascular and Metabolic Research (CMR), the latter established in 2006 and financed in strong competition by the Swedish Foundation for Strategic Research. The CMR also includes research groups belonging to other departments at the Sahlgrenska Academy.

The Department has attracted substantial funding from the main Swedish research foundations, the European Research Council and the European framework programmes. Many research groups also have financing from pharmaceutical industries and local university and hospital funds. The total budget is about SEK 100 million (excluding ALF resources). The CMR is funded by SEK 55 million during the period 2006-2012.

Equipment: State-of-the-art equipment for molecular biology is installed at the Wallenberg Laboratory and the Lundberg Laboratory, providing powerful platforms and tools for the presented research programmes within the Department of Molecular and Clinical Medicine. The equipment is shared by all groups and includes the latest tools for gene and protein detections and for blood cell analysis, as well as different microscopes, such as a laser-dissecting microscope, and a joint facility for flow cytometry. The Lundberg Laboratory offers competence and equipment for clinical investigations, such as microdialysis, glucose clamping, blood flow measurements in adipose tissue and muscles, and histological analyses of tissue samples. The CMR is also equipped with the first lipidomics platform in Sweden. Thus, these platforms and different animal models integrate clinical and basic research methods and competence in an excellent and highly competitive manner, and form firm bases for translational studies.

A very interesting gnotobiotic facility with germ-free animals for studies on the impact of gut microbiota on metabolism and cardiovascular disorders has recently been established, as has a microbiology unit. The gnotobiotic unit is unique within Sweden and Europe, and brings opportunities for experimental studies in the progressive field of gut microbiota effects on host metabolism and human health.

Assessment: *Excellent*

14.1.3 Collaboration and networks

The Department of Molecular and Clinical Medicine has extensive networks and excellent expertise in basic research as well as clinical studies. The involvement in a number of international and EU-funded projects is impressive. There are also good connections with the pharmaceutical industry. The Department has, moreover, established effective collaborations with health care centres, in particular in

the western part of Sweden. This ensures a successful development of ongoing and forthcoming clinical studies within metabolic, cardiovascular and cancer diseases.

Assessment: *Excellent*

14.1.4 Future plans

Careful plans with long-term potentials and promising new data on disease mechanisms are presented by the research groups under Borén, Carlsson, Smith, Bergö and Bäckhed.

14.1.5 Future potentials and possibilities

There are possibilities through the abovementioned strong research groups within the Wallenberg, Lundberg and CMR constellations and their efforts to further identify synergies between the research areas and attract young promising scientists in basic and clinical science to form a firm basis for translational medicine. The individual research groups have excellent long-term funding. However, the CMR's infrastructure is funded by strategic research money until 2012, and the financing thereafter is unclear. It is important for the Sahlgrenska Academy to secure the continuation of successful research.

14.1.6 Interaction with society

The Department has been active in providing a basis for preventive medicine. The SOS study is a very good example, with continuous long-term follow up studies.

14.1.7 Gender and equal opportunities

No problematic issues have been identified.

14.1.8 Other issues

Two important long-term strategies have been implemented in recent years:

- To stimulate and attract young students at the medical programme at the University of Gothenburg to start research early in their careers, a dedicated amanuensis programme was started 2006. The programme has been a success, with high levels of interest from students and very good results in publications after three years.
- To stimulate and help young physician-scientists with opportunities to perform research and to create bases for translational medical research, a number of positions with 50% time for clinical work and 50% time for research have been created within the different clinical sections at the Sahlgrenska University Hospital in collaboration with the Department.

14.1.9 Summary

Within the Department, priorities seem to be driven by highly relevant medical and strategic questions with clear clinical implications. The overall aim of promoting strong interactions between independent research groups and recruiting outstanding young scientists has been pursued consistently, and has so far been very successful. This strategy has attracted excellent external funding and established a secure financial situation. In some fields, the quality of research is at the international front line. The Department has a very strong publication record.

14.1.10 Summary of assessments – Molecular and Clinical Medicine

Quality, productivity, uniqueness and relevance: *Excellent to Outstanding*

Organization and research infrastructure: *Excellent*

Collaboration and networks: *Excellent*

14.2 INTERNAL MEDICINE

The Department of Internal Medicine reports research in different specialties of internal medicine, including endocrinology, respiratory medicine and allergology, gastroenterology and haematology. The Department has two research centres: the Centre for Bone and Arthritis Research (CBAR; which is interdepartmental) and the Krefting Research Centre, which are responsible for a major part of the research activities within the Department. The Department aims to perform translational research including both basic science and clinical and epidemiological studies.

14.2.1 Research quality, productivity, uniqueness and relevance

The quality of research varies between the different units. The research at the CBAR is generally of a very high international standard, whereas research at other units is of variable quality.

The research at CBAR has established a unique international position in bone and arthritis research. The centre has ca 15 established scientists under the leadership of Claes Ohlsson. The profile of the investigators suggests targeted employment of scientists with different skills to work in a collaborative environment. They use an interdisciplinary translational approach with the aim of improving the prevention and treatment of osteoporosis and the joint destruction process in rheumatoid arthritis.

They are currently focusing on three projects. The first project is a more basic project on the potential role of oestrogen signalling pathways as targets for the treatment of immune-mediated bone loss. The second project is a clinical project that investigates environmental and genetic factors of importance for osteoporosis. The third project is innovative and investigates the potential role of gut microbiota as a target for the prevention and treatment of osteoporosis. Other projects investigate the role of retinoids in bone metabolism, immune modulation in rheumatic diseases, symptom-related bone and joint research and endocrine regulation of the osteogenic response to mechanical loading. The work by Claes Olsson is of particular importance. The research is clearly translational, combining cell and molecular biology with animal and human tissue experimentation and epidemiological studies. He has developed mouse models for the study of metabolic bone disease using tissue-specific and/or inducible gene activation, and he has developed novel non-invasive image analyses for phenotypic studies in longitudinal cohorts. He has also focused on mechanisms of action of hormones and growth factors in bone tissue. He has published more than 240 papers during the evaluation period, often in the highest ranked journals within the field, and he has received several international awards.

The research by Ulf Lerner has focused on pathogenetic mechanisms involved in hormonal and inflammation-induced bone remodelling by studying signalling in various cultured bone cells. The research carried out by Hans Carlsten has focused on the oestrogen/hormonal effects on bone mineral density and disease activity and erosivity in rheumatoid arthritis. He has also investigated the effects of different oestrogen receptors including the effects on T-cell-dependent inflammation. Finally, Dan Mellström has been responsible for clinical and epidemiological studies with a focus on risk factors for osteoporosis and fractures. All these investigators have published in major international journals in the field. Several of the junior scientists have also contributed significantly in the field and have obtained independent research grants.

The Krefting Research Centre is another centre within the Department of Internal Medicine, which is chaired by Professor Jan Lötval. This centre aims to investigate and identify clinically relevant phenotypes of asthma and chronic obstructive pulmonary disease (COPD), and to identify biomarkers and underlying mechanisms of disease. The main project is the West Sweden Asthma Study, which is based on a large cohort including more than 18,000 responders out of a total of 29,000 individuals. Subjects with asthma and a selected reference population have been examined by physiologic and allergologic methods. The research also involves immunophenotyping of subgroups and basic studies involving cellular and molecular biology. A total of 14 subprojects are listed. Major achievements include exosome mediated transfer of mRNA and microRNA between cells and cytokine mediated

regulation of bone marrow CD34+ eosinophils. Additional contributions include the participation in the development of new treatment and in clinical epidemiology.

Other research activities are only very briefly summarized, and the quality of this research is difficult to evaluate. Research in the endocrinology section has focused on growth hormones, but this section is partly integrated with CBAR. The gastroenterology section focuses on the pathogenesis and pathophysiology of gastrointestinal motility and perception and on the enteric neuronal control of the mucosa, muscle and immune system. Finally, research within the Department of Hematology has focused on platelet cell biology and disorders, as well as on immune therapy in chronic lymphatic leukaemia.

Assessment: The quality, production, uniqueness and relevance of research at CBAR are *Excellent*, whereas the research at the Krefting Research Centre may be characterized as *Very good*. Otherwise the Panel finds it difficult to evaluate research within the other units of the Department of Internal Medicine, since the evaluation is based on self-evaluation only.

14.2.2 Collaboration and networks

Both the CBAR and the Krefting Research Centre report extensive national and international collaboration, which is materialized by external grants including EU and NIH grants. The other units also report international collaboration with certain potentials.

Assessment: *Very good to Excellent*

14.2.3 Organization and research infrastructure

The Department is chaired by Professor Jörgen Isgaard, who did not present his department to the visitors. Insufficient information has been provided to evaluate the roles of the chair and co-chairs and the administration of the Department. Specifically, there is no overall description of finances, personnel, funding and research strategy, except that the Department has agreed on a programme combining clinical specialist training with a mandatory PhD project with the hospital organization. However, the CBAR reports external funding of SEK 36 million per year from different sources, including the Swedish Research Council, ALF Agreement, EU, the US National Institutes of Health, the Swedish Foundation for Strategic Research and several other funds.

Research is organized in individual units, and it is unclear whether there are any collaborative efforts between these units. From the updated personnel list there are 94 employees, including 16 senior staff (professors, senior lecturers and researchers)

and six adjunct professors/lecturers. Most of the laboratory facilities and clinical research units are located within the Sahlgrenska University Hospital.

The Department consists of two research centres along with individual specialty research units. The CBAR is an interdepartmental collaboration, also including scientists from the Departments of Molecular Medicine, Rheumatology and Inflammation, and Occupational Medicine focusing on research related to osteoporosis and rheumatoid arthritis. The Krefting Research Centre focuses on respiratory diseases and allergology. The specialty units comprise endocrinology, gastroenterology and haematology research. In addition, there is also a separate research unit, which is not within the Krefting Research Centre, but which is focusing on other aspects of respiratory diseases.

The Department reports that it has been successful in obtaining external grants, and that it has had fruitful collaboration with the pharmaceutical industry. However, no specific information on total funding and sourcing of funding has been provided.

The Department claims to have advanced laboratories for translational research, including unit-specific equipment, such as equipment for invasive measurement of the gastrointestinal tract and olfactometers. Common platforms within the Department are not described.

The Panel's conclusion is that the organization and research infrastructure are *Good* to *Very good*.

14.2.4 Future plans, potentials and possibilities

It is unclear how the description of promising research areas in the self-evaluation relates to the most successful research areas.

No details on future research plans have been provided by the CBAR. There are currently facilitating connections between energy homeostasis and the skeleton (the link may involve factors such as leptin, undercarboxylated osteocalcin, serotonin) and the strong research groups on diabetes, obesity and cardiovascular disease would make excellent collaborative partners. This would certainly be an area in which they could maintain their high profile and build on their strengths in translational research.

One target relates to cardiovascular actions of sex steroids, their metabolites and the classical androgen receptor in cardiovascular disease. These studies include an epidemiological approach and studies of genetically manipulated mice (androgen receptor knock-out mice). This research has already provided important contributions in the field.

Another target concerns the role of the cytokines interleukin 16 and 17 on the impact of tobacco smoke on pulmonary host defence, which has also produced important contributions, and which has potential for the development of pharmacotherapy in diseases with impaired pulmonary host defence.

The gastroenterology department focuses future research on the investigation of factors and mechanisms that may explain gastrointestinal symptoms both in patients with functional disorders and in patients with organic disease, such as inflammatory bowel disease.

14.2.5 Research activity and teaching

The Department should be amended for the inclusion of a mandatory combined PhD project and clinical specialist training for every new junior physician.

14.2.6 Interactions with society

No information has been provided.

14.2.7 Summary of assessments - Internal Medicine

Quality, productivity, uniqueness and relevance: CBAR - *Excellent*, Krefting Research Centre - *Very good*

Organization and research infrastructure: *Very good* to *Excellent*

Collaboration and networks: *Good* to *Very good*

14.3 RHEUMATOLOGY AND INFLAMMATION RESEARCH

The Department of Rheumatology and Inflammation Research is a separate department situated within the Institute of Medicine, but there is also a Centre for Bone and Arthritis Research (CBAR) within the Department of Internal Medicine, a division of the Institute of Medicine but separate from the Department of Rheumatology and Inflammation Research. One of the Department's major strengths is the strong links between the research groups and the clinic, in terms of both training personnel and translating experimental results into therapeutic applications.

14.3.1 Departmental staff

There are twenty-four people employed at the Department including six professors. An additional forty scientists, mainly PhD students and post-docs, but also one professor, are active within the Department. These are financed either by the

hospital or directly through different funding agencies, and the majority of them have a part-time commitment to research. It is organized into 13 research groups, which are individually responsible for conducting their scientific programmes and managing their finances. Kristina Eriksson is Professor and Head of Department.

14.3.2 Areas of research endeavour

The main areas of research as highlighted by the Department itself are:

- The molecular and cellular mechanisms of rheumatoid arthritis, including translational research into the development of novel interventions/therapies. In addition, the predisposing genes in autoimmune disorders are studied using a comparative genomic approach in animal models.
- Immunoregulatory mechanisms in allergy and rheumatology, focusing on the activities of regulatory T cells, exosomes and the role of the protein AIRE in central tolerance. The induction of immune tolerance in aseptic arthritis is explored using the lentivirus-vector based delivery of autoantigens and exosomes as vectors for both coding and si-RNA.
- The involvement of B cells in allergy and rheumatology, and anti-B-cell strategies for the treatment of inflammatory diseases.
- Phagocyte biology, with an emphasis on the role of granulocytes in arthritis and infections.
- Immunity to infections and implications for immune-mediated diseases, such as allergies (*Staphylococcus aureus*, human herpes virus type 6) and arthritis (*S. aureus*).
- The modulation of immune responses by post-translational modifications (PTM) of proteins. Experimental models of antigen-induced arthritis based on PTM proteins are used to evaluate immunological mechanisms that predispose to rheumatoid arthritis.
- Clinical research on the consequences of disease, and non-pharmacological treatments aiming to improve impairments, activity limitations and participation in patients with inflammatory or non-inflammatory rheumatoid disease.
- Genetic, molecular and cellular research on selected chronic virus infections, with the particular aim of identifying host factors involved in disease development/severity and translational research on novel treatments against disease.

14.3.3 Research quality, productivity, uniqueness and relevance

Ranking: there is a range of research quality and productivity within this Department, which makes it impossible to give a single accurate assessment, since this would disadvantage the outstanding or very good groups within the Department.

A fair assessment of the situation would be to rank the Department from *Very good* to *Insufficient*.

Although much is made of translational research at several points in the self-evaluation, there is no detail given of examples of successful translational research, that is, the translation of research from the laboratory to the clinic. It would have been of interest to have had some of these examples.

Particularly impressive work includes the following: the work on the immunomodulatory role of intestinal epithelial cell-derived exosomes; the fact that human somatic cell exosomes can be used as vectors to transfer genetic material to primary cells; the role of the pre-B cell receptor in B cell tolerance; and the control of central tolerance. With regard to the latter, the Department almost uniquely has access to human thymus, without which work on central tolerance is impossible. The work of Maria Bokarewa to develop targeted therapy and immune regulation in autoimmune and bacterial arthritis has been recognized by a large EU grant. The establishment of the BCellNet by Inga-Lill Mårtensson-Bopp, which will involve 28 groups in Sweden, is promising for future collaborations and scientific advances.

There is a lack of examples of translational work involving the laboratory and the clinic. We are not told about clinical trials, either commercially sponsored or investigator initiated. Since translational research is one of the major aims of the Department, such a lack raises questions about the commitment or the ability of the Department to deliver this crucial goal.

14.3.4 Organization and research infrastructure

The Department appears to have excellent in-house facilities for carrying out the research which it describes. The Department is internationally recognized for its animal models of arthritis. Of note is the recent award of SEK 4 million to purchase the most sophisticated fluorescence-based self-sorting system and a state-of-the-art animal house. In addition, the Department has access to the University's corporate genomic facilities. No doubt other collaborations can be carried out as necessary.

There is no description in the self-evaluation of the exact relationship with the clinical side of rheumatology. In particular, no examples are given of translational research involving a research group within the Department and the clinic.

Assessment: *Excellent*.

14.3.5 Collaboration and networks

Although several examples are given of collaborative interactions, these do not appear to be particularly large in view of the size of the Department. Furthermore,

two of the five international collaborations cited have been in existence for ten or more years. It is not clear to what extent these collaborations are still active. A major collaborative link appears to involve herpes virus research, which is hardly the main focus of a Department of Rheumatology. An exciting collaboration is the funding of a multi-national European study of periodontal disease in rheumatoid arthritis under the FP7 Programme, to be coordinated by Piotr Mydel.

Establishing and maintaining a productive collaborative interaction is extremely important, but this analysis suggests that international collaborative links are not a major priority. It has not been possible to determine from the information available whether collaboration within the Institute of Medicine is sufficient for the Department's scientists to generate international quality work.

There is a notable absence of involvement in clinical/research networks within Europe that now link researchers with large patient databases. Other institutions in Sweden have not only performed superbly well, but have also established many of these networks.

Assessment: *Very good to Good*

14.3.6 Future plans

The self-evaluation included very little detail in terms of future plans. It is obvious that some work will be carried out into the future from the existing base.

14.3.7 Relationship with CBAR

CBAR (Centre for Bone and Arthritis Research) is part of the Department of Internal Medicine and the Department of Rheumatology and Inflammation Research. This is an interdepartmental collaboration led by Claes Ohlsson. It includes research groups from the Departments of Internal Medicine, Rheumatology and Inflammation Research and Community Medicine. However, it appears to be primarily an independent centre in its own right. Should the Department of Rheumatology and Inflammation Research and CBAR be encouraged to collaborate or even join forces? If yes, how is this to be done without prejudicing existing research?

14.3.8 Summary of assessment – Rheumatology and Inflammation Research

Quality, productivity, uniqueness and relevance: *Very good to Insufficient*

Organization and research infrastructure: *Excellent*

Collaboration and networks: *Very good to Good*

14.4 PUBLIC HEALTH AND COMMUNITY MEDICINE

This Department was created in 2006 by combining the efforts of researchers in several separate disciplines. The current remit is wide, covering such significant areas of public health policy as occupational musculoskeletal health and ergonomics; particulate air pollution and environmental exposures to mercury; occupational and environmental determinants of respiratory disease; nutrition, dietetics, obesity and trends in risk factors for cardiovascular disease, diabetes, and elderly cognitive function; alcohol/substance misuse; intimate partner violence; and social determinants of sickness absence and disability pensioning. The “core” of the research is described in similarly broad terms as clinical public health epidemiology with the major themes of life course health, nutrition, environment, gender, alcohol, social determinants, work-ability, pharmaco-epidemiology, and cardiovascular, respiratory, metabolic, musculoskeletal and mental health.

14.4.1 Research productivity, quality, relevance and uniqueness

A precise bibliometric analysis is not possible from the data supplied, but it is roughly estimated that in 2004-2009 the 13 principal investigators highlighted by the self-evaluation report published some 58 peer review papers per year, about seven of these per year in journals with impact factors greater than 5. Productivity varied between principal investigators, with some publishing in excess of 60 papers over the period and some fewer than ten.

The Panel’s impression is that there are pockets of very good or excellent work, and other areas of enquiry where the output (volume and profile of publication) is less remarkable. Professors Torén and Barregård (Occupational and Environmental Medicine), Björkelund (Primary Care), and Lissner (Public Health) have managed to combine high productivity with regular publication in journals carrying higher than average impact factors; the output in ergonomics and musculoskeletal disorders, acoustics and noise, and social medicine have not matched this record.

The Department’s study areas are highly relevant to public health policy. Most of the ‘problem’ exposures of interest (e.g. adverse ergonomics, air pollution, environmental noise, obesity, alcohol misuse and work limitations in an ageing population) are common; health and socio-economic stakes are high and growing, underpinned by societal and demographic trends. Papers (by Barregård and Torén), chosen by the Institute as marking important contributions to science and social life, illustrate the potential for public health impact: these encompass respiratory work disability

across Europe, hypertension in Swedish residents exposed to road traffic noise, and cardio-respiratory effects of particulate air pollution.

The Department's areas of scientific interest are not novel, but some of the available resources, such as the EpiLife cohorts, offer above average opportunities for study.

Assessment: *Good to Excellent*

14.4.2 Organization and research infrastructure

The Department is the second largest in the Institute as judged by overall staffing levels (in September 2009, 57 individuals contributed 32.8 research FTEs, with eight professors; excluding 'other' staff, the academic complement was 12.6 FTEs). It is organized into four main divisions: Occupational and Environmental Medicine, Family Medicine, Public Health and Social Medicine. (A fifth division, Geriatrics, is listed in the description of structure, but its staffing and outputs are not described). The four divisions are further organized into 16 research groups, seemingly supervised by 13 principal investigators. However, specific details of structure, cross-section integration and co-ordination were not given in the self-evaluation.

A notable resource on which some members of the division have drawn is the excellent EpiLife Centre, and within it the Population Study of Women in Gothenburg (a fruitful general population dataset for investigators in Family Medicine and Public Health). Other infrastructure is provided by laboratories in modern noise research, the measurement of physical capacity and environmental chemical research. As judged from the recent academic publication record, only the last of these has been exploited meaningfully (although the labs may have other uses in teaching, consultancy and technical report work, or future planning). The Department also has access to some historical study populations (e.g. occupational cohorts).

Assessment: *Good* for infrastructure; *Poor* for organization (see observations below on internal collaboration).

14.4.3 Collaboration and networks

Intra-departmental collaborations

During 2004-2009, senior investigators have tended to publish independently of one another and only three pairings – Björkelund with Lissner, Barregård with Sällsten, and Hensing with Spak – published together with regularity. Differences in specialist interests (e.g. acoustics vs. nutrition) is an obvious reason, but insofar as can be told from the bibliography lists supplied, the two principal investigators in primary care did not share publications; one investigator in social medicine published independently of the other two; within occupational and environmental medicine, there was no obvious connection between the work of Torén and, for

example, the environmental team (although each side published on air pollution); there were no joint publications between the two investigators with shared interests in environmental noise; principal investigators in social medicine, with an interest in sickness absence and disability pensioning, did not publish with those in occupational health; and investigators with shared interests in problem drinking from public health and social medicine did not publish together.

There may be good reasons for these disassociations, one possibility being that interests are further apart than they appear to be. It may also be efficient to specialize or to continue mining previously successful seams of inquiry; and partnerships tend to be influenced by shared resources, habit and established relationships. However, the impression is that there are only a few (albeit successful) pockets of interdisciplinary work within the Department, with other investigators in mono-disciplinary silos. If so, the danger lies in a lack of critical mass: it is difficult to be world-beating and receive appropriate intra-mural support within a very small unit of assessment. (Some investigators seem to have overcome this difficulty through strong external links and partnerships – see below.) The challenge of directing a loose grouping, and optimising the performance of all its parts, is also considerable. There are logical linkages within the Department, but it is not self-evident that the whole is a logical, tightly knit functional unit – reflecting its evolution and wide range of interests.

Intra-institute collaborations

The potential exists (e.g. through the EpiLife programme on “obesity over the life course”) for shared work between public health/primary care (work on nutrition, dietetics and population level cardiovascular risk factors) and other departments (e.g. the Department of Emergency and Cardiovascular Medicine, the Department of Clinical Nutrition), but the current linkage is not obvious. The work programmes of Björkelund and Lissner could possibly be strengthened even further in this way in the future.

International collaborations

Several of the senior investigators have forged excellent international partnerships – e.g. Torén’s partnership with the occupational health, respiratory and asthma communities is productive and has resulted in pooled data from 25 centres in eleven European countries (the ECRH survey) and several publications, including a Lancet paper; in public health/family medicine, the resource of the Population Study of Women in Gothenburg is being exploited by international exchange of population data and large scale data pooling, with papers in the Lancet and JAMA, and the Emerging Risk Factors Collaboration has produced some excellent meta-analyses. Although less evident in the publication record, there are some international collaborations elsewhere – on the occupational and environmental side with exposure

experts from other countries and in social medicine with other international universities.

Assessment: Generally *Poor*, although in certain areas *Excellent* (as identified above).

14.4.4 Future plans

Future plans are set out only in general terms in the self-evaluation (apart from four examples highlighted as being particularly promising: sampling of exhaled particles, primary care management of COPD, the childhood obesity epidemic, and medication over-use headache). A general direction is given regarding the resources that will be exploited and the broad areas of inquiry, but projects are not enumerated or described in any detail; nor is the number of work streams specified; nor are the cohorts enumerated in all cases (although some are discoverable from the University's website). The assessment of future plans rests, therefore, on the historic track record and impressions of the capacity to exploit available resources.

On this basis, a good outcome is expected for occupational respiratory and environmental health, public health nutrition, and the cohorts associated with the EpiLife Centre. The cross-EU preventive trial of obesity in children is particularly promising. The Women and Alcohol in Göteborg cohort study, nested within the EpiLife Centre, represents a significant resource for future work planning in Social Medicine and perhaps an opportunity to increase intra-departmental collaboration (e.g. with Public Health and Primary Care).

Assessment: *Good*

14.4.5 Research activity and teaching

The self-evaluation and site visit identify this Department as teaching 55 PhD students (including registered but not employed PhD students). This is a substantial supervisory load, and raises a question about the balance between time for research and time for teaching and support.

14.4.6 Interactions with society

The EpiLife Centre offers a good vehicle for promoting interactions with society, as does the subject matter being studied. Plans to promote such interactions are not explicit, and may not be developed.

14.4.7 Gender and equal opportunity issues

There are no issues that are not highlighted elsewhere in this report.

14.4.8 Summary comments

The Institute's self-assessment documentation describes the strongest and most competitive research groups as being focussed on cardiovascular and metabolic diseases, bone disease and inflammatory and rheumatic diseases, while in comparison occupational medicine is considered a younger research group, with potential; elsewhere the self-evaluation identifies public health nutrition as one of the strongest research areas within the Department. This seems a fair assessment. In comparison, the Institute's internally highest rated groupings have longer and deeper lists of outstanding achievements, and supply more explicit evidence on international standing than the Department overall.

However, the Department of Public Health and Community Medicine undoubtedly has pockets of strength, as highlighted above, in environmental and occupational respiratory medicine and in public health nutrition. It is not obvious that the work in social medicine on alcohol misuse is at the very forefront internationally (in comparison, say, with David Leon's group at the London School of Hygiene and Tropical Medicine), nor that on sickness absence (in comparison, say, with the highly influential Whitehall Study, or the epidemiological work of Vahtera and Martikainen from Finland); and there are international groups (from Denmark, the Netherlands and Finland) with stronger recent publication records in occupational musculoskeletal disease, albeit not within the specialized niche of vibration injury.

The problem of co-ordinating efforts across such a broad range of scientific interests is highlighted in the self evaluation, but so is the public health importance of researchers' lines of inquiry.

14.4.9 Summary of assessments – Public Health and Community Medicine

Quality, productivity, uniqueness and relevance: *Good to Excellent*

Organization: *Poor*

Research infrastructure: *Good*

Collaboration and networks: *Poor*, although in certain areas *Excellent*

Future plans: *Good*

14.5 EMERGENCY AND CARDIOVASCULAR MEDICINE

The Department's activity is primarily located at Östra Hospital. It is not clear how many professors are working in the Department, because at least four of the

listed professors are also reported under the Department of Molecular and Clinical Medicine. Reference is made to two full professors and two adjunct professors, both of which have moved from the Department. One adjunct professor is located at Sahlgrenska Hospital, but no reference is made to his research activity. There is no information on technical staff or funding. The Director of the Institute of Medicine, providing the umbrella for the six clinical departments and the Unit of Innovation and Entrepreneurship, is a member of the academic staff. The mission of the Institute of Medicine in relation to the individual departments has not been clarified to us!

The Department has a long tradition of running epidemiological studies and clinical trials. This tradition has been continued and expanded by the two group leaders in cardiovascular epidemiology and clinical trials. Despite the small size of the research groups, their activity has been quite extensive over the last five-year period, with a high level of published manuscripts. It is surprising that the Department, with its strong focus on clinical epidemiology, has not been named accordingly in order to both emphasize and build up infrastructure and create a strong and viable platform for this research field within the Institute of Medicine. Epidemiological research is currently fragmented and spread out across several departments, seemingly mostly concentrated at the Department of Public Health and Community Medicine. A closer interaction between these two departments with regard to cardiac epidemiology would seem to be of great benefit. There would seem to be good potential for merging epidemiology with the Department of Emergency and Cardiovascular Medicine.

14.5.1 Research quality, productivity, uniqueness and relevance

The epidemiological research profits from established national and international data registries in collaboration with outstanding capacities in statistics and database analysis. The strategy of the epidemiological group has primarily been to target conventional risk factor studies. There seems to be clear opportunities that have not been exploited, and there is a clear demand for being innovative and opening up new epidemiological fields. This should be pursued in collaboration with the front line groups at the Institute of Medicine, who can also offer genetic and molecular expertise. The heart failure group is small, but has extensive experience and networks in performing clinical studies in collaboration with national and international industry. The group has contributed widely towards developing and improving randomized controlled trial (RCT) into a highly sophisticated tool in clinical research. This group has a clear strategy for future research, but the organization is fragile and its future is insecure because of pending retirement.

The National GUCH (Grown Up Congenital Heart disease) Centre is a new activity addressed by the Department, which has not yet demonstrated any activity for evaluation. Thematic areas are also listed dealing with thrombo-embolism and refractory cardiac pain. However, no output data is provided for evaluation, and the impression gained is that the leadership of these areas is in other departments or related to industry demand.

Assessment: *Very good*

14.5.2 Organization and research infrastructure

The cardiovascular research at the Sahlgrenska University Hospital and Östra Hospital have overlapping areas but with a low level of interaction. The infrastructural relationship among the cardiovascular groups in the different departments of the Institute of Medicine is not clearly defined. The Sahlgrenska University Hospital has a large group specializing in emergency cardiology, with no collaboration with the group at Östra Hospital. Östra Hospital has only limited and ad hoc collaboration with the Department of Molecular and Clinical Medicine at the Sahlgrenska University Hospital.

The heart failure group at Östra Hospital exerts strong international leadership and is at the forefront of clinical preventive heart failure research. However, it is almost entirely dependent on the industry for the operational aspects of its trials. In this respect, the close relationship with AstraZeneca has been of great benefit for the group. The potential for translational research projects is excellent, as represented by the Wallenberg Laboratory, the Lundberg Laboratory for Diabetes Research and the Sahlgrenska Center for Cardiovascular and Metabolic Research, and this should be exploited to a greater degree.

Assessment: *Good*

14.5.3 Collaboration and networks

The Department has extensive collaborative international networks. However, these networks are very person-dependent and is vulnerable in view of the impending retirement of the group leader. In the new hospital organization it looks like the interaction between different department groups in cardiovascular medicine has become more fragmented. The Department of Molecular and Clinical Medicine, the Department of Emergency and Cardiovascular Medicine and the Department of Occupational and Environmental Health have overlapping interests but few collaborative projects.

Interdisciplinary collaboration should probably be expanded and the Department competence strengthened by post-doctoral positions. The small size of the thematic

groups and recruitment to academic positions are worrying. Few of the consultants have time for research projects due to high pressure and demand for clinical work. The merit of academic work seems to be low for a clinical career in the three hospitals.

Assessment: *Good to Very good*

14.5.4 Future plans

The future plans are well presented for the heart failure group, but for the other groups within the Department the plans are fragmented and not sufficiently clarified.

14.5.5 Future potentials and possibilities

The possibilities for the Department rest with the initiatives from the epidemiological group and a change in the epidemiological approach from conventional risk factor analyses to advanced genetic and molecular profiling of large targeted cohorts. The heart failure group is very fragile because of impending retirement, a low level of recruitment and a lack of postdoc positions.

14.5.6 Research activities and teaching

Rather few postdoc and PhD positions are listed. No information on teaching is available.

14.5.7 Interaction with society

The Department has been active in providing a basis for preventive medicine and describing guidelines for therapeutic interventions.

14.5.8 Gender and equal opportunity issues

No problematic issues have been identified

14.5.9 Leadership

The current leader is highly competent in epidemiology and clinical cardiology. He has delivered outstanding contributions to randomized clinical trials and has demonstrated eminent leadership at international level for many years. He presents a clear strategy for future research. However, his impending retirement makes it urgent that a senior clinical scientist of international calibre be recruited to maintain the activity at an international level. A strategy to ensure the growth of the Department needs to be developed. The structure of the Department of Emergency and Cardiovascular Medicine is rather artificial and not commensurate with the clinical organization, and gives the impression that the structural organization is less than optimal. A better scientific solution would be to combine the Department with the

Department of Molecular and Clinical Medicine, which has common interests, and to form a platform for cardiovascular epidemiology within the joined departments.

14.5.10 General comments

This Department has an impressive scientific output relative to the number of persons involved. The number of PhD students is only three, which may not be representative, but the number of PhD dissertations by the Department is not presented. This number may be an added measure of academic output. The group has good cooperation with local and international industry, which may help generate part of the substantial funding it needs to continue international competitive activity. Problematic issues may include recruitment to leadership positions within the Department and establishing collaboration within the Institute of Medicine and especially with the basic science laboratories. The laboratories at the Wallenberg Laboratory and the Sahlgrenska Center for Cardiovascular and Metabolic Research may provide a useful complement to their studies of mechanisms for heart failure and myocardial ischemia. Information on collaborative activity with a strong imaging group is lacking. Most heart failure and cardiovascular studies are dependent on a high level of expertise in myocardial imaging, which may serve as a core laboratory. Information on the statistical facilities is lacking. The organization of leadership and resources between academia and clinics has not been addressed, but is undoubtedly a matter of concern in this institution as in other similar university hospitals. The information presented for this evaluation leaves the clear impression that the fusion between the three hospitals in Gothenburg has not benefitted the academic activity.

14.5.11 Summary of assessment - Emergency and Cardiovascular Medicine

Quality, productivity, uniqueness and relevance: *Very Good*

Organization and research infrastructure: *Good*

Collaboration and networks: *Good to Very Good*

14.6 CLINICAL NUTRITION

The Department of Clinical Nutrition reports research in energy balance (whether it is positive or negative) and micronutrients. The staff have strong expertise in a number of key methodologies for biochemical analyses and body composition, and even more collaborations with other departments would be in the best interests of all. It may be optimal for this group to be part of a 'core facility' in body composi-

tion (there are already plans for a new Image Analysis Centre, but it was not clear whether these investigations will be incorporated into that). It is not possible to provide a grade, as the usual metrics (publication record, PhD students and grants awarded) were not available.

14.6.1 Organization and research infrastructure

The Head of Department is Anna Winkvist, and she is also included in the list of professors. There is no description of financial management, personnel, funding or research strategy. There is no mention of research funding or staffing. It is mentioned, however, that Anna Winkvist is the coordinator of the National Network of Epidemiology and Nutrition (NEON), and that this network has received over SEK 2.3 million from the Swedish Council for Working Life and Social Sciences.

The Department organizes a four-year dietetic programme with 40 students per year, and this must be a major activity. The Department collaborates with five other institutes or departments. They have established body composition facilities and biochemical laboratories. These include most of the techniques commonly used in this topic. There was no mention of CT or MRI for the study of regional body composition or of tandem mass spectroscopy to measure key analytes, such as vitamin D metabolites.

14.6.2 Research quality, productivity, uniqueness and relevance

This is impossible to assess given the documentation received by the panel. There are no references cited or grants awarded that can be found in the documents. There is mention, however, that the doubly labelled water analyzed by isotope ratio mass spectrometry (IRMS) is only one of four such facilities in Europe.

14.6.3 Collaboration and networks

The Department collaborates with five other departments and institutes and, as mentioned above, Professor Anna Winkvist is the coordinator of the National Network of Epidemiology and Nutrition (NEON), with over 130 members.

14.6.4 Future plans

None were provided.

14.6.5 Future potentials and possibilities

The Department could make a strong contribution to the plans for the new Image Analysis Centre (described by the Dean in his report).

14.6.6 Research activity and teaching

The Department has a large teaching load.

14.6.7 Interactions with society

The impact of clinical nutrition research on society is usually very high. It is surprising that section 4.5 was left empty and that there was no comment about the impact of any research from the Institute and society.

14.6.8 Gender and equal opportunity issues

No comments made.

14.6.9 Overall evaluation

The Department of Clinical Nutrition is mainly a teaching institution, and the sparse research activity cannot be evaluated on the basis of the “self-evaluation and their non-existence during the site visit”.

14.6.10 Summary of assessment – Clinical Nutrition

Quality, productivity, uniqueness and relevance: –

Organization and research infrastructure: –

Collaboration and networks: –

CONCLUSION

Summary and recommendations

The Institute of Medicine is a beacon for the Sahlgrenska Academy and the University of Gothenburg. Its staff produces science at a high international level and trains a significant number of new researchers in the field. Since the diversity is high within the groups and some do not reach the critical mass, a reorganization is recommended in order to fulfil the Department's strategy. More focus on the key research areas is needed in order to compete internationally, as well as in order to attract new researchers at post-doctoral and professorial levels. At the same time, a strategy for organizing the weak research areas must be developed. This could include a merger with more successful relevant groups.

Based on our evaluation, we find that it is important to concentrate on translational research within three main topics:

- metabolic diseases such as obesity, diabetes and cardiovascular diseases
- osteoporosis and arthritis (merging is necessary)
- clinical epidemiology – mainly within metabolic and cardiovascular diseases (merging areas within the departments of Public Health and Cardiovascular Diseases is recommended)

A new PhD programme is needed with a greater focus on the research part and a shorter duration, allowing more postdoc stipends. Furthermore, a specific recruitment programme for new scientists, including financing the start-up phase, should be developed.

Summary of assessments – the Institute of Medicine

Quality, productivity, uniqueness and relevance:

Molecular and Clinical Medicine - *Excellent to Outstanding*

Internal Medicine - CBAR - *Excellent*, Krefting Research Centre - *Very good*

Rheumatology and Inflammation Research – *Very good to Insufficient*

Public Health and Community Medicine – *Good to Excellent*

Emergency and Cardiovascular Medicine – *Very good*

PANEL 15 – NEUROSCIENCE AND PHYSIOLOGY

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15. THE INSTITUTE OF NEUROSCIENCE AND PHYSIOLOGY

15.1 Introduction and overall assessment

The Panel has based the following report mainly on the information given in the document: “Panel 15. Neuroscience and Physiology Research Evaluation for Development of Research 2010” – its Documents 1-4, and the references given therein, some additional information submitted following the Panel’s meeting in Copenhagen in August (an annual report from 2009 with plans for 2010 (in Swedish) and some additional information requested at that meeting), as well as substantial additional information obtained at the site visit to Gothenburg on November 22-26.

This Institute is one of the largest at the Sahlgrenska Academy, spanning from basic to clinical neurosciences and physiology. The staff totals 280 researchers (corresponding to 229 full time positions and comprising 35 professors and 218 more junior research positions: associate professors, assistant professors and research assistants) and 62 technicians/administrative support personnel. In addition, there are 160 active research students. The distribution of professors and associate professors (tenured positions; in all ~55) between more basic (preclinical) and clinical areas are 16 and 39 positions respectively. (Although three of the “clinical” positions are mainly devoted to “basic” research.)

Overall assessment

We find the Institute *Very good/Excellent*. There is of course a variation in quality across the different research groups at the Institute (as specified below), as may be expected within any large research structure. However, given the excellent leadership and the excellent/outstanding quality of some of the research groups with high international visibility, the overall impression is of scientific excellence. Moreover, the future of the Institute is guaranteed not only by the standard of current research and innovative projects but also by the presence of young researchers with high potential and by strong strategic leadership.

SWOT analysis

An obvious strength is the breadth of neuroscience research being undertaken, from basic science to the evaluation of clinical application, with each aspect paralleled by comprehensive teaching programmes. As the Institute is spread out geographically, day-to-day management of the Institute is inevitably difficult. The leaders seem to be very much aware of this and have undertaken to mitigate these problems. There are some strong groups within physiology and pharmacology, which do not directly relate to “neuroscience” – in some cases (see below) the question is raised as to whether they benefit from being part of the Institute of Neuroscience and vice

versa. However, the task of the Institute is to cover “neuroscience *and physiology*”. Given this, it is interesting to note that much of the “heart and vascular physiology” research seems to have left the present unit several years ago, and is actually located at the Wallenberg Laboratory – connected to other departments. This implies that “physiology” is not present as a unit with the broad professional knowledge of the whole field among the researchers at the Faculty – this is an obvious weakness in relation to “physiology” as a subject area, not least in relation to teaching. This development has possibly serious consequences for the Institute, as the University’s funding of research is strongly linked to teaching commitments assigned to the various groups within the Faculty.

The opportunity to create a well integrated area within neuroscience, physiology and pharmacology is within reach, but the dysfunctional separation of part of physiology is a threat that has to be dealt with. Another problem is the potential failure to secure the excellent collaboration and integration of research with clinical departments at the Sahlgrenska Hospital. Both the leadership and many of the individual research groups were aware of this, and have developed and maintained strong and productive ties to the hospital. However, these collaborations require strong support at Faculty and University level, and better structural organization and more formal agreements are needed. A good example is the plans for a new imaging centre based on collaboration between the University and the Hospital, which is an excellent opportunity, and a key element for the future progress of many of the research groups.

A quite surprising finding (at the site visit to Gothenburg on November 22-26) was the lack of visibility of the Institute within the University, which is a threat to future research funding. The groups that the Panel has identified as “*Outstanding*” have not been given the full opportunity to participate in the competition in the rounds for the top national grants, in which the University as a whole has had a strikingly poor outcome.

To summarize: There are several excellent units with outstanding components, and a well organized Institute with an excellent leadership, but apparently it has been difficult to recruit the necessary support from the higher levels at the University.

Organization (brief)

The Institute is organized into four sections: i) Physiology, ii) Pharmacology, iii) Psychiatry and Neurochemistry, and iv) Clinical Neuroscience and Rehabilitation. This subdivision is mainly based on geographical proximity, although Psychiatry and Neurochemistry is actually located at four different sites.

15.2 Research quality, productivity, uniqueness and relevance

In the Panel's evaluation of the scientific strengths of the different areas of the Institute, we have followed the division into 18 "research profiles" (according to the self-evaluation document), supplemented with the "Description of the most successful research projects", the "Description of the most promising projects" and the other sections of the self-evaluation. The order of the description of the research areas follows the organization into the four sections described above.

15.2.1 Neurophysiology

Staff: Two professors + one active emeritus, two lecturers, one Swedish Research Council (SRC) research assistant, four researchers and three PhD students.

Within this area there are clearly three separate project groups working on:

- synaptic transmission/plasticity (hippocampus slices – *in vitro*),
- integrative motor control (supraspinal control of spinal mechanisms in the control of movement – mainly *in vivo* in cats and rats), and
- sensory information/processing in human subjects (based on microneurography, EEG and fMRI psychophysical evaluation).

All of these areas are well established (> 25 years) at the University of Gothenburg, with contributions to their respective fields at the level of "international leadership". They are presently contributing with substantial impact and international recognition, and all three groups are naturally represented in the "List of the most important publications" selected by the Department. As a whole these groups are small, but productive (63 articles within the period in good journals – including the Nature group; > 716 citations in the 2004-09 period) and with extensive international collaborations.

In the area of "synaptic transmission", new aspects focus on how the nascent glutamatergic synapse acquires and maintains its signalling (with an AMPA-silent state dependent on the synaptic activation history). The demonstration that astrocytes are actively involved in the signalling between different afferents in creating a short-term synaptic depression is another fundamentally new discovery by this group. Part of this group is also actively collaborating with "basic clinical research" on neurodegenerative diseases.

The work on supraspinal control of the spinal cord in the generation of movement is very productive and has been recognized by continuous support by NIH grants to the principal investigator during the last decade, and also by a distinction from the Reeve-Irving Research Medal – for the work of relevance for spinal cord injury

rehabilitation. The recent analyses in human subjects relating to the central processing of gentle touch – from afferent activity to specific patterns of cortical activation – is indeed impressive. These achievements depend on considerable international collaboration (with the University of Gothenburg at the centre) and a profitable “internal” collaboration with the neuro-imaging group in the Division of Clinical Neurophysiology.

SWOT analysis: The groups are small but with some *internal* scientific collaboration. One of the groups is dependent on a very active emeritus – it was not made clear to the Panels Chairs how/whether the Institute plan to continue this research area. Two of the senior researchers contribute to essential collaboration with other parts of the Institute (in addition to the international collaboration). It was noticed that earlier excellent workshop support (electronic and mechanical) has almost disappeared – this is to a large extent an international trend, partly because prioritizing academic positions, but it needs consideration from all involved parties. The present brain imaging facilities are inadequate (this is recognized, and a new unit is under construction at the Faculty).

To summarize: The group is *Excellent*

15.2.2 Endocrine physiology

Staff: Four professors, one SRC research assistant, nine postdocs, four researchers, one SRC researcher and twelve PhD students.

There are four clear research clusters with partial collaboration/interaction. The topics focus on two areas: 1) the brain circuitry controlling appetite, metabolism and reward, and 2) the function of sex hormones in the control of the female reproductive tract, and the effect of early exposure to sex hormones on adult ovarian and cardiovascular functioning. More specifically, the research aims of the research clusters can be summarized as follows:

- i) Understanding, in rodent models, actions of peripheral peptide signals about metabolism on brain circuitry controlling appetite, metabolism and reward-seeking (the last being especially original). The research is highly relevant to problems related to appetite, obesity and alcoholism; there is potential for translation, via new drugs.
- ii) Linking peripheral interleukin-6 (IL-6; released by exercise) to appetite and metabolic regulation through central actions. International collaborations have developed to evaluate polymorphisms in other genes that link to human obesity/appetite problems. This is an outstanding contribution with translational potential.

iii) Understanding, in rodent models, the functions and regulation of oestrogen, progesterone and prolactin receptors, at molecular and cellular level, in the regulation of cyclical functions of the ovary and female reproductive tract, with clinical implications, e.g. ectopic pregnancy.

iv) Understanding, in rodent models, the effects of exposure to sex steroids in early-life on abnormal ovarian function (e.g. polycystic ovarian syndrome) and metabolic/growth/cardiovascular function and control in adulthood. These are distinctive aspects of early-life programming of disease, and are currently of great interest.

v) The research includes novel bioinformatics approaches to evaluating risks from environmental contamination with pharmaceutical products or by-products. This is important and of interest to the international pharmaceutical industry and regulatory agencies. This is also of relevance to the impact of endocrine disrupters on reproduction in fish, which is a research focus, and to human health.

Group overall: The publication record is very good (94 papers in the 2004-2009 period). Papers are in appropriate journals, with impact factors in the low (1-3), good (3-4) to high (6-9) range. There are even several papers in the top journals (Nature Group, Science, etc.) in the review period. Citations for the papers is very good (1,172 citations for papers published in the 2004-2009 period). The group is internationally competitive and leading in some areas (central actions of appetite signals), and several EU grants have been won.

There are productive and sustained internal collaborations within the Institute of Neuroscience and Physiology (and beyond within the University of Gothenburg), and some among the four professors; there are collaborations within Sweden, and notable important international links that are producing understanding of disordered regulation of metabolism and appetite in humans at molecular genetics level. Links to industry are evident, as is appropriate for the translational potential of the research. The key research themes led by the four professors are of high quality, and should be strongly supported.

SWOT analysis: Excellent leadership from the professors: strong collaborations within the University of Gothenburg, both nationally and internationally. Development of the research activities in the different programmes follows logical paths. The themes provide mechanistic explanations for health problems of current intense interest in the developed world. Involvement with international efforts to progress basic knowledge and management from this knowledge. Intellectual compatibility, complementarity and mutual interaction among the lead investigators. The balance between professors: researchers and postdocs (1:3.5), and between researchers and

postdocs : PhD students (almost 1:1) is a strength. These ratios should provide the basis for a very strong group.

The research has translational potential. Major international programmes could apply molecular genetics based on the group's discoveries. The lack of lecturers/adjuncts may pose a problem for the career progression for trainees.

To summarize: The group is *Excellent*, with an *Outstanding* component.

15.2.3 Cardiovascular/gastrointestinal physiology

Staff: Two professors, one lecturer, two SRC research assistants, two postdocs and eight PhD students.

The research directions are perinatal and neonatal vascular and gastrointestinal physiology. The research groups are united by their common interest in mechanisms related to inflammation, which has fostered several common research projects. The research topics covered by the perinatal/neonatal research group are concerned primarily with mechanisms of brain injury in the newborn. The vascular physiology group studies excitation-contraction coupling in vascular smooth muscle and has identified a novel ion channel that contributes to smooth muscle synchronization and activation.

Within this area there are four clearly separate project groups working on the following:

i) The perinatal and neonatal period – especially the apoptotic and inflammatory mechanisms in relation to hypoxic-ischemic brain injury. The animal models are foetal sheep and transgenic mice. This area has a long tradition of collaborations with the clinical neonatal service. The publication record from this group is excellent (53 publications; 730 citations in the 2004-2009 period).

ii) Vascular function – investigation of the mechanisms in the excitation-contraction coupling in vascular smooth muscle and its regulation by intrinsic factors. This field is rather new following an external recruitment. The projects are relevant to major diseases such as the metabolic syndrome, renal failure and the development of arteriosclerosis.

iii) Physiological and pathophysiological studies on the small intestine and colon: the role of the enteric nervous system in the regulation of both intestinal epithelial permeability and intestinal immunity. The projects involve both animal models and human subjects. Another group is focusing on sodium sensors in the gastrointes-

tinal tract in the control of sodium excretion. Several of these projects have a long tradition at the Faculty.

iv) In addition, there is a recently formed group (still no tenured position) focusing on the neurobiology of physical exercise. Experimentally, this work has mainly focused on neurogenesis in mice and its dependency on physical exercise. The perspective is to improve cognitive function and delay dementia following early-life incidents. This group originated from the Center for Brain Repair and Rehabilitation – see below.

SWOT analysis: Over the last year, the unit has seen a substantial change of staff and hence is in a transitional phase. The unit had a strong reputation in the study of the enteric nervous system and its role in secretion and absorption in the intestine but, due to retirement, the activity in this area has declined. A new (young) lecturer has recently been recruited to strengthen research in the field of renal physiology. “Heart and vascular physiology” seems to have a “small volume”. Indeed, for several years this field has been established outside physiology, at the Wallenberg Laboratory. This may pose a serious “threat”, and will be dealt with at the end of this report.

To summarize: As a whole, the performance and international recognition of these groups are *Very good/Excellent*. As the group is in a transitional phase, publication records are difficult to evaluate for the group as a whole.

15.2.4 Pharmacology

Staff: Four professors, two SRC research assistants, three postdocs, four researchers and 13 PhD students.

There are two clear research clusters: one focused on neuropsychopharmacology combining mechanistic experimental preclinical and human studies, e.g. genetic studies, in order to enhance our understanding of conditions such as addiction, ADHD, anxiety disorders, autism, depression, Parkinson’s disease, premenstrual dysphoric disorder and schizophrenia. The other cluster is focused on salivary gland function and its neural control (muscarinic cholinergic mechanisms in salivary gland function as well as the roles of neuropeptides and classical neurotransmitters and receptors in regulating secretion and growth – apparently two groups working separately); these studies are sound, and outcomes can improve dry mouth management. In addition, there is work on altered bladder control with cystitis. Rat models are used in this cluster, with some additional human work.

The publication record is very good overall (95 papers during the period 2004-09). Papers are in appropriate journals, with impact factors in the low (1.5-3), good (3-4) to high (6-9) range. There are no papers in the top journals (Nature Group, Sci-

ence, etc.) in the review period. Citations of the papers is very good (772 citations for papers published during the period 2004-2009, but unevenly spread within the group). The group is internationally competitive in the area of human molecular genetics and disease, which should be supported, although translational possibilities are not yet clear.

SWOT analysis: There are strong collaborations nationally. However, the international collaborations are essentially focused around one professor. Development of the research activities in the different programmes follows logical paths. The molecular genetics theme may provide – with testing of findings – mechanistic explanations for health problems of importance in the developed world. Apart from a lack of lecturers and adjuncts, the balance, 1:2, between professors on the one hand and researchers and postdocs on the other is a strength; similarly the balance, almost 1:1.9, between researchers and postdocs (n=7) on the one hand and PhD students (n=13) on the other should be a strength. These ratios should provide the basis for a very strong group.

There is evidence, from publications, of interaction between just two of the professors. Combined research leadership of the group among the professors seems not to be strong. The lack of lecturers/adjuncts could be a problem for the career progression for trainees. Internationality within the group at trainee level is not evident/clear.

To summarize: The group is *Very good* overall, with *Excellent* components.

15.2.5 Pharmacokinetics and drug metabolism

Staff: One professor and four PhD students.

This group was inaugurated in 2001 as a consequence of the University of Gothenburg establishing undergraduate programmes in the pharmaceutical sciences (bachelor's and master's degrees). The teaching load has probably had a very significant impact on research activity, and only one senior scientist is attached to this unit.

The focus of the research is on pharmacokinetic, metabolic, toxicological and pharmacodynamic information on drugs related to a number of diseases including 1) antimalarial drugs, 2) eflornithine in the treatment of late-stage African sleeping sickness (HAT – human African trypanosomiasis), and population PK/PD modelling of antiretroviral drug therapy in relation to HIV/AIDS. There is important international collaboration (both within Europe and with developing countries). The scientific output (publications and citation) and the number of PhD degrees (five in the period 2007-2009) from this small group has been impressive. This comprises 19 papers in 2004-2009. Citations of the papers is very good (212 cita-

tions for the papers published in 2004-2009, averaging 11.2 citations per item, five papers cited more than 20 times; these indices are comparable with those for the Endocrine Physiology and Pharmacology groups on a per professorial capita basis). The papers were published in appropriate journals with low (2-3) or good (4.8; 3 papers) impact factors. There are no papers in the top journals (Nature Group, Science, etc) in the review period.

SWOT analysis: A small group with an enormous teaching load, which seems not intrinsic to the institute of neuroscience and physiology, but with a powerful international network and a very good publication record for its size. The question was raised whether this group was disadvantaged by being a part of a “neuroscience institute”. The Panel Chair and Co-Chair were informed that the problem was recognized and that the Faculty would allocate further positions in recognition of the teaching load assigned to this small group.

To summarize: *Very good.*

15.2.6 Addiction biology

Staff: One lecturer, two SRC research assistants, two postdocs, one researcher and six PhD students.

This research group has preclinical, translational and clinical activities in the alcohol addiction field. It was critically involved in the discovery of nicotinic and glycinergic mechanisms mediating dopamine activating (within the reward system) and reinforcing properties of ethanol. On the basis of its preclinical findings, several randomized controlled trials (RCTs) were initiated. More recently, a multi-centre RCT on the effectiveness of a glycine transporter blocker in alcohol relapse and craving was conducted with the support of a pharmaceutical company. Without the initial preclinical work of the Addiction group at the University of Gothenburg, this trial would have not been conducted. Group members also hold a patent on this particular application. Another important RCT has been initiated on the partial nicotinic receptor agonist varenicline in alcohol-dependent patients. This group was also involved in one of the Institute’s most important projects on ghrelin and reward mechanisms.

Within the 2004-2009 period there were 15 publications with 228 citations (in the last ten years approx. 40 publications which were together cited more than 700 times). If the Integrative preclinical and clinical studies of alcoholism and related disorders project is included, many more publications must be added. Most publications are in low to good journals (up to an impact factor of 5). The group has obtained substantial external funding, most notably it was involved in a six-year

funding programme from NIH. It has also received financial support from the pharmaceutical industry.

SWOT analysis: There is very good leadership from one lecturer who does, however, have a high daily clinical work load. However, the group has a lot of benefits from this strong clinical involvement, e.g. direct translation of its preclinical findings into RCTs. There is also an excellent balance of supervisors and PhD students (4:6 relationship), which leads to well educated young scientists. The collaborations within the Institute are very good. International collaborative efforts should be improved, and most importantly the group should publish in better journals. (There are no high to top impact papers in the last ten years, despite the fact that it generates very good work.) This group has strong teaching activities.

To summarize: The group is *Very good/Excellent*.

15.2.7 Psychiatry and neurochemistry

Staff: Six professors, one lecturer, one SRC research assistant, 19 postdocs, two SRC researchers and 19 PhD students.

This unit aims to elucidate pathophysiological mechanisms of neuropsychiatric disorders, and to develop biomarkers and new treatments. There are evidently two main research areas:

1. Neuropsychiatric epidemiology
2. Alzheimer's disease, biomarkers

In addition, research in bipolar disorder pathophysiology is being initiated.

1) *The Neuropsychiatric Epidemiology* group has a long-standing tradition at the University of Gothenburg, maintaining several large epidemiological and well-described clinical cohorts within Sweden, as well as participating in international collaborative studies of combined data. The group has contributed key epidemiological findings in neuropsychiatric disorders, notably in its extension of risk factors for late-life neuropsychiatric disorder to mid-life events, which has significantly changed current approaches to etiological modelling. The group provides an important interface between population and clinical research, as evidenced by its collaboration with the Alzheimer's group. The research has substantial impact and international recognition, with several papers in the "List of the most important publications". Members of the group are frequently solicited for international expertise. The group is clearly excellent.

2) *The Alzheimer's* group has emerged as one of the most productive and internationally well-recognized groups in neurodegenerative disorders research worldwide. This is highlighted by several high-impact (and highly cited) papers in recent years, as well as invitations to present results and chair sessions at key international meetings. The group has secured large amounts of funding, is highly productive, and has provided several of the papers on the “List of the most important publications”.

The group is involved in several multi-site international studies of cerebrospinal fluid (CSF) biomarkers and genetics of neuropsychiatric disorders, especially Alzheimer's disease (AD), and is clearly among the frontline groups in this field internationally. It has demonstrated that CSF markers (notably T-tau, A β 40/42 and P-tau) may be used to predict AD development at early stages of the disease (mild cognitive impairment), and has published extensively on the biochemical aspects of these important biomarkers. This is a very important area of research, and the group has extensive knowledge of the biochemistry involved, analytical techniques and clinical procedures, and has internationally competitive facilities for genetic and proteomics investigations. The group has developed the field of AD biomarkers into a very promising area for early prediction and treatment stratification, and to guide drug development. It is continuing with excellent new projects in this field, and has also started translational approaches, combining brain imaging and animal studies.

The publication record is outstanding (> 336 papers during the period 2004-2009; the citations of publications originating from the Alzheimer's group is > 2,600 for 2010 alone). Papers are in appropriate journals, with impact factors in the low (1.5-3), good (3-5) and high (6-9) range. There are also several papers in the top journals (JAMA, Nature Group, Science, etc.) in the review period. Citations of the papers are outstanding. The unit is internationally highly competitive and leading in some areas.

SWOT analysis: The synergy with the other groups in the Department of Psychiatry and Neurochemistry is not adequately specified, although there are a number of joint publications, and there is little information as to how the group intends to develop its multidisciplinary approach combining CSF markers with other methods (brain imaging, epidemiology, etc.). The size of the unit seems to be large enough to provide research at the forefront of the field, with a large group of postdocs and PhD students, amounting to roughly 3-4 per professor, which seems to be adequate. The national and international collaboration is excellent. Quality and productivity are high, in relation to both PhD degrees and publications. Despite the outstanding achievement by the neurochemistry group, it has apparently been difficult to win support from higher levels at the University. There also seem to be future problems related to the lack of medical practitioners undertaking research and enrolling in doctoral programmes. Currently there is no imaging facility, but

there are plans to establish one soon. One advantage is that several young “senior” scientific personnel have been recruited to secure the future.

To summarize: The Psychiatry and Neurochemistry unit is *Excellent*, including an *Outstanding* individual group.

15.2.8 Child and adolescent psychiatry

Staff: One professor, five postdocs and nine PhD students.

This unit studies child and adolescent mental health problems, focusing on autism, attention deficit/hyperactivity disorder (ADHD) and anorexia nervosa (AN).

The unit has a long-standing tradition at the University of Gothenburg, and was one of the pioneers in modern child and adolescent research, with excellent contributions to the field ranging from clinical characteristics and longitudinal outcome, to genetic and environmental causative factors. The unit has been an “international leader” in this area for decades, and has an extensive knowledge of several aspects of the area, as illustrated with the review in *Lancet*. The group is involved in several strong international collaborations, continuously performs research with substantial impact and international recognition, and is very productive. The unit has a paper in the “List of the most important publications”.

It has contributed with groundbreaking discoveries of frequency and longitudinal outcome of ADHD, from population-based epidemiological studies of the prevalence of important child and adolescent psychiatric disorders. Furthermore, the group has strong experience and expertise in clinical assessment and evaluation tools, which have been key tools in developing the whole clinical field. The group has maintained several large well-described clinical cohorts, and successfully investigated longitudinal aspects of the relevant disorders in follow-up studies. In recent years, the group has also contributed with important genetic findings, especially in autism, where abnormal synaptogenesis has been implicated. These findings have been published in high impact journals and are highly cited. In addition, the group has a strong dissemination and teaching focus, with high international visibility.

The publication record is excellent (> 90 papers during the period 2004-2009, cited > 1,700 times). Papers are in appropriate journals, with impact factors in the low (1.5-3), good (3-5) and high (6-9) range. There are some papers in the top journals (*Nature Group*, *Science*, etc.) in the review period. The unit is internationally highly competitive and leading in some aspects.

SWOT analysis: The size of the unit is small, with only one senior position, which may be a handicap for thematic continuity as students move on to other positions.

Despite this, research quality and productivity are high, with regard to both PhD degrees and publications. The international collaboration is excellent. How the unit works together with other units in the Department could be better explained, and there is little focus on future synergy such as translational research involving other groups in the Department with key expertise (i.e. genetics, neurochemistry and epidemiology). During the site visit to Gothenburg on November 22-26, the Panel Chair and Co-Chair were informed that the future has been secured through new, large long-term private funding for a research centre, named the Gillberg Center, based on the current research team, and the recruitment of new professors.

To summarize: The Child and Adolescent Psychiatry unit is *Excellent/Outstanding*.

15.2.9 Forensic psychiatry

Staff: One professor, one researcher and four PhD students.

This unit studies forensic psychiatry and aims to establish the background factors of childhood-onset conduct disorder and subsequent antisocial personality disorder.

The unit is new (formed in 2008), and serves two forensic psychiatric hospital clinics and three governmental boards. The research involves clinical characteristics and risk factors for criminal offenders, studies through both retrospective and prospective cohorts, and there is also interest in pathophysiological mechanisms studied with molecular genetics and neurobiological methods. Epidemiological methods are also used.

The unit has a strong focus on education and teaching, and despite its short history has become one of the leading groups within forensic psychiatry research in Sweden. The group has published several international papers, but few in high ranking journals. The unit is currently involved in studies of biomarkers and clinical assessment tools as predictors for violent recidivism, and pathophysiological mechanisms related to aggressive and violent behaviour/phenotypes.

The publication record is good (39 papers during the period 2004-2009, cited 452 times). Papers are in appropriate journals, with impact factors in the low (1.5-3), good (3-5) and high (6-9) range, and one in the Nature Group and an additional 3 in other high impact journals.

SWOT analysis: The size of the unit is small, with only one senior position and five postdocs/PhD students, but several additional are affiliated with the group through the network described above. Productivity is good, with a few high impact papers. Owing to its short history, it is difficult to evaluate the group. How the unit works

together with other units in the Department should have been better explained, as this is critical for this small group.

To summarize: The Forensic Psychiatry unit is *Good*, with significant future potential.

15.2.10 Clinical neurology

Staff: Seven professors (including two adjunct professors), one postdoc, one researcher and 24 PhD students.

This unit attempts to cover many topics (stroke, epilepsy, movement disorders, neuromuscular disorders, normal pressure hydrocephalus, multiple sclerosis, spinal cord injury and experimental astroglia research), including translational issues. All groups are characterized by a multidisciplinary approach with other neuro-related disciplines.

The stroke research has revealed important data concerning pathogenetic mechanisms as the relation between CRP (C-reactive protein) and stroke. In epilepsy, the main research has been on treatment, including the effects of surgery. Studies of hydrocephalus have given important clinical and pathophysiological data. The experimental astroglia research has given new information, in particular relating to the glutamate transporter GLT-1. In all these areas, productivity and quality are good to very good. Concerning international collaboration, this seems – so far – to be less than expected.

The staff of seven professors (including one adjunct professor) and 21 PhD students indicates a reasonable balance between students and supervisors. The fact that there is only one postdoc may be explained by many clinicians carrying out part-time research in addition to their clinical obligations. The publication record is good (> 120 publications; > 2,200 citations in the period 2004-2009).

The unit has plans for developing its long tradition in movement disorders into new studies related to genetic and environmental factors in collaboration with well recognized international centres. To achieve a position among the world-leading groups, it may be necessary to concentrate on one or two of the many different aspects listed. The epilepsy research group may also need to give priority to specific aspects if the group aims to be at the forefront of epilepsy research world-wide.

SWOT analysis: The unit illustrates a well-known problem in clinical departments where there are so many important topics to deal with. On one hand it is necessary to be continuously involved in new clinical diagnostic and therapeutic developments and to participate in clinical studies. On the other hand, it is necessary to

concentrate human, technical and economic resources in one or two areas if one aims to be at the forefront of international research. As specified above, this clinical department certainly has several strong research areas. It is notable that Neurosurgery is hardly visible, even though it is an important player in the research projects on epilepsy and hydrocephalus. Neurosurgery is obviously an area that needs attention from the leadership.

To summarize: The unit is *Very good*.

15.2.11 Clinical neurophysiology

Staff: One professor, one SRC research assistant, one postdoc, one researcher and four PhD students.

The main area of research is different aspects of thin nerve fibre function in relation to the sympathetic nervous system and to the sensory system for light touch. EEG and ERP have been used to study brain functions in autism.

Using microneurography from single or multiple units in peripheral nerves has made it possible to explore mechanisms involved in human sympathetic function. Such studies and findings may have clinical implications. Of similar clinical importance are studies using EEG and ERP in autism. These research areas are judged to be good/very good. Another main area of research in collaboration with basic neurophysiology has given knowledge about tactile afferents showing a new system for light touch. This is excellent basic research in humans! Even though the number of academic staff is very small, there are several publications – including in the Nature Group – from the 2004-2009 period. The plans for the future include studies with fMRI to explore higher order aspects of touch and central control of autonomic functions, including consequences of brain pathology. The group is evidently able to play a leading role in examining central processing of sensory and autonomic information with national and international collaboration.

The importance of the plan for “microwave-based diagnosis of stroke” is difficult to judge due to the lack of a more detailed description and documentation.

The size of this unit is rather small. Scientifically there is an ongoing collaboration with (parts of) the basic neurophysiology group. It could be considered whether the combined strength of the present basic research line in clinical neurophysiology and that of the collaborating partner from basic neuroscience would gain strength if merged physically.

SWOT analysis: Excellent contribution to basic research in humans both on autonomic nervous activity and small diameter sensory fibres involved in gentle touch.

The academic unit seems to be very small – and thus vulnerable. The present lack of good imaging facilities is serious, but at the site visit to Gothenburg on November 22-26 the Panel Chair and Co-Chair were informed that the plans to install leading-edge imaging facilities at the Sahlgrenska Academy are very advanced.

To summarize: The unit is *Good*.

15.2.12 Brain repair and rehabilitation

Staff: Two professors, two SRC research assistants, about 14 postdocs and one PhD student.

This unit performs studies in astrocytes, neuroplasticity and neurogenesis with very advanced methods. Translational aspects are part of the major projects and make them highly relevant for many clinical problems.

Studies on astrocytes have given new information concerning their role in CNS injuries and the mechanisms involved in their response to different injuries. By down-regulation of intermediate filament proteins, neurogenesis and astrogenesis were demonstrated to increase after transplantation. The findings suggest that astrocytes may be important targets for promoting regeneration in various disorders. Another main area has been the regulation of neurogenesis under normal and pathological conditions. The modulation by physical exercise and the demonstration that the juvenile brain may have a better capacity for neurogenesis than the immature brain are two of many important findings. Of particular interest are the findings that certain factors like G-CSF can enhance learning and the survival of newborn neurons; this may have therapeutic implications in the future. The publication record is very good (> 50 publications and > 1,880 citations in the 2004-2009 period).

The plans for the future include a continuation of the studies of astrocytic functions on regeneration and neurogenesis including studies on brain tissue from patients. The studies concerning the enhancement of plasticity will continue, including mechanisms involved in the effect of physical exercise. Altogether these plans seem realistic and promising, and the group has already secured strong funding, international collaboration and interaction with the biotechnological industry.

The group has only two professors; however, there are presently several postdocs. There have been eleven PhD exams the last six years. The group should have had lecturers and adjuncts to help the career progression. The addition of “rehabilitation” to the name is confusing as long as there is another group in Rehabilitation Medicine and also one in Physiotherapy – further comments on this problem are made at the end.

SWOT analysis: Strong scientific track record in a very competitive field with excellent external funding. A surprising lack of collaboration with the Rehabilitation unit at the Institute – see further at the end.

To summarize: The group is *Very good* to *Excellent*.

15.2.13 Rehabilitation medicine

Staff: One professor + one active emeritus and four PhD students.

The first Department of Rehabilitation Medicine in Sweden was set up at the University of Gothenburg in the 1960s. The first physiotherapists and occupational therapists to receive a PhD degree also graduated here. The Scandinavian Journal of Rehabilitation Medicine (now the Journal of Rehabilitation Medicine) was founded in Gothenburg in 1969. Today, it remains one of the leading journals of rehabilitation medicine worldwide.

Current research focuses on disability and rehabilitation in patients with neurological disorders (e.g. motor function from a longitudinal perspective, cognition and its impact on the individual and integration into society). There is an emphasis on stroke (see e.g. Evidence-based Guidelines for Stroke Rehabilitation).

The section has a strong international collaboration with regard to assessment in rehabilitation medicine.

The section is seriously understaffed. Nevertheless, the output is considerable (> 50 publications with a total citation of > 300 in the period 2004-2009).

SWOT analysis: An excellent track record – this has been a leading unit in its field, but with a more uncertain future. Certainly the physical location may cause a problem for close collaboration, but in the case of stroke rehabilitation it seems to work. A surprising lack of collaboration with the Center for Brain Repair and Rehabilitation.

To summarize: A unit with a strong background and impact. Still good output, despite being seriously understaffed. *Very good*.

15.2.14 Physiotherapy

Staff: Two professors, seven lecturers, three adjuncts and nine PhD students.

The scientific activity of physiotherapy covers a broad spectrum of topics, depending on the questions developing in clinical practice. The main research areas are:

- **Cranio-Cervical Pain:** – Physical therapy for headache; the symptomatology and non-pharmacological treatment of migraine, tension-type headache, whiplash-associated disorders and long-term neck pain and its associated disturbances.
- **Physical activity and exercise:** Prevention and rehabilitation in healthy persons and patients with different diseases – e.g. cardiovascular disease.
- **Respiration and surgery:** The main focus is to evaluate rehabilitation, pre- and post-operative care and surgical procedures in abdominal and/or plastic surgery. Research is also undertaken on the breathing/respiratory movements in different diseases and conditions.
- **Rehabilitation medicine:** Research into neurologic diseases, mainly in stroke and post-polio. The focus is on different aspects of walking capacity and movement analysis studied with quantitative as well as qualitative methods – connected to 13) *Rehabilitation Medicine*.
- **Spinal cord injury – the body and learning:** Relearning to use the body after spinal cord injury. Coping strategies, locus of control, sexual life, participation in rehabilitation process, and health-related quality of life are studied in persons with spinal cord injury. The research includes development and testing of assessment instruments.
- **Paediatric physiotherapy:** Mapping motor function and activity in children with disabilities and how this affects their participation and quality of life.

The section has (judging from the self-evaluation) a large educational task for training physiotherapists. The staffing seems to be rather unbalanced (many lecturers), but is related to the large educational task of the section. Several of the staff were not named in the original self-evaluation, but additional material with the names was supplied, making it possible to evaluate the publication record. Overall, the publications reflect collaboration with other clinicians dealing with the patients. The academic staff has contributed to > 80 publications during the 2004-2009 period, thus demonstrating a relatively high scientific involvement/output.

SWOT analysis: The scientific involvement of the academic staff (often only being able to devote a small percentage of their time to research) is high. However, the publication pattern reveals that there is a broad spectrum of topics depending on the clinical conditions where they are professionally involved. This may certainly be “good enough” – but in some international renowned physiotherapy departments it is often possible to see a core activity that is originated and driven by the principal investigators at the unit. (See also “Future potential and possibilities” below.)

To summarize: *Good*

15.2.15 Occupational therapy

Staff: One professor, four lecturers, one adjunct, four part-time postdocs, one researcher and five PhD students.

Occupational therapy is a young and developing scientific discipline at the University of Gothenburg. All the researchers have defended their theses between 2000-2008 within various disciplines such as geriatric medicine, neurology, rehabilitation medicine, rheumatology and occupational therapy. The professor was appointed in 2007 and an associate professor (“docent”) in 2009. The position of lecturer offers a maximum of 10% research time. Teaching, course development and administration account for the rest. The research depends on external findings. Fortunately, the unit has been very successful in receiving long-term external funding.

The main research areas are 1) Health-promoting programmes for elderly people – immigrants with disabilities (including clinical trials), 2) Everyday technology and elderly people, and 3) Research on elderly persons with visual impairment. The section has a large educational task for training of occupational therapists. The staffing seems to be unbalanced, but this is related to the large educational load of the section. High productivity in the group (> 53 publications), although several of the publications are national surveys.

SWOT analysis: This is a very recently established group. Many of the publications originate from the period before the author was part of the present group. Nevertheless, the publication pattern seems to reflect an effective interaction within the group. There is potential for a promising future.

To summarize: *Good*

15.2.16 Speech and language pathology

Staff: Two professors, two lecturers and two adjuncts.

This is a fairly new research area. The section is very small, but has an impressively high output (> 41 papers in the period 2004-2009 with > 100 citations; 16 papers in 2010).

Research aims at increased understanding of:

- speech in patients with cleft palate
- communicative functioning e.g. phonatory and velopharyngeal function in speech
- speech intelligibility
- participation, i.e. the individual's perception of their various uses of communication.

Studies are carried out on children and adolescents (e.g. normal children, children with a cleft palate) and adults (e.g. Huntington's disease, aphasia). The section collaborates strongly with other groups within the Institute and other units at the University of Gothenburg, and also at national and European levels. Although the section has two professors and two lecturers, there are no recorded "researchers" and or PhD students. However Speech and language pathology had, at the time (2004-2010) 4 PhD exams and an additional 6 doctoral students. The publication output has been fair, but the apparent lack of younger researchers (PhD students) is obvious.

SWOT analysis: The groups of scientists originate from several different fields – all with their own scientific networks. There is possibly a very promising future, especially if the group manages to create a unique programme where all participants can contribute with their specific competencies.

To summarize: *Good*

15.2.17 Ophthalmology

Staff: Two professors, one SRC research assistant, two postdocs and three PhD students.

There are two major groups of projects. The more basic science project focuses on the molecular pathophysiology of the retinopathy often seen in prematurely born infants (retinopathy of prematurity; ROP). The group participates in national and international collaborations with the aim developing further diagnostic tools and in designing preventive replacement therapy with IGF-I.

The other major project addresses the pathogenic mechanisms of cataract formation – possibly with important spin-offs relevant to other diseases with protein aggregation.

The publication record from this small group is impressive (> 60 publications and > 300 citations), with participation in a Nature Group publication.

SWOT analysis: The group is small and the strong "retinal" projects thus seem to depend on much collaboration outside the Institute. There is surprisingly weak scientific interaction between the academic leaders in this group.

To summarize: The group is *Good*, with great future potential.

15.2.18 Audiology

Staff: Three lecturers

This is a newly established unit in relation to the establishment in Gothenburg of a new 3+1 year audiology teaching programme (bachelor's + master's). One or two (or more) University lecturers are to be employed during 2011-2012 according to the staffing plan.

From the self-evaluation, it is seen that one of the presently employed lecturers participated in a national expert group (during 2008-2009) where practical guidelines were decided – the participation in this group was based on being one of the few in Sweden conducting audiological research within the area of hearing and hearing disorders in relation to musicians, the impact of exposure to music and leisure time noise, sound levels and acoustic interventions.

SWOT analysis: As this group is now being established, it is difficult to make a judgment. Quoting the Institute Chairman: *We will continue the process of building up the Department of Audiology. We will initiate and collaborate around both national as well as international research. We have already invited collaboration with the other national and international audiology departments. We will be seen and heard at international conferences. We will also hold a dialogue with society via different media. Our vision is to build up an excellent audiology programme and focus more on research activities in time. Our vision is also that we will be a prominent and active group, contributing to society by working at different levels on these questions. Our goal is to contribute with measurable research results by published scientific and popular scientific articles and functioning national and international networking*

To summarize: The unit is under development.

15.3 Organization and infrastructure

On the organization

The Institute is organized in four sections: i) Physiology, ii) Pharmacology, iii) Psychiatry and Neurochemistry, and iv) Clinical Neuroscience and Rehabilitation. This subdivision is mainly based on “geographical proximity”, although Psychiatry and Neurochemistry is actually located at four different sites.

Covering the full range of “neuroscience” research from basic science to clinical practice/research is an obvious strength – not least from the point of view of integrated teaching within this topic. As the Institute is spread out geographically, it is obviously difficult to manage it as a single functional unit on a daily basis.

Although the Panel is aware that the Sahlgrenska Academy made major changes in the Institutes at the Faculty approximately five years ago, the details of this reorganization have not been made clear. It is obvious that collecting all preclinical and clinical neurosciences in one Institute is visionary and has potential strength – not least for the large number of teaching programmes that are part of the Institute’s responsibility. However, to create an integrated Institute from several previously independent units – still geographically located at seven different sites – may be difficult, and in the short run even an impossible task.

During the Panel’s meeting in Copenhagen, there were indeed many questions in relation to how far the integration had progressed since the reorganization/mergers in 2004-2005. The description in the self-evaluation and the presentation at the website (did not convince the Panel members. After the meeting, the Panel received the annual report from 2009 with plans for 2010 (in Swedish) – here it is more clear that the leadership of the Institute is working hard to achieve a real integration, although the four sections seem to have a large degree of independence (which is probably due to both historical reasons and present geographical location). Although it seems well documented that the leadership – including representatives from the four sections and subcommittees for undergraduate and graduate/PhD studies, etc. – is striving to create an “integrated institute”, it still seems doubtful to what extent individual researchers actually identify themselves with the new Institute in their daily activities/priorities.

Another aspect of the research profile of the Institute is related to the inclusion of “physiology and pharmacology” in general. In actual fact, most of the current projects within the areas of cardiovascular/gastrointestinal physiology and endocrine physiology have strong links with the nervous system. The focus of pharmacology is also strongly related to “neuroscience”. Does this imply that other areas of physiology and pharmacology belong to other Institutes, or does it reflect the fact that priority is mainly given to “neuroscience-related” areas in physiology and pharmacology?

On core facilities

The access to core facilities and the use of the other group’s expertise could have been better explained. However, there is a large degree of collaboration and synergy within the Institute.

There is a clear lack of access to brain imaging technology, which is recognized by the University. At the site visit, the Panel Chair and Co-Chair were presented with plans for a large imaging centre located at the Sahlgrenska area, as a result of collaboration between different institutions in the region. It will be ready in 2015, and will have a major positive impact on future research at the Institute.

It was noticed that the unique mechanical and electronics workshops that were established by Anders Lundberg in the 1960s are almost gone, and technical development currently has to be done by international collaborators.

The neurochemistry laboratory has impressive but necessary technological equipment, enabling it able to provide world-wide service. Apparently this was developed using its own resources and international grants, with little support from the University.

There was little description of future plans for the acquisition of expensive equipment or core facilities that can serve many of the groups at the Institute. However, at the site visit the Panel Chair and Co-Chair were informed about strategic work in this area, so there is obviously a clear realization of the equipment situation at the Institute.

15.4 Future potentials and possibilities

Comments on future plans

Firstly – at the site visit to Gothenburg on November 22-26 – the Panel Chair and Co-Chair were impressed by the strong and future-oriented leadership at the Institute. We had already received rapid responses to several questions asked both at the Panel's meeting and later. During the site visit we received further well documented and thoughtful information on the present status and the future plans.

Judging by the present performance in the 18 research profiles, the choice of the following headlines for future efforts is expected:

- The Center for Brain Repair and Rehabilitation (CBR) and other projects focusing on brain injuries
- Endocrine physiology
- The Gothenburg Psychiatry Network (GOPS)
- Neurology
- Neurophysiology (basic and clinical)
- Occupational therapy
- Ophthalmology (basic and clinical)

There are several strong and promising areas in this plan. We would particularly mention the Gothenburg Psychiatry Network (GOPS) and Endocrine Physiology as very promising research areas based on strong groups with current leaders in the field and new young researchers ready to take over to fulfil the future potential.

In the case of the Center for Brain Repair and Rehabilitation (CBR), the Panel feels that the “*aim is to be a global leader in neurorehabilitation in five years*” is too ambi-

tious in such a competitive field. The Panel certainly agrees that this centre should receive strong support, but it seems important to integrate Rehabilitation Medicine into this new plan.

From the website, it appears that classic rehabilitation medicine is part of the Center for Brain Repair and Rehabilitation – but that is certainly NOT the case in the self-evaluation document. In the future plans, “rehabilitation” is only mentioned in relation to *“The FunCure concept, based on novel research findings on brain plasticity, [which] aims to design neurorehabilitation programmes tailored to the individual, maximizing functional recovery and reintegration”* and *“Functional culture: The hypothesis is that cultural activities such as music, rhythm or dancing can improve human health and brain plasticity, and can contribute to healthy aging with limited cognitive decline.”* The participation from the University of Gothenburg is described in the “Research Plan Culture and Health1”. This may be an interesting framework for specific research projects. However, it is difficult to see this as a successful integrated project unless the “hard core” and high-class competence within this area at the Institute is directly involved. Following the site visit to Gothenburg on November 22-26, the Panel Chair and Co-Chair would urge the leadership to review these future plans.

It seems that there is much common ground for the following four units: Rehabilitation Medicine, Physiotherapy, Occupational Therapy and Speech and Language Pathology. As stated above, Rehabilitation Medicine had a strong international standing, but seems to be heading towards an uncertain future. The four units were merged into the Clinical Neuroscience and Rehabilitation unit in 2008, but until now there is a weak interaction between the groups. The leadership is challenged to find incentives to stimulate integration. An important pre-condition is better staffing of the Rehabilitation Medicine unit.

It is also notable that Neurology is mentioned in the future plans, although it is hardly seen in the presentation of the present research profile. In relation to this, it should be pointed out that the readers of the self-evaluation can hardly tell whether neurosurgery is part of this Institute or another clinical Institute covering “general surgery” – indeed it IS part of the present Institute, but academically it is hardly visible. Following the site visit to Gothenburg on November 22-26, the Panel Chair and Co-Chair were informed that this problem has been recognized, and that plans exist to add at least one professorial position to this field.

We also note the description *“Neurophysiology (basic and clinical)”*: is a “merger” between basic and clinical neurophysiology intended? At present *part* of basic neurophysiology is collaborating closely with clinical neurophysiology and we have raised the question of whether these collaborating partners would be strengthened by a physical merger (in close functional relationship with the upcoming neuroim-

aging unit). For the remaining basic neuroscience groups, a merger with clinical neurophysiology would be detrimental.

General comments on research grants

The financial basis for the research activity is to a large – and growing – extent based on external support. In both the documentation of the Institute’s finances and the annual report there is a focus on the positive development of the external support for research. The Governmental support has been SEK 129 million for undergraduate education, and only SEK 49 million for research – thus a significant majority of the financial support for research comes from external funding (including SEK 128 million in direct grants for research). There has been a continuous and strong increase in the external support for research – from approximately SEK 76 million in 2005 to SEK 128 million in 2009. The contribution from the Swedish Research Council has increased from approximately SEK 20 million to SEK 45 million in the same period. The sources for the grants (beside the Swedish Research Council grants) are competitive national and international (EU and NIH) grants. According to the reports from the Institute, there seems to be reason to believe that this increase is sustainable – and even may increase further. It will, however, be important to increase the financial contribution from the EU. In view of the size of the Institute, the EU contribution should be approximately 10% of the total grant money (benchmark compared to many other European academic institutions). In particular, one or two of the outstanding researchers at the Institute should seek a prestigious ERC grant and National Centre of Excellence grants.

15.5 Research activity and teaching

In the self-evaluation it is stated that the Institute has the University’s largest educational commission. Not much is written about pre-graduate education in the self-evaluation. (Most information is received from the annual report from 2009 with plans for 2010, in Swedish.) However, the research activity and teaching commitments are very much related. Firstly, an integrated Institute of Neuroscience and Physiology will secure an academic/scientific background for the study programmes – for which they have received the responsibility – that require a broad scientific repertoire. Secondly, the distribution of basic resources (positions) seems tightly linked to teaching – at least at the preclinical levels.

The Institute currently has significant responsibilities for the programmes in medicine (physiology, pharmacology, biochemistry, neurology, psychiatry and ophthalmology) and dentistry. In addition, the Institute has major responsibility for the following programmes: 1) physiotherapy, 2) occupational therapy, 3) speech therapy and 4) audiology. Courses are also given within the framework of other programmes, such as Biomedical Laboratory Science and the MSc in Pharmacy. During the “category meetings” at the visit to Gothenburg, considerable tension

regarding the distribution of the teaching commission surfaced (clinical departments wishing to “take over” parts of the Institute’s present educational commission). This “dysfunctional” situation obviously needs the strong attention of the Faculty leadership.

General comments on PhD degrees

The number of students acquiring a PhD degree from the Institute in the period 2004-2009 is 149 (with 27 graduating in 2009). Although this number seems adequate, the Institute brings up the difficulties in recruiting PhD students as one of the weaknesses in its own SWOT analysis. This seems to be restricted to medical graduates (probably in the preclinical parts of the Institute). Although this problem is indeed “international”, it is certainly serious, as a particular reason for the present organization of the Institute is to bridge basic and clinical neuroscience. One of the most effective ways of doing this from a long-term perspective is to have young PhDs from the basic sciences continue a clinical career where several of them may become essential for establishing translational research.

Another possibility to address this problem is to arrange for PhDs from other areas to enter a “fast track” for medical education leading to an MD degree. In Document 5 (the Dean’s description of the Faculty and its research) this is specifically described:

We have therefore made it possible for students with a PhD in natural sciences and medicine to enter and undergo a shortened training programme to achieve an MD degree. By recognizing previous knowledge and utilizing compressed knowledge acquisition, we use both the individuals’ and society’s resources efficiently. We also believe that having students with a PhD in the medical training programme will add to the educational quality through an increase in academic debate and critical attitude, and will further strengthen the connection between education and research

This aspect is not discussed by the Institute in relation to the problem of recruiting PhD students with a relevant background for a later interaction with applied/clinical research.

15.6 Interactions with society

Being an Institute with the major academic commission within the clinical fields of neurology, psychiatry (adult and child), medical rehabilitation, physiotherapy, occupational therapy, speech therapy and audiology, it is self-evident that the Institute contributes to “society” in broad terms. The important scientific contributions within the fields of obesity, dementia, autism and ADHD, drug dependency, stroke prevention/rehabilitation, “brain repair” and “drugs in the environment” certainly speak for themselves.

15.7 Gender and equal opportunity issues

General comments on gender

In the Dean's description of the Faculty and its research, it is specified that "*Gender, equality and diversity issues are important aspects for the pedagogic development and research. Consequently we are recruiting a gender senior lecturer and forming a committee for pedagogic development. The Sahlgrenska Academy has reached the University's goal on the distribution between the sexes (40/60) in managerial positions.*"

The Institute (as do all institutes) has a committee that works on achieving the overall goal that the under-represented sex shall at least constitute 33% within each category.

The numbers for researchers reported in the Institute's annual report for 2009 shows that among professors (n=64) 27% are women, for associate professors (n=17) (senior lecturers) the number is 24%, for assisting professors (n=10) (adjunct) it is 100%. Among the PhD students (n=167) 70% are women. It seems that these numbers reflect an international trend. Hence, except for the category "professor", all other categories of the academic career ladder in the life sciences (especially if clinically-related) are now increasingly predominantly women.

15.8 Summary and recommendations

Overall assessment

We find the Institute *Very good/Excellent*. As described above there are large variations in terms of quality within the Institute, but there is *Excellent* leadership, and some *Excellent/Outstanding* research groups that certainly contribute significantly to the overall quality of the University. In general, the future of the Institute is guaranteed through both current scientific excellence and the potential of the research projects together with strategic leadership. As this is an important part of this evaluation we have added (above) a rather long paragraph commenting on the future plans. The bottom line is: continue to support strong groups and talented young scientists – there is obvious insecurity and frustration among several excellent young investigators at preclinical levels (without clinical or alternative positions). Appropriate tenure track programmes seem to be lacking in Sweden.

Recommendations

Here we refer to *Comments on Future Plans* presented above. In addition, we want to stress the need for modern imaging facilities, which are absolutely necessary in modern neuroscience research. Being among the last in Sweden hopefully means that the new unit (to be ready in 2015) will be the technically most advanced when installed. It is important to secure access to "pure" research projects in this imaging unit – this relates to establishing a Steering Group in which the academic needs are strongly represented. This comment may seem self-evident, but following the site

visit to Gothenburg it seems to be a relevant and necessary remark. There is also a need for efficient access to molecular genetic platforms.

Assignment of teaching

Clearly the Institute of Neuroscience and Physiology has accepted considerable responsibilities in teaching – not only for medical and dental students, but also in a number of other study programmes (including newly established fields). In the descriptions obtained (mainly in the annual report from 2009 with plans for 2010, as well as during the site visit), it is obvious that the Institute takes these obligations very seriously. This certainly originates from professional responsibility and pride – but in addition it provides the financial foundation for most of the positions at the Institute, which importantly also provides the base for the research activities. At preclinical level, the Institute represents the only unit with integrated competence (and responsibility) in the areas of physiology and pharmacology. The establishment of significant research groups involving cardiac and vascular research at other units at the Faculty seems to have created considerable tension (which surfaced at a “category meeting” during the visit to Gothenburg). This “dysfunctional” situation obviously needs the strong attention of the Faculty leadership, not only to ensure efficient and effective teaching, but also to optimize the research base.

15.9 Summary of assessments – the Institute of Neuroscience and Physiology

Overall assessment: *Very Good to Excellent*

Scientific quality: *Excellent*

Leadership: *Excellent*

PANEL 16 – ODONTOLOGY

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16. THE INSTITUTE OF ODONTOLOGY

16.1 Introduction

The Institute of Odontology was previously a separate faculty (the Faculty of Odontology) at the University of Gothenburg, but was in 2001 integrated into the Sahlgrenska Academy as one of six institutes.

In collaboration with the Public Dental Service (Folk tandvården) in Region Västra Götaland (VGR), which owns and runs the dental clinics used for undergraduate and postgraduate training, the Institute comprises one of four dental schools in Sweden. The undergraduate studies are Dentistry, Dental Hygiene and Dental Laboratory Technology. Researcher training programmes lead to doctoral (PhD) and licentiate degrees and, in collaboration with the Public Dental Service, the Institute of Odontology takes part in teaching for eight clinical dental specialties.

The organization of the Institute of Odontology follows a departmental structure, reflecting the traditions for teaching undergraduate students according to disciplines. The 13 departments are, for the most part, headed by full professors. In order to enhance the critical mass of researchers and to facilitate research collaboration between the departments, they have been grouped into three academic sections since 2007.

Section 1

Endodontics, Behavioural and Community Dentistry, Oral Medicine and Pathology, Oral and Maxillofacial Surgery, Oral and Maxillofacial Radiology, Stomatognathic Physiology

Section 2

Oral Biochemistry, Prosthetic Dentistry/Dental Materials Science, Periodontology

Section 3

Cariology, Oral Microbiology and Immunology, Orthodontics, Pedodontics

According to the leaders of the Institute of Odontology, the grouping of departments into sections is mainly based on their physical location within the building housing the Institute. Although the Institute's self-evaluation report notes an improved climate for interaction, it was also noted that the grouping of departments into three sections has had little effect on research collaboration across the departments.

The Institute of Odontology is headed by a Director, who is appointed for three years (60% time), and a Deputy Director (30% time). Additionally, there are As-

sistant Directors for researcher training and for the undergraduate curriculum. Administrative support personnel include administrative coordination (60%), financial control (60%) and IT (100%). The Director serves in an administrative capacity to oversee finances and functions in undergraduate education, research and researcher training. The Director is also responsible for interaction with the Public Dental Service.

16.2 Overall assessment

The Panel has faced serious problems in the assessment of research at the Institute of Odontology, since the activities at the Institute are very much integrated with activities at the Public Dental Service, and the delineation between the two institutions was difficult to identify. This integration includes both budget issues and academic positions. The research activity is mostly separate at the two institutions, but is also integrated to some degree, and the researchers frequently hold part-time positions at both institutions.

The so called TUA agreement between the Institute of Odontology and the Public Dental Service, as part of “Hälso-Sam”, regulates the organizational responsibilities for the undergraduate education of dentists, as well as the research that may result in increased quality in dental care. Based on the TUA agreement, a majority of the researchers at the Institute have either clinical teaching duties at the Public Dental Service and/or clinical duties as specialists. There are obvious educational advantages to this arrangement, but the Panel sees this as a major drawback for research at the Institute, since it splits the day and week for the researchers between different activities and does not leave sufficient continuous time for research activities. The TUA agreement involves a significant opportunity for clinical research, e.g. long-term clinical cohort studies, but the potential is grossly underutilized as the Institute of Odontology and the Public Dental Service seem to run most of their research projects separately.

The TUA agreement includes funding allocated for dental research, and it seems to be the most important source of funding for researchers employed at the Institute of Odontology. The amount allocated for research may vary considerably from year to year, which may be unfortunate, but the Panel was informed that an average of about SEK 6 million was available per year as working capital. Even if this money is obtained from a different institution – the Public Dental Service – the University accounts for this money as internal funds for the Institute of Odontology. This is unfortunate, since university funds are allocated on the basis of factors such as the ability to attract external funding. A few of the research groups within the Institute of Odontology have managed to secure external grants from the Swedish Research Council (VR) or the Swedish Council for Working Life and Social Research (FAS), and even in one case from the EU, but several researchers outside these successful

groups reported a feeling that the Swedish Research Council is reluctant to finance clinical research, and that when funding was obtained, the sums granted were small. This led them to direct their applications towards TUA funds, which were considered more accessible.

Generally, the Panel estimates the research activity at the Institute of Odontology has been high during the period 2004-2009. More than 800 papers, about 600 of which are original peer-reviewed articles, is generally very good in light of the rather low number of full time equivalents for research (research FTEs; 24 excl. PhD-students according to the self-evaluation), and in light of the international standards within dental research.

Seen from an international oral science perspective, much of the research can be characterized as being of very good or excellent quality, and in one area the research is even outstanding and unique. Most of the research also has high relevance. Internationally, the Institute of Odontology is a highly recognized research institution within oral sciences – currently best manifested in craniofacial development biology, implant-related research and behavioural sciences.

The main weakness of the research activity at the Institute of Odontology is that it is extremely fragmented. Proper research groups addressing specific research questions/themes are few and often rather vulnerable owing to their limited size. The research questions addressed are many and highly varied in their aims and in the methods used to address them. A very broad range of topics and methodologies are covered, but only very superficially. This is a result of an organization where only 24 research FTEs are spread across 13 departments, which vary considerably in size from comprising only one member of staff at PhD level to a group of more than ten staff. The current departmental organization is a product of traditional dental school thinking, which holds that organizational structure should reflect the clinical and pre-clinical disciplines taught in the undergraduate curriculum. Such a structure might work provided that staffing was adequate, but this is no longer the case, and the current departmental structure does not support the research needs. The many very small departments constitute a serious threat for the near future when a considerable number of senior professors will be retiring, and young scientists are supposed to be entering small and vulnerable groups. As external funding becomes more and more important, it would seem vitally important to seek to create larger research environments/groups. Although the attempt to group the many small departments into three sections shows an awareness of the problem of too many, too small research environments, the grouping seems to have had no effect at all.

In this context, it is a weakness that the Board/Head of the Institute of Odontology has relatively limited authority relative to the departments. The Head of Depart-

ment and the Deputy Director are elected from among the senior staff of the Institute of Odontology for a three-year period at 60% time (Head of Department) and 30% time (Deputy Director), and when their assignments terminate they return to their full positions. This system is not conducive to a strong and visionary leadership, and the real power at the Institute would seem to remain at the departmental level.

A strength that at least partly balances the weakness of many very small research groups is that most of the research groups have large national and/or international collaborative networks.

There are many PhD students at the Institute of Odontology, partly financed by the Institute and the Sahlgrenska Academy, partly by the Public Dental Service and partly through external funding. Their average age at disputation is extremely high. The main reason is that many of the students have very low research activity while enrolled as PhD students and take a long time to finish. This seems to be a threat for the recruitment of both new active and engaged researchers, just as the long study times indicate a considerable misuse of academic resources for supervision. The Institute of Odontology has five PhD students funded by the National Graduate School of Dental Research, which is a nationally funded programme for dentistry. These students are admitted to specialist training after their PhD and thereby obtain double competency. It was noted, however, that this special double-competency programme was also used as a way of fast-tracking into the specialist training programme.

The Institute of Odontology has no postdoc positions, and it is therefore very difficult for the Institute to plan ahead actively with respect to the replacement of retiring senior academic staff.

16.3 Research quality, productivity, uniqueness and relevance

The present evaluation of research activity in the 13 departments is mainly based on the material that was made available to the Panel from RED10, in addition to information available in medical databases and websites. During the site visit, the Panel had the opportunity to meet with the Institute of Odontology's leadership group and with members from three departments (Behavioural and Community Dentistry, Biochemistry and Periodontology), and the information obtained during these visits is also included.

The Panel realizes our assessments have been hampered by a number of factors: The initial total list of publications received from RED10 contained many publications for which the affiliation with the Institute of Odontology was not clear or could

not be verified. The list also contained publications from former employees (i.e. researchers who had not been employed during the period assessed), which should therefore not be considered in the assessment. On asking for a database of publications with a view to grouping the research according to research themes, this turned out to be impossible. What could be obtained was a file in which the academic staff and their publications were grouped according to departmental affiliation. This list was the main basis upon which the research could be evaluated. The Panel is fully aware that this evaluation by department has its weaknesses, since people may be affiliated with a department that does not represent their research interests.

16.3.1 Endodontics

In the period 2004-2009, the research in at the Department of Endodontics was carried out by two professors, one senior member faculty staff, three other members of faculty and postdoctoral staff, three PhD students and four other members of staff – 13 persons in total. Currently, three staff members are listed for the Department, one of whom is a professor, one is a senior lecturer, and one is a non-research employee. At present, they represent a total research FTE of 0.48 (range 0-0.33). The senior lecturer is employed by the county, with research obligations integrated with the Institute of Odontology.

Research themes

The research themes are varied and only part of the research emanating from this department centres on clinical and biological aspects of endodontic treatment. These are:

- Endodontic infections
- Immune components in pulpal and periapical inflammation
- Criteria for case selection in endodontics
- Translation of technical research into clinical endodontics

Other major research themes covered by members of the Department include:

- (Behavioural and psychological aspects of dental therapy, and dental fear and anxiety issues)
- (Turner syndrome)
- Immunological aspects of allografts
- (Immunology of induced arthritis)
- (Adherence of periodontal pathogens)
- (Dental caries microbiology)

(Items in parentheses are themes covered by faculty staff who do not often list the Department of Endodontics as their affiliation.)

The total volume of registered peer-reviewed publications is 83, and 20 of these have department associates as first author. However, a number of these publications are listed under author(s) where the Department is not mentioned as an affiliation. The majority of publications are published in major international endodontic journals or in well respected journals in general odontology, immunology or microbiology.

Overall assessment

The Department has had, and appears to have, a very successful interaction with the Departments of Microbiology & Immunology and Oral Medicine & Pathology. Much of the Department's research is considered leading in its fields of study, particularly the microbiology of chronic and persistent apical periodontitis, and cell and tissue responses to antigenic challenge of the pulp and periapex. The laboratory facilities of the abovementioned departments have apparently been instrumental in the execution of research initiated by faculty staff from the Department of Endodontics.

The clinical facilities have been used to collect data in conjunction with assessments of treatment modalities and of teaching and instructional effects. This research has had a significant, global impact on treatment practices.

Assessments:

Research quality: *Very good*

Productivity: *Very good*

Uniqueness: *Very good*

Relevance: *Excellent*

16.3.2 Behavioural and Community Dentistry

Professor Ulf Berggren was the initiator and driving force in the Department of Behavioural and Community Dentistry, but he died last year. According to the list received from RED10, a number of members of staff whose research interests obviously lie within the behavioural sciences (including Professor Berggren) have been technically affiliated with the Department of Endodontics.

According to documents from RED10, the research is presently carried out by one professor and one adjunct professor in addition to one PhD student. They represent a total of 1.17 FTEs, with an average of 0.39 FTEs (range 0.02-0.8).

Research themes

The research themes are spread over a large spectrum and seem to reflect different individual interests of the two professors.

- Relationship between general health and oral health, quality of life
- Socio-economics and oral health
- Dental anxiety
- Pain
- Bone density and fracture prediction
- Micro-topography of dental hard tissues
- Endodontics – quality and risks
- Caries assessment on radiographs
- Oral retention of fluoride from adhesive paste
- Caries risk assessment in children and adolescents
- Association between periodontitis and high blood pressure
- Mercury recovery and emission from dental clinics
- Oral health and nutrition in adults with intellectual disabilities

The total volume of registered peer-reviewed publications during the period was 58 including Berggren's production, and 28 based on the two remaining professors. The majority of publications are published in recognized international journals.

Overall assessment

The research, which has been carried out in collaboration between dentistry and psychology, as well as with researchers in medicine, education and public dental health, was established many years ago and developed to a level that must be considered unique internationally. Based on this collaboration, and with researchers in many other fields within and outside the University of Gothenburg, the research group has achieved a position as one of few international leading groups in the field of behavioural science. A unique "clinical laboratory" was established, in which dental anxiety patients were exposed *in vitro* to different clinical stimuli. This laboratory is still in use in ongoing projects. Good citation indexes indicate the high scientific relevance of their research. Many clinical studies in collaboration with the Public Dental Service indicate good clinical and social relevance.

Treatment principles for dental anxiety developed by the group have been acknowledged by society and implemented in the Swedish Dental Insurance System.

Since Berggren's death, the Department has undergone organizational changes. During the site visit, the Panel had the opportunity to meet with the newly established research group, which included eleven researchers and six PhD students. These members represented different health fields, mainly dentistry and psychology, and with a large collaborative network (including the Public Dental Service). The group continues to focus on dental anxiety disorders, dental public health and epidemiological studies, and dental financial systems in large prospective studies. Clinical studies in gerodontology are also ongoing.

Assessments:

Research quality: *Excellent*

Productivity: *Excellent*

Uniqueness: *Very good*

Relevance: *Excellent*

16.3.3 Oral Medicine and Pathology

The research at the Department of Oral Medicine and Pathology is presently carried out by one full-time professor, a guest professor and three PhD students. They represent a total of 2.65 research FTEs, with an average of 0.53 FTEs (range 0.05-0.8).

The following research themes have been identified:

- Web-based collaboration in community practice
- Oral lichen planus
- Aphthous stomatitis
- Oral epithelial dysplasia
- Immunology
- Oral health as risk indicator of cardiovascular disease
- Alcohol and periodontitis
- Treatment of osteoporosis
- Orofacial granulomatosis
- Oral infections and rehabilitation of kidney transplants
- Radiography of caries
- Saliva
- Oral lichen planus
- Radiotherapy of cancer

The total production during 2004-2009 was 23 peer-reviewed articles (plus two review papers and chapters in books). The majority of publications are published in recognized international journals.

The two professors have no papers in common and their research fields are different.

Overall assessment

The only full-time professor in the Department is the driving force in this field, and seems to have a large international and national network. The research is of very good quality and scientific relevance, judging from impact factors of journals and citation index. In collaboration with Chalmers University of Technology, the Department has developed a unique computer-based system which aims to model and process patient information generated in clinical dental practice. The system may also provide useful data for research.

There are also a few papers on oral pathology issues in which large international research groups are involved.

However, since the research is spread across a variety of subjects and there does not seem to be research collaboration between the two professors, it must be asked whether there is a need to reorganize the activity.

Assessments:

Research quality: *Very good*

Productivity: *Excellent*

Uniqueness: *Very good*

Relevance: *Very good*

16.3.4 Oral and Maxillofacial Surgery

In the period 2004-2009, the research in the Department of Oral and Maxillofacial Surgery has been carried out by three professors and one senior faculty member – four persons in total. Currently, there are three researchers in the Department, one of whom has joined the Department since 2004. The total number of research FTEs is 0.7. The following research themes have been identified:

- Surgical aspects of oral implants
- Orthognathic surgical technique and efficacy
- Histological and histomorphometric analysis of bone replacement
- Implants in patients and animals
- Local tissue reactions to tooth replacement implants

The total production during 2004-2009 was 32 peer-reviewed articles (plus one review and one book). Within the scientific field, articles have been published in appropriate journals. It is very good that the Department has pushed beyond the comfort zone of its own specialty and published in some excellent, more general fora (Biomaterials and Trends in Biotechnology).

Collaboration between professors: two papers.

Overall assessment

This department has consistently produced scholarly research work of high quality and quantity. Impact factors, citation scores and H-indices are very good. Particularly noteworthy are the clinical long term follow-up studies and analysis of implants using basic scientific techniques. There is a strong local history in tooth implant development, commercialization and use, and the research in this area could be considered unique to the University of Gothenburg. The Department has made good use of this unique resource. One paper from this department has been selected

by the Institute of Odontology as a publication which represents good innovative research activity (Kahnberg K-E and Hagberg C, 2007). This paper represents good interaction between departments and with clinic practice, and is a good description of highly skilled clinical technique.

Assessments:

Research quality: *Very good*

Productivity: *Very good*

Uniqueness: *Very good*

Relevance: *Very good*

16.3.5 Oral and Maxillofacial Radiology

In the period 2004-2009, the research group at the Department of Oral and Maxillofacial Radiology has comprised five persons: two professors, two senior faculty members (docents) and one assistant researcher. However, both professors retired before the end of the period.

The overall research theme for this department is the utility of different radiographic techniques for the assessment of various oral and dental conditions. The Department has been instrumental in the evaluation and assessment of the imaging techniques that are relevant to dentistry, such as classical film radiography, digital radiography, cone beam tomography and (to a minor extent) techniques such as scanography and sonography.

The research carried out may be grouped into research initiated within the Department and research in which the departmental contribution is due to its function as a diagnostic service department.

The intra-departmental research in the period 2004-2009 has followed three lines:

- Technological/methodological aspects of digital radiography and tomography
- Comparative utility of tomography, digital radiography and film radiography for accurate assessment of caries lesions, periapical lesions, root fractures and root canal fillings
- Utility of cone beam computer tomography for implant therapy planning

The research with a strong radiological service component is mainly in the area of implantology, where the Department has contributed to several cohort studies of the prognosis of implant therapy.

The research is chiefly published in leading journals of relevance for the topic. The total number of publications for the period is 51, and one or both of the professors co-authored 46 (90%) of these.

Overall assessment

The Department has a longstanding position as one of the leading research groups in dental radiography, and the two professors are internationally renowned for their high-quality research. The research quality must be graded as excellent, and it is a clear strength of the research activities that both methodological/technical issues as well as clinical utility issues are addressed in the research.

Owing to the recent retirement of the two professors, the Department is clearly in a transition phase. The three remaining faculty members have a level of productivity that is considerably below that of the two professors. The Department's researchers have extensive networks and collaborations extending across Europe, Sweden, the University of Gothenburg and other departments within the Institute of Odontology.

Assessments:

Research quality: *Excellent*

Productivity: *Excellent*

Uniqueness: Not rated

Relevance: *Excellent*

16.3.6 Stomatognathic Physiology

In the period 2004-2009, the research in the Department of Stomatognathic Physiology has been carried out by one professor. The total number of research FTEs is 0.1.

Research into stomatognathic physiological disorders, by the very nature of these conditions, is often ambiguous and difficult. However, the publications achieve clear-cut and logical scientific analysis and results, and are therefore of practical help to the treatment provider.

Subjects studied included: obstructive sleep apnoea and the masticatory system, systemic conditions affecting the temporomandibular joint including osteoarthritis, efficacy of treatment for temporomandibular dysfunction.

Five peer-reviewed papers have been published in the appropriate journals.

Overall assessment

This is a department of one person who spends only 10% of his time on research. With this in mind, the quality of the publications and the standing of the Department within its community are good. With a full time equivalent of 0.1, the productivity of five peer-reviewed articles and a book chapter is good. Relatively low impact factors, citation scores and H-indices are a reflection of the size of specific field of stomatogastric physiology as a whole, rather than of low quality.

Assessments:

Research quality: *Very Good*

Productivity: *Good*

Uniqueness: *Good*

Relevance: *Excellent*

16.3.7 Oral Biochemistry

In the period 2004-2009, the research at the Department of Oral Biochemistry has been carried out by one professor, one senior faculty member and three PhD students. There are currently four researchers in the Department, including two PhD students. The number of FTEs is 0.95 for senior members of staff and 1.64 for PhD students, with a total research FTE of 2.59.

Research themes are:

- Biochemistry of oral hard tissues
- Craniofacial developmental biology

The total volume of publications for the period is 13 peer-reviewed articles (plus three reviews). The Department has published in high ranking dental science journals, as well as top ranking journals in developmental biology, molecular biology and general medical science.

Overall assessment

This is a very successful department with very little manpower, which has produced work of exceptionally high quality in a very competitive field. There has obviously been a deliberate switch from studying the biochemistry of oral hard tissues to craniofacial developmental biology (palate and tooth) and growth factors signaling. This directional change has proved fruitful. Globally, it is very unusual for research from a dental school to break into the upper echelons of basic science and biomedical science. With publications in *Molecular Cell*, *Developmental Cell* and the *Journal of Clinical Investigation*, the small group has done this on a consistent basis.

From any assessment perspective – H-indices, citation indices, impact factors or simply reading the articles – the work is erudite and impressive. It is particularly striking that this good work comes from what appears to be remarkably limited resources for a very small number of personnel. Normally, work of this nature comes from large, well staffed and well funded laboratories, which are able to maintain a reasonably large nexus or core of people so that they develop a critical mass of researcher and support staff. Below this critical size, a threshold is reached where the group becomes vulnerable.

It is concluded that the Department should certainly be given more support in its endeavours. In practice, this would mean ensuring that the Department has sufficient technical and academic staff and training positions, as well as funds for maintaining the laboratory.

It is to the Department's credit that it has managed to secure external funding over a long period in increasingly competitive circumstances.

Assessments:

Research quality: *Outstanding*

Productivity: *Outstanding*

Uniqueness: *Excellent*

Relevance: *Excellent*

16.3.8 Prosthetic Dentistry/Dental Materials Science

In the period 2004-2009, the research in the Department of Prosthetic Dentistry/Dental Materials Science has been carried out by three professors, one adjunct professor, four senior faculty members, one other member of faculty/postdoctoral staff and one other member of staff: eleven persons in total.

Currently, 15 faculty and staff members are listed for the Department, two of whom are professors, one is an adjunct professor, three are senior lecturers and four are guest researchers/teachers, the latter apparently without research obligations. In all, eight people are listed with research obligations. They represent a total research FTE of 1.83 (range 0-0.45).

The research themes covered by this department centre predominantly around implants and prosthodontic materials:

- Zirconium dioxide
- Prospective and retrospective cohort studies on implant function
- Antimicrobial action of dental materials
- Tissue interaction of implants

- Surface topography of dental hard tissue and dental materials
- Inflammatory responses to implants
- Bone induction
- Soft tissue reactions to implants
- Chemical reactions at the implant surface
- Laser-welded titanium

The total volume of registered publications is 103, of which 82 (81%) are co-authored by two professors. Most scientific articles have been published in journals of very good standing; however, a sizable part of the listed publications in bone-implant interactions are of a review nature. Looking at the titles, it would appear that the similarity in headings may reflect a maximization of research output from the same or very similar studies. There are a number of follow-up articles that do not escape the limitations of such designs in general (lack of material/method for comparison). However, at the time of publication, the data presented has been considered important and in some cases in the forefront of current research.

Overall assessment

The Department has a strong relationship with the county's specialist clinic (the Brånemark Clinic), but the relationship is a complex one in which it is hard to delineate the Department's activities. Moreover, the two permanent professors have succeeded each other as temporary heads of other institutions. New, young and energetic staff seem to be joining the Department, but the direction and force of research originating within the Department is uncertain. However, a newly returned professor is of high international standing, and currently imparts stature and purpose through his own research and its momentum.

Activity over the period of study – which is dependent on the outgoing and minimally associated professors – has been very high, and the Department is therefore well recognized for its research in clinical follow-up studies and experiments on implant/tissue interactions.

There seems to be only minor levels of activity related to dental materials other than implants.

Assessments:

Research quality: *Very good*

Productivity: *Very good*

Uniqueness: *Good*

Relevance: *Very good*

16.3.9 Periodontology

In the period 2004-2009, research in the Department of Periodontology has been carried out by two professors, one adjunct professor, two docents, six assistant researchers, two PhD students and three other members of staff: 16 persons in total. The total research FTE represented by this staffing amounts to 6.50 (average 0.41, range 0.08-0.80), although it should be noted that the 2010 staffing of 15 persons is not identical to that of the period 2004-2009 (four members of staff replaced, one position eliminated).

This department pursues research themes within implantology and within periodontology. The following have been identified:

Implantology:

- Animal experimental studies on the effect of implants and their surface structure/composition on bone formation and bone and soft tissue healing following implant insertion, and on the progression of periimplantitis
- Animal experimental studies on the effect of nicotine on bone healing and osseointegration
- Animal experimental studies on the effect of functional load of implants on the bone
- Animal experimental studies on the effect of treatment of periimplantitis
- Human and animal studies of the histopathology of periimplant mucosal lesions
- Human clinical studies on immediate functional loading of implants
- Human clinical cohort studies of the prognosis of implant therapy

Periodontology:

- Animal experimental studies of wound healing following GTR
- Human clinical studies of the prognosis of GTR therapy
- Human studies of associations between periodontitis and various gene polymorphisms
- Human studies of immune-competent cells in the gingival tissue in periodontitis and during experimental gingivitis
- Clinical studies of the effect of the use of antimicrobials, lasers, powered toothbrushes and full-mouth debridement on the outcome of periodontal therapy
- Epidemiological studies of periodontal conditions and risk factors for periodontal bone loss
- Studies of patients' dental beliefs and their perceptions of dentists, dental hygienists and periodontal therapy
- Clinical studies of toothpastes and mouth rinses on plaque formation and gingivitis/mucositis

A small side-line of research deals with the improvement of histochemical methods.

The total volume of registered publications for the period is 135, 106 (79%) of which are co-authored by one or both of the two professors.

The research pertaining to implantology is generally published in topic-specific top-ranking (within dentistry) journals. The research pertaining to periodontology would appear to be less focused, which is reflected in a greater diversity of themes and journals chosen for the publication of the results.

Overall assessment

Implantology is a field of research that attracts considerable attention worldwide, and this 'popular topic' effect should be taken into account when comparing assessments across different topics. Even so, the implant-related research currently carried out at the Department is highly relevant, is of excellent quality and is obviously front-line research from an international perspective. A clear line of thinking is evident, focused on a few major domains, all of which are highly relevant for successful implant therapy. The animal experimental approach is extremely valuable, and the ability to carry out such studies must be considered an asset.

As stated in the self-evaluation report, the Department also has longstanding and internationally well recognized traditions for research in the etiology, pathogenesis and treatment of periodontal disease. However, the themes that have been covered under the heading "Periodontology" in the period 2004-2009 are many and somewhat varied, covering a broad range of study designs and themes ranging from animal experimental studies of treatment modalities over immunohistochemical studies to epidemiological studies and qualitative research on patient perspectives. A common thread throughout the research is less discernible, and a 'cover all themes' or 'one member of staff, one theme' strategy seems to prevail. Maybe this is the problem alluded to in the self-evaluation report, where it is stated that it "may be difficult to change the tradition that groups and departments operate independently of each other". However, two themes stand out as more visionary: one pertains to human and animal experimental studies of the local and systemic host response to oral biofilms; and the other theme is the quality of life aspects related to periodontal diseases and their treatment. The former could be developed into a more general model for studying inflammation and is mentioned in the self-evaluation report as a more promising research area under the project title "Periodontal and peri-implant disease".

Assessments:

Research quality: *Excellent*

Productivity: *Excellent*

Uniqueness: Not rated

Relevance: *Excellent*

16.3.10 Cariology

In the period 2004-2009, the research in the Department of Cariology has been carried out by three professors, one adjunct professor, one docent, one assistant researcher, one PhD student and two other members of staff: nine persons in total. Currently, six researchers remain in the Department, two of whom are professors, and they represent a total research FTE of 1.32, with an average of 0.22 (range 0-0.7).

The research themes centre on the biological factors that influence caries development, including topics such as:

- Caries risk assessment among children and the elderly
- Influence of aspects of salivary secretion on caries risk factors
- Methods for increasing salivary secretion
- Methods for increasing fluoride retention and concentration in the oral cavity
- The influence on plaque Ph of specific food items, soft drinks, drinking mode, mswaki extracts and xylitol
- Antimicrobials in dentifrices
- Studies of plaque acidogenicity reducing agents
- Vitamin C chewing gums and calculus formation
- Clinical studies of methods of caries control
- The relationship between Lactobacillus and S. mutans in caries active and inactive subjects.

The total volume of registered publications is 95, of which 76 (80%) are co-authored by one of the two remaining professors.

Most of the research has been published in international dental journals, where one would expect to see research of this nature published.

Overall assessment

This department has expertise in carrying out rather complicated cross-over trials for the purpose of studying the effects of agents in various concentrations or formulations on fluoride retention, salivary secretion and plaque acidogenicity. To this end, the Department makes use of *in situ* models and plaque pH measurements using microelectrodes following various challenges. A fair number of the studies involve randomized clinical trials. Another line of thinking involves caries risk assessment, often using the Cariogram approach, which synthesizes a number of biological markers of caries, such as mutans and lactobacilli counts, salivary buffer capacity, etc.

In the period under review, the Department has participated in an EU-supported joint project with six other universities in Europe (the NUTRIDENT project) on the caries and gingivitis protective potential of certain beverages and food products. This EUR 22 million project would appear to have been running since 2006 and to have been terminated in the summer of 2010. It is not apparent that participation in the programme has resulted in publications for members of the Department.

The quality of the research must be considered very good, as is indeed productivity. The projects embarked on are highly relevant as they seek to elucidate ways of making caries control even more effective, whether by increasing fluoride availability in the oral cavity, by increasing salivary secretion or by pointing out subjects of particular risk to new caries lesion development. The Department has important expertise in *in situ* models and *in situ* plaque pH measurements, although use of the latter seems to have diminished in recent years.

Assessments:

Research quality: *Very good*

Productivity: *Excellent*

Uniqueness: Not rated

Relevance: *Excellent*

16.3.11 Oral Microbiology and Immunology

In the period 2004-2009, research in the Department of Oral Microbiology and immunology has been carried out by three professors, one senior faculty member, one other faculty member and one PhD student: six persons in total. Currently, nine scientific staff members are listed for the Department, three of whom are professors, one is a research fellow, one is categorized as “other” and three are guest researchers/teachers, the latter apparently without research obligations. Five are listed as non-research staff. They represent a total research FTE of 2.38 (range 0-0.45).

The following research themes have been identified:

- Cellular reactions to dental materials
- Inflammatory reactions in arthritis and Sjögren's syndrome
- Immune stimulation
- The oral bacterial flora in dental and periodontal infections
- Water quality
- Antibiotics in local therapy of periodontal infections
- Lead and dental health in Thailand
- Hyposalivation and microbial flora
- Minor salivary glands and oral microbiology

The total volume of registered peer-reviewed publications is 60, of which twelve have department associates as first author and 23 as last author.

Overall assessment

Over the decades, this department has been at the forefront in terms of the cultural characterization of oral bacteria in various infections, particularly pulpal with periapical inflammation. The publication list includes papers published by the founder of the Department, Dr. Åke Möller. The department has continued to lead in seeking associations between clinical variations of disease and the cultivable microflora. Another line of research concerns the immune reactions in inflammations, while another deals with microbiology in hyposalivating individuals.

The research is characteristically robust in design, with well-defined reactants or parameters selected for analysis.

It must be acknowledged that many of the techniques supporting the robust experimental designs are also time-consuming and labour-intensive. Productivity suffers as a result, and is generally low for the Department, at four publications per year per person. One senior professor contributes to more than half of the publications

The research may at first glance seem conventional and conservative, but it has elements of a special focus, which sets it apart from the research at many other laboratories. The persistence in analysis of cultivable bacteria rather than the detailed genetic classifications frequently overtaking interest and activity in other laboratories has placed this department in a special position regarding comparative studies of microbial flora composition. In short, anyone who wants clinical bacterial data for comparisons among environments within and among oral sites in one or different individuals would go to Gothenburg. Therefore, the Department maintains an excellent position of uniqueness. By the same token, and reflecting the extensive cooperation with clinical departments, its research may be seen as highly relevant.

Assessments:

Research quality: *Very good*

Productivity: *Good*

Uniqueness: *Excellent*

Relevance: *Excellent*

16.3.12 Orthodontics

In the period 2004-2009, the research in the Department of Orthodontics has been carried out by one professor, two senior faculty members, two other faculty members, two postdocs and three PhD students: ten persons in total. There are currently seven researchers in the Department, six of whom have arrived since 2004.

The FTEs are 0.16 for senior members of staff, 1.0 for PhD students and 1.16 for total research.

The following research themes have been identified:

- Evidence-based orthodontics
- The need for treatment and treatment stability
- Social factors
- Temporomandibular joint dysfunction and orthodontics
- Craniofacial growth
- Orofacial aspects of Ehlers-Danlos syndrome
- Cleft lip and palate patients

The total volume of publications for the period is 33 peer-reviewed articles (plus four reviews, three books and two chapters).

Overall assessment

This is a small department that has produced erudite research of high quality at a very good productivity rate. This is particularly impressive as there is a total of just 1.16 full time research equivalents, with senior members of staff making up only 0.16 of the total full time research equivalents. Internationally, the Department is comparable to and competitive with other well known departments.

On the surface, it would appear that the Department publishes in journals with relatively low impact factors. The citation scores are low and the staff for 2004-2009 have relatively low H-indices. However, the Department has published in the top journals of the orthodontic field. Also, the Department publishes in some good general dental journals. Relatively low impact factors, citation scores and H-indices are merely a reflection of the orthodontic field as a whole.

Assessments:

Research quality: *Very good*

Productivity: *Excellent*

Uniqueness: *Very good*

Relevance: *Excellent*

16.3.13 Pedodontics

The research at the Department of Pedodontics is presently carried out by one professor and one senior faculty member in addition to one guest lecturer/researcher and two PhD students. They represent a total of 2.09 research FTEs, with an average of 0.42 FTEs (range 0.04-1).

The following research themes have been identified:

- Morphology of teeth
- Chemical composition of teeth
- Caries prevalence
- Microbiology and caries
- Oral health care
- Bonding of resins

The professor and senior faculty members are co-authors of six publications, and their total production during 2004-2009 is 24 peer-reviewed articles. There are no co-authorships with the guest researcher and the PhD students. The papers are published in international journals of low to moderate impact factors, and citations are also low/moderate.

Overall assessment

The majority of the research deals with the chemical composition and micromorphology of the dental hard tissues in primary teeth, partly in patients with developmental disturbances. The research activity seems to be based on collaboration with other national and international research institutions. The quality of the research is good based on impact factor. The productivity is very good when assessed in relation to the low number of research FTEs. It seems reasonable to assume that this is based on good network collaboration. It is also possible that the Department has had resources during the 2004-2009 period (e.g. PhD students) that are not seen in the papers.

The clinical relevance of the research is high, primarily since paedodontics deals with developmental disturbances in primary teeth. Potential collaboration with the Public Dental Service is a unique possibility, but this is not fully utilized.

Assessments:

Research quality: *Good*

Productivity: *Very good*

Uniqueness: *Good*

Relevance: *Good*

16.4 Organization and research infrastructure

Academic personnel

The total number of academic staff was fairly stable throughout the period 2004-2009. In September 2009 there were 18 professors (17.9 FTEs, 28% research), 13 associate professors (11.5 FTEs, 25% research), 13 researchers (7.5 FTEs, 15% research), five adjunct professors (1.2 FTEs, 13% research), one assistant professor

(0.6 FTEs, 33% research), and 19 other members of academic staff (12.4 FTEs, 44% research). The total number of members of academic staff engaged in research was 65, corresponding to 51.0 FTEs, but their time allocated for research activities varied greatly. Only four out of 18 professors have 50% or more time for research. The number of PhD students employed by the Institute of Odontology was 13 in 2009 (9.2 FTEs, 98% research), but the total number of registered PhD students is considerably higher, since many are employed by the Public Dental Service and funded by TUA grants.

The age profile of the academic staff is rather unbalanced, and a considerable number of senior staff (professors and senior lecturers) is expected to retire within a few years (Table 1): eleven out of 18 professors are 60+ years old and five out of 18 are 65+ years old. In view of the many and small research environments, it is vitally important that these staff transitions are carefully planned and that the organizational opportunities created by this situation are fully used.

Table 1. Distribution of academic personnel at the Institute of Odontology according to age

	<40 yrs	40-50 yrs	50-60 yrs	>60 yrs
Professors			7	11
Adjunct professors			5	1
Senior lecturers		3	6	4
Guest teachers/researchers	3	1	3	2
Others	3	4	2	1

The PhDs are rather old at the time of their dissertations, typically above the age of 40, and they seem to have taken rather a long time to complete their dissertations. A PhD study time extending beyond a decade is not unusual, and although a trend for reduced study times has been noted, it would seem that study times are still rather long. It would clearly be desirable if PhD students were enrolled at a younger age and could concentrate more on their PhD study than on other parallel activities to ensure the production of young and highly vital PhD candidates.

Infrastructure and equipment

The Institute of Odontology has several laboratory facilities which belong to the different departments (the Departments of Biochemistry, Microbiology, Cariology, Periodontology and Dental Materials). The tissue and cell culture facility at Oral Biochemistry is a unique facility. The Sahlgrenska Academy’s core facilities

are nearby, with equipment and facilities for advanced molecular genetics, imaging resources, electron microscopy and a modern facility for experimental animal research with a university veterinary unit.

The Panel concludes that these facilities as a whole comprise an excellent basis for experimental dental research at the Institute of Odontology and the Sahlgrenska Academy. However, the impression was that there was little collaboration between departments at the Institute of Odontology regarding utilization of the equipment in the different laboratories, which in some departments were considered to be exclusively for the use of the departmental staff. The Panel therefore doubts there is potential for more synergy under the current departmental structure.

The close collaboration with the Public Dental Service, with access to clinical facilities in the same building, clinical records and technical laboratories in all dental disciplines, constitutes an excellent environment for clinical research. These resources are presently not utilized to the extent that might be expected, and this is clearly an issue that should be discussed in the process of revising the TUA agreement.

A research support function, in the form of biostatistical support and a clinical trials unit, does not exist.

Finances

The annual budget for the Institute of Odontology increased slightly during the period 2004 to 2008 from SEK 150 million in 2004 to SEK 156 million in 2008, but was substantially increased in 2009 to SEK 182 million. According to information at the site-visit, the budget for teaching has increased during the whole period, while the research budget has been reduced. However, the funds from the TUA agreement have been constant.

Both the Institute of Odontology leadership and the researchers consider the TUA funding to be the most important source of external funding, even if these funds are accounted for as internal funds in the University's system. In addition to the TUA funding, the Swedish research councils (the Swedish Research Council and the Swedish Council for Working Life and Social Research) and a number of minor funds have been the most important sources of research funding. One project (Cariology) has obtained funding from the European Commission. As a whole, the research income from grants per member of research staff is very low and among the lowest at the University of Gothenburg according to statistics given by RED10.

Research organization

There is only limited collaboration internally at the Institute of Odontology, and the attempt to group the 13 departments into three academic sections has not had

any effect on this. However, some groups have excellent collaboration outside the Institute of Odontology/the University of Gothenburg with other Swedish institutions, while others have excellent international collaborations.

The close collaboration with the Public Dental Service, which constitutes an excellent potential for clinical research, is not substantially utilized.

According to the self-evaluation report, the research is being organized in the following directions:

Implant research - Technical/materials issue: design of implants, procedures, materials; patient outcomes and function

According to the Panel's evaluation, this has been the flagship of dental research at the Institute of Odontology for decades, and still is. However, even this field seems to have been fragmented between the different departments involved, mainly the Department of Periodontology, the Department of Prosthetic Dentistry/Dental Materials Science and the Department of Oral & Maxillofacial Surgery

Behavioural and community dentistry - Anxiety, dental care avoidance, patient-tailored interventions, chronic pain and health services research

This research field is also among those where the Institute of Odontology has a unique international position, based on a very good network of different disciplines. It might be expected that this activity would diminish after the death of the previous professor. However, after the site visit, the Panel is convinced that the research group is intact, active and still very competent.

Craniofacial development - Developmental biology – tooth development, craniofacial development.

This is based on staff at the Department of Biochemistry and is presently the top ranking research group at the Institute of Odontology, producing research of outstanding international quality. However, the group is small and vulnerable, and is dependent on temporary and modest grants from the Swedish Research Council and TUA. The group has little collaboration internally at the Sahlgrenska Academy, but it does have a broad and vital international network. It is the Panel's opinion that this group must receive further support in order to retain the competency that has been so successfully established over the years at the Institute of Odontology.

The following three research areas are described in the self-evaluation report as being the most promising:

Oral health and dental care of the elderly

A Centre of Gerodontology is said to have been organized at the Institute of Odontology. However, the Panel was unable to locate this centre during the site visit. In our meeting with the group at the Department of Behavioural and Community Dentistry, it appeared that this group is responsible for a population-based study of dental health and dental care for the elderly population in collaboration with the Public Dental Service.

Evidence-based research in clinical dentistry

The vision behind this type of research is that the collaboration between Institute of Odontology researchers and the Public Dental Service clinic has significant potential for carrying out clinical studies in order to increase evidence-based dentistry. However, the Panel has not been able to identify a definite initiative in establishing the necessary resources for this. We suggest that this is matter of discussion during a future revision of the TUA agreement.

Periodontal and peri-implant disease

This pathogenesis research involves both human and experimental animal research, and aims to characterize inflammatory lesions around teeth and implants.

The theme is being undertaken in an excellent way by a research group which is organized at the Department of Periodontology. The group has been able to obtain external grants and establish both staff and equipment that facilitate high quality research. The group seems to be strong, with a network that secures its future. This research group is also responsible for a large part of the research mentioned under "Implant research".

Assessments:

Organization and research: *Good*

Infrastructure: *Excellent*

16.5 Collaborations and networks

Internal collaboration between departments and even within some departments is surprisingly low, although staff from the Departments of Microbiology & Immunology and Oral & Maxillofacial Radiology in particular have engaged in cross-departmental research activities. The trend for limited internal/cross-departmental collaborations seems to be compensated for by external collaboration, within both the Sahlgrenska Academy and the University of Gothenburg, within Sweden and internationally. Departments with exceptionally large international networks are the Department of Oral Medicine and Pathology, the Department of Oral and Maxillofacial Radiology and the Department of Oral Biochemistry. Even so, the

fragmentation and the lack of internal collaboration may pose a long-term threat to the viability of research at the Institute of Odontology.

Improved collaboration with the Public Dental Service based on the TUA agreement should be a number one issue for the Institute of Odontology and the Sahlgrenska Academy to deal with.

Assessment: *Very good*

16.6 Future plans

The Institute of Odontology admits that, in spite of its extensive research activity, it needs to be more focused on collaboration between the different departments in developing large and strong research groups with a critical mass of researchers. The division of departments into three sections was an attempt to achieve this, albeit with limited success so far. The Panel would suggest that action be taken on the part of the leadership to ensure support for the present strong groups, in order to help them grow even stronger.

According to its self-evaluation, the Institute of Odontology underlines the potential strength of collaboration with the Public Dental Service in translational and clinical research. After almost 20 years of collaboration, the Institute has still not reached its level of expectation. During the site visit, the Panel heard several opinions about the main reasons for this. One of the issues is that there are different opinions about the need for collaboration at the different organizations, including different personal views among leaders, just as a number of practical and financial issues seem to provide a barrier. It may be that someone at a higher level (than the Institute of Odontology) at the University of Gothenburg needs to take action to facilitate collaboration in a smoother way. Plans for establishing a centre for gerodontology and evidence-based research in clinical dentistry are good, but are dependent upon a joint plan for this among the TUA agreement partners.

The Institute of Odontology also plans to expand its collaboration with other institutes at the Sahlgrenska Academy and to better utilize the common core facilities. Some of the departments have so far been very successful in this (e.g. Biochemistry, Periodontology).

Assessment: *Good*

16.7 Future potentials and possibilities

It is the Panel's opinion that the Institute of Odontology has the main prerequisites for further growth of dental research, for a number of reasons:

- Very good researchers and some excellent research groups
- Good facilities in terms of laboratories, library services and access to core facilities at the Sahlgrenska Academy
- Being part of the Sahlgrenska Academy, with excellent possibilities for collaboration with and support from other medical research fields
- Collaboration with the Public Dental Service, with possibilities for collaboration with both general and specialist clinics in the vicinity
- Large national and international network

In order to utilize these resources, some organizational revisions would be necessary. The most important of these are probably:

- The revision of the TUA agreement for more and better adjustment to dental research, particularly translational and clinical research. Academic personnel who are good researchers should be allocated more time for research, while time for those most competent in teaching and clinical practice should mostly be allocated for this. Time allocated for research should be protected and ring fenced.
- More collaboration between departments in research activity, in which the strong research groups form cornerstones in the process.

The collaboration between the Institute of Odontology and the Public Dental Service is a unique potential that makes the University of Gothenburg highly competitive in relation to the dental schools at Karolinska Institutet and Malmö. Two of the research areas that are mentioned in the self-evaluation report as most promising, *Oral health and dental care of the elderly* and *Evidence-based research in clinical dentistry* are typical areas where the Institute may utilize the unique possibilities inherent in the proximity of the Institute to the Public Dental Service.

Organizational revisions are always difficult in a traditional environment such as a dental school with many sub-disciplines and strong individualists. However, since a majority of senior professors are now close to retirement, this may actually pose a golden opportunity to navigate towards a more suitable organizational structure. However, strong leadership is needed in order to achieve this.

Assessment: *Positive trends*

16.8 Research activity and teaching

The Institute of Odontology is a dental school with the main aim of educating dentists, dental hygienists and dental technicians. Since dentistry as a medical discipline is heading towards becoming increasingly evidence-based, research and research education are very important operational aspects.

The Institute of Odontology, just like most dental schools in the world, teaches a number of sub-disciplines. At the Institute, 13 sub-disciplines have their own department, most of them with one or a few professors. These professors feel a reasonable obligation and interest to carry out research in their own sub-discipline in order to be competent in their field. They see this as necessary for being a competent teacher in their sub-discipline.

However, this is the main reason for fragmentation of the research at the Institute of Odontology, and it illustrates the typical “teaching vs. research” dilemma. A reasonable question would therefore be whether it is possible to combine the education of good dentists with doing outstanding research within the resource framework of today’s Institute of Odontology?

This is possible in the Panel’s opinion, but it is dependent on a revision of the departmental structure and a revised TUA agreement.

The main vision for the Institute of Odontology should be that future academic personnel (including PhD students) work in research groups across the traditional departments, preferably in fields where the University of Gothenburg has advantages in comparison with other dental schools in Sweden and abroad.

The collaboration with the Public Dental Service in teaching and research, based on the TUA agreement, probably represents both advantages and drawbacks. One advantage is that the academic staff are released from a heavy burden of clinical teaching and thereby have more time for research. However, the very low research FTEs for most members of staff indicate that other teaching obligations and administrative work may still be consuming too much time to ensure that they have the time necessary to become truly prolific in research. One drawback may be that this collaboration is a reason for a reduced number of academic staff at the Institute of Odontology. It is most important that the Institute of Odontology and the Public Dental Service come to an agreement about a distribution of staff that favours both teaching and research. A revised TUA agreement should preferably aim at an organization where clinical teachers with no/little research burden do most of the teaching, while professors and other researchers are given most of their time for research and less teaching. A prerequisite in order for this to be effective is close collaboration between the clinical teachers and the researchers so that new knowledge and clinical experience are exchanged.

The teaching of PhD students is an important part of the research activity and a necessary resource. The number of doctoral theses during the period 2004-2009 was 41, which is reasonably high and shows good activity. However, high age and long education time among the PhD students is a challenge both for the recruit-

ment of PhD students and for the appropriate and efficient use of PhD supervision resources. Even if researchers at the Public Dental Service also participate in the supervision of PhD students, the Panel considers the high number of registered PhD students who are only partly active to be an unreasonable load for the academic personnel at the Institute of Odontology.

Assessment: *Remarkably good relationship*

16.9 Interactions with society

Dental schools have long traditions of interacting with society, particularly in terms of giving lectures, courses and continuing education for practising dentists and other dental health personnel. This is also the case for the Institute of Odontology at the University of Gothenburg.

Academic personnel serve as active lecturers in international and national congresses for practising dental health personnel. A number of review papers in national dental journals are also part of this.

Members at the Institute of Odontology have also participated in expert committee working groups producing guidelines (e.g. SBU) for clinical decision-making.

Sweden is one of very few countries that has a national insurance system with reimbursement for the treatment of dental anxiety disorders, and this is to a large extent the result of research in this field carried out at the University of Gothenburg.

The collaboration with the Public Dental Service also is a factor in terms of interaction with society.

Some of the researchers at the Institute of Odontology have written informative textbooks for the general population, such as *Ortodonti Varför? När? Hur?* in which the questions of ‘What is orthodontics?’, ‘When to deliver orthodontics?’ and ‘Whom to treat?’ are discussed. This is extremely important, as these questions are currently being hotly debated in society.

Assessment: *Above expected level*

16.10 Gender and equal opportunity issues

There are approximately equal numbers of males and females among the academic staff at the Institute of Odontology, but among the professors the vast majority are male (94% as of September 2009). Of the 13 PhD students listed by the Institute, ten are females (77%).

The Panel's general impression is that female researchers have the same opportunities as males at the Institute, and it may therefore only be a matter of time until a better balance between the genders reaches the professorial level. This is, however, a matter that should be focused on in the future by the Institute's leadership.

16.11 Summary and recommendations

- The present evaluation concerns the research as evidenced by the publication activity for the period 2004-2009. The Panel wishes to stress that the conclusions drawn and the ratings given may not necessarily apply to the present day situation. First of all, research papers published in the period reflect actual research activities and plans developed several years before publication. Secondly, a large part of the publications during the period have been initiated or driven by senior staff/professors who have retired, moved away or died, and these have not necessarily been replaced. It remains to be seen whether this has resulted in an overall reduction in research activity at the Institute of Odontology.
- The research activity at the Institute of Odontology has been extensive during the period 2004-2009, as more than 800 papers – about 600 of which are original peer-reviewed articles – have been published by a rather low number of research FTEs.
- Most of the research is of very good quality. The craniofacial development research carried out in the Department of Oral Biochemistry has been rated as outstanding, and the research carried out in three departments (Behavioural and Community Dentistry, Oral and Maxillofacial Radiology, and Periodontology) has been deemed excellent. The relevance of most of the research is excellent.
- Generally, it is concluded that the Institute of Odontology at the University of Gothenburg has an internationally highly recognized research tradition in oral sciences.
- The main weakness of the research activity at the Institute of Odontology is that it is extremely fragmented, both within and between departments. This is a result of the organization, where only 24 research FTEs are spread across 13 departments. Sizes of departments vary hugely from only one member of staff at PhD level to more than ten. The attempt to generate more collaboration across departments by grouping them into three larger sections has so far not had any effect. However, most departments and researchers have a broad national and international network for research collaboration.
- The TUA agreement between the Institute of Odontology and the Public Dental Service plays an important role for research at the Institute, with both advantages and drawbacks. The TUA agreement is the most important source of funding for researchers employed by the Institute of Odontology, and it supports PhD grants and other research staff. It also presents a unique opportunity for translational and clinical research, which is, however, not sufficiently

utilized. One drawback is that the agreement ties researchers at the Institute to teaching and clinical work to a degree that inhibits the research activity.

- External research funding comes from a large variety of sources, but little comes from the Swedish Research Council and the Swedish Council for Working Life and Social Research. The amount of external funding is low per academic position. However, in the Sahlgrenska Academy's accounting system, the largest source (the TUA fund) is regarded as an internal source of funds, even though the funds come from the Public Dental Service (the county).
- The high number of PhD students with very low study activity, long education time and high age when they finish is considered to pose a threat to the efficient and appropriate use of academic personnel time resources at the Institute of Odontology. The recruitment to vacant positions is a problem in certain fields.

16.12 Recommendations

- The traditional organization, with 13 small departments that reflects teaching rather than research needs, is a serious threat for the future when senior professors are retiring, young scientists are entering small and vulnerable groups, and external funding is becoming increasingly important. The Panel suggests that this problem is taken more seriously by the leadership at both the Institute of Odontology and the Sahlgrenska Academy.
- The integration of the Institute of Odontology into the Sahlgrenska Academy seems to be progressing, but there is obviously a number of synergy effects to be gained within research activity. A common meeting place and arranging common seminars might be tools for researchers to meet and contact each other.
- During a future reorganization of the Institute of Odontology, which may be implemented during the transition elicited by the generation shift of professors during the coming years, the strong research groups should be further supported and allowed to grow. This requires an incentive system in which good research is rewarded. It also requires strong academic leadership oriented towards research, possibly an internal research committee (the Institute of Odontology + the Public Dental Service). **Overall research strategies based on visions for the future and implemented by a strong leadership are needed.**
- The Panel strongly suggests that the TUA agreement is evaluated and revised in order to make it more favourable for dental research at both the Institute of Odontology and the Public Dental Service. The unique potential that the University of Gothenburg has for translational research and evidenced-based clinical research represented by this agreement should be fulfilled. A prerequisite for this is that the "teaching vs. research" dilemma is solved. **Since this potential is still under-utilized after 20 years of formal collaboration, it**

is suggested that this issue is paid attention to at the highest level at the University of Gothenburg.

- Initiatives should be taken to encourage young dentists and dental hygienists to carry out PhD studies at an early stage. This may be done during their undergraduate studies, provided that they are given the time and financial support for this. The amanuensis programme at the Institute of Odontology seems to be mostly oriented towards teaching, and this could be changed in the direction of research. The National Graduate School of Dental Research is a positive initiative and should be supported.
- In order to increase and facilitate the transition from PhD to tenured position, and thereby facilitate recruitment, it is highly recommended that postdoc positions be established, so that a tenure-track system is made visible to the PhD candidates.

16.13 Summary of assessments – the Institute of Odontology

Research quality: One department: *Outstanding*
 Three departments: *Excellent*
 Eight departments: *Very good*
 One department: *Good*

Productivity: One department: *Outstanding*
 Six departments: *Excellent*
 Four departments: *Very good*
 Two departments: *Good*

Uniqueness: Two departments: *Excellent*
 Five departments: *Very good*
 Three departments: *Good*
 Three departments: No rating

Relevance: Nine departments: *Excellent*
 Three departments: *Very good*
 One department: *Good*

Organization and research: *Good*

Infrastructure: *Excellent*

Collaborations and networks: *Very good*

Future plans: *Good*

Future potentials and possibilities: *Positive trends*

Research activity and teaching: *Remarkably good relationship*

Interactions with society: *Above expected level*

PANEL 17 – BUSINESS

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INTRODUCTORY REMARKS

The introductory section of the evaluation report first discusses the basic starting points, challenges and principles of the assessment work, and then sums up the main conclusions on a general level. The report is the outcome of collaboration and collective writing by all members of Panel 17.

Specification of evaluation criteria

Members of Panel 17 met in Copenhagen to discuss and decide on the specifics of the evaluation criteria that were to be used in the evaluation work. The aim was to work on a shared understanding of the meaning of the criteria specified in the guide for evaluators and to agree on reference points that could be used to compare the different departments and to define the scale from ‘poor’ to ‘outstanding’ performance. As a result of the meeting, the following set of concrete criteria was outlined for making judgments about the quality, productivity, uniqueness, relevance, organizational capacity and interactive capacity of the departments.

Quality

Quality of research is obviously a troublesome and very subjective issue that is extremely difficult to assess definitively, even across four sub-units in a particular department. In this report, we evaluated the quality of the research carried out in the departments primarily in terms of the international impact and prestige of the publication outlets where the members of the research staff regularly present their work. For comparing the different departments, it seems necessary to assess the quality of the publication outlets based on internationally known and used criteria for high-impact or A-journals. As high-quality publications, we thus consider peer-reviewed articles published in international “top-tier journals”, as listed in the well-established journal rankings. While these rankings are obviously not without problems, they do give an indication of the relative standing of a journal within its field or discipline, the relative difficulty of being published in that journal, and the prestige associated with it. Regular publication activity in the top-tier journals thus arguably demonstrates that the unit has the “ability to achieve and present clear-cut scientific analyses and results”. For Panel 17, rankings of the Financial Times (FT-45 list) and the Association of Business Schools (ABS) in particular have offered good reference points for defining “high quality”.

Moreover, quality publications include monographs published by highly reputable international publishers, such as Cambridge University Press, MIT Press and Oxford University Press.

We acknowledge, however, that in addition to publishing in the top-tier journals, it may be strategically important for a department to have its staff present their work in other types of peer-reviewed publication outlets, e.g. for participating in the development of its niche research area, a new field of research or an emerging research community. Therefore, high-quality publications may also include non-mainstream outlets strategically targeted to promote a given research agenda.

We feel, however, that in the end it is the Vice-Chancellor of the University of Gothenburg and his/her top management team (deans, heads of departments) who should define the criteria for high-quality publications – so as to set transparent quality standards and objectives for the heads of department and individual researchers to pursue.

Productivity

In this report, productivity is defined in terms of the total volume of academic publications produced by the Department, judged in relation to the number of (full-time equivalent) researchers employed in the Department. To evaluate the productivity of the staff, we have felt it necessary to refer to standards that correspond to internationally widely used criteria in research assessment exercises.

Ideally, however, the criteria and standards for productivity should be explicitly defined by the University and/or the Department.

As a rough reference point, we have used the criteria adopted by Aalto University, according to which a member of staff needs to publish two articles in international peer-reviewed publication outlets in a period of five years in order to be academically qualified. An outstanding level of productivity, on the other hand, would be signalled by the publication of five articles in international peer-reviewed publication outlets in a period of five years, with at least two of these articles representing high-quality and high-impact publications in A-journals.

Uniqueness

In assessing the uniqueness of the research carried out and published in the departments, we have focused on the following questions:

- Has the Department been able to identify and articulate its competitive advantage?
- Are the strategic objectives relating to the focus and research agenda well articulated, justified and realistic?
- Has the Department been able to identify and focus on specific niche areas in terms of geography, history, theory and available databases?
- How is the unique niche or focus area connected to the University's priority research areas?

Unfortunately, however, we found it fairly difficult to find answers to these questions based on the self-evaluation material, as few of the departments had articulated explicit research strategies and strategic objects for the staff to pursue.

Overall, then, we conclude that the self-evaluation material provided inadequate information for the Panel to be able to evaluate the uniqueness of the research carried out in the departments. During the site visit, the departments outlined some general focus areas for their research activity, but there was little strategic deliberation on the unique organizational capabilities and resources that the choice of these areas was based on. It thus remains unclear *why* these areas have been selected as strategically important and how research in the selected focus areas helps the Department to develop and cash in on its competitive advantage in the field.

Relevance

Much like quality, relevance of research is arguably a complex issue. In this report, we have focused on citations, media coverage and industry partnerships, as well as the amount of external (industry) funding obtained as indicators that might give us some sort of an idea of the relevance of the research carried out within the de-

partments. We note, however, that the local, national and international relevance of research would seem to be difficult to assess in a fair and true manner without explicit criteria defined by the top management of the University.

Organizational capacity – organization and research infrastructure

In this report, we have decided to assess the organizational capacity of the departments primarily based on the sufficiency of available resources for research and publication activity (teaching loads, number of staff-members in senior positions, age profile, funding structure, etc.) and effective management practices and incentive schemes that encourage and enable the staff to engage in ground-breaking research activity and to publish in high-quality journals, in the Department's particular areas of strategic focus.

Interactive vitality – collaboration and networks

Interactive capacity in this report refers to the capability of the departments and their staff to participate successfully in interdisciplinary and cross-disciplinary cooperative research efforts and networks. We have evaluated this primarily based on:

- Memberships of editorial boards of international peer-reviewed journals
- Memberships of professional and academic associations
- International collaboration and co-authoring activity
- More established forms of research networks
- Scholar exchanges
- Recruitment from other universities, and
- Placement of PhD students.

Quality of the self-evaluation material

The RED10 evaluation relies heavily on the written material provided by the evaluated departments' self-evaluation reports. It is unfortunate, however, that the reports prepared for the evaluation exercise contain a number of errors, inaccuracies and omissions.

The documentation of the departments' publication activity, in particular, appears to be unreliable. We are puzzled by the fact that so few of the staff had verified their publication records. Moreover, the information provided is clearly inadequate, both in content and detail, for the purposes of the research evaluation task. We particularly missed a more fine-grained – and thus more informative – account of the academic intellectual contributions of different categories of research staff over the assessment period (e.g. number of papers published in top-tier journals).

Also, the presentation of the more qualitative, strategic analyses tended to be overly abstract and inadequately argued for in the self-evaluation material.

Overall, we therefore find the quality of the self-evaluation material disappointing – it seems that the self-evaluation reports have not received the level of commitment and attention that they deserve.

Overall assessment

To summarize the results of the evaluation work, we discussed the research-related strengths, opportunities, weaknesses and threats of all the departments assessed here on a fairly general level. A more detailed elaboration of the different dimensions of quality, productivity, uniqueness and relevance of research activity is then presented in the department-specific chapters that follow.

Strengths and opportunities

Based on the self-evaluation material and the interviews carried out during the site visit, it seems justified to conclude that faculty members of all of the departments evaluated by Panel 17 are actively engaged in research activity, and there is an emerging tendency towards publishing in international peer-reviewed journals. Overall, a shift from a teaching-oriented to a research-driven organizational culture seems to be underway. As some of the current faculty members are expected to retire within the next ten years, there would also seem to be an opportunity to initiate a more radical strategic change through more strategically defined and capabilities-based recruitment policies.

In all of the departments, moreover, there are a number of exceptionally well-performing or outstanding individuals and unique research programmes, which tend to produce the majority of the departments' high-quality intellectual contributions. The past success of these individuals and programmes can arguably be viewed as a strategic strength that the departments can build upon in planning their future operations.

Finally, exceptionally good relationships with local industry and the ability to obtain external research funding constitute another strategic strength that seems to characterize all of the departments evaluated here. Collaboration with local companies and organizations would seem to provide the departments with an opportunity to develop fruitful long-term partnerships, which can provide the research staff with not only external funding but also valuable empirical material for longitudinal case research and practice-based theorizing. On the other hand, in departments where the proportion of external funding is particularly significant, the administrative burden of grant and project management may be much too heavy and time-consuming, as several faculty members pointed out during the site visit.

Weaknesses and threats

Based on the self-assessment material, it seems justified to conclude that, except for Gothenburg Research Institute (GRI), perhaps, none of the departments evaluated here show a particularly strong publication record in terms of international high-impact peer-reviewed journal articles. Much of the work continues to be published in the form of book chapters, C-journals or even research reports. While members of the staff are active in presenting papers in international conferences, insufficiently few of these working papers seem to be further developed and refined into high-quality journal articles. This would seem to constitute the main challenge for all the departments in their efforts to improve the quality and relevance of their research activity. During the site visit, all heads of department and their teams acknowledged this challenge and claimed to have devised plans for changing the previously prevalent publication practices and for encouraging the faculty members to start publishing their work in better international peer-reviewed journals.

However, while the University of Gothenburg's strategy emphasizes the role of clear academic leadership and quality management in strengthening the quality and long-term competitiveness of research at the University, the departments evaluated by Panel 17 appear to have no carefully deliberated research and publication strategies or any other explicit 'strategies' or operational plans for creating and sustaining the types of stimulating working environments, incentive schemes and organizational practices that foster high-quality research and internationally acknowledged publication activity among their faculty members. The institutional support for postdoc researchers, for example, seemed inadequate. In the absence of tenure track or systematic career support and mentoring programmes, postdoc researchers may not have incentives to publish in high-quality journals. And this can clearly be a problem for the departments, as postdocs usually constitute a valuable resource in the production of high-quality intellectual contributions.

Moreover, while a number of research areas have been identified as the key focus areas of research activity, there is little explicit and well-grounded deliberation on the strategic importance of the areas in the self-evaluation material. Neither the site visit nor the interviews with the heads of department and their teams provided significant further insights into the specific capabilities and future visions on which the selection of the focus areas was based. Overall, the staff members tended to be reluctant to articulate the competitive advantage or the relative strengths of the key research programmes in the international scientific community and in the particular fields of research in which the Department had chosen to operate. A question thus arises as to whether the selection of future strategic areas is based more on an opportunistic response to local funding possibilities instead of a careful and critical assessment of strengths and weaknesses in research capacity.

As regards international and inter-departmental collaboration, the self-evaluation material displays levels that also seem to be somewhat below par. The number of articles co-authored with scholars from foreign universities, in particular, seems too low for developing the kind of international collaborative networks that can boost and support successful research and publication activity at the frontiers of research. During the site visit, however, we learned that the University is in the process of developing specific incentives and visiting professor programmes for encouraging the staff members to collaborate and co-author with internationally distinguished scholars from abroad.

Overall, it thus seems that the departments evaluated by Panel 17 would benefit significantly from articulating more explicit and transparent strategic objectives and guidelines, as well as from developing management and organizational practices that enable more effective and professional leadership and support high-quality research activity in the departments. As emphasized in the University of Gothenburg's strategy document, the principal task of management in active leadership is to take responsibility for the quality and success of the organization. Based on the self-evaluation material, it seems that this has not been the case in the departments evaluated by Panel 17. The material rather suggests that in the past there has been a clear lack of academic leadership as well as strategic thinking and visioning, particularly as regards efforts to improve the impact and visibility of the Department's research within the international scientific community.

17A. THE DEPARTMENT OF APPLIED INFORMATION TECHNOLOGY

17A.1 Overall assessment of the Department

The Department of Applied Information Technology has been able to identify 'leading edge' topics in the past. It has been an influential contributor to a new perspective on information systems research, with an emphasis on close interaction with industry, society and users of the technology.

The Department includes a significant number of researchers who have published in premier outlets and who are at a career stage where they could lead the field. We believe that, given the right support and incentives, this 'leading edge' could be further developed.

To improve the quality, visibility and impact of their research within the international scientific community, the Department will have to establish a stronger and more shared methodological, theoretical and thematic platform across its different constituent groups and activities. In our meetings, we were impressed by the enthusiasm of various departmental members who were keen to press on with the research evaluation exercise.

17A.2 Research quality, productivity, uniqueness and relevance

Quality

Several high-quality publications have been achieved in journals accepted as high quality, such as MISQ, JMIS, ISJ and EJIS. Also, papers have appeared in high-quality peer-reviewed conferences such as ICIS and ECIS.

There is not much evidence of strategically selected publications in the self-evaluation material. However, the departmental representatives identified a clear publication strategy around particular topics and leveraging relationships with key visiting faculty members.

There is some evidence of prestige in that a number of research papers have featured as award-winning papers.

An issue of some concern is that two of the three key papers identified in the Department's self-evaluation report are from 2001. It is unclear to the evaluators why no more recent quality publications from the publication list were selected as important. Again, departmental representatives reiterated their strategy for addressing this issue, and noted that several publications had been achieved in the widely accepted 'Basket of 6' journals accredited by AIS (the Association for Information Systems).

Productivity

In terms of publication rate, a quick analysis suggests that 14 peer-reviewed journal papers (the main currency of publications) were produced in 2009 from a potential publishing cohort of about 37 people (34 full time equivalents). This is not a very good average, at less than 0.5 publications per year per researcher. In many institutions, this level of productivity is closer to a ratio of 1. For example, the 5/5/2 heuristic often cited for business schools (i.e. five publications in five years, of which two are in premier outlets) does not appear to have been achieved.

However, rather than publication rate, citation impact is increasingly becoming the focus of attention. A quick scan of ISI does not suggest a high level of citations overall, although there are some relatively well-cited papers on Google Scholar.

Again, however, the Department seems to be well aware of this and has bought into the evaluation exercise, while also being aware of the need not to sacrifice quality in blind adherence to bibliometric exercises.

Uniqueness

The Department has a certain uniqueness in its research approach, characterized by closeness with external partners in industry and public organizations, an emphasis on qualitative methods privileging ethnographies and case studies, and a commitment to interventions in the form of action research/design-oriented research approaches.

It is difficult to see how plans for the future are related to and build on existing work. Research agendas are always infused with a certain element of arbitrariness and improvisation, yet some signs of conscious planning/argumentation would have benefited the plans. The research areas suggested seem diverse and it is not obvious how these areas would form a coherent whole, or what niche ‘sweet spot’ might emerge that could mark out the Department as unique in international or national terms. Sustainable transportation is arguably unlikely to be a topic that would lead to an abundance of publications in premier journals in the field of information systems. Learning and visualization are very well established research topics, and it is not clear just how a competitive niche could be established in these areas.

It is encouraging, however, that the Department has been able to identify ‘leading edge’ topics in the past and presumably could do so again. When discussing recruitment policies, it is clear that the Department has considered where its unique niche might be achieved in the respective priority areas of informatics, learning and visualization. Much this is being achieved through creative collaborations with other units across the University and externally. This is being factored into recruitment policies. The Department stated that several positions would be advertised in the coming year.

Relevance

There does seem to be a desire to be ‘relevant’. Topics such as sustainable transport do probably satisfy such a criterion at national and international level, but as was pointed out above, these topics are not ‘unique’ to the University of Gothenburg, and nor would they feature as regular publications in mainstream information systems journals. Other forms of economic/business relevance, which might be evidenced by spin-out companies or patents awarded, do not seem to be present, although this is admittedly not typical in business departments as a general rule. There is certainly evidence of strong links to industry partners on research projects.

17A.3 Organizational capacity – organization and research infrastructure

There seem to be relatively few staff at senior levels. This is important, as the Department is home to several talented researchers with high potential. A larger cohort of senior staff would help to provide additional leadership and greater critical mass with the University of Gothenburg. Perhaps this will be addressed in the comprehensive recruitment exercise that was mentioned as being imminent by academic staff at the meeting with the Department.

We would also like to commend at this point the strong interaction with Chalmers University of Technology, where about 40% of the departmental activity is carried out, since such strategic inter-institutional collaborations can be very worthwhile. However, it was difficult to evaluate this collaboration as the submission material did not contain material on the work carried out at Chalmers. Such collaborations are difficult to achieve in practice. This seemed to be quite sophisticated in this case, with clear future planning for competitive research areas and cooperation around recruitment. There is much to be admired in this example.

The Department suffers, as noted in their self-evaluation report, from a “fragmented” environment, with inadequate interaction and synergies between the Department’s distinct groups and activities. The research strengths and the potential of the different groups within the Department varies significantly, with the learning and visualization groups not being particularly visible. Exactly how the Department intends to address this challenge is difficult to grasp in the absence of strategies.

In the self-evaluation, six externally funded projects are mentioned. This seems a low figure given that there are 27 relatively senior research personnel within the Department. Furthermore, the annual research budget of SEK 2 million for software engineering seems low in order to sustain a major research strand. In international terms, a ratio of about EUR 100,000 per researcher per annum would be a metric that would not be unusual as a target across a university as a whole, although admittedly this level would usually be lower in the typical business departments of a university than in the ‘hard’ sciences.

The Department as a whole, however, seems quite successful in generating external funding. Moreover, the external funding features a healthy spread from a variety of sources (the Swedish Research Council, European funding and private funding) which gives a certain robustness to the Department’s external funding.

17A.4 Interactive vitality – collaboration and networks

Historically, the Department has been an active participant in research networks on the socio-technical dynamics of the information systems field in Europe. Members

of the Department have had a noticeable presence in the development of the field. As a result, Gothenburg regularly received a stream of international visitors.

International networking is clearly an essential aspect of high-quality and high-impact research. It also facilitates opportunities in EU-funded programmes.

The intensity of collaboration and interaction – both department members' engagement in international networks and external visitors to Gothenburg – seems to have slowed down. However, there seems to have been a more vigorous visiting researcher programme in the past, and this is clearly an important part of networking. For example, the documentation refers to Herbert Simon, Richard M. Cyert and James G. March as previous visitors.

The Department certainly does engage in relevant networking. For instance, the European Conference on Information Systems (ECIS) was hosted a few years ago. Yet, overall the full range of networking activities listed above does not appear to be as intensive as in the past.

The interaction and interdisciplinary collaboration within the University of Gothenburg appears to be relatively well-functioning, as witnessed by joint activities such as seminars, projects and writing. This is promising, but needs to be strengthened for non-local research collaborative networks. Worthy of particular mention here is the faculty research seminar series. These comprise retreats (two days in the spring and a half day in the autumn), and involve senior faculty mentoring PhD students. This is worth extending.

Another worthwhile initiative is the Graduate School in Cognitive Science. This is a national initiative, and such graduate schools are in keeping with best practice internationally. The potential benefits to students outweigh the procedural complications of such systems.

There are also plans to increase recognition and awareness of the identity of the informatics field in Sweden. This is an important step in the maturing of a relatively young discipline such as informatics. It is important for many reasons, not least of which is the 'funding follows formalization' argument, and the Gothenburg group are well placed to spearhead this nationally.

17A.5 Future potentials and possibilities

The self-evaluation report describes the Department's research plans and activities. The most promising research directions in the Department consist of sustainable transport, eGovernment, learning and visualization. The evaluators found neither argument nor evidence to date supporting these choices. On the contrary, the selec-

tion of future strategic areas appears to be based more on an opportunistic response to (local?) funding possibilities than a careful and critical assessment of strengths and weaknesses in research capacity.

In moving forward, we would like to suggest the following:

- Re-vitalize networking activities for key department members;
- Strengthen research management to encourage particularly promising staff with fair chances of high-quality publications;
- Ensure that (local) funding opportunities that emerge are conceptualized in such a way that they provide interesting research opportunities as well;
- Cultivate industry relationships into strategic alliances to secure long-term funding.

17A.6 Research activity and teaching

The Department's close interaction with external partners contributes towards a "complete academic environment", but the Department's thematic fragmentation research-wise makes it difficult to establish a rich ecology of mutually beneficial research and teaching.

The exact teaching load (and hence the mix between research and teaching obligations) is not very easy to determine from the self-evaluation report. The indication, however, is that the teaching load (including supervision) is quite high, especially for senior faculty, which limits the scope for strategic research initiatives.

17A.7 Interactions with society

With its explicit ambition of interdisciplinarity and relevance, the opportunities for exchange at multiple levels with the public and society at large are significant. The Department seems to have succeeded to an interesting degree in engaging in such a debate with the surrounding society.

The Department appears more successful than comparable departments in Scandinavia and possibly in Europe in contributing to ongoing societal and political public debates and the media.

Particularly interesting in terms of finding novel modes of interacting with the broader society is the Department's track record of industry-based PhD candidates. Here, the Department is one of the pioneers in Europe.

17A.8 Gender and equal opportunity issues

The Department, not unlike comparable European departments, does not have a balanced gender representation. In particular, more senior positions are biased

towards males. None of the full professors are female, and only 33% of the associate professors and 27% of the researchers are female.

From the self-evaluation report, there do not appear to be any targeted actions or interventions to establish more equality.

A striking aspect in terms of gender equality is the fact that 75% of the PhDs are female. This indicates that, over time, the gender balance could shift.

17A.9 Summary of assessments – the Department of Applied Information Technology

Quality: *Good*

Productivity: *Good*

Uniqueness: *Very good*

Relevance: *Good*

Organizational capacity: *Good*

Interactive vitality: *Very good*

Future potentials: *Very good*

17B. THE DEPARTMENT OF BUSINESS ADMINISTRATION

17B.1 Overall assessment

The Department of Business Administration has been relatively successful in establishing a strong research profile in some niche areas. It also shows promising tendencies in terms of its ability to attract external research funding and strengthening the focus on publication in peer-reviewed journals. However, the research output is not very impressive when seen in relation to the overall size of the Department, and is skewed towards a relatively small number of employees and groups within the Department. This is probably a consequence of its very heavy teaching load, which can be expected to skew the emphasis away from research of high international standing. This is not unusual for Swedish business schools, and can be explained by historical contingencies.

The self-evaluation material provides little information about what the Department is aiming to do to change its teaching-focused practices and to improve the impact

and visibility of its many research programmes within the international scientific community. During the site visit, however, it became evident that faculty members were aware of this challenge, and a process of strategic change seemed to have been initiated. At the time, there appeared to be no clear or explicit operational plans, however, for strengthening the quality and long-term international competitiveness of the research that is carried out within the Department.

The self-evaluation report tells us little about the relationship between the Department and GRI. However, it is possible that there is some unutilized potential to strengthen the Department's research profile through these contacts. During the site visit, the opportunities that a closer cooperation with GRI might offer, particularly in the field of consumer research, were also identified by the Head of Department and his team.

17B.2 Research quality, productivity, uniqueness and relevance

Quality

According to the self-evaluation material provided by the Department, there is a promising tendency towards a stronger focus on publication in peer-reviewed journals, although this starts from a very low level. However, journal publications are mostly in second- or third-tier journals (up to and including level 3 on the ABS ranking). A significant proportion of research output, however, is still in the form of books, research reports, book chapters and conference proceedings, which do not necessarily represent high-quality publications.

During the site visit, members of the Department's staff acknowledged this problem and expressed their commitment to take concrete action to improve the visibility and impact of their research within the international scientific community. At the time of the site visit, collaboration with internationally well-known scholars, through the University of Gothenburg's visiting professor programme for example, was identified as the main tactic in striving towards this goal.

Productivity

Over the six-year period under consideration (2004-09), the average number of peer-reviewed journal publications per member of staff is fewer than two articles. This is very low as far as research productivity is concerned. These publications are also skewed towards a relatively small number of staff.

This problem was acknowledged by the Head of Department and his team during the site visit, and was also identified as one of the most important challenges faced by the Department in its efforts to bring about a shift from teaching-oriented to

research-driven practices and mindsets in the organizational culture of the Department.

Uniqueness

It is unclear, moreover, whether the Department has been able to identify and articulate its areas of unique competence and future potential in research. While a number of competence groups have been specified in the self-evaluation material, it is unclear *how the particular areas of research that these groups represent are prioritized based on strategic and quality-based decisions*. Overall, the Department's strategic focus and research agenda appear to be somewhat inadequately articulated and justified. The nature of the distinctive international profile that the Department endeavours to create thus remains unclear.

This problem was also acknowledged and discussed during the site visit, and there is reason to believe that the Head of Department and his team are in the process of devising plans to create a more carefully elaborated research strategy based on the unique capabilities and resources of the Department.

Relevance

The Department has been rather successful in sustainably generating external research funding over the time period concerned. However, total external funding seems to have decreased over the years. The average size of the grants has also remained relatively small over the time period. It is somewhat unclear what funding sources “other important funding” refers to, but it would seem likely that this covers a large proportion of industry-based or applied research contracts. Heavy reliance on a combination of small and applied research contracts is generally not an ideal basis for building a sustainable research environment with a long-term focus.

However, the volume of funding from research councils shows an increasing trend. It would also seem that the Department is increasingly successful in attracting larger grants of this kind. The number of grants from Swedish research councils is fairly constant over time (2006-09). If the Department can maintain this trend, it is likely to be beneficial for the quality of research outputs. However, we do not know what strategies and systems have been established to this end.

17B.3 Organizational capacity – organization and research infrastructure

The Department has a relatively typical staff structure for a Swedish business school. Ten full-time professors is a relatively small number for a department of this size, although this is not unusual in Swedish business schools. The average age of the full professors is also relatively high.

An issue of concern is the very strong tendency to recruit staff from the Department's own PhD programme. This is generally considered to have a negative impact on research quality and the generation of new ideas.

While the strategy of the University of Gothenburg emphasizes the role of clear academic leadership and quality management in strengthening the quality and long-term competitiveness of research at the University, the Department of Business Administration appears to have no explicit 'strategy' or operational plans for creating and sustaining the types of stimulating working environments, incentive schemes and organizational practices that foster high-quality research and internationally acknowledged publication activity among its faculty members. It seems, for example, that the Department has not identified and articulated the 'strategically' important high-impact publication outlets that reflect the particular areas of strategic focus that it wishes its staff to work on and to be internationally known for. Such a list might provide the Department not only with a strategic direction but also with transparent quality standards and objectives for individual researchers to pursue in their publication activity.

Overall, it thus seems that the Department would benefit from developing management and organizational practices that enable more effective and professional leadership. As the University's strategy document emphasizes, the principle task of management in active leadership is to take responsibility for the quality and success of the organization.

17B.4 Interactive vitality – collaboration and networks

In the self-evaluation material, the Department seems to emphasize the significance of regular conference attendance for building global collaborative networks and for improving the international reputation of the Department. According to the self-evaluation material, however, few of the faculty members actually regularly collaborate with international scholars in publishing their work.

The University of Gothenburg appears to emphasize the importance of interdisciplinary collaboration within the University in producing cutting-edge research results. Such collaboration, however, appears to be scant within the Department. There also appear to be no explicit plans to create new platforms and practices that would foster and support this type of interdisciplinary collaboration among the faculty members.

While co-authoring with scholars from other Swedish universities seems to be a common practice in the Department, it seems to have no explicit strategies or operational plans for forming strategic research alliances with other institutes of higher

education in Sweden and elsewhere to create new platforms for fruitful research collaboration and to strengthen the quality of research within the Department.

17B.5 Future plans

The self-evaluation report is rather silent about any future plans to develop the research environment. It is unclear whether any strategies or systems have been put in place for building such an environment. In particular, it would have been useful to know more about what the Department could do to:

- Incentivize research-active staff to publish in top-tier, international research journals and attract external funding enabling the establishment of a research culture and environment, which is conducive to this end
- Increase mobility and reduce the tendency to mostly hire its own former PhD students
- Expand international collaboration and networks
- Expand and rejuvenate the professorial collegiate
- Further capitalize on contacts with business and society in order to support a stronger, international research profile

17B.6 Future potentials and possibilities

The information provided in the self-evaluation material seems insufficient for an evaluation of the future potential and possibilities of the Department. A major problem is that the Department appears to have no clear strategy for future. The SWOT analysis presented in the self-evaluation material does not seem to be based on careful analysis, and the Department does not seem to have a clear strategy or vision for future.

17B.7 Research activity and teaching

There is a clear imbalance in the workload of the Department, with a heavy emphasis on teaching. Whilst this is the norm rather than the exception within Swedish business schools, it is unclear what the Department can or is planning to do to rectify this. One possibility could be to differentiate the workload so that research-active staff are given a lower teaching load, subject to them meeting clear research performance criteria. This could also be tied to stronger incentives to generate external research funding (e.g. seed funding or matching reductions in teaching load).

It is difficult to discern what the extent and nature of cross-fertilization between research and teaching is in the absence of curricula and course programmes.

17B.8 Interactions with society

The Department prides itself on its close interactions with business and society, and seems to have established strong network ties at local and regional level. Since

many of the actors in this network are large multinational companies (e.g. Volvo, SKF and Stena) there would seem to be scope for internationalization. However, it is unclear to what extent this potential is being realized or whether there are plans and systems in place for doing so.

17B.9 Gender and equal opportunity issues

In 2009, 80% of the professors and 70% of the senior lecturers/associate professors employed by the Department were male. In the self-evaluation material, however, there is no reference to any sort of policies or practices designed for promoting gender balance and equality of opportunity among faculty members. Nor does the Department seem to have any plans to develop such policies, or to identify and elaborate on the nature of the barriers that female faculty members might experience in pursuing their careers within academia and within the Department. There is no reason to conclude, therefore, that the Department is committed to countering the clear gender bias in its faculty structure or to promoting gender equality in science.

17B.10 Other issues

The conferring of PhD degrees shows a somewhat uneven pattern over time (2000-09), with a clear peak in 2007-8. This is not unusual, and the more stringent funding requirements for Swedish PhD students have probably had some impact here. This is also reflected in a marked drop in the mean study time for PhDs over the same period. However, it is unclear how this correlates with the quality of PhD theses. For example, it would have been useful to know more about the effects of the Department's PhD programme on job placements and/or publications in peer-reviewed journals.

17.B.11 Summary of assessments – the Department of Business Administration

Quality: *Good*

Productivity: *Insufficient*

Uniqueness: *Insufficient*

Relevance: *Good*

Organizational capacity: *Good*

Interactive vitality: *Good*

Future potentials: *Good*

17C. GOTHENBURG RESEARCH INSTITUTE (GRI)

17C.1 Overall assessment of the department

Gothenburg Research Institute (GRI) is a small multidisciplinary research institute, which was founded in 1990 as an independent part of the School of Business, Economics and Law. GRI has been and remains small – three professors are listed both in 2004 and in 2009 (even though additional affiliated professors are, in a somewhat confusing manner, also listed as belonging to the Institute). GRI can be characterized a research project/programme-based institute, focusing on a few major research programmes with a number of affiliated and collaborating researchers.

The research agendas through which that GRI has defined itself are all highly relevant and have the potential to have a major influence on the international discussion. In this, GRI can be viewed as a research “driver” – a research institution with broad visibility and which produces publications with great impact. Over the years, it has been characterized by quite significant productivity as well as well-recognized research of the highest quality.

However, much of this has come down to a few key individuals, and the submitted documentation is not particularly clear as to how this will be addressed with regard to the long-term standing of the institution. Similarly, it seems that some of the research programmes have passed their peak, and the Institute may be forced into making significant changes to ensure the continuity, stability and upkeep of its standing. In addition to this, the funding of the institution is characterized by “soft” money, which could indicate that losing key individuals would be critical, not only when it comes to research output, but also when it comes to financing.

Overall, the question is how an institution such as GRI will be able to maintain its rather unique and highly interesting research tradition in an environment where institutional pressures are increasingly encouraging single-disciplinary, quantitative work, preferably with short turn-around times. GRI’s focus on more complex, qualitative work is both laudable and admirable, but the above-mentioned issues means that keeping this up will require a thorough strategy in order to remain viable in the long term.

17C.2 Research quality, productivity, uniqueness and relevance

Quality

GRI’s research orientation is quite distinctive – in great part multidisciplinary, mainly qualitative and based on long-term fieldwork. This has translated into a specific kind of publication pattern, which combines publishing in top academic journals with a large number of books and chapters. Some of the regular outlets here have been high-quality academic presses like Oxford University Press or Ed-

ward Elgar. But the presence of more national and even “internal” publishers is also quite notable, with Bokförlaget BAS – the press attached to the School of Business, Economics and Law – meriting a particular mention.

Overall, the team at GRI does publish in good/very good quality journals. Outlets have included *Organization Studies* and *Accounting, Organizations and Society*, both of which are A-list journals in many rankings and are included in the FT list. Other regular outlets include *Human Relations*, *Organization* and *Journal of Business Ethics*, which are also generally considered to be top range (the latter being in the FT list too). *The Scandinavian Journal of Management* is also an important and definitely good quality outlet. As this is the leading Nordic-based journal in the field, it makes sense that it should be an important outlet for the GRI team.

In addition to these publication venues, GRI lists a number of others, including internally produced reports. Reading through the supplied material, it is not always clear whether chapters and books have been counted once or twice. (Is a chapter by a GRI researcher in a book edited by the same GRI researcher one publication or two?) On the whole, we find that the number of “in-house” publications is quite high: 50 “GRI-published” publications plus 43 from the University of Gothenburg Press and 28 from Bokförlaget BAS. Naturally, these types of published products are always important as first steps in what is often a long process towards final publication. They should be seen, though, more as a useful means than an end in themselves.

It is clear that GRI has chosen a publication strategy that fits its overall goals and has been successful over the years – work produced and published by the team has gained broad international visibility. It is fair to say that the work of this team has been overall of high to excellent quality, including a number of the pieces coming from smaller and national publishing houses. Still, the assessors would have liked to see the high number of internally-based publications addressed by the institution, as well as a clearer statement as to the overall publication strategy for the future.

Productivity

In absolute numbers, the productivity of GRI is impressive, particularly when compared to the Department of Business Administration, taking into account the relative discrepancy of resources – both in terms of number of researchers and overall budget. This said, we have to acknowledge that there is a (significant) discrepancy between GRI and the Department of Business Administration when it comes to teaching and administration constraints.

Over the period 2004-2009, 139 chapters, 97 peer-reviewed articles and 40 books/monographs have been published by researchers at or affiliated with GRI. If we compare this publication pattern to that of the Department of Business Admin-

istration, we see on the GRI side a slightly greater representation of chapters and books compared to peer-reviewed articles. In the case of the Department of Business Administration, the pattern is different with 164 peer-reviewed articles versus 150 chapters and 70 books (including edited ones). Naturally, the multidisciplinary nature of the research at GRI is a partial explanation of this.

Over the period, we can see a constant and regular increase in the number of total publications – quite significant in fact, from 66 in total for 2004 to 110 in total for 2009, with a similarly sized team. Overall, productivity has thus increased. A great part of this comes from an increased number of chapters and books, with a somewhat more erratic pattern appearing when it comes to peer-reviewed articles. Comparing GRI again to the Department of Business Administration, where overall numbers have also increased (from 79 to 141), we can see a greater increase in peer-reviewed articles at the Department of Business Administration, prompting questions about GRI's publication strategy.

Uniqueness

The strength of GRI has traditionally been its highly original and creative programmes, as well as a unique, very “Gothenburg” approach to organizational research. In this, it would make sense to rate the uniqueness of GRI, both as a research institution and as a research leader, very highly indeed. By drawing on both the novel approaches pioneered by some of the key people at the Institute, as well as allowing space for more experimental work from the many promising junior researchers, GRI has done an admirable job of positioning itself as a unique research environment.

GRI lists six different research programmes in the submitted material. However, the website only lists five – *Bank Management* does not appear there. At the same time, again referring to the website, another programme suddenly appears that is not listed in the self-evaluation report: *Managing Overflow*. The website also lists a terminated programme: *The Centre for Business in Society*. The fact that the submitted material fails to note the former is puzzling, as is the lack of any explanation as to why the latter was terminated.

The current programmes are discussed below separately:

Organizing in Action Nets has been a very productive programme. This is the programme that the report chooses to highlight, which makes sense as this programme has had a great impact on organization studies in Scandinavia throughout its lifetime. While it still lists a series of engagements, it seems as if some of the initial energy has dissipated (or at least become focused more on the individual researchers' projects), which is understandable in that the programme has existed for almost ten

years. Its importance for GRI is thus such that it would have been helpful to have additional information about its future. The submitted listing is impressive in that it is clear that a very large number of excellent researchers and important outputs are attached to the programme – yet it is not always easy to see how the different research projects create a coherent programme. How could GRI take the next step here, one that would reassert the originality and relevance of this particular research programme?

Bank Management. The name of this programme is rather vague and does not provide a clear sense of what is the main focus. The description indicates that the interest here is to study the governance of the banking and financial sector. The programme should however strive for a clearer reframing in order to enhance its visibility and relevance – which in principle should be quite high in today’s world. At the same time, in an age when many people carry out research into the financial sector, it also remains unclear what makes or would make this programme unique.

Something similar can be said for the *Centre for Consumer Science*. While this is a topical and highly relevant research agenda, and there has been some excellent work published within the programme, the submitted material was not altogether informative as to what is unique and special about the programme. As the centre is, according to its website, the largest centre for consumer research in Sweden, it would have been useful to know what are the unique and defining characteristics of the research conducted here – the list of research projects indicates that much of what is done at the centre is one- or two-researcher projects without significant overlap. The list of strategic engagements consists mainly of fairly general points (does a centre of consumer science really need to emphasize that understanding consumption is part of their strategy?) which, except for the interest in actor-network theory and possibly the reference to “large infrastructures”, could probably be said of most places where consumer research is conducted. It should however be noted that there is a broadening of the network in progress, which is promising.

Managing Big Cities is a programme with a highly relevant research topic that has managed to capture a unique niche. The works that have come out of the programme have displayed a high degree of originality and uniqueness, and a number of the publications coming out from this project have certainly left their mark on the field. Looking through the information supplied and available, it is not entirely apparent how active this project is at the moment and what its next steps and challenges might be.

Leadership, Innovation and Co-workership has, at this stage, a much less clear and striking identity than some of the other programmes, although it could represent a promising direction. The project seems to focus greatly on the research interests of a

few key individuals, and while their individual research profiles may well live up to the highest standards of research, the overall picture of the programme is one where it is difficult to see what unites the varied projects.

The *Business and Design Lab* occupies a special place, as GRI has picked this as an example of innovative significance. Combining design and management studies is very much “in fashion” these days, and should be applauded. There is, however, little information about how this programme will develop, and a lot of the projects listed are doctoral or postdoc projects rather than being tied to an overarching programme such as in the most successful GRI programmes. It is thus too soon to truly assess the uniqueness of this new programme, although the ambition to become a unique environment should be noted.

Overall, many of the research programmes either have been very successful at carving out a highly interesting niche in their approach or show promise to be able to do so. They thus stand as testament to the capacity of GRI to identify and articulate unique research programmes within which it can show and sustain a competitive advantage. Beyond the positive assessment of what those research programmes have contributed to within the broad field of organization studies, it would be nice to have a clearer sense as to what will be the main thematic and issue challenges within those research programmes (or possibly in new ones) in the future, allowing GRI to retain the type of original and leading edge positioning it has had in the past.

Relevance

GRI makes it very clear that its approach to relevance builds on methodological considerations and the ways in which societal engagements are constructed. The Institute focuses on methods where direct and prolonged contact with organizations is central, and there is thus an effort to focus on issues that arise out of the relevant everyday reality of organizations. Much of the research published shows this by addressing questions that are at the core of the organizations studied.

In addition to this more general notion of relevance, GRI states that it carries out commissioned research and that its members lecture to and collaborate with external actors. The submitted documentation does not detail what this would entail, nor the extent to which the members of GRI would partake in e.g. executive education.

The engagements listed under societal influence and interaction seem to be mainly local and/or national, and it can also be noted that many of the textbooks as well as the books and articles for a non-academic audience are written in Swedish. This obviously helps to make the work of GRI *societally* relevant in a national context, but less so on a European or international level.

However, this changes when we assess GRI's *scientific* relevance on a global level. Here we can note, from both the impact of the research conducted and the manner in which the organization has been able to host guests and international engagements, that GRI has exhibited a remarkable relevance as a place where original research can be conducted in an environment which allows for creative and innovative engagements.

17C.3 Organizational capacity – organization and research infrastructure

Personnel structure

The GRI team includes only a small number of senior professors, a number that has remained stable over the last six years. Between 2004 and 2009, we note a significant decrease in the number of researchers (14 in 2004 and eight in 2009) which might be real or reflect simply a change in the labelling of positions. In parallel, there has been an increase during the same period in the number of “affiliated” staff (from one to eight). Those affiliated staff contribute to research within the Institute, but they are not employed by the University of Gothenburg. This evolution triggers a question: Are those “affiliated positions” more flexible – not to say precarious – and associated with shorter-term contracts? If this is indeed the case, we might wonder about both research continuity over time and the quality and motivation of the staff hired in this kind of position.

It is important to note that, over the same period, the overall number of doctoral and postdoctoral students has increased. While there was one graduate student in 2004, there were five in 2009. Postdocs went from one to three over the same period. In principle, this is a positive development. Nevertheless, there is an issue with this. This increase is taking place while the number of stable senior staff able to supervise the work of doctoral students and postdoc researchers is unchanged. There is therefore a natural limit to such an increase. At the same time, it is not very clear from the report whether the senior staff are also supervising doctoral students who are formally registered elsewhere.

The table in the self-evaluation that summarizes the situation with respect to personnel structure also shows that a category of personnel, somewhat cryptically labelled “other personnel”, has more or less disappeared from GRI – from six in 2004 to one in 2009. This brings up a number of questions. Who are/were those persons? Why did their number go down so drastically? What kind of impact does this erosion have on the functioning of the Institute?

Finally, we should note that we find some inconsistencies when we compare the data provided in the personnel structure table and the information coming from the publication lists in the self-evaluation. This is particularly true with respect

to the number of senior professors, which differs between the two lists. It is also quite unclear how the two subcategories in the publication lists of “senior faculty members” and “other faculty members and postdoctoral staff” correspond to the categorization provided in the table of personnel.

Finances and funding structure

Between 2006 and 2009, GRI has gone from exhibiting a surplus to a deficit. This appears to be explained primarily through increased costs, as revenue has been constant or increasing over the period. Costs have gone up during the period, but it is not clear from the information we have how much depends on the changed method for calculation of overhead costs and how much depends on other factors, and whether this kind of development is now under control or whether it should be expected to continue.

It is important to note that the share of external funding has eroded somewhat during the period from 2006 to 2009. In 2006, external funding represented around 60% of the overall revenue of GRI. Three years later, it represents only around 45%. This suggests a number of issues. We do not have any complementary information as to where the remaining part of the revenue comes from. If this other part of the revenue comes directly from the University, this could be seen as an evolution that would contribute towards stabilizing the Institute – in the sense of making it a little less dependent on short-term external funding. On the other hand, most of the decrease in external funding comes from the funds provided by Swedish research councils while “other important funding” in 2009 is more or less at the same level as it was in 2006. This trend might be a little worrying if we consider the fact that funding from Swedish research councils probably come with “fewer strings attached” compared to other kinds of private funding.

Another notable development is that even though the overall amount of funds coming from Swedish research councils drops very significantly over the period (from SEK 8,280,000 in 2006 to SEK 5,870,000 in 2009), the number of projects financed through that overall budget has increased slightly. This suggests that each project is running on a thinner budget, and it is certainly worth asking what consequences that may have on the nature of projects and on the ways in which they are being run.

A final point to highlight here is the low level of European financing. We all know the complexities of getting European or EU funds, and one issue is naturally whether the University as a whole or the School of Business, Economics and Law has the logistical capacities to help the different institutes to target such projects.

Management processes and incentive structure

We have scant information on management processes within GRI. In particular, it is not very clear from the information we have how the different research programmes are coordinated, how the sharing of funds and resources works, or how a general strategy for the Institute could and would be elaborated.

With respect to teaching and/or administrative obligations, we understand that they represent between 25% and 50% of a staff member time. We do not have a clear sense, though, of the differences there might be here for different individuals depending in particular on their level of seniority. We understand that Faculty members will generally teach in the Departments to which they are formally connected.

Finally, we have no information on the nature of incentive systems, whether specific to GRI or applicable to the School of Business, Economics and Law or even to the University as a whole, that would encourage certain types of publications and outlets or value certain types of contributions over others.

17C.4 Interactive vitality – collaboration and networks

From the data we have, it is clear that GRI is an institute with significant interactive vitality. Even though the team is small, it has a spectacular record with respect to matters such as keynote lectures or chairing sessions at international conferences, invited seminars and editorship or membership of the editorial boards of peer-reviewed journals.

However, with respect to direct collaboration (co-authorship in particular), the figures are quite low. Only 21% of publications have at least one co-author from outside the University. Even more surprisingly, only 14% of publications count a co-author from a foreign university. The share of direct foreign collaboration, in the form of authorship, is probably too low for a research institute of GRI's standing.

In a similar vein, we see that the share of publications that are jointly produced with members of other departments within the University is very low (5%). This again is surprising, considering the clear multidisciplinary or trans-disciplinary vocation of GRI.

Arguing along similar lines, we would have expected a much more active guest researcher programme – with, in particular, a greater diversity of people coming regularly or for shorter visits to GRI. The data we have shows that between 2004 and 2009 only two visitors came to GRI for more than three months, with two more visitors coming several times during that period but for shorter stays. This is quite low. There might be a resource issue behind these numbers, but it would certainly be worth assessing, at university or school level, what kinds of resources

it would take to make this guest researcher programme much more active. For the kind of cutting-edge research centre GRI has been and will hopefully remain, this would be a very important area of development.

A quick note should be made about the fact that institutional in-breeding remains very high. Six of the nine new recruits to GRI in the period 2004-2009 have a PhD from the University of Gothenburg. To be fair, this is not specific to GRI, but is also very much true for all departments at the school (and more generally true for Nordic universities on the whole). With regard to interactive vitality, this is not an ideal situation.

It is said in the self-evaluation that GRI entertains close contacts and exchanges with other departments and institutes. But as we highlighted above, this was not particularly visible in e.g. publication counts and co-authorship. So what are the other forms that these exchanges and contacts are taking?

17C.5 Future potentials and possibilities

We have already outlined the fact that there are several strands within the research conducted at the Institute that have a great deal of potential. The two areas that the Institute highlights are the research group in consumer research and the Business & Design Lab. These both represent areas with significant potential, and with the right guidance and enough resources, both could possibly be significant international research centres in their own right. The same goes for several of the research groups, as discussed earlier in this evaluation.

To this should be added the fact that the Institute has long acted as an incubator of talent, producing an impressive number of PhDs and professors, both associate and full. The main future potential and possibility of GRI might thus be that the Institute keeps doing what it has been doing, creating the research stars of the future.

17C.6 Research activity and teaching

GRI is a research institution, and is thus primarily focused on research activities. As stated elsewhere in this report, this has resulted in a highly productive, if arguably at times insular (when it comes to connections to the overarching goals of the University) research organization. While GRI has no course responsibility, teaching activity takes about 20% of working time. Both senior and junior faculty members and PhD students regularly contribute to courses organized by other departments at the University of Gothenburg, delivering learning modules and guest lectures on topics, theories and methodologies within the area of expertise and research focus of the different programmes of the Institute. GRI staff members also engage in PhD thesis supervision, primarily as co-advisors for students enrolled in the PhD programmes of other University of Gothenburg departments.

During the site visit, GRI representatives emphasized the positive value and importance of this pedagogical activity not only for GRI's community service but also for the career development of its junior faculty members. Teaching was discussed as an important vehicle for broader dissemination of new knowledge and insights gained through the Institute's many academically successful research projects, and as a means of pursuing the Institute's societal mission. It was also emphasized that, for junior faculty members, the possibility of obtaining practical teaching experience and perfecting their pedagogical skills was crucially important to becoming an academically fully-qualified faculty member.

17C.7 Interactions with society

In the documentation, GRI does highlight a number of interactions with business and society, but these networks seem primarily to be on a local and regional level. Members of the institution do seem to engage in a number of interactions – in both communicative and consultative roles – but the self-evaluation does not indicate any more developed strategy in connection with this. The strategy submitted does make some general statements such as “being part of associations”, “field research” and “meeting with practitioners”, but this could be expanded upon in order to show the type and nature of societal influence that is ultimately activated. Furthermore, looking at the high level of research carried out at the Institute, one would think that GRI could now develop an ambitious strategy to enhance the Institute's standing both in local society and within a more international policy arena. Encouraging researchers to engage more in e.g. policy debates and the public discourse on business and the economy is something we would expect to be critical for the future development of GRI.

17C.8 Gender and equal opportunity issues

As an institution, GRI seems to have dealt well with gender and equality issues, and we find no significant gender-imbalance when it comes to the Institute. Women and men are fairly equally represented at all levels of seniority, and if anything there is a surplus of productive and significant female researchers. As gender has been a research interest for several of the researchers at the Institute – as well as for people closely aligned to it – this should perhaps not come as a surprise. The Institute does have mainly Swedish researchers, which one might argue is something to take into account in future hiring, but we do not find this to be a major issue. Overall, the Institute seems to have handled gender and equal opportunities issues fairly well. Obviously this is something to be commended, and we can only hope that the Institute keeps doing good work in this respect and strives for continuous improvement on these issues.

17C.9 Summary of assessments – Gothenburg Research Institute (GRI)

Quality: *Excellent*

Productivity: *Very good*

Uniqueness: *Excellent*

Relevance: *Very good*

Organizational capacity: *Good*

Interactive vitality: *Very good*

Future potentials: *Excellent*

17D. THE INSTITUTE FOR INNOVATION AND ENTREPRENEURSHIP (IIE)

17D.1 Overall assessment of the department

Organizationally, the Institute for Innovation and Entrepreneurship (IIE) comprises not only activities at the School of Business, Economics and Law; it is also a unit at the Department of Medicine at the Sahlgrenska Academy, but information is provided only on the former. IIE was established in 2008 and, at the time of the site visit, had a research staff of four professors, one full-time lecturer, four postdocs, three PhD students and a number of visiting professors. The research carried out by IIE is concerned with innovation, entrepreneurship and intellectual asset management. This agenda is pursued with considerable attention to policy and business relevance, and IIE has the status of being an active and well-recognized partner in relevant government agencies at national and international levels. At the same time, researchers from IIE have published work that is frequently cited by the academic community. In several respects, IIE's performance is very good. Its achievements over the two previous years allow IIE to be considered a unit with high potential.

17D.2 Research quality, productivity, uniqueness and relevance

Quality

According to the self-evaluation material, during the years 2008-9 IIE published three papers in peer-reviewed journals, listed in ABS grades 1, 2 and 3. Regardless of their modest ABS standing, two of these three journals are the core of the international cluster of innovation-related issues pursued by IIE. A monograph was also published by IIE, including several of the 15 chapters published in books by

IIE researchers. One of the publications listed as important in the self-evaluation is a book from 1996 by one of IIE's professors. It has accumulated more than 200 citations (Google Scholar). Another important publication is a paper from 2008 which so far has accumulated 87 citations (only one of its five authors, however, is from IIE). Characteristically, this paper addresses conceptual issues in rendering the theory of innovation systems more powerful from a policy maker's perspective. Additional important documents bear witness to the importance of IIE research in the eyes of policy makers in EU. The Swedish key agency for innovation policies, Vinnova, is listed among the key publishers of IIE research.

Moreover, the additional information about the track-record of the professors currently employed by IIE that was provided during the site visit suggests that IIE has great potential in developing the impact and visibility of its research activities in the international scientific community and in the fields in which it operates.

Productivity

Some uncertainty enters into an assessment of IIE's productivity, since it had only 8% of publications personally verified by their author. Furthermore, of the five researchers identified in the statistics on IIE in the self-evaluation material, only three are included in the publication list.

According to the self-evaluation material, IIE produced 20 publications in 2008 and 22 in 2009. 12 were book chapters and 15 were conference papers (peer reviewed). This is a satisfactory volume considering the small size of IIE staff (2.65 FTEs funded for research by the University of Gothenburg). IIE's current (year 2009) external funding amounts to above SEK 10 million. This helps explain IIE's comparatively high publication rate, but does not detract from its achievements.

Uniqueness

A substantial part of IIE's work addresses issues about the role of universities in innovation and economic development. It is rare to find single research units giving so much attention to this specific agenda, and in this sense IIE has an element of uniqueness. This focus has brought IIE into the European team behind the construction of the KEINS database on European patents. KEINS is a unique research infrastructure which is well suited to examining the commercialization of academic research, and in its current research IIE is actively harvesting from this unique data source.

Relevance

To IIE, relevance is not a concern addressed once other criteria have been met. Rather, it appears to be perceived by IIE as an essential part of its *raison d'être*, and it leaves a pervasive stamp on its publications and research practices. The latter is

reflected in the role played by IIE staff on governmental committees and in reports commenting on, or preparing, legislation.

17D.3 Organizational capacity – organization and research infrastructure

With 2.65 FTEs available for research, IIE is by far the smallest unit evaluated by this panel. 2.65 FTEs represent a limited set of resources, particularly when considering the scope of IIE's research, spanning innovation, entrepreneurship AND intellectual asset management (IAM). Indeed, a point for IIE to consider is that the scope of this agenda seems to be only partially met. Few references on IIE's publication list are about entrepreneurship per se. No information is available allowing research management and incentive schemes to be evaluated.

17D.4 Interactive vitality – collaboration and networks

IIE is well connected to the academic community. 73% of the publications have at least one author outside the Department, and 66% outside the University. IIE researchers take on responsibilities as editors of special issues and books, and as developers of international databases. Considering the size of senior staff, IIE has an impressive involvement with the academic community, as reflected in 16 appearances as invited speakers at international conferences, and another 16 interactions with government commissions.

IIE is similarly well connected with practitioners in its fields of research, particularly in the institutions of government at regional and national level and above (EU and OECD).

17D.5 Future potentials and possibilities

Taking into account the rich research agenda on entrepreneurship of the preceding decade, IIE might consider whether it should take more research in this direction in order to justify the name of the Institute. Similarly, it could be considered whether there is untapped synergy in the relationship between IIE's research agendas in innovation and intellectual asset management (IAM). No publications from IIE indicate that these strains of its research have been brought together, although IAM could be combined with issues of both innovation and entrepreneurship in multiple ways. This could also be contemplated as an agenda for strengthening the uniqueness of IIE.

17D.6 Research activity and teaching

The self-evaluation material contained no information about IIE's teaching activity. The information given during the site visit reveals, however, that IIE runs several MSc programmes and collaborates with Chalmers University of Technology in de-

livering Master’s level education for University of Gothenburg students. IIE faculty members also engage in PhD training through its research projects.

17D.7 Interactions with society

See above, sections on “Relevance” and “Interactive vitality”.

17D.8 Gender and equal opportunity issues

The total research staff of IIE is reported as 13, of which two are women. There seems to be a clear case for paying attention to gender equality in future recruitments. It should be noted that amongst the much smaller group of the five researchers covered by the publication data, the two female scientists rank highly in terms of research output, quality and contribution to those publications highlighted to which IIE itself assigns particular importance.

17D.9 Summary of assessments – the Institute for Innovation and Entrepreneurship

Quality: *Very good*

Productivity: *Very good*

Uniqueness: *Very good*

Relevance: *Excellent*

Organizational capacity: *Good*

Interactive vitality: *Excellent*

Future potentials: *Very good*

PANEL 18 – ECONOMICS AND LAW

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INTRODUCTORY REMARKS

Panel 18 was responsible for evaluating four academic units: Economic History (18A); Economics including the Centre for Finance (18B); Law (18C); and Human and Economic Geography (18D). All four departments are located within the School of Business, Economics and Law. In terms of their operational size, the departments differ considerably, with a senior staff (professors and senior lecturers) FTE (full time equivalent) in 2009 ranging from 6.6 (Economic History), 11.2 (Human and Economic Geography) and 23.1 (Law) to 24.2 (Economics). There is also a significant variation in terms of the proportion of time devoted to research by professorial and senior lecturer staff (particularly in the case of Human and Economic Geography), and the number of students per staff (as an indicator of the overall burden of teaching) fluctuated between 42.8 (Law), 32.6 (Economic History), 28.0 (Economics) and 15.5 (Human and Economic Geography).

The following points should be noted:

Research quality

Although there is evidence of good to excellent research output in all four departments, their overall quality profiles differ significantly. Economic History has a well-established reputation, particularly in agrarian, business and industrial history, and is successfully improving its national and international reputation in a number of key areas supported by the implementation of appropriate strategies and effective leadership. During the current review period, Economics has strengthened its international reputation in three designated areas (behavioural, environmental and development economics) and clearly operates successfully at a national and, increasingly, at an international level. There is evidence of some excellent research in Law in a number of specific areas (including contract and commercial law, environmental law, gender studies, property law, social security and tax law), but there are insufficient publications in peer-reviewed, international journals. In general, the Department suffers from a lack of strategy, a failure to formulate research priorities, and an absence of coherent research plans for the future. Human and Economic Geography has produced good quality research specifically in economic geography, transport and mobility issues, but its overall development during the review period has been relatively unimpressive and there is evidence of selective underperformance with respect to research.

Research planning

It is clearly apparent that research planning in some of the departments is deficient, and that best practice has not been disseminated effectively at either Faculty or University level. This is specifically a problem in the case of Law, where the prioritization of research quality has been compromised by the absence of an appropriate strategy and a failure to adopt objective criteria for ranking output, while in Human and Economic Geography there is a need for more effective research leadership to identify existing strengths and to build on them in the future. By contrast, both Economics and Economic History have developed a focused approach to research planning which reveals an awareness of international standards and a commitment to utilizing existing resources to enhance their respective research profiles. The marked variation in the extent and implementation of research planning at a departmental level suggests a wider failure by the University to focus sufficiently on the development of an appropriate strategy in this key area. The extent to which the Faculty fulfils a strategic research role is apparently up to each Dean: quality control is weak; there is no requirement to advertise posts internationally; and little attention has been paid to succession planning, despite its significance for future research development. Within this context, it is vital that measures are undertaken to ensure that the Faculty can become a focal point for delivering any necessary changes in research planning and for making sure that best practice is disseminated amongst all its constituent academic units.

The balance between research and teaching

There is evidence to suggest that the research performance of individual departments has been affected by the balance between teaching obligations and research time. At one extreme, professorial and senior lecturer staff in Economics and Economic History were able to allocate 48.8% and 84.8% more time respectively to research than their colleagues in Human and Economic Geography. There appears to be little direct correlation between the relative importance of teaching (or the proportion of time available for research) and departmental student per staff ratios, perhaps because a reduced teaching burden almost certainly reflects success in obtaining externally-funded research grants. Some departments, such as Law, are ‘rather focused on teaching’ (reflecting the constraint of delivering a professional educational programme), while Geography has ‘deliberately’ chosen to strengthen its teaching input. But teaching quality cannot be sustained in the long run without ensuring an appropriate balance between research and teaching, and nor should staff be appointed as teachers in the hope that they will become good researchers. There is a need for a more proactive University and Faculty policy to enable all tenured academic staff, particularly senior lecturers, to benefit from a minimum period of dedicated research time or sabbatical research leave in order to develop existing projects and to prepare new submissions for external funding. It is equally important that appropriate strategies are adopted to allow individual departments to achieve a better balance between teaching and research in order to prioritize new research initiatives.

18A. THE DEPARTMENT OF ECONOMIC HISTORY

18A.1 Overall assessment

The Department has a well-established reputation in agrarian, business and industrial history. There is clear evidence that it has developed a strategy to consolidate its position by developing new research areas, particularly in environmental economic history and historical labour market and migration studies; by adopting a more strategic approach to research development; and by securing an increasing number of substantial grants from the Swedish research councils and other funding agencies. At the same time, Economic History is a relatively small department: its research is arguably too Swedish in orientation; insufficient emphasis has been placed on the need to publish good quality research output in international, peer-reviewed

journals; and there is continuing concern over the future level of student demand for economic history courses. The Department is capable of generating some excellent research, but consideration should be given to the need for greater investment and the future location of the unit within the context of the need to maximize opportunities for interdisciplinary and collaborative research.

18A.2 Research quality, productivity, uniqueness and relevance

Monograph publication is still important within a discipline such as economic history and the level of output during the review period has been considerable. However, the list contains a number of project reports, at least two text books and a number of publications for which no details are provided: all the publishers are Swedish. Book contributions represent almost 20% of the total output, but the proportion of peer-reviewed journal articles (5.7%) is poor. Some full-time members of staff have not published at all in peer-reviewed journals during the review period and the Department's output profile has been dependent, to some extent, on contributions from doctoral students and researchers.

There is certainly evidence of good quality research output, with some important monograph studies, particularly on the Swedish labour market, the development of the tourist industry, and specific business enterprises and financiers. This is equally the case in relation to peer-reviewed journal articles, some of which represent important contributions to international debates, while the fact that over one-fifth of the book contributions appeared in English-language publications is evidence of considerable integration within the wider academic community. The nominated important publications (2000, 2002) originally appeared before the start of the review period, but they clearly represent the continued vitality of the monograph tradition within the Department, while some of the work by younger researchers and doctoral students demonstrates considerable promise. Because of a general concentration on Swedish topics, where material is not always located within an international research framework, the overall quality of research output is only *good* or *very good*, although there are some examples of international excellence. Overall, there needs to be a stronger focus on prioritizing publications in peer-reviewed journals, rather than producing a disproportionate number of non-peer-reviewed conference papers (63) and journal articles (23). There is evidence that such a policy is now being pursued with an increase in the publication of articles in top journals. Both staff and doctoral students should be encouraged to produce a smaller number of high quality research outputs which locate their research within a wider context and would justify publication in major English-language journals.

There has been a significant improvement in the level of external funding in recent years, with an increase in Swedish research councils' support (from SEK 933,000

to SEK 3,229,000) and a noticeable rise in the number of externally supported projects. Of the four disciplines covered by Panel 18, Economic History has the second highest ranking in terms of Swedish research council income per senior academic staff FTE. This trend has been reinforced by a rise in externally resourced PhD studentships. However, the through-put of doctoral students, although solid, has been relatively modest, with an annual average of two doctoral degrees awarded throughout the review period.

The Department has five designated research fields (business history, macroeconomic history, historical labour market and migration studies, agrarian history and historical demography, and environmental economic history), but none of these could be said to be unique to Gothenburg. As one might expect, however, there has been a productive engagement with the long-run development of Gothenburg itself, with useful contributions in business, maritime and trade history.

Assessment: generally *Good* to *Very good*, with some examples of excellent research

18A.3 Organization and research infrastructure

As confirmed in the self-evaluation, Economic History is a relatively small department (6.6 FTEs) consisting of three professors and five associate professors/senior lecturers. The review period has seen a marginal decline in the number of research staff (excluding one research fellow) from five (2004) to three (2009), compensated to some extent by the appointment of one postdoc. However, the Department is structured around five distinct research fields which are composed of ‘loosely organized groups of researchers’, and there is little evidence of an appropriate investment or development strategy, except in the case of business history. For a department of this size, there is clearly a case for reviewing and rationalizing the operational remit of the existing research groups, as a focus on fewer strategic research areas might be beneficial in the medium term. Ideally, all of the professors should have a specific planning responsibility for the development of a key strand of the Department’s research profile. There is also an increasing emphasis on historical gender studies and environmental economic history, both of which are important and developing topics within the discipline. Both fields of research would benefit from greater institutional support within the framework of a wider review of the Department’s future research priorities.

In recent years, significant steps have been taken to improve the organization of research and to enhance the quality of research leadership, although there is still room for further improvement. There is a clear impression that the Department functions as an effective unit, with a good level of both formal and informal interaction reinforced by a commitment to ‘strong’ communication. There is an increasing emphasis on the role of research groups; a recognition of the strategic significance

of multidisciplinary and interdisciplinary research projects; and an awareness of the benefits which can be derived from the development and analysis of large-scale databases. As part of the strategic plan for 2007-2010 it was recognized that the Department was in a transition phase, but the objectives set out in terms of research development reflected a realistic awareness of key priorities. The self-evaluation emphasized the importance of strategic planning, but also indicated that the production and publication of research were still ‘the big challenges’. It also recognized that the limited number of sources for funding basic research necessitated by definition an interdisciplinary and collaborative approach to new research opportunities.

Assessment: *Very good*

18A.4 Collaboration and networks

The Department has already initiated collaboration at university, national and international levels, and there is sufficient evidence to suggest that an extension of collaborative activity will generate significant benefits in the future. At the moment, joint research seminars and workshops are held with a number of other Gothenburg departments (specifically History, Public Health and Community Medicine, and the Science of Work); environmental historians collaborate with other disciplines, both within the University and with Chalmers University of Technology; and two joint projects have been initiated with colleagues in economic history at Lund University and Uppsala University. There is evidence of collaboration in delivering a master’s programme (in Environmental Management and Economics) and in taking forward interdisciplinary research within the School of Global Studies. Research networks and collaborative projects are being developed with international scholars, while foreign researchers are ‘regularly’ invited to Gothenburg. From a strategic perspective, the Department is moving in the right direction, and it has the potential to benefit considerably from greater involvement in international projects.

During the review period, however, only four members of staff have been involved in overseas research visits of more than one week and there has only been one visiting researcher. In terms of research output, the level of effective collaboration is also limited: only 11% of publications were co-authored with a colleague outside the University; the degree of interdisciplinary collaboration was minimal; and not a single refereed journal article was published with an overseas academic. As a discipline, economic history is well-placed to exploit the benefits of collaborative, interdisciplinary research, but more could be done to realize the potential, both within the University and internationally. Stronger research links with History, Economics and other relevant disciplines need to be explored, with greater institutional support for taking forward promising proposals for developing interdisciplinary research networks and collaborative projects.

Assessment: *Good* (with the potential to be *Very good*)

18A.5 Future plans

Although the emphasis is on recent or ‘ongoing’ research, there is a welcome, forward-looking perspective, which recognizes the importance of broadening the scope of the Department’s return, in relation to specific themes, the consolidation of collaborative networks, and the publication of research output in international journals. Equally, there is a recognition that major initiatives will increasingly have to be taken forward by research groups, with the specific objective of securing external funding. Although multidisciplinary and interdisciplinary projects have recently been ‘launched’, insufficient detail is provided. However, the strategy of developing large-scale databases (specifically on European merchant trading and the Swedish labour market) is very sound both as a basis for strengthening external collaboration and for generating high quality research output. The overall preference, however, is for a ‘bottom-up’ approach to the generation of new research topics, although it would have been helpful to have discussed the appropriate mechanism for ensuring that good ideas (whether individual or collective) can be developed and implemented effectively. A wider concern, but one which affects the University as a whole, is the extent to which the new overhead system actually militates against departmental attempts to secure external funding, particularly from private funding agencies.

Assessment: *Good* (with the potential to be Very good)

18A.6 Future potentials and possibilities

The Department is aware of how it needs to move forward in order to capitalize on its existing research strengths, whether in relation to external research funding, collaborative and interdisciplinary research, or the publication of research output in highly-rated international journals. Most members of staff have enjoyed a good profile at international conferences during the review period, but perhaps the opportunities for networking could be exploited in a more focused manner. Priority should be given to the further development of the two large-scale databases, while existing expertise in database management might facilitate analogous initiatives in other key areas of the Department’s research. The appointment of a new professor in business history will reinforce the strategic planning of research, but a wider ranging review of future possibilities in other key areas of departmental research should be undertaken, together with a reassessment of the most appropriate administrative and managerial framework for taking forward new possibilities. The Department is already beginning to operate effectively at an international level: by advertising posts within the Nordic area and further afield; by promoting the attendance of doctoral students on training courses at other universities; and by prioritizing research collaboration with international partners. A further strengthening of policy in this area will enable the Department to capitalize on future research opportunities and to consolidate its international reputation.

18A.7 Research activity and teaching

It is clear from other documentation (in particular the strategic plan for 2007-2010) that there is a close relationship between teaching and research at all levels. Research-led teaching has been prioritized at advanced level, but even lower level courses (*grundutbildningen*) are informed by the research interests of academic staff. Almost all teachers are engaged in research, with little difference in the weighting between teaching and research between the full and associate professors, although the overriding focus within the Department on research relating to Sweden may be a reflection of the constraints under which some senior lecturers operate and the fact that a small number of staff members have a relatively heavy teaching load. However, one member of staff has received two prizes for high quality teaching, and all the evidence suggests that there is a strong and meaningful interaction between teaching and research within the Department as a whole.

18A.8 Interactions with society

There is a good range of interactions with society, whether in the form of specific websites, TV programmes, contributions to local history, academic publications with a wider audience or high quality textbooks. However, there does not appear to be any real strategy in this important area and, in the absence of adequate university resources, initiatives have been left to individual members of staff. It would be sensible to develop a coherent strategy to maximize the potential of networking links with non-academic agencies (whether locally, regionally or nationally), particularly where they have an interest in heritage, museum studies, local history or business enterprise. Consideration should be given to establishing an advisory board with representatives from academic-related or non-academic bodies in Gothenburg to develop a more effective approach to knowledge exchange and social interaction.

18A.9 Gender and equal opportunity issues

There are no substantial problems below the level of full professor, with women being well-represented among associate professors (40%), researchers (33%) and doctoral students (40%). Currently, all three professors are male, but the recent appointment of a female professorial colleague will have a positive impact on the gender composition of the Department's senior staff. Consideration might be given to the provision of mentoring and other supportive mechanisms as a means of further improving gender representation within the Department.

18A.10 Other issues

This is a department with a good research record, but one that is visibly seeking to improve its national and international reputation. To achieve this objective, the Department needs to review its current range of research interests, rationalize its research priorities, and ensure that appropriate support is available to enable it to realize its full potential. The appointment of a new professor in business history will

help to reinforce the Department's reputation in this field, and the future retirement of senior members of staff should be taken as an opportunity to strengthen investment in the Department and underpin the strategic management of research priorities. In a wider context, consideration should be given to the location of the Department as a means of maximizing its research and teaching potential. There is a very strong case for retaining existing links with the social sciences (perhaps within a School of Economics, Economic History and Human Geography, a Faculty of Social Science, or a wider configuration of the social sciences, possibly based on the institutional model of the London School of Economics and Political Science), while the viability of a closer relationship with History should also be explored.

18A.11 Summary of assessments – the Department of Economic History

Research quality, productivity, uniqueness and relevance: *Good to Very good*

Organization and research infrastructure: *Very good*

Collaboration and networks: *Good* (with the potential to be *Very good*)

Future plans: *Good* (with the potential to be *Very good*)

18B. THE DEPARTMENT OF ECONOMICS, INCLUDING THE CENTRE FOR FINANCE

18B.1 Overall assessment

Over the last decade, the Department of Economics has increased its international reputation in research, especially in the areas of environmental economics, development economics and behavioural economics, as evidenced by the quantity and quality of publications, the increasing flow of external grants, and the ability to attract good graduate students. Overall, some questions still exist regarding the role of the Centre for Finance, visiting professors, and how to address the gender imbalance.

18B.2 Research quality, productivity, uniqueness and relevance

The Department follows the mainstream goal of publishing mainly in peer-reviewed article format: peer-reviewed articles account for over 30% of the total number of publications in 2004-2009. The overall number of peer-reviewed articles has been on the rise – the number in 2009 was 163% of that in 2004. This may be related

to the increase in the number of professors, but it may also be the consequence of strong incentives to publish such works. Many publications are published in high-quality outlets, with several articles being published in top-tier journals. The top journals in economics (a list with only five to six journals) are, however, sparsely represented.

The publications statistics include a large number of reports (390, i.e. 37% of the total number of items). These are to a large degree working papers, i.e. first complete versions of papers that in most cases end up being published in peer-reviewed outlets. This is standard practice in economics, but implies a certain number of papers will be counted twice. The share of peer reviewed articles in the total is therefore underestimated: adjusting for such double-counting would probably bring the share of peer-reviewed articles to approximately 45%.

The publication list includes comparatively few monographs (19 – or 2% of the total). This is likely to be a consequence of the focus on publishing in international peer-reviewed outlets. In terms of the Department's standing in the international research community, this is likely to be a positive development.

Productivity is high. For example, on average, each professor published well over two peer-reviewed articles per year over the evaluation period. On average, there were 1.6 peer-reviewed articles per staff FTE (excluding postdocs and 'other' academic staff) published each year over the period 2004-2009, with a strong upwards trend over the period.

Judging by outlets, the quality of research output appears good. Many professors have had a substantial impact on their fields, with several hundred Google Scholar citations and a few well over a thousand.

The Department of Economics is strong in certain subfields of economics, specifically in behavioural economics, development economics, and environmental economics. These are fields that are relevant to current policy in important areas such as climate change, poverty and finance. Although not quite as strong as the first three, industrial economics also represents an area of strength. Core fields of economics, such as macroeconomics, public economics, econometrics and the related field of finance, are weak by comparison, despite some excellent individuals who work in these areas. The Department has focused on a niche by concentrating on the three aforementioned areas of economic research. While not unique on a worldwide scale, this focus gives the Department punching power within its niche which is above its weight.

The Centre for Finance is a small unit, with one professor, three associate professors/researchers and two postdocs. Research productivity is lower than at the Department of Economics as a whole – on average, approximately one paper per year and FTE. Quality, as measured in terms of the strength of outlets, also appears not to be as high as that of the Department of Economics.

Assessment: *Very good to Excellent*

18B.3 Organization and research infrastructure

Economics (the Centre for Finance is included unless otherwise indicated) is the largest department of the four reviewed by the Panel, consisting of 14 professors (11 FTEs), 15 associate professors (13 FTEs), and some 25-30 lower-ranked research staff, including postdocs (18.5 FTEs). The number of professors has increased markedly (75%) over the last five years, from eight in 2004 to the present 14. The review period has seen a decline in the number of research staff (including research fellows) from 20 (2004) to 15 (2009). The Department is small on an international scale, but may be said to be mid-sized in terms of the Nordic area – for example, the number of professors and associate professors is similar to the staffing levels at economics departments at the University of Uppsala and the University of Bergen.

Excellent researchers lead the three strongest fields. While the self-evaluation report does not describe formal structures around these groups of researchers – the report acknowledged that the group structure is rather loose – they seem to be well-defined and to have a longer-term strategy as to where their research is heading. There has been a conscious focus on recruiting academic staff and doctoral students into these fields. It seems that this model is working well – a more formal structure is not likely to improve performance, but could raise walls between groups. That would be a negative development, since the groups interact, cooperate and overlap to some extent with the present structure. Closer cooperation between the different research groups along the lines described in the self-evaluation could further strengthen these fields.

Even if core areas of economics need to be strengthened – e.g. for the purposes of teaching – the focus on a limited number of fields is wise. Critical mass is easier to reach, and the volume and quality of research is increased.

Assessment: *Very good*

18B.4 Collaboration and networks

It is evident from publications lists that the Department of Economics engages in extensive research collaboration locally, nationally and internationally. Given the tradition for co-authoring articles in economics, sole-authored publications make

up an unusually high proportion of the total (48%). However, there is plenty of research collaboration, both within and outside the University. One measure of the latter type of collaboration is a 33% share of publications with at least one author outside the Department but within the University, and a 29% share of publications where at least one author is outside the University. Collaborators are located both at other institutions in Sweden and in other countries. The Department is rooted in an international research tradition, and is also international in its outlook and strategy; the number of international junior research staff is one example.

International collaboration is also reflected in the number of research visits, both outgoing and incoming. On average, each researcher visits another research institution outside Sweden for a week or more every year. There is a corresponding number of incoming visitors.

Despite interdisciplinary research efforts noted in the self-evaluation report – on globalization, on energy markets and in the environmental field (fisheries and climate change) – the share of publications classified as such is very low (6%). Furthermore, the Department does not seem to have a strategy or any goals regarding interdisciplinary work. It would be sensible to consider incentivizing interdisciplinary collaboration within the University, although it is clear that international networks will be more important for the Department in the long run.

Assessment: *Very good*

18B.5 Future plans

The Department intends to build on its strength in its three strongest areas – development economics, environmental economics and behavioural economics. The goal is to become the leading department in Sweden in these fields and one of the top institutions in Europe. There are also plans to combine these research areas.

In effect, the Department is doing something that many smaller institutions find difficult and even painful, *viz.* focusing on a few areas where critical mass can be achieved rather than trying to cover all sub-fields of economics with limited resources. This strategy seems likely to at least maintain the current strength of the Department and could even lead to outstanding results.

Assessment: *Excellent*

18B.6 Future potentials and possibilities

The Department's future seems clear from the report: to focus on its research and teaching strengths, to continue to seek and secure external funding, and to attract good graduate students from around the globe. The future is good, provided that

the Department can maintain its excellent relationship with Sida, the Beijer Institute (The Royal Swedish Academy of Sciences) and the network of like-minded scholars around the globe. The Department already operates effectively at an international level; it has a clear sense of its strategic priorities; and it is fully aware of the market potential when seeking to recruit new members of staff.

18B.7 Research activity and teaching

The positive relationship between research and teaching is emphasized in the Department's strategy document. Given the research niche and the relative dearth of research in the central fields of economics, it is natural that this relationship should be especially relevant at the advanced level, as both introductory and intermediate courses necessarily concentrate on the more central areas. There are three to four faculty members – about one out of every ten – who teach full time, with little or no research activity. A longer-term priority should be for all faculty members to be active researchers.

18B.8 Interaction with society

Given the applied slant of the research at the Department of Economics, it is to be expected that there will be strong demand for societal interaction – participation in commissions, etc. – as the self-evaluation report points out. Some faculty members also contribute to such interactions internationally.

On the basis of the self-evaluation report, it seems to be the case that no attempt has been made to develop a conscious strategy in this area. To some degree this is natural – economics interacts naturally with society and there is usually more demand than supply for such interactions (media comments, committee work, etc.).

18B.9 Gender and equal opportunity issues

There is a strong gender imbalance among senior staff: of 14 professors, only one is female; of 15 associate professors (senior lecturers), two are female. Among researchers and research fellows there is better balance, with six females out of a total of 15. To some extent, these numbers reflect a historical gender imbalance in economics. This may change for the better in future: when it comes to PhD students, almost half are female. The Department's strategy document – which has as one of its goals a commitment to hire and promote female researchers – notes the difficulty in recruiting female PhD students into academia. Moreover, there is evidence that appropriate steps are being taken to address this problem, and consideration will be given to the provision of mentoring programmes for PhD students and postdocs as well as extra research time for female members of staff.

18B.10 Other issues

The level of “selected external funding for research” (Department of Economics and Centre for Finance combined) was an impressive 40% of total revenue on average in 2006-2009. The number of projects remained the same over these years. The level of large research grants has fluctuated during the same period: they amounted to 30% of revenue in 2006, rising to 50% in 2007-2008, and falling back to 30% in 2009. This shows also the vulnerability of the Department and the Centre for Finance to this type of funding. The majority of these funds come from sources other than the Swedish Research Council or EU grants; the latter two types of grants account for only 12% of total research grants in 2006-2009, and the Department of Economics has the second lowest amount of Swedish Research Council grant funding per FTE among the four disciplines covered by Panel 18. Although it is accepted that there is intense national competition for such grants, the Department’s profile is somewhat disappointing. EU funding is a recent phenomenon at the Department, with no grants of this type until 2008. With its strength in applied research, particularly in behavioural economics, development economics and environmental economics, it would seem that this leaves some unexploited funding opportunities for the Department.

18B.11 General issues affecting research quality

To follow up on its goal of a higher standing, the Department has introduced a bonus system, in which ‘authors receive a significant bonus (SEK 50,000) for articles published in a “good” journal’. Such articles are also given a high merit value when it comes to the criteria for promotion. This strategy is likely to work and, if the recent trend in publications is anything to go by, has already returned some of the desired results. It can also have some drawbacks – as behavioural economists know, external motivators can drive out internal ones.

The question has to be raised of the extent to which the prolific visiting professors Dufwenberg and Sutter contribute to the actual work at the Department. Sutter appears to be included in the publication statistics with 13 peer-reviewed journal articles (4% of the total number), but he has no publications with Gothenburg staff, except for one working paper from 2009. Dufwenberg’s accomplishments are noted in the self-evaluation, but his role at the Department is unclear; his publication list is excluded, for example. This does not detract from the high quality and productivity seen when the research record of full-time professors is examined on an individual basis.

The second question relates to the Department’s strategy regarding the Centre for Finance. The Centre lags behind the Department as a whole in research output and quality. Furthermore, it is barely mentioned in the self-evaluation and does not appear to play a role in the Department’s future plans for research. However, the Panel

was informed that the Centre has now been fully integrated into the Department, with the explicit intention of developing a new educational programme in Finance and Economics and promoting research development.

18B.12 Summary of assessments – the Department of Economics including the Centre for Finance

Research quality, productivity, uniqueness and relevance: *Very good* to *Excellent*

Organization and research infrastructure: *Very good*

Collaboration and networks: *Very good*

Future plans: *Excellent*

18C. THE DEPARTMENT OF LAW

18C.1 Overall assessment

For a law department, this is a small- to medium-sized unit. The first students were accepted into a full law programme in 1991, and it has since been a priority of the Department to develop the law programme and to ensure that it has sufficient staff to cover all the central legal fields. As is the case in many law departments, it is clearly affected by a heavy burden of teaching and by the need to cover all the key areas of a full law programme. To this extent, it remains ‘rather focused’ on teaching, with an emphasis on the professional utilization and practical relevance of both teaching and research. To this extent, social and practical relevance has been more important than scientific excellence in its own right. However, the Department has developed good to excellent research in some areas where it has distinct clusters of researchers, as in intellectual property law, social security, tax law, contract and commercial law, environmental law, gender studies and aspects of international law. In many of these areas, legal research can contribute positively to cross-disciplinary initiatives and can foster productive cooperation with other departments. By contrast, in many of the other research areas there is room for improvement.

In general, however, there is a clear lack of strategy in terms of establishing priorities and setting out future plans for research in the Department. There are no objective criteria for ranking output and an unwillingness to prioritize specific research fields. The primary focus on ensuring that all aspects of the law programme are delivered by teaching staff with appropriate legal competence is fully understandable from an educational point of view, but it may lead to spreading the research resources too thinly and thus create a lack of ambition in terms of research strategy. The Depart-

ment has some high quality research areas, but it is unwilling to prioritize them. In order to exploit this potential, greater priority must be given to research areas where the Department already has clusters of good researchers.

Both research and publications in law tend to have a higher degree of domestic orientation than in other disciplines, as national law is an integral component of research activity in legal science in every country. To this extent, the scope of international research and publication may be less prominent than for most other departments. However, law is becoming increasingly internationalized and elements of the Department's research profile already include international law, both as a separate field and in relation to its effects on Swedish law. It is a weakness of this department that it lacks a strategy for international research collaboration, networks and publication. Publications are still predominantly in Swedish and have been placed with Swedish or Nordic publishing houses and journals. More importantly, the Department lacks a research strategy and the self-evaluation report makes no reference to research priorities at all. Research is very closely linked with teaching responsibilities, with the result that practising law professionals represent the Department's main target group in terms of research dissemination, rather than the national or international research communities. Both target groups are important, but greater consideration needs to be given as to how the Department can improve its status within the international research community. Even if a department of this size has to teach all areas of the law programme, it must develop clearer research priorities in order to build and sustain dynamic research clusters.

18C.2 Research quality, productivity, uniqueness and relevance

In law departments in general, there is a relatively heavy teaching burden in order to cover all areas of the law programme, with too little time left for research. This is particularly true for medium- to small-sized departments, and appears to be a significant problem in Gothenburg. Equally, there is a considerable demand on law departments to generate publications for a domestic audience and to prioritize other forms of disseminating research results. There are many examples of research and publications of high quality, both monographs and articles, in both Swedish and English. The output of articles and monographs based on original research could be better. The Department has produced several high quality doctoral dissertations which could have been exploited more effectively as a basis for the publication of articles and a wider dissemination of research results. Some of the research undertaken within the Department has considerable potential, but insufficient attention has been paid to the need to produce more high-quality articles, whether for an international or domestic audience. The profile of published articles and monographs shows that some areas are well represented in terms of research output, in both Swedish and international publications. These areas include international law,

EU law, environmental law, contract law, tax law, intellectual property law, social security law and some aspects of gender and legal theory.

During the period 2004–2009, the Department had 61 peer-reviewed articles published in journals, 38 in non-peer-reviewed journals, 90 chapters in books and 44 monographs. Of the 61 articles in peer-reviewed journals, 15 were published in international journals, nine in Nordic journals and 37 in Swedish journals. The 15 articles in international journals were published in eleven different journals: three in *European Company Law*, two in the *European Journal of Social Security*, and two in *Ambio: Journal of the Human Environment*. The international articles were generally published in discipline-specific or niche journals, but this is often a general pattern of publishing in law journals. Of the 37 Swedish articles, nine were published in *Svensk Juristtidning* and twelve in *Skattenytt*. Of the nine Nordic articles, four were published in *Retferd*. Of the 44 monographs, some are new editions of previous books. Of the 90 chapters/articles in edited volumes, approximately 27 (30%) have been published by international publishing houses. There is a significant variation in the types of monographs and articles published by departmental staff.

There is a similar distribution in relation to non-peer-reviewed articles. Among the published monographs are several general textbooks, but also research volumes of high quality. Several of the published doctoral dissertations were also of a very high quality.

However, for a staff of this size the publications are predominantly Swedish to an extent which gives rise to concern. It is usual for Nordic law departments to attach considerable importance to publishing in their own language, but in this case there seems to be a lack of ambition and an absence of supportive strategies to facilitate or encourage international publications. Conversely, several of the doctoral dissertations are highly original, demonstrate real research quality, and are also written in English. As a priority, more time should be devoted to disseminating the research results from high-quality dissertations as articles in international journals. There is also insufficient publication collaboration.

The total external funding for research (grants) for 2006–2009 was SEK 35 million (or SEK 8.8 million per year). This is not very much for a department with a staffing complement in 2009 of 23.1 FTEs. Of the four departments evaluated by Panel 18, law has the lowest level of external funding per FTE. This may have been acceptable for a traditional law department, but there is clearly room for considerable improvement. In 2009 the Department received SEK 2.7 million in funding support from the Swedish Research Council, which is indicative of its ability to attract external funding in a competitive environment. Legal research is not neces-

sarily expensive, but the Department should increase its external funding in order to extend its research activities and improve its research output.

In its self-evaluation, the Department emphasizes that legal research is ‘more focused on utilization and practical relevance than on scientific excellence in its own field’. It sees its role primarily as a department which has to cover ‘all central legal fields’ in delivering its education programme and living up to the motto of ‘Scholar Teacher’. In terms of staffing policy, the primary focus in the long term has been on providing a law programme with appropriate scientific teacher competence across the board. Such an approach has been underpinned by a belief that the Department is primarily a law school which has to prioritize the provision of teaching competence. The implication, however, is that there has been a lack of focus on research as a specific objective and an institutional priority.

The evaluation panel finds it problematic for an academic department, such as the Department of Law, not to have a clearer strategy for research or its prioritization. Even if universities need to retain a broad parity between teaching and research, medium- to small-sized law schools should still be able to prioritize specific research areas and try to develop a critical mass of researchers in a number of specific fields. It will be much more difficult, if not impossible, to develop appropriate research quality if the researchers are spread thinly over all or most disciplines and there is no coherent planning mechanism to consolidate and develop individual research groups.

However, the Department does produce interesting research in several areas, some of which have groups of researchers of good to high quality. Environmental law, intellectual property law, tax law, contract law, social security and public law, gender studies, commercial law and international law are all research areas with high levels of activity and also, in many instances, of high quality. In some of these areas, research is conducted on a multidisciplinary basis, and there is also evidence of a clear tendency to produce socially relevant research. Equally, the Department has benefitted from cooperation with other departments at the University of Gothenburg, particularly in intellectual property law, but it has the potential to improve its contribution to other areas of multidisciplinary research considerably. There is also clearly room for improvement in many areas of discipline-specific research, but the short-term objective should be the development of an appropriate research strategy, with clearly designated research priorities supported by clusters of good quality researchers.

Both methodical reflection and legal theory have been given priority, for which the Department should be commended, while interdisciplinary and socially relevant research areas have also been viewed as more important than core legal areas such

as criminal and procedural law. This provides the Department with a focus, and will enable it to develop a visible profile for socially relevant and interdisciplinary research. Even with current resources, there is the potential for further development. But the Department needs to develop a coherent strategy and articulate a real sense of ambition in terms of research activity, increased international research cooperation and participation, and the publication of research output in international journals.

Assessment: generally *Good*, with several examples of Very good to Excellent research, but in some areas Insufficient

18C.3 Organization and infrastructure

The Department of Law has expanded considerably over the last 20 years to become a law school with staff covering most of the main legal areas in order to deliver a comprehensive education programme. Postgraduate studies were offered from 1996 onwards. In 2009 the Department had a staffing complement of 23.1 FTEs (eight professors and 19 senior lecturers/assistant professors) with 12 doctoral students employed (25 registered). In the period 2000-2009, only eleven doctoral degrees were awarded, but 2010 witnessed a clear increase in the number of doctoral degrees given. The Department gives priority to developing scientifically trained teacher competence for the full law programme, and its organization reflects its teaching priorities. Although there has been a recent increase in the number of doctoral students and doctoral degrees awarded, a further improvement in this area is necessary in order to further strengthen the Department's research profile. More importantly, the absence of an appropriate research strategy is a major weakness in terms of the Department's organizational framework. There is apparently no policy in relation to the dissemination and publication of research; no objective criteria for evaluating output; and no strategy to enhance the internationalization of research. There is an underlying unwillingness to prioritize specific research fields, and existing research groups – where they exist – are 'not formalized'. It is therefore difficult to assess the real potential of the Department.

Assessment: *Good to Insufficient* (in terms of research organization)

18C.4 Collaboration and networks

A significant proportion of current research relates to cross-disciplinary themes within law or in relation to other subjects. In fact, cross-disciplinary research themes are arguably one of the strong qualities of the Department, particularly in areas such as human rights, international law, social security, energy law, intellectual property rights and jurisprudence/legal philosophy. However, the full potential has yet to be exploited. Equally, there is some collaboration with other disciplines at the University of Gothenburg, particularly with the new Institute of Innovation

and Entrepreneurship and the Centre for Intellectual Property Studies where researchers from the Department of Law have made a significant contribution. This is also the case in relation to the Centre for European Research, the Lighthouse (the maritime competence centre) and the Centre for Public Sector Research. These represent useful collaboration with various social science departments within the University which reflects, in part, the Department's intention to avoid isolated internal research clusters. However, there seems to be a lack of internal research organization, as far as the Panel was able to judge on the basis of the available information. Interdisciplinary collaboration is taken forward on an individual basis, and there is currently no departmental strategy in this area. Perhaps inevitably, there is very little evidence of co-authorship. There is also a lack of clear information on the participation of staff in international networks and other collaborative undertakings. Given the increasing complexity of the legal research today and the growing importance of research groups and organizations undertaking work on national, European and international law, it is essential that the Department develops a range of collaborative networks in order to enhance its research profile in a practical and effective way. This is an area which should be given far greater priority in terms of the Department's future strategy.

Assessment: Current practice is *Very good* in some areas, but also *Insufficient* in others.

18C.5 Future plans

The Department does not have a research strategy. It does give priority to developing teaching skills for the law programme, but not to particular areas of research. There is an implicit prioritization of cross-disciplinary collaboration, both internally and externally, but this does not represent an agreed strategic objective. It is a major weakness that the Department does not have a research strategy, particularly in view of the increasing and accelerating internationalization of legal research which affects most legal disciplines. Overall, the Department's plans for research development must be deemed to be generally insufficient due to the lack of a clear research strategy; some of the research areas may benefit from better planning, but this is not evident in the documentation.

Assessment: *Insufficient*

18C.6 Future potentials and possibilities

The Department should make clearer plans and priorities for its research. As a small- to medium-sized law department it cannot sustain high quality research in all disciplines. It has the potential for further developing its cross-disciplinary research, both internally and externally, in particular in relation to cross-disciplinary collaboration with other disciplines and departments at the University.

18C.7 Research activity and teaching

The Department has prioritized the development of teaching competence by members of staff to serve the needs of the law programme. The teaching burden is generally quite heavy in law departments due to high student–teacher ratios, and this is specifically the case at the University of Gothenburg where it amounts to 42.8:1. The Department gives priority to research which is focused on professional utilization and practical relevance in order to make connections between teaching and research. An increased focus on certain areas of research could also be seen as a way to strengthen the academic profile of the Department in both teaching and research.

18C.8 Interactions with society

The Department has a strong focus on the practical and social relevance of its discipline, particularly in terms of its practical application by legal professionals. The University of Gothenburg law programme has been ranked the highest in Sweden in terms of collaboration with private sector actors, and external teachers are used in the education programme. The Department states that practising lawyers are also their most important target group for research purposes. The Panel questions this statement: in terms of future policy, the Department needs to engage with a wider research community, within both a Nordic context and an international context, rather than prioritizing the dissemination of research results amongst practising lawyers. At the same time, there is no evidence of an explicit commitment to consolidating and extending the Department’s connections with the wider legal research community. Clearly there are benefits from maintaining good contacts with practising lawyers, but the Department needs to develop a clear strategy for extending links with other legal research environments.

18C.9 Gender and equal opportunity issues

Approximately one third of the professors and senior faculty members are women: three out of eleven doctoral degrees awarded between 2000 and 2009 were to women candidates. This is not good enough for improving the Faculty’s female/male ratio; there is no strategy to address this issue in a meaningful way; and no mentoring support programmes have been implemented. The Department has a good research profile on legal theory relating to gender issues, which should enable it to develop future policy in this area in a more effective manner.

18C.10 Other issues

It should be noted that law departments with responsibility for delivering full law school programmes face particular challenges in terms of research, because they are professional schools and have to cover a highly comprehensive programme of teaching. As a result, it is often more difficult to formulate research priorities internally. This is also a relatively young law department which is still in the process of acquiring sufficiently comprehensive teaching competences. Legal research is also

more national in its orientation than is the case in other disciplines, and the balance between domestic and international publications and networking may thus be slightly different.

18C.11 Summary of assessments – the Department of Law

Research quality, productivity, uniqueness and relevance: generally *Good* (examples of Very good to Excellent, some areas *Insufficient*)

Organization and research infrastructure: *Good* to *Insufficient*

Collaboration and networks: some areas *Very good*, others *Insufficient*

Future plans: *Insufficient*

18D. THE DEPARTMENT OF HUMAN AND ECONOMIC GEOGRAPHY

18D.1 Overall assessment

This is a department with an illustrious past that is now developing rather slowly and under-performing with regard to research. There has been a recent lack of recruitment at senior levels. Consequently, the broad field of research targeted is thinly covered and outputs are generally not of a competitive, international quality. There is a need for research leadership to identify strengths and build on them. The overall assessment of the current state of research is *insufficient*.

18D.2 Research quality, productivity, uniqueness and relevance

Peer-reviewed articles comprise the largest category of research output, although the 56 articles published within the review period are not evenly distributed amongst staff, with 13 (23.2%) being authored by an academic who has now presumably retired and is no longer listed within the Faculty. Without his output, the list of peer-reviewed articles would be modest by international standards. The peer-reviewed publications are not generally in the most widely read human geography journals, and this is reflected in the rather low citation rates for senior staff. Reports and book chapters are the next largest output categories, with the majority of the reports in Swedish and published in the Department's own series of occasional papers. These titles are only available from the University website, so this type of output is of limited accessibility.

There have certainly been some research highlights in the Department, particularly within economic geography, transport and mobility issues. The recent emergence of biodiversity and landscape research is also a promising area of international importance. The nominated important publications are from 1999 and 2002 and are of good quality, but it can be discussed whether more recent publications will eventually achieve the relatively modest attention that these papers attracted.

The rate of examination of PhD students has fallen slightly during the new millennium, and licentiate degrees are now rare. The number of doctoral students per FTE of permanent staff (0.7) is low in international terms. The majority of research funding has been from faculty sources, which is convenient but which may not encourage international collaboration, and proposals are less likely to receive rigorous peer review than with external funding sources. There is also the problem of whether the available faculty funds have been allocated effectively during the review period, with too great an emphasis on the need to support PhD students rather than taking forward new research initiatives. External funding has been stable or in slow decline, with relatively little European Union activity now that EURODITE has finished. There is, nevertheless, good support from Swedish research councils with the highest income per FTE in the school, although the average grant size is small, bringing little opportunity for broader collaboration.

Assessment: the research quality has been *Good*, but it borders on *Insufficient* as FTEs fall and teaching demands remain high.

18D.3 Organization and research infrastructure

The Department of Human and Economic Geography is of medium size (11.2 senior staff FTEs) for this subject area, and has lost 3.6 FTEs during the review period, although this has been compensated for with a slight rise (five) in the number of researchers, postdocs and PhD students. This is the largest department of its kind in Sweden in terms of student numbers, so teaching loads are probably high.

Research is organized around five themes and groups (development geography, economic geography, environmental geography, regional analysis and spatial mobility). This seems to be too many groups given the size of the Department, with a risk of fragmentation mentioned in the self-analysis. These groups reflect the major traditional areas of the subject, so perhaps a broad teaching capability is maintained. However, a research focus on fewer areas where the Department has special expertise could be beneficial. A formal merging of some of these groups could improve cohesion (e.g. development with economic, and/or regional analysis and mobility). The Panel was informed that measures will be undertaken in the near future to minimize the underlying problem of fragmentation by promoting joint seminars,

but a more radical reconfiguration of the existing research groups should also be considered.

It is surprising that there is no evidence of links with the Department of Economics, which might be rewarding given the evidence of mutual research interests in development-related issues. The School of Global Studies appears to have research areas with a potential overlap (e.g. regions and nationalism, migration and diaspora, and sustainable development); it attracts considerably more international funding; and the contribution of the Department's staff to joint initiatives should be further consolidated and appropriately recognized by the University. Environmental geography is an important and developing topic, but it appears to be isolated and potential links to other university sectors do not appear to be fully exploited.

Assessment: The organization and research infrastructure is judged to be *Poor*.

18D.4 Collaboration and networks

There is evidence of collaboration at university, national and international levels. This is at relatively modest levels compared with other institutions of comparable size, although the Department itself would argue that it has numerous links and has made a considerable contribution to interdisciplinary developments within the University. An annual international conference on research into services was, however, recently hosted by the Department. Faculty members are sponsored by Sida to help develop research capacity in Uganda and Rwanda. There has, however, been just one long-term guest researcher visit during the review period. The one EU project, EURODATE, appears to have finished in 2006 and the Department was one of about 30 partners. The active participant is listed as 'other faculty staff'.

Assessment: The current level of collaboration is relatively *Poor*, but there is scope for development.

18D.5 Future plans

All five research groups present research plans that are developments of existing activities and therefore cover a broad front and represent a 'business as usual' approach. No specific funding programmes or new research collaborations are identified. The publication chosen as representative of innovative research is a national analysis of summer house ownership, with the Gothenburg researcher as second author. These future plans appear relatively unambitious, and reflect the current state of research quality which is classified as Good to Insufficient.

Assessment: *Good to Poor*

18D.6 Future potentials and possibilities

Geography could be at the centre of relevant, contemporary research dealing with the socioeconomic impacts of developing environmental issues. Despite evidence of a limited number of research projects in this field with a regional, national or international focus, the potential for taking forward new initiatives of this type has not been sufficiently developed. The Department should make clearer plans and priorities for its research and consider investing in the younger researchers who could form the core of future research groups, while developing links with international networks.

18D.7 Research activity and teaching

The self-analysis states that ‘as regards teaching and in terms of number of students, we are the largest geography department in Sweden’ and there is a continuing concern over problems generated by a heavy teaching load and the need to offer courses to other departments as a means of recruiting a wider range of students. The breadth of research activity is probably a valuable support for this teaching load, but the self-evaluation report suggests that the Department has a relatively greater teaching load than other academic units in the Faculty, particularly as the number of staff FTEs has fallen during the review period. It is recognized that maintaining an appropriate balance between research and teaching is an ‘ongoing challenge’, but there is a clear implication that a relatively heavy teaching load may have affected the quality of research output during the review period. In reality, the Department had a relatively low number of students per staff (15.5) in 2009, which was the lowest of all the four departments reviewed by the Panel, although this probably excludes a range of teaching inputs delivered to other academic programmes. To this extent, the relative extent of the Department’s teaching commitments may not be a sufficiently convincing explanation for any visible underperformance in relation to research.

18D.8 Interactions with society

The Department has well-established contacts with the local regional authorities through the Centre for Regional Analysis, and lists other concrete contact areas in the self-analysis. Interaction with society is perhaps slightly above the average for a department of this type.

18D.9 Gender and equality opportunity issues

Gender and equality issues are minor below professorial level. Over time, a gender balance has been achieved at the doctoral level, but the three professors are all male and there has been no recruitment recently at this level.

18D.10 Other issues

This department needs some attention. It has an important teaching function that seems to include important GIS (Geographic Information Systems) training, but it has been allowed to shrink in size with no recent professorial recruitment. Non-teaching time may have been reduced in recent years, and there has been little attempt to identify research strengths and focus on them. Research leadership with advice on publications and networking may have been insufficient during the review period. There is evidence of an illustrious past. However, physical geography was split off at some time in the past and the newly formed School of Global Studies may have become a type of internal competitor with input from staff and doctoral students from Geography receiving insufficient recognition. Did its creation take some researchers from this department? Geography could be at the centre of relevant, contemporary research dealing with the socioeconomic impacts of developing environmental issues, but there is little evidence of this type of development here.

18D.11 Summary of assessments – the Department of Human and Economic Geography

Research quality, productivity, uniqueness and relevance: *Good*, bordering on *Insufficient*

Organization and research infrastructure: *Poor*

Collaboration and networks: *Poor*

Future plans: *Good to Poor*

PANELS AND EXPERTS

Panel 1 – Philosophy, linguistics and language technology

Departments

- 1A. The Department of Computer Science and Engineering
- 1B. The Department of Philosophy, Linguistics and Theory of Science
- 1C. The Department of Swedish

Experts

- Professor Kersti Börjars, Chair, The University of Manchester, United Kingdom
- Professor Roger Strand, Vice-chair, University of Bergen, Norway
- Professor Olli Koistinen, University of Turku, Finland
- Professor Kasper Lippert Rasmussen, Aarhus University, Denmark
- Professor Stephen Pulman, University of Oxford, United Kingdom
- Professor Hans Uszkoreit, Saarland University, Germany

Panel 2 – Non-Swedish languages and literatures

Department

- 2. The Department of Languages and Literatures

Experts

Panel members

- Professor em. Gunnel Tottie, Chair, University of Zurich, Switzerland
- Professor Germán Gullón, Vice-chair, University of Amsterdam, The Netherlands
- Professor Arne Melberg, University of Oslo, Norway
- Professor Waczesław Nowikow, University of Łódź, Poland
- Professor Maria Wyke, University College London, United Kingdom
- Professor Gisela Zifonun, Institute for the German Language, Germany

Additional experts

Professor Lutz Edzard, University of Oslo, Norway

Professor em. Bernd R. Heine, University of Cologne, Germany

Professor Juhani Nuorluoto, Uppsala University, Sweden

Panel 3 – Culture, religion and historical studies

Departments

3A. The Department of Conservation

3B. The Department of Cultural Sciences

3C. The Department of Historical Studies

3D. The Department of Literature, History of Ideas and Religion

Experts

Professor em. Nils G Holm, Chair, Åbo Akademi University, Finland

Professor Harriet Silius, Vice-chair, Åbo Akademi University, Finland

Professor Mats Burström, Stockholm University, Sweden

Dr. Katrine Fangen, University of Oslo, Norway

Dr. René Larsen, School of Conservation, Denmark

Professor Jens E. Olesen, Ernst Moritz Arndt University of Greifswald, Germany

Professor em. Morten Nøjgaard, University of Southern Denmark, Denmark

Panel 4 – Education

Departments

4A. Department of Education

4A1. Department of Education and Special Education*

4A2. Department of Education, Communication and Learning*

4A3. Department of Pedagogical, Curricular and Professional Studies*

4B. Department of Food, Health and Environment

4B1. Department of Food and Nutrition, and Sport Science*

4C. Department of Work Science

Experts

Professor Hannele Niemi, Chair, University of Helsinki, Finland

Professor Arne Kalleberg, The University of North Carolina at Chapel Hill, USA

Professor Mogens Niss, Roskilde University, Denmark

Dr. Gun Roos, National Institute for Consumer Research, Norway

Professor Bernard Schneuwly, University of Geneva, Switzerland

Professor Geoff Whitty, University of London, United Kingdom

* New department after a reorganisation 1 July 2010.

Panel 5 – Music, drama and literature

Departments

- 5A. The Academy of Music and Drama
- 5B. The Department of Literary Composition, Poetry and Prose
- 5C. Göteborg Organ Art Center
- 5D. The School of Film Directing

Experts

- Professor Harald Jørgensen, Chair, Norwegian Academy of Music, Norway
- Mr. Peter Dejans, Vice-chair, Orpheus Institute, Belgium
- Assoc. Professor Kati Hämäläinen, Sibelius Academy, Finland
- Adj. Professor Jacqueline Martin, Queensland University of Technology, Australia

Panel 6 – Fine and applied arts

Departments

- 6AB. The School of Design and Crafts including Steneby
- 6C. The School of Photography
- 6D. Valand School of Fine Arts

Experts

- Professor Nina Malterud, Chair, Bergen National Academy of the Arts, Norway
- Professor Chris Wainwright, Vice-chair, University of the Arts London, United Kingdom
- Professor Rachel Cooper, Lancaster University, United Kingdom
- Professor Mark Nash, Royal College of Art, United Kingdom

Panel 7 – Biology

Departments

- 7A. The Department of Cell and Molecular Biology
- 7B. The Department of Marine Ecology
- 7C. The Department of Plant and Environmental Sciences
- 7D. The Department of Zoology)

Experts

- Professor Susanne Renner, Chair, Ludwig-Maximilians-Universität Munich, Germany
- Professor Eivin Røskraft, Vice-chair, Norwegian University of Science and Technology, Norway
- Professor Brenda Andrews, University of Toronto, Canada
- Professor Mark Hay, Georgia Institute of Technology, USA
- Dr. Helena Korpelainen, University of Helsinki, Finland

Professor Thorsten Reusch, Leibniz Institut of Marine Sciences, Germany
Professor Carsten Schultz, European Molecular Biology Laboratory, Germany
Professor Glen J. Van Der Kraak, University of Guelph, Canada

Panel 8 – Chemistry and earth sciences

Departments

8A. The Department of Chemistry
8B. The Department of Earth Sciences
8C. The Swedish NMR Centre

Experts

Professor Jörn Thiede, Chair, Alfred Wegener Institute, Germany
Professor Maarit Karppinen, Vice-chair, Aalto University School of Science and
Technology, Finland
Dr. Bernadette Byrne, Imperial College London, United Kingdom
Professor Ernest Laue, University of Cambridge, United Kingdom
Professor Peter Liss, University of East Anglia, United Kingdom
Professor Marja-Liisa Riekkola, University of Helsinki, Finland
Professor David S.G. Thomas, University of Oxford, United Kingdom
Professor Erik van der Eycken, K.U.Leuven, Belgium

Panel 9 – Mathematics and physics

Departments

9A. The Department of Mathematical Sciences
9B. The Department of Physics

Experts

Professor Talat Rahman, Chair, University of Central Florida, USA
Professor Helge Holden, Vice-chair, Norwegian University of Science and
Technology, Norway
Professor James Binney, University of Oxford, United Kingdom
Professor Eric Carlen, Rutgers University, USA
Professor John Hertz, University of Copenhagen, Denmark
Professor Helge Knudsen, Aarhus University, Denmark

Panel 10 – Social sciences

Departments

- 10A. Center for Public Sector Research, CEFOS
- 10B. Department of Journalism, Media and Communication
- 10C. Department of Political science
- 10D. Department of Psychology
- 10E. Department of Social work
- 10F. Department of Sociology
- 10G. School of Global studies
- 10H. School of Public administration

Experts

- Professor em. Raimo Väyrynen, Chair, University of Helsinki, Finland
- Professor Britt-Marie Drottz Sjöberg, Vice-chair, Norwegian University of Science and Technology, Trondheim, Norway
- Professor Alan Irwin, Copenhagen Business School, Denmark
- Professor Richard Jenkins, The University of Sheffield, United Kingdom
- Professor Ullamaija Kivikuru, University of Helsinki, Finland
- Professor Yves Mény, European University Institute, Italy
- Professor Annika Rabo, Stockholm University, Sweden
- Professor Pekka Santtila, Åbo Akademi University, Finland
- Professor Helen Wallace, London School of Economics and Political Science, UK

Panel 11 – Biomedicine

11. The Institute of Biomedicine

Experts

- Professor Tomas Lindahl, Chair, London Research Institute, United Kingdom
- Professor Leif C. Andersson, Vice-chair, University of Helsinki, Finland
- Professor Laurence Bindoff, University of Bergen, Norway
- Professor Veijo Hukkanen, University of Turku, Finland
- Professor Margaret A. Liu, ProTherImmune, USA
- Professor Marian Neutra, Harvard Medical School, USA
- Professor Monica M. Palcic, Carlsberg Research Center, Denmark
- Professor Harald Stenmark, University of Oslo, Norway

Panel 12 – Clinical sciences

12. The Institute of Clinical Sciences

Experts

Professor Reynir Tómas Geirsson, Chair, Landspítali University Hospital, Iceland
Professor Lyndon Cooper, University of North Carolina at Chapel Hill, USA
Professor Cor W.R.J. Cremers, Radboud University Nijmegen, The Netherlands
Professor Freddie Hamdy, University of Oxford, United Kingdom
Professor Mef Nilbert, Hvidovre Hospital, Denmark
Professor Dag Rune Olsen, University of Bergen, Norway
Professor Helena Pihko, Helsinki University Central Hospital, Finland

Panel 13 – Health and care sciences

13. The Institute of Health and Care Sciences

Experts

Professor Berit Rokne, Chair, University of Bergen, Norway
Professor Marit Kirkevold, Vice-chair, University of Oslo, Norway
Professor Helena Leino-Kilpi, University of Turku, Finland
Professor David Thompson, University of Leicester, Australia

Panel 14 – Medicine

14. The Institute of Medicine

Experts

Professor Henning Beck-Nielsen, Chair, University of Southern Denmark, Denmark
Professor Gabriel Panayi, Vice-chair, King's College London, United Kingdom
Professor Richard Eastell, University of Sheffield, United Kingdom
Professor Sirpa Jalkanen, University of Turku, Finland
Professor John Kjekshus, University of Oslo, Norway
Professor Rolf K. Reed, University of Bergen, Norway
Professor Keith Palmer, University of Southampton, United Kingdom
Professor Per Morten Sandset, University of Oslo, Norway
Professor Agneta Siegbahn, Uppsala University, Sweden

Panel 15 – Neuroscience and physiology

15. The Institute of Neuroscience and Physiology

Experts

Professor Hans Hultborn, Chair, University of Copenhagen, Denmark
 Professor Ole Andreas Andreassen, Vice-chair, University of Oslo, Norway
 Professor Leif Gjerstad, University of Oslo, Norway
 Professor Gustaaf Lankhorst, VU University Medical Center, The Netherlands
 Professor Alessandro Padovani, University of Brescia, Italy
 Dr. Karen Ritchie, Inserm, France
 Professor John Russell, University of Edinburgh, UK
 Professor Rainer Spanagel, University of Mannheim, Germany

Panel 16 – Odontology

16. The Institute of Odontology

Experts

Professor Magne Raadal, Chair, University of Bergen, Norway
 Professor Vibeke Bælum, Vice-chair, Aarhus University, Denmark
 Professor David Rice, University of Helsinki, Finland
 Professor Dag Ørstavik, University of Oslo, Norway

Panel 17 – Business

Departments

17A. The Department of Applied Information Technology
 17B. The Department of Business Administration
 17C. Gothenburg Research Institute, GRI
 17D. The Institute for Innovation and Entrepreneurship

Experts

Professor Johanna Moisander, Chair, Aalto University School of Economics, Finland
 Professor Brian Fitzgerald, Vice-chair, University of Limerick, Ireland
 Professor Marie-Laure Djelic, ESSEC Business School, France
 Professor Eric Monteiro, Norwegian University of Science and Technology,
 Trondheim, Norway
 Professor Sven Modell, University of Manchester, United Kingdom
 Professor Alf Rehn, Åbo Akademi University, Finland
 Professor Finn Valentin, Copenhagen Business School, Denmark

Panel 18 – Economics and law

Departments

- 18A. The Department of Economic History
- 18B. The Department of Economics, including the Centre for Finance
- 18C. The Department of Law
- 18D. The Department of Human and Economic Geography

Experts

- Professor Robert Lee, Chair, University of Liverpool, United Kingdom
- Professor Inger Johanne Sand, Vice-chair, University of Oslo, Norway
- Professor Friðrik Már Baldursson, Reykjavik University, Iceland
- Professor Richard Bradshaw, University of Liverpool, United Kingdom
- Professor Kirsten Ketscher, University of Copenhagen, Denmark
- Professor Jason Shogren, University of Wyoming, USA

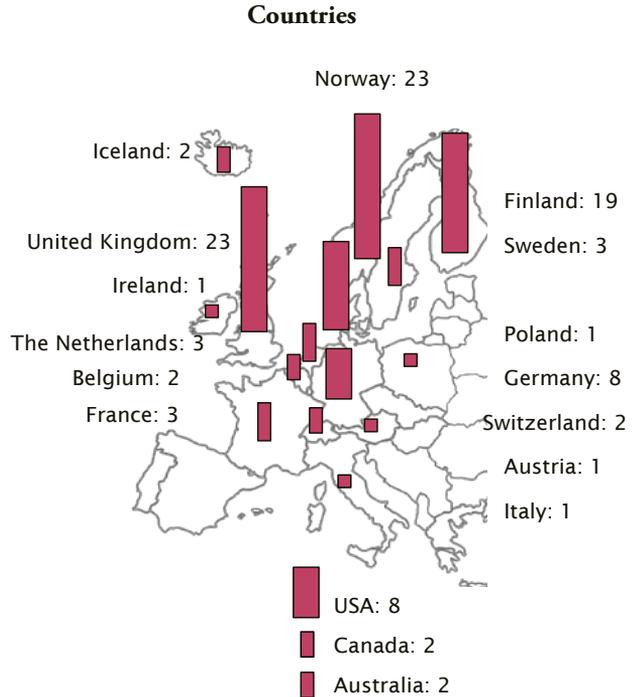
Statistics on the experts

Invitations

- 199 sent
- 118 accepted (59%)
- 7 cancellations

Sex distribution

- Women 39 (33%)
- Men 79 (67%)



DIAGRAMS

Included in the self-evaluations from each department were sets of data retrieved from different databases, considering research personnel structure, licentiate and doctoral degrees, finances, basic bibliometrical data, and research activities at the department. Some of these data are presented below in overview diagrams over the whole University of Gothenburg.

Legend x-axis all diagrams

- 1a. Department of Computer Science and Engineering
- 1b. Department of Philosophy, linguistics and Theory of Science
- 1c. Department of Swedish
2. Department of Languages and Literatures
- 3a. Department of Conservation
- 3b. Department of Cultural Sciences
- 3c. Department of Historical Studies
- 3d. Department of Literature, History of Ideas and Religion
- 4a. Department of Education
- 4b. Department of Food, Health and Environment
- 4c. Department of Work Science
- 5a. Academy of Music and Drama
- 5b. Department of Literary Composition, Poetry and Prose
- 5c. Göteborg Organ Art Center
- 5d. School of Film Directing
- 6ab. School of Design and Crafts including Steneby
- 6c. School of Photography
- 6d. Valand School of Fine Arts
- 7a. Department of Cell and Molecular Biology
- 7b. Department of Marine Ecology
- 7c. Department of Plant and Environmental Sciences including the Herbarium
- 7d. Department of Zoology
- 8a. Department of Chemistry
- 8b. Department of Earth Sciences
- 8c. Swedish NMR Centre
- 9a. Department of Mathematical Sciences
- 9b. Department of Physics
- 10a. Center for Public Sector Research, CEFOS
- 10b. Department of Journalism, Media and Communication
- 10c. Department of Political Science
- 10d. Department of Psychology
- 10e. Department of Social work
- 10f. Department of Sociology
- 10g. School of Global Studies
- 10h. School of Public Administration
11. Institute of Biomedicine
12. Institute of Clinical Sciences
13. Institute of Health and Care Sciences
14. Institute of Medicine
15. Institute of Neuroscience and Physiology
16. Institute of Odontology
- 17a. Department of Applied Information Technology
- 17b. Department of Business Administration
- 17c. Gothenburg Research Institute, GRI
- 17d. Institute for Innovation and Entrepreneurship
- 18a. Department of Economic History
- 18b. Department of Economics including Centre for Finance
- 18c. Department of Law
- 18d. Department of Human and Economic Geography

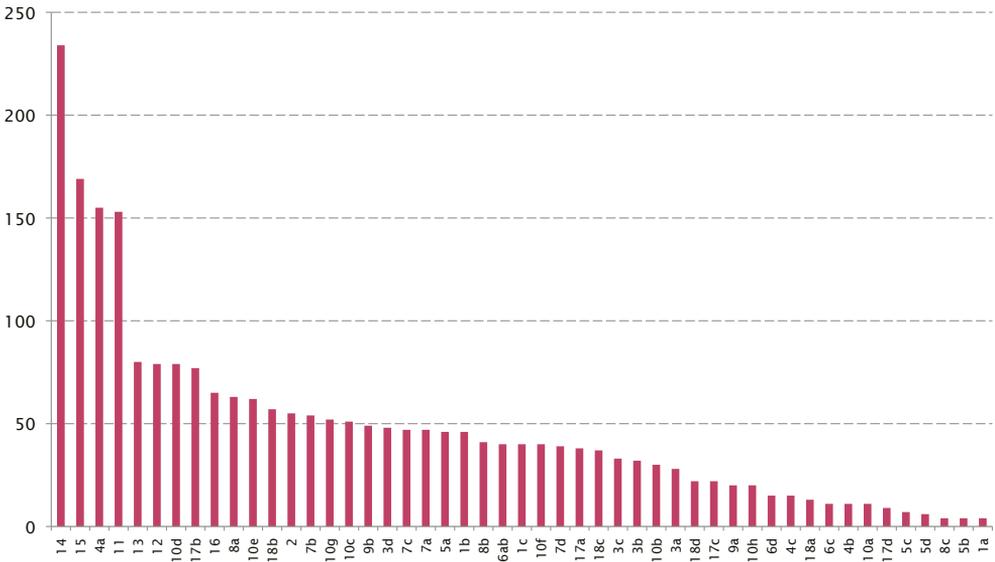


Diagram 1. Research staff number at different departments at the University of Gothenburg Sept. 2009 (i.e. all personnel with research included as a fraction of their work plan, PhD students included). X-axis: departments 1a-18d, see Legend page 530. Source: PA datalagret.

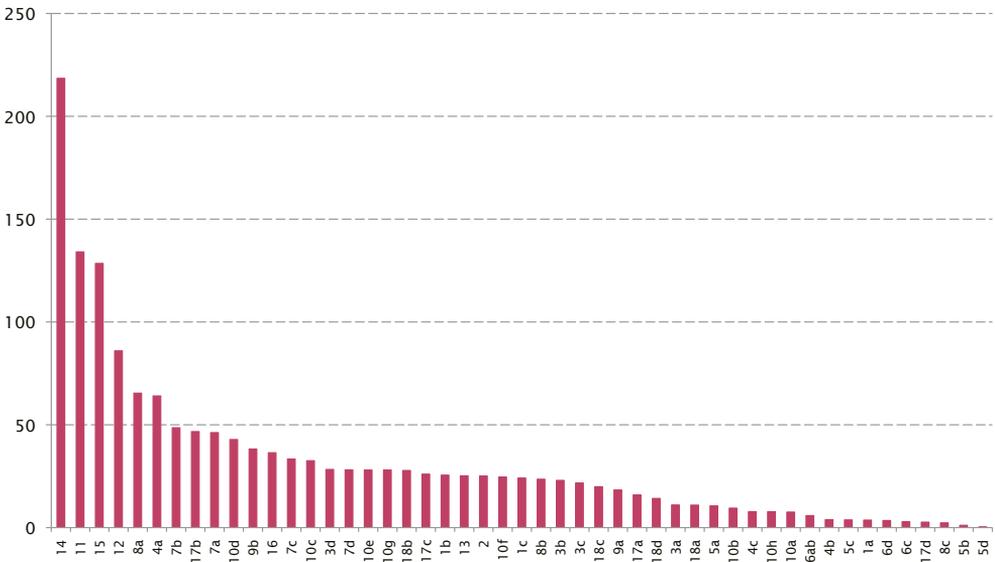


Diagram 2. Research volume at different departments as full time equivalents available for research (research FTE, i.e the sum of all employees' fraction of research in their work plan). PhD students are counted to 50%. X-axis: departments 1a-18d, see page 530. Source: individual work plans.

DIAGRAMS

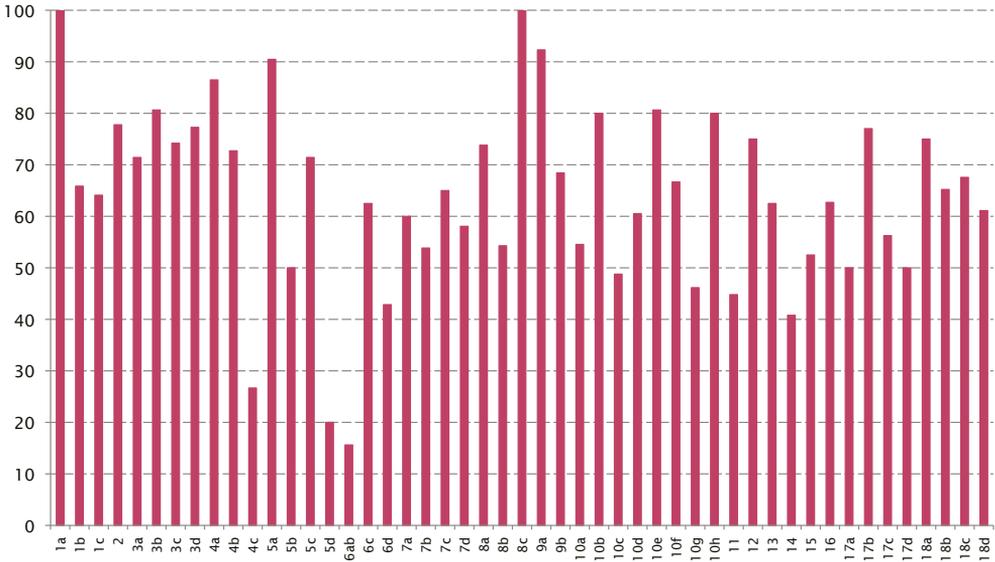


Diagram 3. Percent tenured research staff in the categories professor, senior lecturer, researcher and other research personnel (grouped) at different departments at the University of Gothenburg Sept. 2009. Categories never containing tenured positions are excluded. X-axis: departments 1a-18d, see Legend at page 530. Source: PA datalagret.

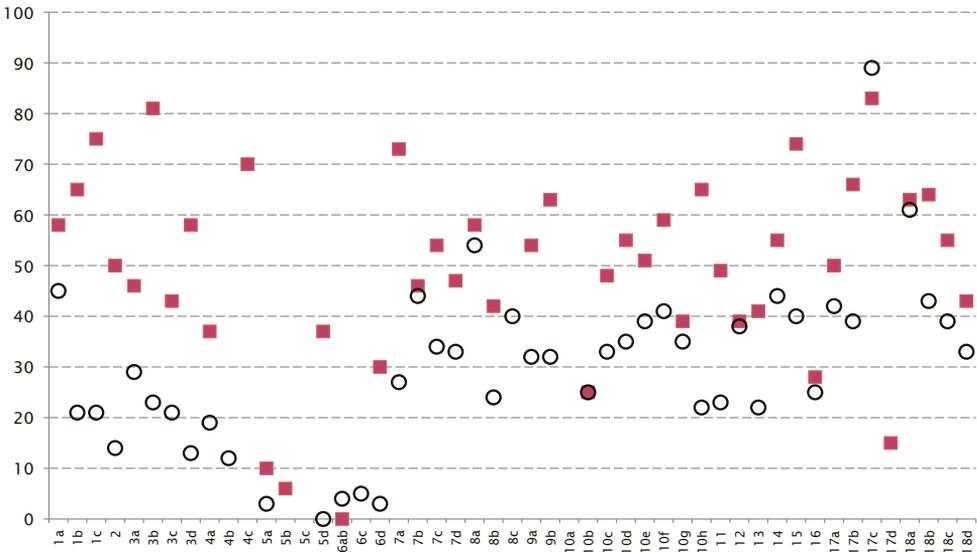


Diagram 4. Mean fraction of research in work plan (percent research) of professors (filled squares) and senior lecturers (open circles) at different departments at the University of Gothenburg in 2009. Research paid from governmental faculty resources and grants are included. X-axis: departments 1a-18d, see page 530. Source: individual work plans.

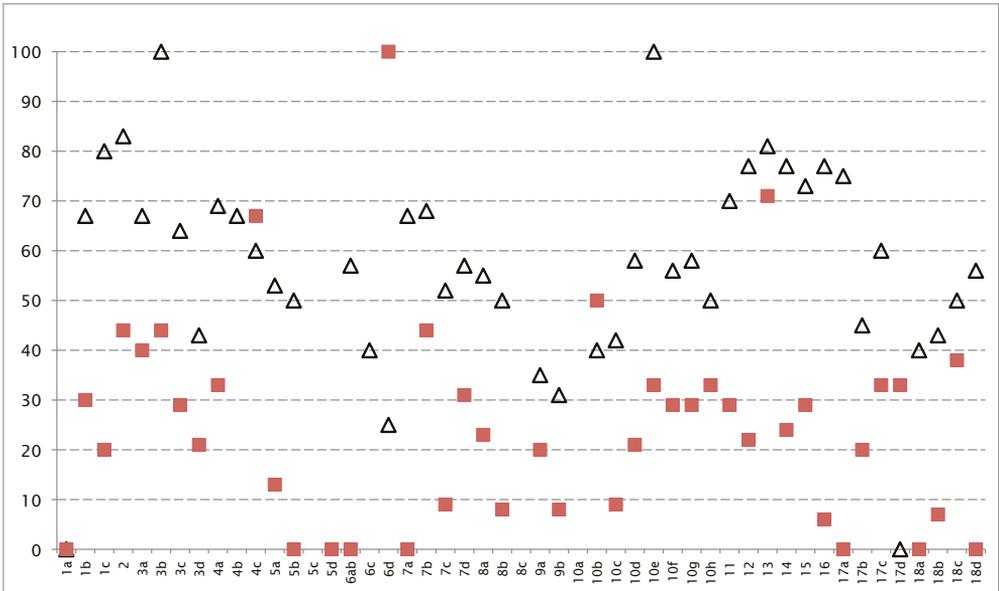


Diagram 5. Percent females among professors (filled squares) and PhD students (open triangles) at different departments at the University of Gothenburg Sept. 2009. X-axis: departments 1a-18d, see page 530. Source: PA datalagret.

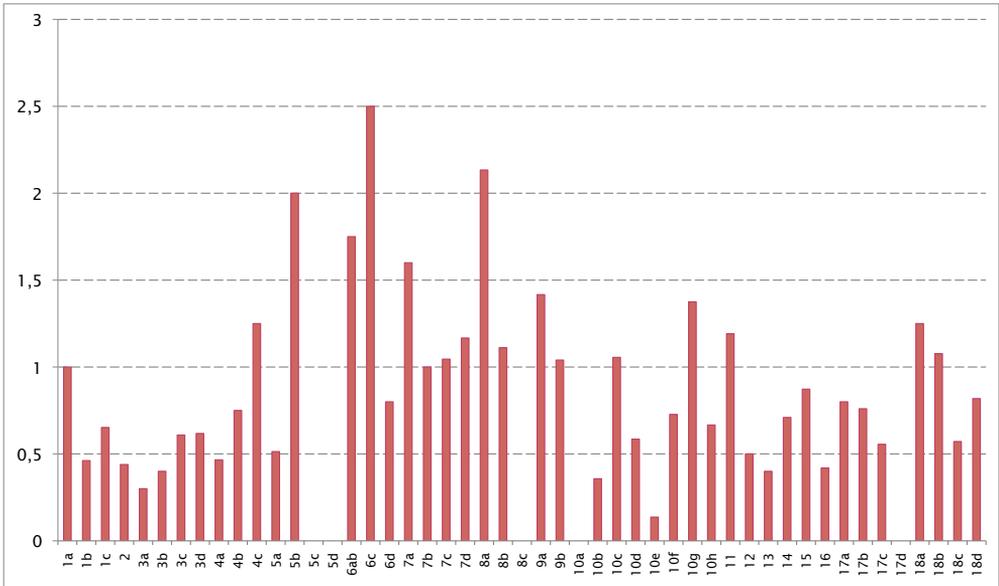


Diagram 6. Number of PhD students employed by the department per tenured academic staff (professors, lecturers and researchers) at different departments at the University of Gothenburg Sept. 2009. X-axis: departments 1a-18d, see page 530. Source: PA datalagret.

DIAGRAMS

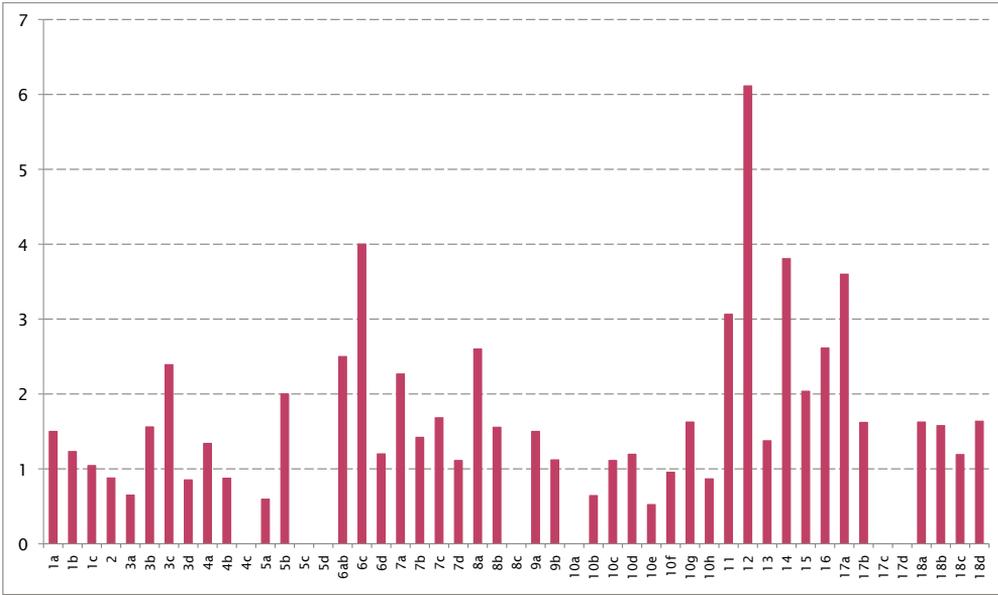


Diagram 7. Number of PhD students registered per tenured academic staff (professors, lecturers and researchers) at different departments at the University of Gothenburg 2009. X-axis: departments 1a-18d, see page 530. Sources: Ladok and PA datalagret.

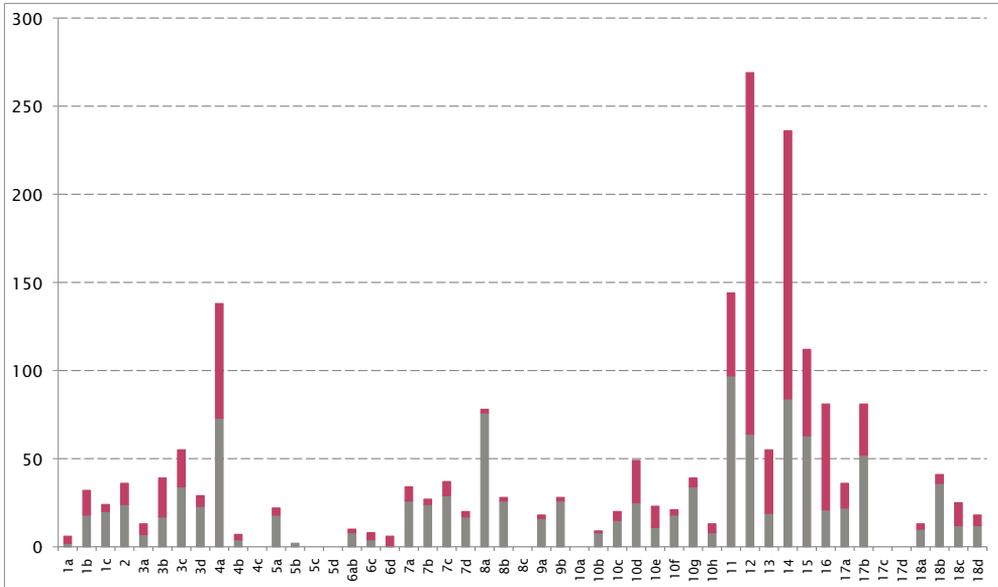


Diagram 8. Registered PhD students at different departments at the University of Gothenburg in 2009. Rate of study above 50% of full time (lower bar, grey) and below 50% of full time (upper bar, red). X-axis: departments 1a-18d, see page 530. Source: Ladok

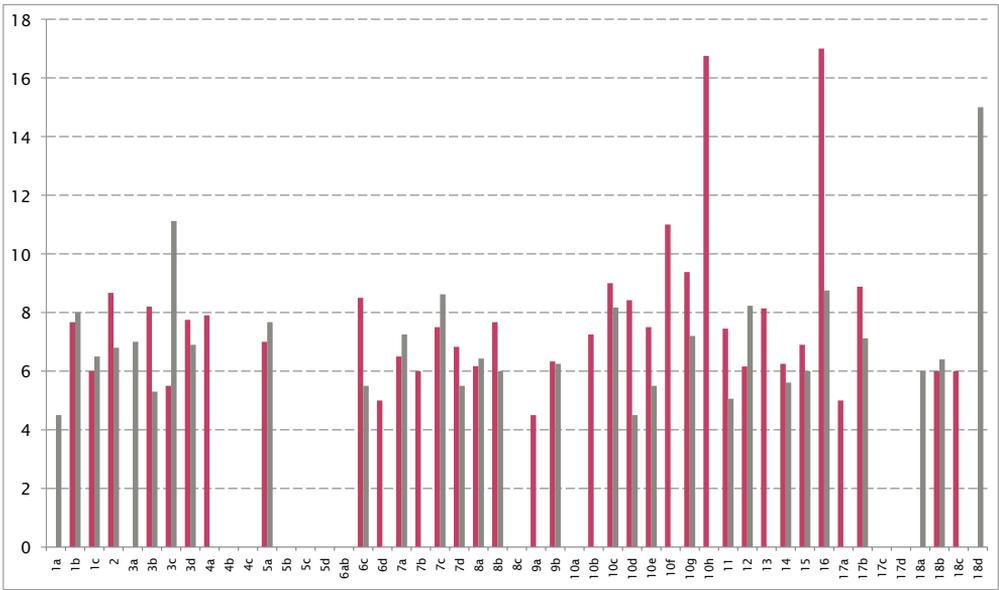


Diagram 9. Mean gross study time, i.e. time passed from onset of PhD studies to exam, for PhD students examined in 2009. Left bar (red) women, right bar (grey) men. Over the University, women (N=193) had a mean gross study time of 7.36 years, median 6.50 years, and men (N=116) had 7.06 years, median 6.00 years. X-axis: departments 1a-18d, see page 530. Source: Ladok.

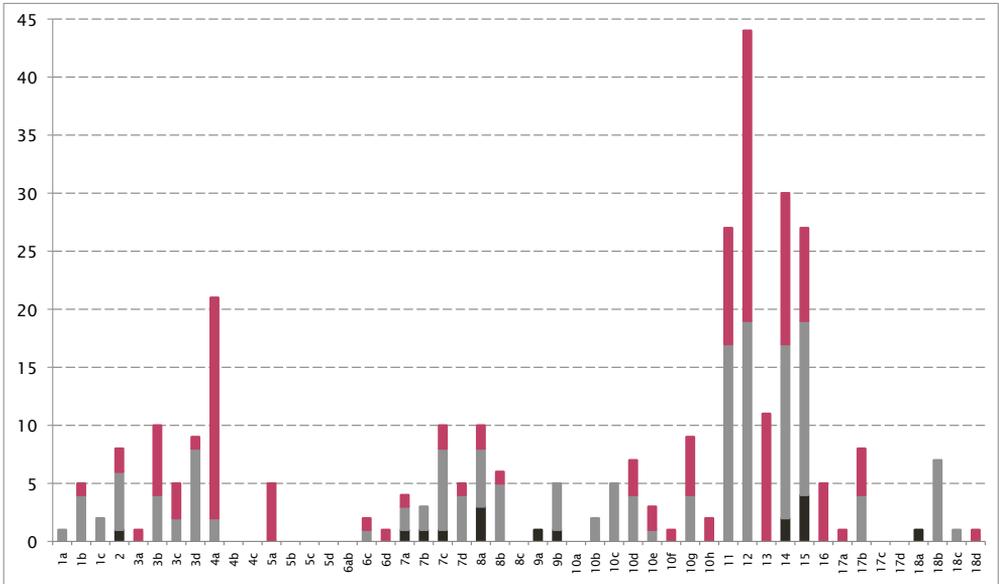


Diagram 10. Number of PhD exams at different departments at the University of Gothenburg in 2009. Black bar: age below 30 years. Grey bar: age 30-39 years. Red bar: age 40 years and above. X-axis: departments 1a-18d, see page 530. Source: Ladok.

DIAGRAMS

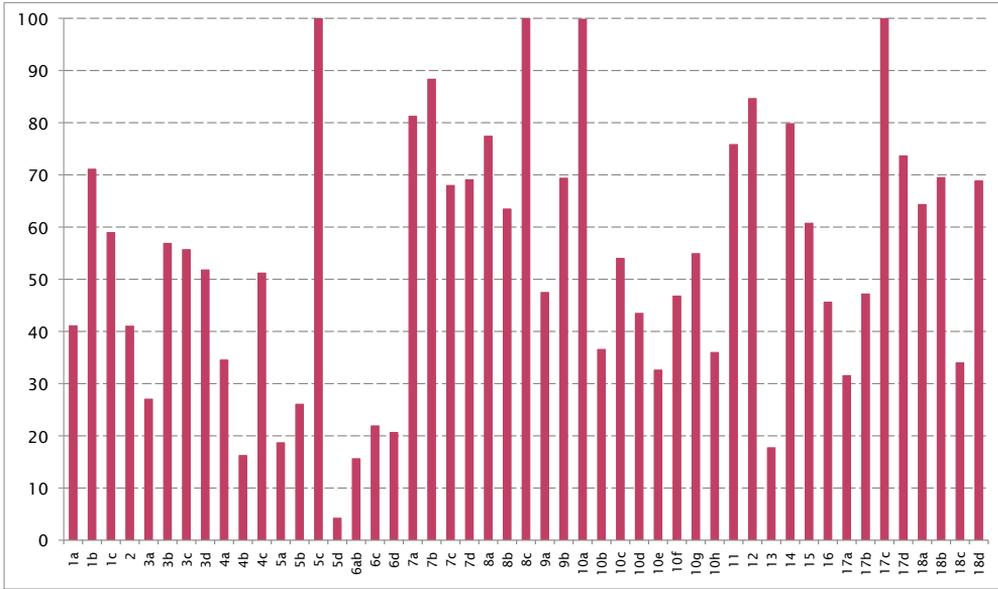


Diagram 11. Total research income in percent of total income of different departments at the University of Gothenburg in 2009. X-axis: departments 1a-18d, see page 530. Source: EA datalagret

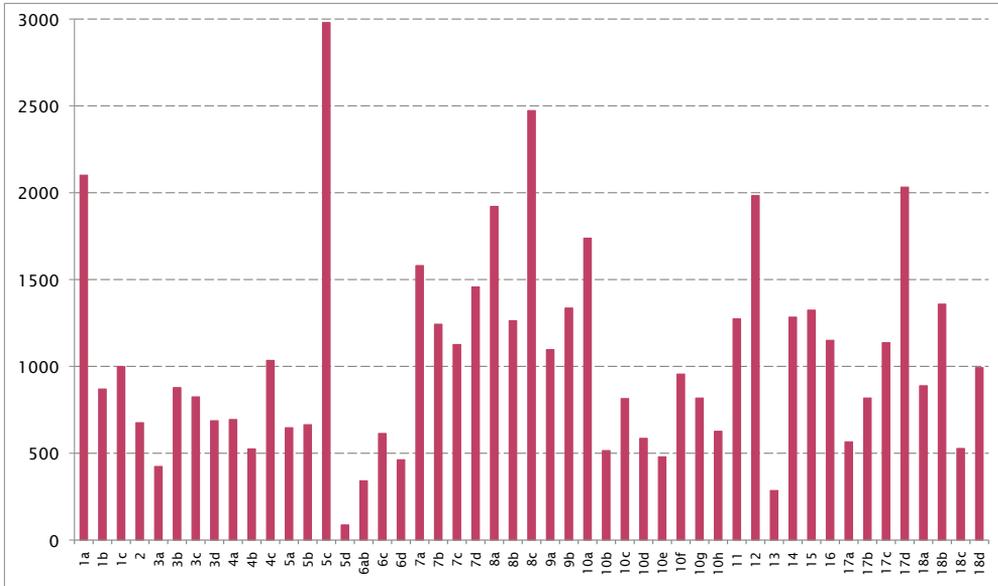


Diagram 12. Total research income per research staff (i.e. all personnel that have research included as a fraction of their work plan, PhD students not included). X-axis: departments 1a-18d, see page 530. Source: EA datalagret

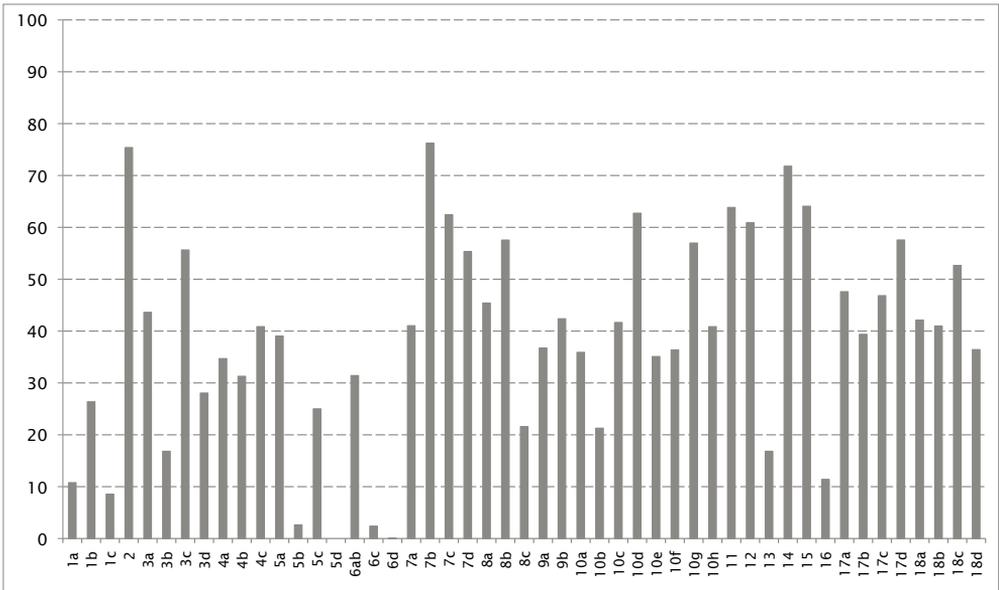


Diagram 13. Income from research grants in percent of total research income of different departments at the University of Gothenburg in 2009. X-axis: departments 1a-18d, see page 530. Source: EA datalagret

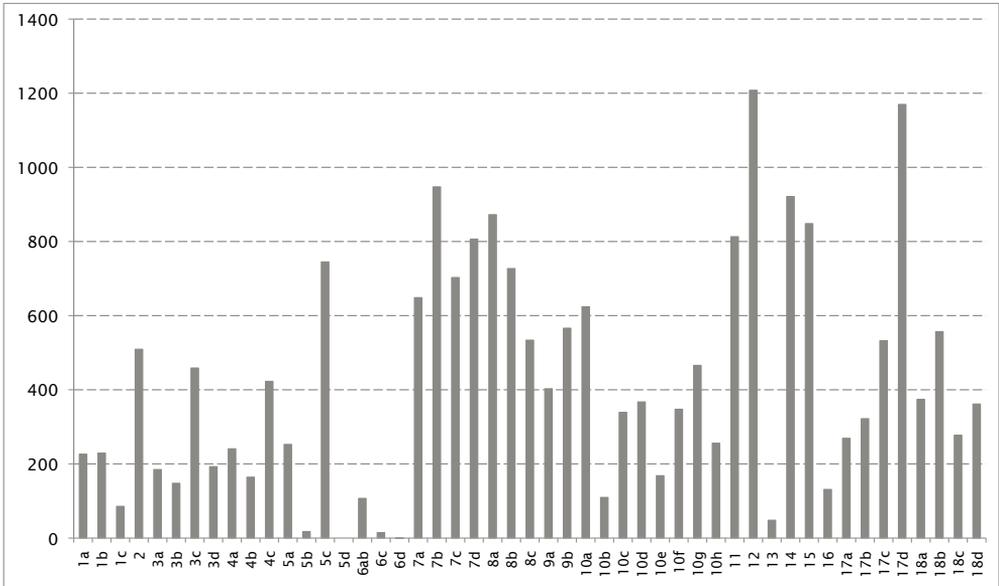


Diagram 14. Income from research grants per research staff (i.e. all personnel that have research included as a fraction of their work plan, PhD students not included). X-axis: departments 1a-18d, see page 530. Source: EA datalagret

DIAGRAMS

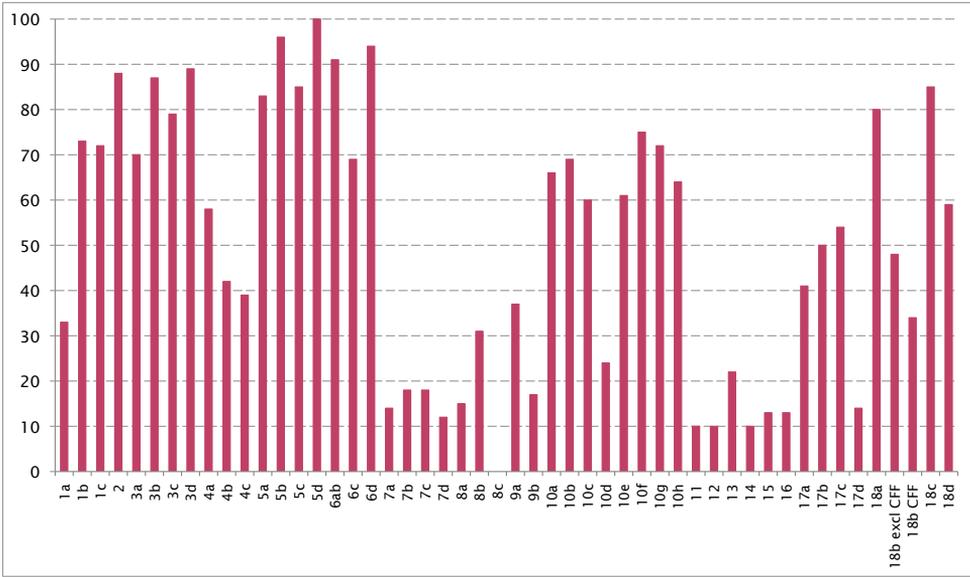


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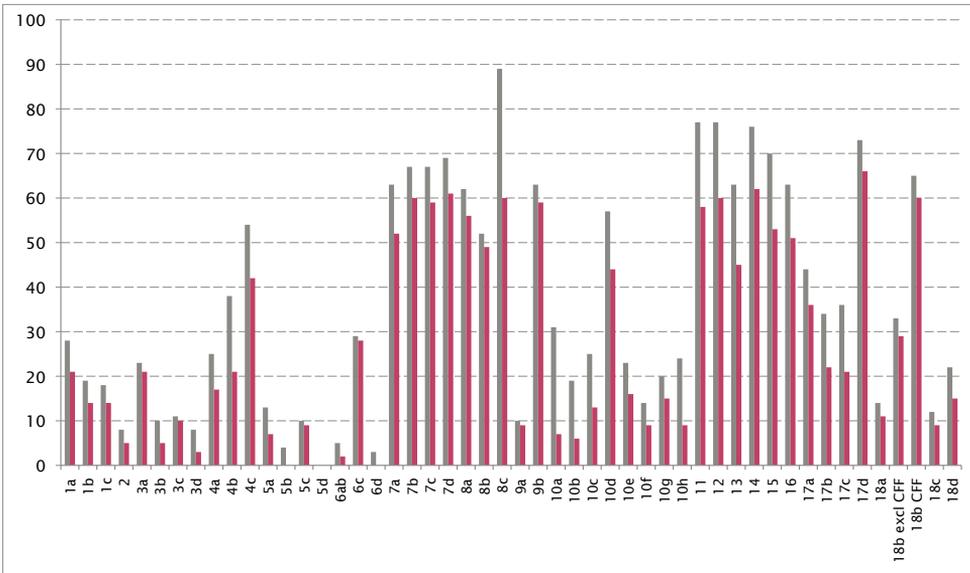


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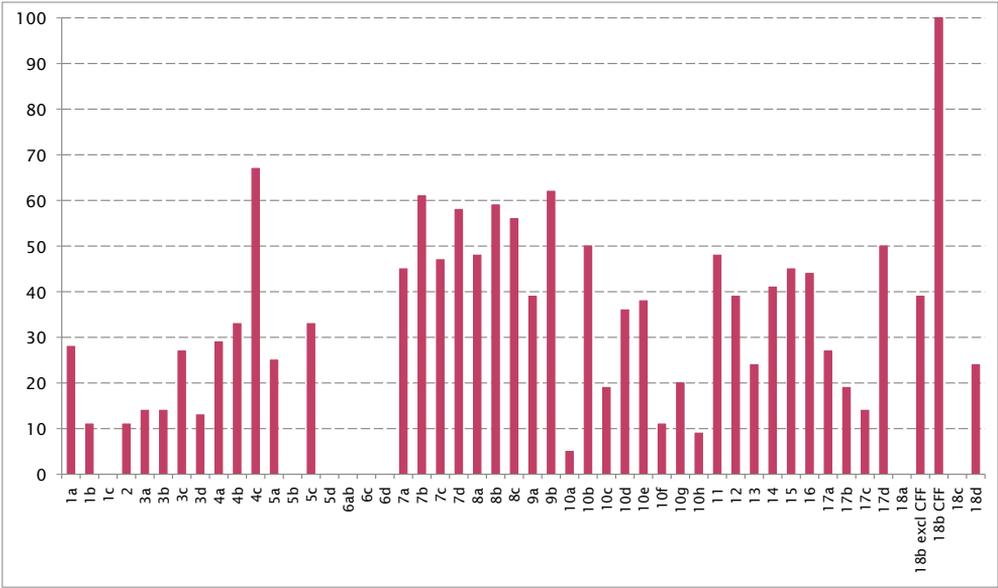


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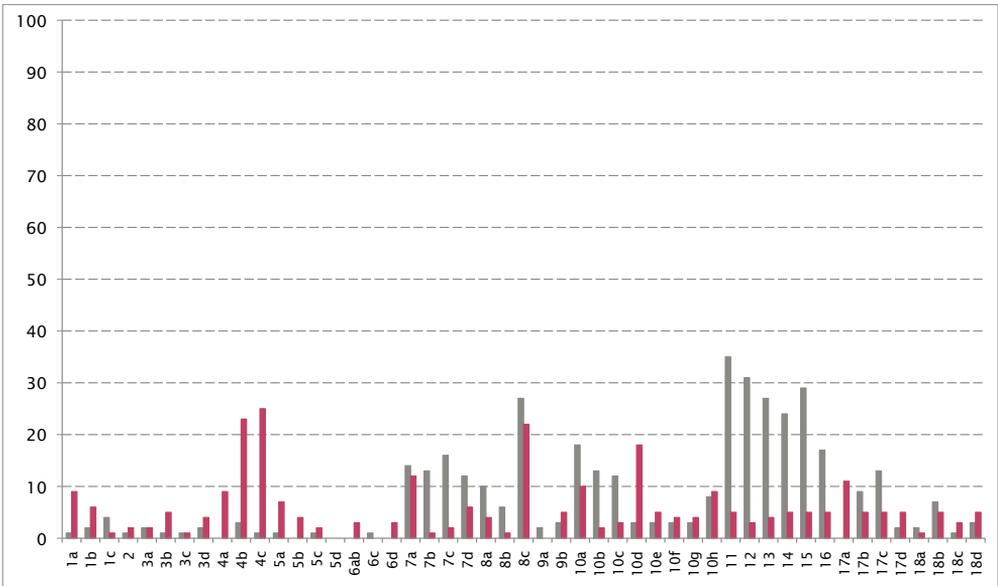


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DIAGRAMS

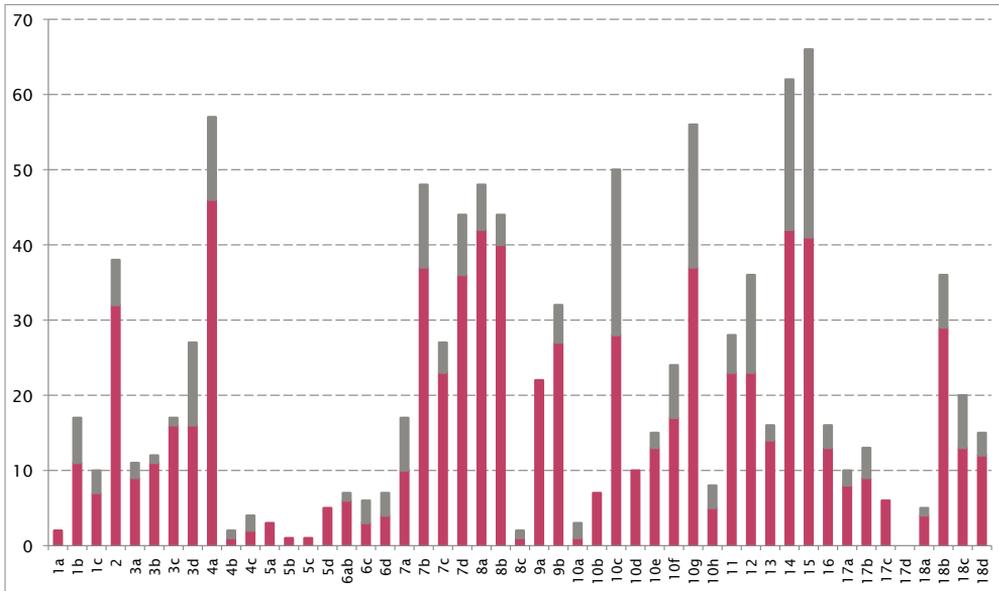


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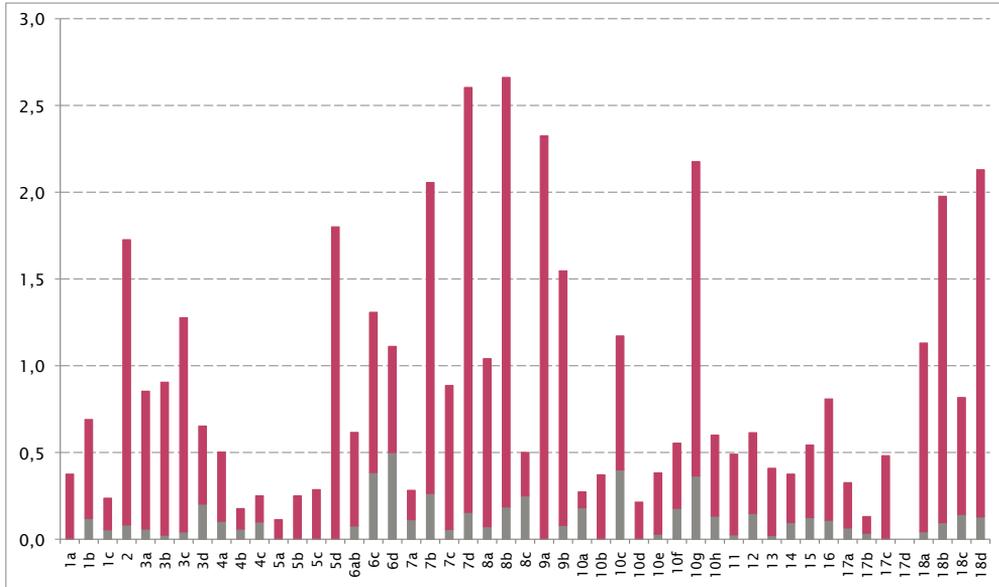


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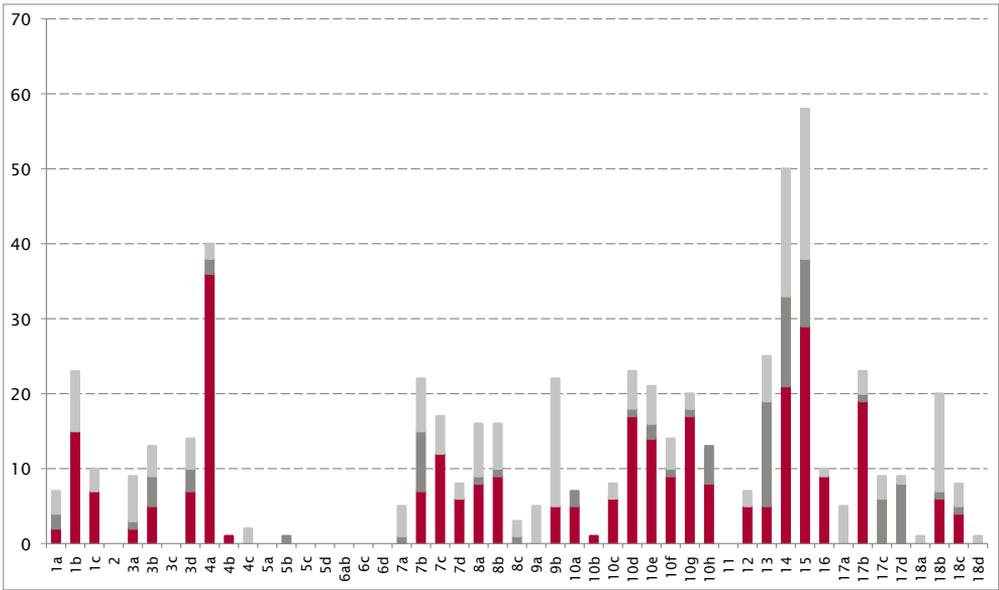


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Part III

Bibliometric analysis

BIBLIOMETRIC ANALYSIS

A bibliometric analysis is a statistical study which relies on information from a large number of peer review events associated with the publication process. When aggregated, this information can provide a valuable picture of scientific track record, and can be followed-up and analysed frequently. On the down side, the performance analysis provided is always based on historic data, and can be biased and questioned in a number of ways.

As part of the RED10 research evaluation, a thorough bibliometric analysis was commissioned, following a procurement process, to Evidence, Thomson Reuters. This is intended to complement the peer review by international experts. Its primary goal was to give an initial second opinion, which hopefully will be useful in the interpretation of the experts' reports.

A second reason was to study the validity of the bibliometric data analysis in estimating the quality of research at the University. The University's publication database (Gothenburg University Publications, GUP, 2004-2009) has been used as the source of data. Several bibliometric techniques were used to provide as diverse and fair a picture as possible, considering the fundamentally different publication traditions of different disciplines at the University. A citation analysis has been carried out using links to Web of Science. A publication analysis has been performed using rankings provided by the national Norwegian publication channel ranking system.

To ensure that the bibliometric analysis can be regarded as impartial and separate from the peer evaluations, it was performed by an external contractor completely separately from the peer review by panels of international experts. Neither party had access to the other's results. For their evaluation, the experts were exclusively provided with classic bibliometric statistics, such as publications lists and frequency studies of different publication types, as a background for their work.



University of Gothenburg

Bibliometric analyses

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Contact details

Evidence, Thomson Reuters, 103 Clarendon Road, Leeds, LS2 9DF

t/ 0113 384 5680

f/ 0113 384 5874

e/ scientific.enquiries.evidence@thomson.com

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1. OVERVIEW AND SUMMARY

This report has been commissioned by the University of Gothenburg from *Evidence*, a business of Thomson Reuters, to provide an evaluation of the University's research, overall and by department, based on bibliometric analyses. The bibliometric indicators underlying these analyses have been provided to the University in an Excel file for internal management purposes. The full range of bibliometric indicators are also provided in the Data Tables in Annex 3 of this report.

The University of Gothenburg

Analysis of the University of Gothenburg publications (GUP) database shows that the general trend has been for a growth in research outputs over the six years covered by this report from 2004 to 2009 inclusive, but this does not apply equally across all document types. Peer-reviewed scientific journal articles are the principal document type and the volume of these has increased by 12.2% (growth rate between first 3-year period (2004-2006) and second (2007-2009)). This increase is similar to that of books, monographs and chapters in books (considered together). The output of peer-reviewed conference papers has increased by 48.9% and of reviews by 32.7%. Analysis using fractional publication counts shows very similar trends in output growth.

There is evidence of a disproportionate volume 'spike' of many document types in 2005 as compared to 2004. This anomaly is even more apparent when the analysis is restricted to papers linked to Thomson Reuters Web of KnowledgeSM. The GUP data are self-reported – reporting began in 2007 and was retrospective back to 2004, however, all Thomson Reuters Web of KnowledgeSM papers are included by default. This may have led to lower reporting in 2004. Consequently, data concerning growth may be affected, though we have sought to minimize the effect by using two 3-year periods rather than annual data.

The University of Gothenburg publishes extensively in internationally well-regarded journals. Many of these are titles associated with areas of medical research, especially dental, heart and other internal medical specialisms. Using the Norwegian model, nearly 17% of the University of Gothenburg's publications are published in prestigious, level 2 publication channels. This rises to nearly 24% if we consider the percentage of such publications compared to 'scientific' publications (i.e. levels 1 and 2 together). This compares favorably with publicly available data for Norwegian universities for a similar time period (for example, the University of Oslo has just over 20% of its publications at level 2).

Overall, the average field-normalized citation impact for the University of Gothenburg for the 6-year time period is 1.32. Although well above the world average of

1.0, this is the same as for the Swedish national research base. The University has a marginally lower percentage of papers remaining uncited at the end of 2009 and a slightly higher percentage of papers which are cited more than expected compared to the journals in which they are published than the Swedish national benchmark.

Evaluation by Thomson Reuters Essential Science Indicators fields

Papers published by the University of Gothenburg can be assigned to specific Thomson Reuters *Essential Science Indicators* (ESI) fields based on which journals the papers are published in. This aggregation allows direct comparison to the Swedish national research base but may not necessarily reflect the research published by an academic unit of similar name. For example, researchers in the Department of Chemistry may publish in biology and materials journals and publications in Chemistry journals will come from a diversity of disciplines, not just Chemistry.

Compared to the Swedish national research base, the University of Gothenburg publishes proportionally more papers in the ESI fields of Clinical Medicine and Neuroscience & Behavior and fewer papers in Chemistry, Engineering and Physics. The overall growth in output seen in the analysis of the GUP database is repeated at individual ESI field level for all fields except Immunology, Microbiology and Physics.

Analysis of research performance at ESI field level, in general, shows that the average citation impact of the University of Gothenburg's papers is above the world average citation impact of 1.0 in the majority of fields. Those fields in which the University of Gothenburg performs below world average are: Immunology, Psychiatry/Psychology, Economics & Business, Mathematics, Arts & Humanities and Space Sciences. Papers published by the University of Gothenburg in journals associated with the ESI field of Immunology are cited well below world average and represent a significant volume of research published by the University (-5% of the total). Papers published in Chemistry journals, although cited at around the world average, are not as well cited compared as the Swedish national benchmark and are not cited as well as expected compared to the journal baselines.

Papers assigned to the Biology & Biochemistry ESI field have performed well compared to the average world and national citation impact benchmarks. However, this indicator has declined from 1.33 for papers published in the 3-year period from 2004-2006 to 1.20 for the most recent 3-year period from 2007-2009.

Papers published by the University of Gothenburg in journals assigned to the ESI field of Clinical Medicine clearly represent an area of significant and improving strength for the University both in terms of volume and citation impact. The aver-

age citation impact in this field is well above both world average and the Swedish national research base benchmark and the volume of research published accounts for one-third of the University's total output.

In Arts & Humanities, the University of Gothenburg publishes around 10% of the national total in this ESI field. Although the average citation impact is below both world and national benchmarks, it is cited more than expected at the journal level (50.0% of these papers are cited more than the journal baseline compared to 44.5% of comparable Swedish research). It may be that this research has a particular focus or niche that is not recognized by the overall ESI field but, nonetheless, is well-regarded by academic communities worldwide.

Research published by the University of Gothenburg in journals assigned to the Engineering ESI field is a small part of the University's research base but it is well-cited compared to both world and national benchmarks. Both volume and impact have increased between the two 3-year periods (2004-2006 and 2007-2009),

The Impact Profile® for the University of Gothenburg shows a very similar distribution of uncited and cited papers as for the Swedish national research base over the same time period.

Evaluation by panels and departments

Papers published by the University of Gothenburg can also be assigned to individual panels and departments. Bibliometric analyses at this level use the same bibliometric indicators but aggregated by academic unit rather than ESI field and thus do represent the research of these units.

As would be expected from analyses at ESI field level, the panels of Medicine (14) and Clinical sciences (12) publish a substantial proportion of the University's output and these papers are exceptionally well-cited by the international research community.

All the departments within the panel of Clinical sciences (12) perform above or around the world average. The Section for Anesthesiology, Biomaterials and Orthopaedics has an outstanding average citation impact of 1.94 and 18.3% of its papers in the top 10% worldwide. The Section for the Health of Women and Children also performs well above world average with an average citation impact of 1.51 and 15.3% of its papers in the top 10% worldwide. The Section for Dermatology, Plastic Surgery and Otorhinolaryngology and the Section for Oncology, Radiation Physics, Radiology and Urology are the weakest departments in this panel. Overall, the panel of Clinical sciences (12) has just over 20% of its publications assigned

to level 2 ‘prestigious’ publication channels in the Norwegian model. Within the panel, there is little variation in the percentages of level 2 publications.

Within the panel of Medicine (14) only two departments, Department of Rheumatology and Inflammation Research and Department of Clinical Nutrition perform below or at the world average. All the other departments in this panel have performed exceptionally well, especially the Department of Emergency and Cardiovascular Medicine and the Department of Molecular and Clinical Medicine with average citation impacts of 1.93 and 1.82 respectively. The Department of Emergency and Cardiovascular Medicine also performs very well on the Norwegian level 2 indicator with 31.5% of its publications assigned to this prestigious level.

The Institute of Odontology, the only department within the panel of Odontology (16) performs well above the world average and although it produces fewer papers than many of the ‘biomedical’ panels, 15.1% of its papers are ranked in the top 10% worldwide. This suggests that it may be a strong niche specialization of the University of Gothenburg.

The Neuroscience and physiology panel (15) has performed well above world average and with a substantial volume of papers. Within this panel, all departments perform at or above world average, however, the Department of Psychiatry and Neurochemistry stands out with an outstanding average citation impact of 1.92 and 20.8% of its papers in the top 10%. This department has more than one-quarter of its publications assigned to prestigious publication channels (Norwegian level 2 – 27.3%).

These panels together will account for much of the good performance of research published by the University of Gothenburg in the Clinical Medicine ESI field. It would be interesting and informative to break down these analyses to a more detailed level using individual journal categories.

The panel of Biomedicine (11) illustrates the complementarity of analyses carried out at University-defined academic unit and ESI field. Overall, the performance in Biomedicine is good with an average citation impact of 1.26 and 11.4% of its papers in the top 10% worldwide. At the departmental level, the Department of Pathology and the Department of Medical Biochemistry & Cell Biology perform very well and much of the research from these departments may well be assigned to the ESI fields of Clinical Medicine and Biology & Biochemistry. The departments performing less well (Department of Infectious Medicine, Department for Microbiology and Immunology and Department of Medical Genetics) may contribute more to the relatively poor performance in the ESI fields of Immunology, Microbiology and Molecular Biology & Genetics. Two departments, Department

of Medical Biochemistry & Cell Biology and Department of Medical Genetics have more than one-third of their publications assigned to prestigious, level 2, publication channels.

Similarly, the Biology panel (7) appears as an area of strength for the University of Gothenburg with 14.4% of its papers in the top 10% worldwide, with the departments of Marine Ecology and Plant and Environmental Sciences performing at well above the world average. However, the Norwegian bibliometric indicators suggest a rather different interpretation with the Department of Cell and Molecular Biology, which has the lowest average citation impact (1.21) outperforming the other departments with 31.7% of its publications assigned to level 2 publication channels. Conversely, the departments of Marine Ecology and Plant and Environmental Sciences with average citation impacts of 1.70 and 1.60 respectively both have relatively low percentages of publications assigned to level 2. This panel and its constituent departments may publish research in several ESI fields including Biology & Biochemistry, Environment/Ecology and Plant & Animal Science. Analyses at ESI field level indicate that the University of Gothenburg's papers published in Environment/Ecology and Biology & Biochemistry appear to be in decline whilst strength in Plant & Animal Science is increasing. This is another focus of research where more detailed analysis may be informative as the apparent strength of research published by the panel is not reflected in the ESI field analyses. Also, it may be interesting to look at journal use by researchers as there is some discrepancy between the citation impact analyses and the Norwegian indicators.

The Chemistry and earth sciences panel (8) has performed above world-average, both in citation impact and share of papers in the top 10% worldwide. The ESI field analysis suggests, however, that papers in Chemistry or Geosciences are not well-cited when compared to the Swedish national research base. All the departments within this panel have a more than average share of the world's top 10% papers. Overall, panel 8 has more than one-quarter of its publications assigned to prestigious, level 2, publication channels. At departmental level, Earth Sciences performs less well (level 2 – 19.3%) compared to Chemistry (level 2 – 31.5%).

The Mathematics and physics panel (9) performs well above the world average with an average citation impact of 1.27 and with 13.7% of its papers in the top 10% worldwide. This panel has an outstanding percentage of publications assigned to level 2 under the Norwegian model, nearly 40%. It is the only panel to publish more than one-third of its output in prestigious publication channels. It may be that this is an area of opportunity for the University as analysis of the ESI field of Mathematics shows that the citation impact of papers published in these journals has increased over the 6-year time period.

The panel for Business (17) has the lowest average citation impact at the panel level and this is well below world average. Papers published by the University of Gothenburg in the ESI field of Economics & Business also perform less well than both world and national benchmarks. However, analyses using the Norwegian bibliometric indicators suggest that the Institute for Innovation and Entrepreneurship is publishing well-regarded research in publication channels other than journals abstracted by Thomson Reuters.

Overall, panel 10 – Social sciences ranks third behind Medicine (14) and Clinical sciences (12) on Norwegian points indicating that this is an area of significant research focus for the University of Gothenburg. The panel has 22.2% of its publications assigned to prestigious, level 2, publication channels. Within the panel, the Department of Political Science and the School of Global Studies each contribute around 20% towards the total of 1953.8 Norwegian points and have more than one-quarter of their publications assigned to prestigious publication channels (level 2 – 26.9% and 29.2 % respectively). Assessment of research published by this panel by citation analyses is in broad agreement with this evaluation using the Norwegian model – overall, it performs just under the world average (average citation impact 0.95) However, the Department of Political Science has an outstanding average citation impact of 1.73, although this is based on just 39 papers.

2. INTRODUCTION

2.1 Background

Research evaluation is increasingly making use of bibliometric data and analyses. Publication of research outcomes is an integral part of the research process and is a universal activity. Consequently, bibliometric data have a currency across subjects, time and location which is found in few other sources of research-relevant data.

Research publications accumulate citation counts when they are referred to by more recent publications. Citations to prior work are a normal part of publication, and later citations are a reflection of the value placed on a work by later researchers. Some papers get cited frequently and many remain uncited. Highly cited work is recognized as having a greater impact and *Evidence* has shown that high citation rates are correlated with other qualitative evaluations of research performance, such as peer review (**Maintaining Research Excellence and Volume: A report by Evidence Ltd to the Higher Education Funding Councils for England, Scotland and Wales and to Universities UK** (2002), Adams J, *et al.*). This relationship holds across most science and technology areas and, to a limited extent, in social sciences and even in some humanities subjects.

Citation indicators must always be used with caution. Specific methodological issues are discussed in Annex 1. Citation counts must be carefully normalized to account for variations by field and growth by year. Indicators are more informative for core natural sciences, especially for basic science, than they are for applied and professional areas and for social sciences.

The relationship works best with large data samples. As the data are disaggregated, so the relationship weakens. The average impact of small numbers of publications can be skewed by outlier values. At a finer scale, when analyzing the specific outcome for individual departments, the statistical relationship is not a sufficient guide by itself. For this reason, bibliometrics are best used in support, but not instead, of decision processes. They can enable conclusions to be reached more rapidly and more confidently but they cannot substitute for review by well-informed and experienced peers.

For this evaluation, bibliometric data have been sourced from Thomson Reuters databases. These databases, based on Thomson Reuters Web of KnowledgeSM, are widely acknowledged to be the world's leading source of citation and bibliometric data. The authoritative, multidisciplinary content which covers over 11,000 of the highest impact journals worldwide, is known as the Web of Science, including Open Access journals and over 110,000 conference proceedings. Coverage is both current and retrospective in the sciences, social sciences, arts and humanities, in

some cases back to 1900. These data are often still referred to, within the research community, by the acronym 'ISI'. *Evidence* has extensive experience with databases on research inputs, activity and outputs and has developed innovative analytical approaches for benchmarking and interpreting international, national and institutional research impact.

2.2 Methodology

Annex 1 provides background for the standard methodology and data definitions used in bibliometric and citation analysis. However, for reference, some key definitions are also given here.

Annex 2 provides detailed descriptions of the indicators and methodology used in the report, the Data Tables in Annex 3 and the Excel file which accompanies this report.

Papers/publications: Thomson Reuters abstracts publications including editorials, meeting abstracts and book reviews as well as research journal articles. The terms 'paper' and 'publication' are often used interchangeably to refer to printed and electronic outputs of many types. In this report the term 'paper' has been used exclusively to refer to substantive journal articles and reviews and exclude editorials, meeting abstracts or other types of publication. The term 'publication' has been used inclusively to cover all document types.

Articles and reviews (papers) are the subset of publications for which citation data are available and which are used in calculations of citation impact.

Citations: The citation count is the number of times that a citation has been recorded for a given publication since it was published. Not all citations are necessarily recorded since not all publications are indexed. However, the material indexed by Thomson Reuters is estimated to attract about 95% of global citations.

Citation Impact: 'Citations per paper' is an index of academic or research impact (as compared with economic or social impact). It is calculated by dividing the sum of citations by the total number of papers in any given dataset (so, for a single paper, raw impact is the same as its citation count). Impact can be calculated for papers within a specific research field such as Clinical Neurology, or for a specific institution or group of institutions, or a specific country. Citation count declines in the most recent years of any time-period as papers have had less time to accumulate citations (papers published in 2006 will typically have more citations than papers published in 2009).

Normalized Citation Impact: Citation rates vary between research fields and with time, consequently, analyses must take both field and year into account. In addition, the type of publication will influence the citation count. Typically, citation counts from reviews and articles only are used in calculations of citation impact. The standard normalization factor is the world average citations per paper for the year and journal category in which the paper was published.

Research field: Standard bibliometric methodology uses journal category as a proxy for research field. Journals are assigned to one or more categories, and every article within that journal is subsequently assigned to that category. Papers from prestigious, ‘multidisciplinary’ and general medical journals such as Nature, Science, The Lancet, BMJ, The New England Journal of Medicine and the Proceedings of the National Academy of Sciences (PNAS) are assigned to specific categories based on the journal categories of the references cited in the article. The selection procedures for the journals included in the citation databases are documented here <http://scientific.thomsonreuters.com/mjl/>.

Evidence has extensive experience with databases on research inputs, activity and outputs and has developed innovative analytical approaches for benchmarking and interpreting international, national and institutional research impact.

2.3 Report and Section outlines

This report has been commissioned to provide the University of Gothenburg with well-developed analyses and interpretation including an Executive Summary, Summary and abbreviated data Tables to each Section and Appendices to include Methodology (full data Tables are provided in the Data Tables in Annex 3 and an Excel file which accompanies this report for internal management purposes). Analyses are presented in Tables and Figures as appropriate.

Section 3 (Trends in University of Gothenburg research outputs, 2004-2009) summarizes the publication output of the University of Gothenburg. Data cover all outputs recorded in the University of Gothenburg publications database (GUP) described above including those that were not linked to Thomson Reuters citation databases. From the publication database, we present the two Tables as specified and also visualize the trends graphically. As these data are specific to, and provided by, the University of Gothenburg it has not been possible to benchmark these aggregated outputs with national and similar institutions. However, the report comments on the strategic conclusions which can be drawn from internal comparisons.

These analyses set the background for the more detailed citation analyses covered in Section 4.

2.3.1 Baseline bibliometric analyses of University of Gothenburg publications, 2004-2009

Section 4 (Baseline bibliometric analyses of University of Gothenburg publications, 2004-2009) provides baseline bibliometric indicators (for research publications with an associated UT ID) and, where appropriate, benchmarks these against the national research base of Sweden. This Section considers all articles and reviews linked to the Thomson Reuters citation databases to provide an overview of the volume output and citation impact of research published by the University of Gothenburg. Both overall analyses of the dataset and analyses of publications by Thomson Reuters Essential Science Indicators (ESI) research field are presented. Analyses cover:

- Categorization and share of types of publication - benchmarked against Swedish national data;
- Trends in publication output - benchmarked against Swedish national data;
- Percentage of publication output in Thomson Reuters abstracted databases based on the Thomson Reuters Web of KnowledgeSM;
- Trends in percentage of publication output in Thomson Reuters Web of KnowledgeSM;
- Most frequently used journals with Journal Impact Factor data where available for journals in the Thomson Reuters Web of KnowledgeSM (no benchmark data available);
- How much research is not cited? - benchmarked against Swedish national data;
- Which research fields does the University publish most frequently in? (this analysis will use the aggregation of Thomson Reuters Web of KnowledgeSM journal categories to the standard overall Thomson Reuters *Essential Science Indicators* fields);
- Is research overall published by the University of Gothenburg well-cited, comparison of uncited research? - average citation impact and impact relative to the journal benchmarked against Swedish national data;
- Is research in individual *Essential Science Indicators* fields published by the University of Gothenburg well-cited? - comparison of uncited research, average citation impact and impact relative to the journal benchmarked against Swedish national data;
- Analysis of highly-cited papers using Impact Profile[®] methodology to expand the University's understanding of the overall averages.

2.3.2 Bibliometric analyses of University of Gothenburg academic units, 2004-2009

The next Section evaluates the performance of academic units within the University of Gothenburg using a variety of aggregated bibliometric indicators for the period 2004-2009. As in the previous Section the analyses only include article and review

papers listed in the University of Gothenburg database which have been linked to the Thomson Reuters Web of KnowledgeSM. In the report Tables of aggregated bibliometric indicators for the 6-year period include:

- Number of papers (P);
- Sum of citations (C);
- Percentage of papers not cited ($\%P_w$);
- Percentage of papers cited more than expected relative to the journal (not in list of suggested bibliometric indicators – this indicator relates the citation count for the paper to the expected citation count for the specific journal and year) ($\%C_{>exp}$);
- Average citation impact relative to the world citation average for the appropriate journal categories (\bar{C}_r);
- Percentage of highly-cited papers (defined as those with a paper-level average normalized citation score of at least 4 times world average (not in list of suggested bibliometric indicators – this indicator provides similar information as that in 3.7 but at an overall level not restricted to a specific journal category) ($\%C_{Hi}$);
- Percentage of papers in the world's top 10% relative to the appropriate journal category (Top10%).

This Section visualizes the strengths and weaknesses of individual departments using 'bubble charts' to highlight departments with high output, high impact; high output, low impact; etc. Commentary summarizes the overall and strategic implications of the publishing patterns of the University of Gothenburg, at the level of panel and at the level of department.

2.3.3 National Norwegian bibliometric publication channel analysis for University of Gothenburg research outputs

The final Section of the report analyzes the research output of the University of Gothenburg, using the national Norwegian bibliometric indicators. The Norwegian system classifies journals and publishers as either level 0, level 1 (normal) or level 2 (prestigious) and the relative proportion of publications falling into these classes is analyzed. Norwegian bibliometric indicators are discussed further in Annex 2. The analyses in this Section cover:

- The data for the University of Gothenburg as a whole;
- The data for the University of Gothenburg disaggregated by year (2004-2009);
- The data for the University of Gothenburg at the departmental level, where appropriate.

3. TRENDS IN UNIVERSITY OF GOTHENBURG RESEARCH OUTPUTS, 2004-2009

This Section summarizes the publication output of the University of Gothenburg. The data cover all 35,039 unique publication outputs recorded in the University of Gothenburg publications (GUP) database for the years 2004 to 2009.

In the database, each publication has been assigned to one of 21 document types (e.g. doctoral thesis) by the University of Gothenburg. The number of each type is analyzed by year so that trends in publication behavior can be identified.

The document types used are those provided in the GUP database and are not those used in the Thomson Reuters Web of KnowledgeSM database.

Publications often have more than one author, and these are often based at different institutions. When evaluating the publication output for an institution it must be borne in mind that individual authors may have only contributed a minor part towards a publication. Therefore, this Section uses two methods to count publication output:

- Total publication counts – the total number of publications with at least one author from the University of Gothenburg (Section 3.1).
- Fractional publication counts – the proportion of each publication's authorship that is based at the University of Gothenburg is counted. This means a publication with five authors, two of which are based at the University of Gothenburg, would be counted as 0.4. A publication with an author based jointly at Gothenburg and another institution would have a fractional count of 0.5 (Section 3.2).

Fractional publication counting does not resolve the issues raised by co-authorship because it does not quantify the contributions of different authors. It does, however, provide context to the total publication counts.

3.1 Publication outputs by document type

Table 3.1.1 shows the numbers of publications in the GUP database by year and document type. There are no reference data available that would indicate whether this distribution of document types is typical. Peer-reviewed scientific journal articles are the principal document type (over 40% of the total) which is a typical observation for university publication databases.

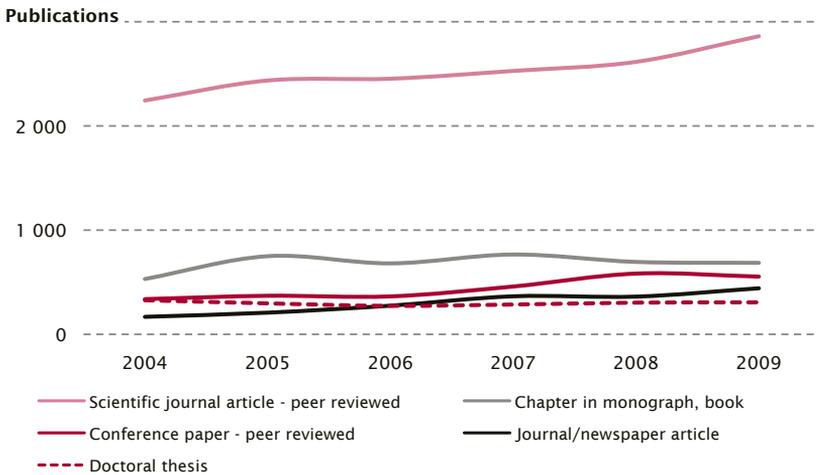
Table 3.1.1 University of Gothenburg total publication counts per year by document type, 2004-2009

Document type	2004	2005	2006	2007	2008	2009
Article - book review	85	112	130	169	152	131
Artistic research and development	6	7	16	24	33	45
Chapter in monograph, book	531	750	681	766	695	686
Conference paper - non peer reviewed	199	290	311	299	348	291
Conference paper - peer reviewed	338	370	364	459	583	554
Conference poster	55	50	76	86	142	119
Doctoral thesis	327	297	273	286	304	307
Journal article - popular science	0	0	0	1	0	1
Journal/newspaper article	168	208	275	365	362	442
Licentiate thesis	32	37	34	32	30	28
Monograph, book	127	142	172	146	151	133
Monograph, book - edited	79	99	105	111	106	121
Other	54	49	94	83	103	80
Patent	2	2	2	0	1	1
Preprint	0	6	10	10	9	16
Report	329	347	391	311	339	297
Report - popular science	0	0	0	0	1	0
Scientific journal article - non peer reviewed	200	208	174	281	361	286
Scientific journal article - peer reviewed	2,244	2,436	2,453	2,528	2,615	2,861
Scientific journal article - review article	79	97	78	112	110	115
Text critical edition (editor)	2	0	1	1	3	3
Total	4,857	5,507	5,640	6,070	6,448	6,517

The general trend has been for output to grow over the six years but this does not apply equally across all document types. The volume of peer-reviewed scientific journal articles (the principal document type) has increased by 12.2% (growth has been calculated as $(\sum \text{papers } 2007-2009 - \sum \text{papers } 2004-2006) / \sum \text{papers } 2004-2006$). A similar increase is apparent in the output of books, monographs and chapters in books (considered together). The output of peer-reviewed conference papers has increased by 48.9% and of reviews by 32.7%.

Figure 3.1.1 shows the trend in publication volume for the five document types that account for the largest proportions of total output for 2009. While output increased in most cases, it remained relatively stable for doctoral theses and fluctuated for book chapters. The data also show that growth in the output of artistic research Figure 3.1.1 University of Gothenburg total publication count trends by document type, 2004-2009 and development has been particularly strong over the 6-year period. This may reflect changes in reporting practice within the University of Gothenburg.

Figure 3.1.1 University of Gothenburg total publication count trends by document type, 2004-2009



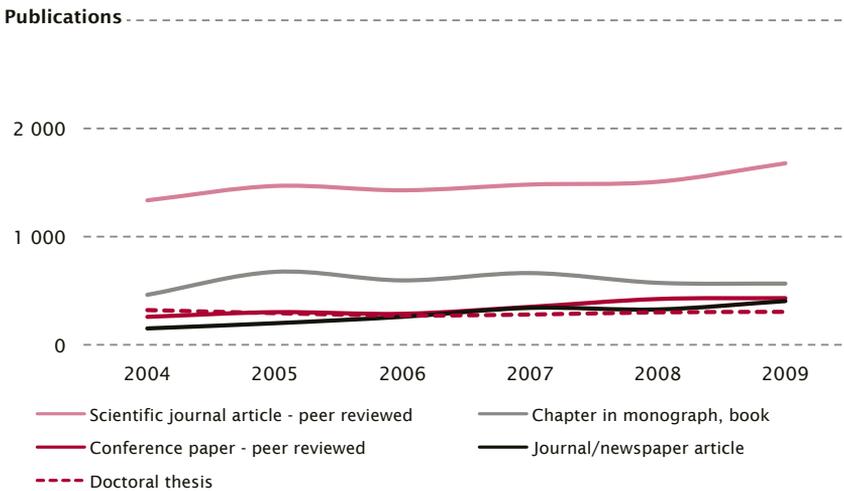
There is evidence of a disproportionate volume of many document types in 2005 as compared to 2004. This anomaly is even more apparent when the analysis is restricted to papers linked to Thomson Reuters Web of KnowledgeSM (Section 4.2). This may be an artifact of the GUP database but data concerning growth will be affected by this though we have sought to minimize this by using two 3-year periods rather than annual data.

3.2 Fractional publication outputs by document type

Table 3.2.1 shows the fractional publication counts for the University of Gothenburg. The fractional publication counts follow a similar distribution to the total publication counts (Section 3.1). Peer-reviewed scientific journal articles are the principal document type and there is a general trend to increasing output over time. Analysis using fractional publication counts show very similar trends in output growth as whole publication counts (Section 3.1).

Figure 3.2.1 shows the trend in fractional publication counts for the five document types accounting for the largest proportion of total output. As would be expected fractional publication counts are generally lower than the total counts, but the magnitude of this difference varies according to document type reflecting differences in collaborative authorship. For example, the fractional counts for peer-reviewed scientific journal articles are around 40% lower while the fractional counts of doctoral theses are only marginally lower.

Figure 3.2.1 University of Gothenburg fractional publication count trends by document type, 2004-2009



BIBLIOMETRIC ANALYSIS

Table 3.2.1 University of Gothenburg fractional publication counts per year by document type, 2004-2009

Document type	2004	2005	2006	2007	2008	2009
Article - book review	84.0	111.0	124.7	165.0	151.0	126.0
Artistic research and development	3.0	4.5	12.5	23.0	33.0	42.8
Chapter in monograph, book	462.1	674.2	595.4	663.1	572.9	565.7
Conference paper - non peer reviewed	161.6	257.1	270.1	263.9	300.4	260.7
Conference paper - peer reviewed	258.2	301.7	286.7	350.9	423.2	431.3
Conference poster	43.2	38.8	63.5	71.0	110.1	94.8
Doctoral thesis	321.0	292.5	270.0	279.7	300.0	304.5
Journal article - popular science	0.0	0.0	0.0	1.0	0.0	0.3
Journal/newspaper article	151.2	199.3	258.8	341.3	326.7	404.1
Licentiate thesis	32.0	36.0	32.5	32.0	29.5	28.0
Monograph, book	109.0	115.9	145.0	123.4	126.2	116.5
Monograph, book - edited	56.3	79.0	78.6	84.9	80.7	90.9
Other	45.4	43.3	85.4	68.8	93.3	73.4
Patent	0.8	0.8	0.8	0.0	0.3	0.5
Preprint	0.0	5.0	7.8	5.7	4.3	9.4
Report	289.9	288.4	322.9	259.5	283.0	228.4
Report - popular science	0.0	0.0	0.0	0.0	0.3	0.0
Scientific journal article - non peer reviewed	177.6	182.6	152.2	237.3	313.3	253.2
Scientific journal article - peer reviewed	1,335.5	1,468.4	1,428.4	1,481.7	1,507.2	1,678.0
Scientific journal article - review article	52.2	64.9	51.3	69.9	76.3	79.9
Text critical edition (editor)	0.8	0.0	1.0	1.0	2.0	3.0
Total	3,583.7	4,163.2	4,187.6	4,522.8	4,733.8	4,791.2

3.3 Thomson Reuters Web of KnowledgeSM coverage of University of Gothenburg publications

The percentage of papers linked to Thomson Reuters citation databases has shown a slight but consistent downwards trend over the 6-year time period as indicated in Figure 3.3.1. This may reflect changes in journal usage or publishing policy within the University. These linked data are described in the following Section (Section 4).

Figure 3.3.1 Percentage of publications linked in Thomson Reuters citation databases



4. BASELINE BIBLIOMETRIC ANALYSES OF UNIVERSITY OF GOTHENBURG PUBLICATIONS, 2004-2009

This Section considers all articles and reviews linked to Thomson Reuters Web of KnowledgeSM and gives an overview of the volume output and citation impact of University of Gothenburg research. It should be noted that this analyzable part of the database represents just % of the GUP database and is referred to as the University of Gothenburg dataset.

Bibliometric indicators for the University of Gothenburg dataset are benchmarked against the national research base of Sweden. Both overall analyses of the dataset and analyses of papers by Thomson Reuters *Essential Science Indicators* (ESI) research field are presented. Details of the ESI fields are given in Annex 2 (Section A2.3).

Publications for the Swedish national research base were selected from the Thomson Reuters National Citation Record for 2009 using the criteria that they were published between 2004 and 2009 and had at least one Swedish address. Of these 130,642 publications, 98,390 were journal articles and reviews (papers). For all papers, citations were counted as at the end of 2009 and individual citation counts for these were normalized using standard methodology and the Thomson Reuters National Science Indicators (NSI) database for 2009.

Section 4.1 analyzes all document types but all subsequent analyses in this Section include only journal articles and reviews and do not cover conference proceedings, meeting abstracts, books, chapters in books or grey literature such as reports. They therefore capture only a specific part of the total output generated by the University of Gothenburg over the period. This element, however, is usually recognized as describing the most direct contribution to the research base.

In summary:

- More than 90% of University of Gothenburg publications in the GUP database and linked to Thomson Reuters Web of KnowledgeSM are articles and reviews. Overall, the University of Gothenburg publishes a slightly higher proportion of journal articles and a slightly lower proportion of meeting abstracts and proceedings papers than the Swedish national research base (Section 4.1).
- University of Gothenburg publication output per year has grown over the 6-year period (2004-2009) (Section 4.2).
- Many of the journal titles used most frequently by the University of Gothenburg are associated with medicine. Well-regarded multidisciplinary journals

such as Proceedings of the National Academy of Sciences USA are also among the most frequently used titles (Section 4.3).

- Overall, the University of Gothenburg publishes a similar proportion of uncited research to the Swedish national research base with papers published prior to 2007 slightly less likely to remain uncited over time (Section 4.4).
- Just over a third of all University of Gothenburg papers are published in the field of Clinical Medicine, a markedly higher percentage than in the Swedish national research base. A lower percentage of research is published within Chemistry (4.2% compared to 7.5%), Engineering (3.3% compared to 8.3%) and Physics (3.1% compared to 6.2%) than the Swedish national research base (Section 4.5).
- The overall normalized citation impact of University of Gothenburg research is comparable to the Swedish national research base for the 6-year time period (Table 4.6.1 and Section 4.7).
- Overall average normalized citation impact of University of Gothenburg research has increased over the last three years of the 6-year time period, 2004-2009 as compared to the first three years (Table 4.6.2).
- The average citation impact (aggregated to ESI fields) of the University of Gothenburg's papers is above world average in the majority of fields. The most frequently used field of Clinical Medicine is among the highest in citation impact. A substantially lower volume of research is published in the fields of Engineering, Neuroscience & Behavior and Plant & Animal Science but this research is also well-cited (Figures 4.6.1a & b).
- Research in more than two-thirds of individual fields has increased in normalized citation impact. The increase in normalized citation impact in the fields of Physics and Microbiology is associated with a decrease in volume output, potentially indicating selectivity or concentration in these areas (Table 4.6.2).
- Research in the fields of Clinical Medicine, Biology & Biochemistry, Neuroscience & Behavior, Plant & Animal Science and Engineering is cited relatively more frequently than is typical for the Swedish national research base. Research in fields including Chemistry, Environment/Ecology, Physics, Agricultural Sciences and Mathematics is cited relatively less frequently than the Swedish national research base (Table 4.6.3).

4.1 Proportion of journal articles to other types of publication

The University of Gothenburg dataset of publications linked to Thomson Reuters Web of KnowledgeSM contained 9,483 journal articles, 508 reviews, 193 editorials and around 800 other published items such as (conference) proceedings papers, book reviews and letters in scientific journals (Figure 4.1.1).

Journal articles and reviews (papers) comprise 86.3% of the University of Gothenburg dataset over the 6-year time period, 2004-2009.

Figure 4.1.1 Categorization and share of types of publication for the University of Gothenburg

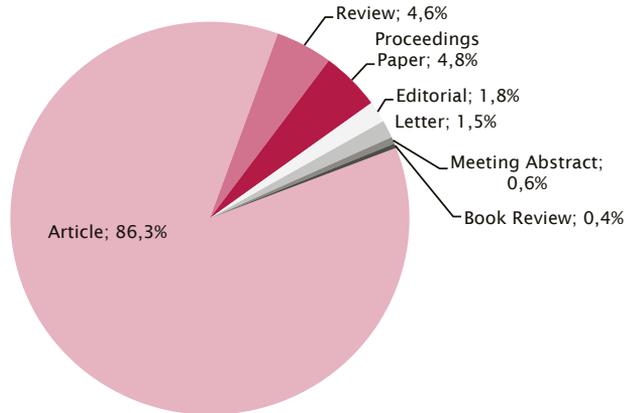
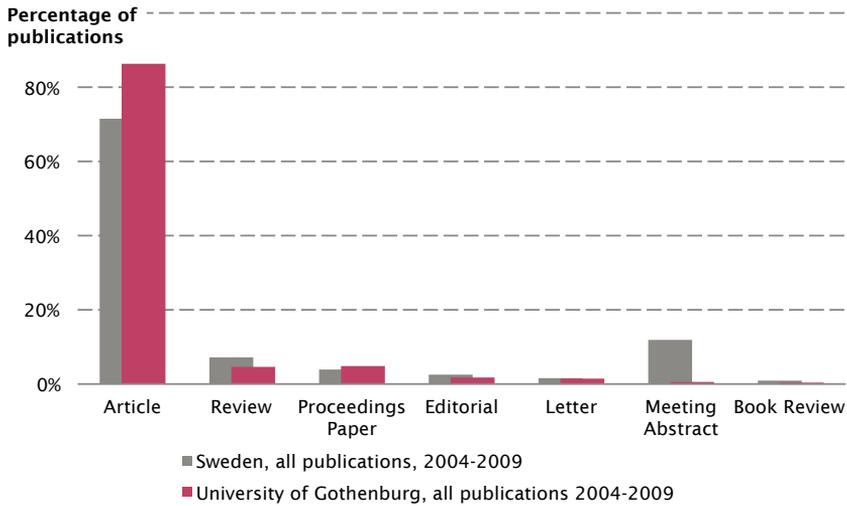


Figure 4.1.2 shows that, overall, the University of Gothenburg dataset contains a higher percentage of journal articles and a lower percentage of meeting abstracts and proceedings papers than the Swedish national research base: journal articles, 86.3% (University of Gothenburg) compared to 71.5% (Sweden); meeting abstracts, 0.6% compared to 11.9%; proceedings papers, 4.8% compared to 7.2%.

This is most likely to be a consequence of how publications are collated by the University for the GUP database which may place more significance on journal articles and reviews than conference abstracts and papers.

Figure 4.1.2 Share of publication types for the University of Gothenburg benchmarked against the Swedish national research base, 2004-2009



4.2 Trends in publication output

Figure 4.2.1 shows annual numbers of papers (journal articles and reviews) in the University of Gothenburg dataset over the 6-year period between 2004 and 2009 and compares these to the Swedish national research base over the same time period.

Figure 4.2.1 Annual numbers of papers linked in Thomson Reuters citation databases

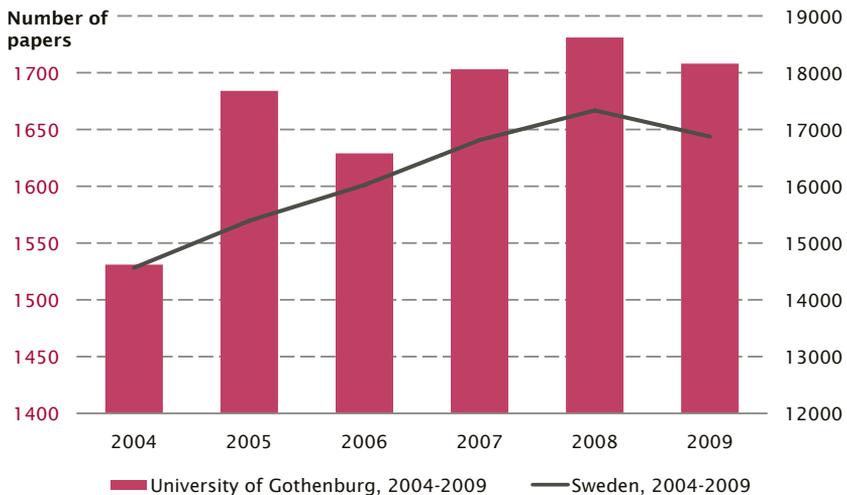


Figure 4.2.1 shows an upwards trend in the numbers of University of Gothenburg papers each year, with an atypical increase in 2005 over 2004. The slightly lower volume of papers in the most recent year may be due to a lag in abstraction into Thomson Reuters databases and should not necessarily be taken as indicative of reduced output. The trend in volume and the growth rate is comparable to the Swedish national research base over the same time period.

4.3 Journals most frequently used by researchers at the University of Gothenburg

The twenty journals used most frequently by researchers within the University of Gothenburg are listed in Table 4.3.1 (a total of 1,389 journal titles are used more than once). Many of the most frequently used titles are associated with medicine. Well-regarded multidisciplinary journals such as Proceedings of the National Academy of Sciences USA also appear in this list.

Together, the papers in the twenty most frequently used journals comprise 999 papers, or approximately 10% of the total number of articles and reviews in the dataset. More than half these journals (13 of 20) are ranked in the 'top' 20% (by Journal Impact Factor) of journals in their specific research fields (bold highlight).

Table 4.3.1 Journals in which University of Gothenburg researchers have published

Journal title	Number of papers	Journal Impact Factor 2009
Acta Paediatrica	78	1.768
Physical Review B	56	3.475
Journal of Clinical Endocrinology and Metabolism	54	6.202
Journal of Chemical Physics	54	3.093
Journal of Clinical Periodontology	53	3.549
Marine Ecology-Progress Series	52	2.519
European Heart Journal	51	9.800
Clinical Implant Dentistry and Related Research	51	2.452
Clinical Oral Implants Research	50	2.920
International Journal of Systematic and Evolutionary Microbiology	47	2.113
Acta Obstetrica et Gynecologica Scandinavica	47	1.618
Scandinavian Journal of Urology and Nephrology	46	0.883
Acta Oncologica	45	2.265
Proceedings of the National Academy of Sciences USA	41	9.432
Journal of Internal Medicine	40	5.942
Journal of Biological Chemistry	40	5.328
Acta Neurologica Scandinavica	40	2.324
Scandinavian Journal of Gastroenterology	39	2.084
Scandinavian Journal of Caring Sciences	39	0.686
Journal of Immunology	38	5.646
European Journal of Heart Failure	38	3.706

The 2009 journal impact factor (JIF) is calculated by Thomson Reuters as the average number of times that papers from the journal published in the past two years were cited in 2009. Thus, a JIF of 2.0 means that, on average, the papers published in 2007 or 2008 have been cited twice. Citing papers may be from the same journal but most citing papers are from other journals.

Table 4.3.2 lists the twenty journals with the highest JIF used more than once within the University of Gothenburg dataset. These include high-impact medical journals (New England Journal of Medicine, the Lancet) and elite multidisciplinary titles such as Science and Nature.

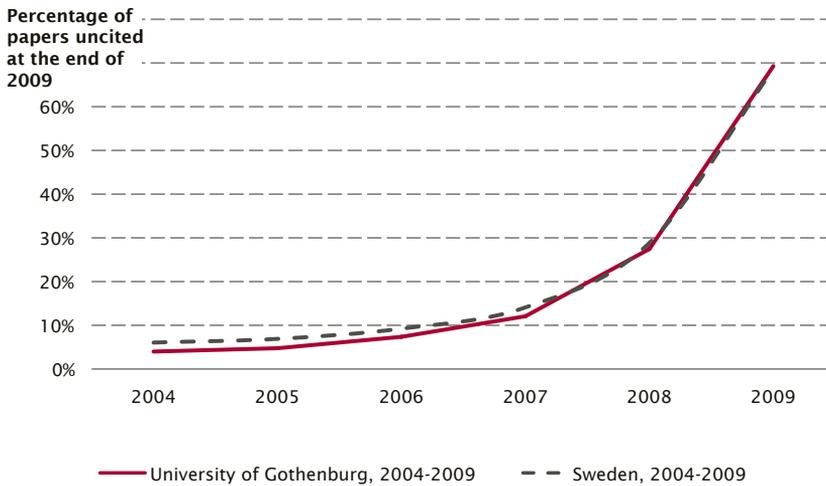
Table 4.3.2 Journals with high Journal Impact Factors in which University of Gothenburg researchers have published

Journal title (ranked by Journal Impact Factor for 2009)	Number of papers	Journal Impact Factor 2009
New England Journal of Medicine	15	47.050
Nature	8	34.480
Nature Genetics	8	34.284
Lancet	21	30.758
Science	11	29.747
JAMA - Journal of The American Medical Association	11	28.899
Nature Medicine	3	27.136
Nature Reviews Neuroscience	3	26.483
Immunity	2	20.589
Endocrine Reviews	3	19.761
Nature Cell Biology	4	19.527
Arthritis and Rheumatism-Arthritis Care and Research	5	18.255
Lancet Neurology	6	18.126
Journal of Clinical Oncology	4	17.793
Nature Methods	4	16.874
Journal of Clinical Investigation	11	15.387
Molecular Psychiatry	2	15.049
Circulation	29	14.816
Lancet Oncology	6	14.470
Nature Neuroscience	3	14.345

4.4 How many of the University of Gothenburg research publications are uncited?

Citations accumulate over time with more recent papers having less time to accumulate citations or to be cited. Figure 4.4 presents a comparison of uncited papers from the University of Gothenburg and from the Swedish national research base. It shows the percentage of papers published in each year by the University of Gothenburg, that remain uncited at the end of 2009.

Figure 4.4 Percentage of papers uncited at the end of 2009



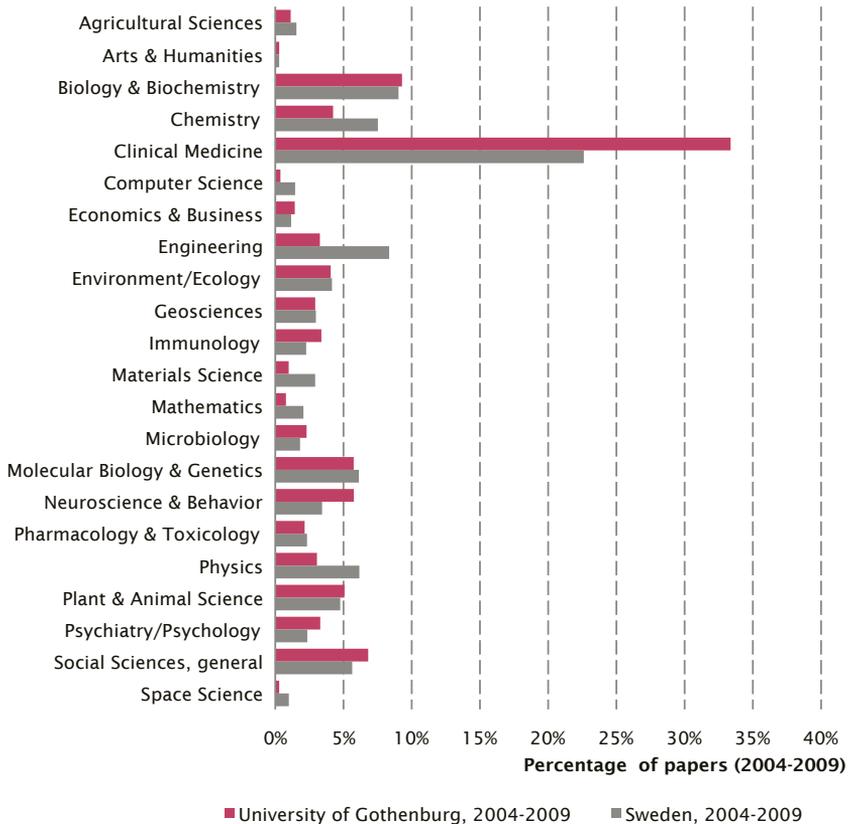
Overall, the performance is very close to the Swedish national research base with a similar percentage of the most recent papers remaining uncited. Prior to 2007, there are slightly lower percentages of uncited papers for the University of Gothenburg than for Sweden as a whole, indicating that papers published by the University of Gothenburg are slightly less likely to remain uncited over time.

4.5 In which fields does the University of Gothenburg publish most frequently?

Papers in the University of Gothenburg dataset have been mapped to 23 research fields using the ESI fields (see Annex 2 for details). This mapping is based on journal categories and these categories can be used a proxy for a research field or area (Annex 1).

Figure 4.5.1 shows the most frequently used ESI fields within the dataset. Raw paper counts for University of Gothenburg and the Swedish national research base are in Table 4.6.3).

Figure 4.5.1 Percentage of University of Gothenburg papers by field benchmarked against the Swedish national research base, 2004-2009



Just over a third of all papers in the dataset (33.4%) are published in journals associated with Clinical Medicine. This is a markedly higher percentage than in the Swedish national research base (22.6%). The next most frequently used field is Biology & Biochemistry (9.3%) which has a similar percentage nationally (9.0%). The University of Gothenburg publishes a relatively greater percentage of papers that fall within Neuroscience & Behavior (5.8% compared to 3.4%) than does the Swedish research base as a whole. By contrast, it publishes a smaller percentage within Chemistry (4.2% compared to 7.5%), Engineering (3.3% compared to 8.3%) and Physics (3.1% compared to 6.2%) than the Swedish national research base.

Table 4.5.1 compares paper count by ESI field for the first (2004-2006) and second (2007-2009) 3-year periods of the dataset. These data highlight trends in research activity.

Table 4.5.1 Trends in output for University of Gothenburg research, 2004-2009

Journal category	Number of papers (P)			Number of papers (P)
	2004-2006	2007-2009	Change†	2004-2009
Agricultural Sciences (AS)	82	106	↑	188
Arts & Humanities (AH)	22	26	↑	48
Biology & Biochemistry (BB)	747	798	↑	1,545
Chemistry (CH)	340	365	↑	705
Clinical Medicine (CM)	2,665	2,886	↑	5,551
Computer Science (CS)	27	36	↑	63
Economics & Business (EB)	86	152	↑	238
Engineering (EN)	250	294	↑	544
Environment/Ecology (EE)	309	367	↑	676
Geosciences (GE)	230	257	↑	487
Immunology (IM)	296	266	↓	562
Materials Science (MS)	73	91	↑	164
Mathematics (MA)	48	82	↑	130
Microbiology (MI)	208	174	↓	382
Molecular Biology & Genetics (MG)	462	494	↑	956
Neuroscience & Behavior (NB)	452	505	↑	957
Pharmacology & Toxicology (PT)	153	205	↑	358
Physics (PH)	269	239	↓	508
Plant & Animal Science (PA)	410	433	↑	843
Psychiatry/Psychology (PP)	253	295	↑	548
Social Sciences, general (SO)	430	703	↑	1,133
Space Science (SP)	20	28	↑	48
Overall	4,715	5,276	↑	9,991

† Change has been calculated as $(\sum \text{papers } 2007-2009 / \sum \text{papers } 2004-2006)$, where ↑ indicates a ratio of > 1.00 and ↓ indicates a ratio of < 1.00.

Overall, the number of papers has grown over the most recent three years of the 6-year time period as compared to the first three years. Growth has been sustained in all ESI fields with the exception of Immunology, Physics and Microbiology.

4.6 Is research published by the University of Gothenburg well-cited?

Citation rates vary between research fields and with time. Consequently, all analyses must take both field and year into account. In other words, because the absolute citation count for a specific article is influenced by its field and by the year it was

published, we can only make comparisons of indexed data after normalizing with reference to these two variables. In addition, the type of publication will influence the citation count. For example, a review will typically be cited more frequently than an article (**Report on the pilot exercise to develop bibliometric indicators for the Research Excellence Framework**. (2009), HEFCE) and both of these publication types will tend to be cited more than editorials or meeting abstracts. Only citation counts from articles and reviews are used in calculations of impact. The most common normalization factors are the average citations per paper for the year and either the field or journal in which the paper was published. As outlined in Annex 2, all citation counts for articles and reviews have been normalized by field to end-2009 citation counts to calculate the average field-normalized citation impact (\bar{C}_f).

The Figures and Tables in this Section present average field-normalized citation impact data for the University of Gothenburg dataset:

Figures 4.6.1a and 4.6.1b: show an analysis by research field of the output volume and average field-normalized citation impact for the full 6-year time period (2004-2009). These Figures illustrate particular research strengths of the University by visualizing citation impact against output volume.

Table 4.6.1: presents overall summary bibliometric indicators for the University of Gothenburg dataset benchmarked against the Swedish national research base for the full 6-year time period. These data will allow an assessment of the extent to which University of Gothenburg research is cited compared to the national benchmark.

Table 4.6.2: compares average field-normalized citation impact by research field over the first (2004-2006) and second (2007-2009) 3-year periods of the dataset. These data highlight trends in citation impact.

Table 4.6.3: presents summary bibliometric indicators by research field for the University of Gothenburg dataset benchmarked against the Swedish national research base for the full 6-year time period. These data will allow an assessment of the extent to which University of Gothenburg research in particular fields is cited compared to the national benchmark.

Table 4.6.1 presents overall summary bibliometric indicators for the University of Gothenburg dataset benchmarked against the Swedish national research base and illustrates the extent to which University of Gothenburg research is cited compared to the national benchmark.

Table 4.6.1 Summary of bibliometric indicators for University of Gothenburg research benchmarked against the Swedish national research base, 2004-2009

6-year time period, 2004-2009	P	%P _u	%C _{>exp}	\bar{C}_f
University of Gothenburg	9,991	22.2%	38.5%	1.32
Sweden	98,390	23.9%	37.3%	1.32

The overall normalized citation impact of University of Gothenburg research is comparable to the Swedish national research base for the 6-year time period. University of Gothenburg papers are slightly less likely to be uncited and slightly more likely to be more well-cited than expected than papers from the Swedish national research base. The latter indicator (%C_{>exp}) describes the percentage of papers that are cited more frequently than expected relative to the journal and year in which they are published.

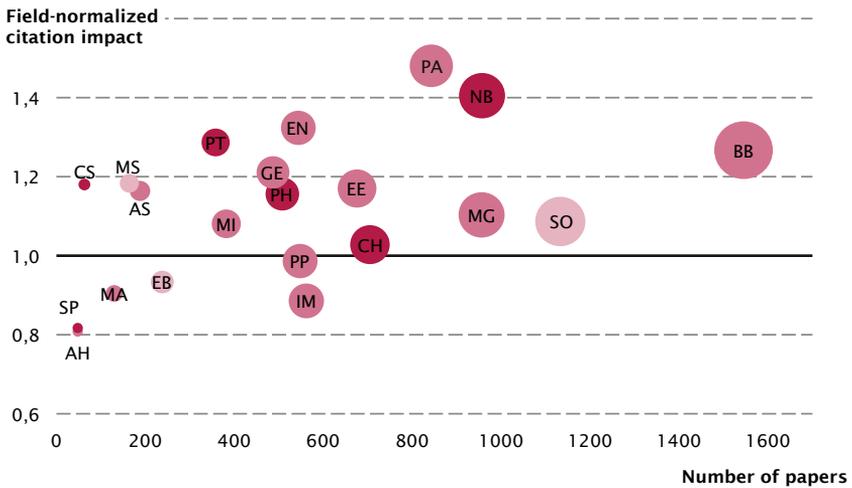
Figures 4.6.1a and 4.6.1b illustrate the research strengths of the University of Gothenburg within ESI fields by visualizing both the number of papers in a particular field and the average citation impact for the six years between 2004 and 2009. The area of each 'bubble' reflects the number of papers as a percentage share of the total dataset. The line at 1.0 represents world average citation impact. Figure 4.6.1a presents data for all ESI fields; Figure 4.6.1b is an expansion of the same dataset excluding the field of Clinical Medicine (CM).

Figure 4.6.1a Paper count and average citation impact by ESI field, including Clinical Medicine



Legend, see next page

Figure 4.6.1b Paper count and average citation impact by ESI field , excluding Clinical Medicine



AS	Agricultural Sciences	EE	Environment/Ecology	NB	Neuroscience & Behavior
AH	Arts & Humanities	GE	Geosciences	PT	Pharmacology & Toxicology
BB	Biology & Biochemistry	IM	Immunology	PH	Physics
CH	Chemistry	MS	Materials Science	PA	Plant & Animal Science
CM	Clinical Medicine	MA	Mathematics	PP	Psychiatry/Psychology
CS	Computer Science	MI	Microbiology	SO	Social Sciences, general
EB	Economics & Business	MG	Molecular Biology & Genetics	SP	Space Science
EN	Engineering	MU	Multidisciplinary		

Figures 4.6.1a and 4.6.1b show that the majority of fields in which the University of Gothenburg publishes perform, on average, above world-average citation impact. Just over a third (33.4%) of University of Gothenburg papers are published in the field of Clinical Medicine – this field is also among the highest in citation impact (Cf). A substantially lower percentage of research is published in the fields of Engineering (3.3%), Neuroscience & Behavior (5.8%) and Plant & Animal Science (5.1%) but this research is also well-cited.

Table 4.6.2 compares the average field-normalized citation impact aggregated by ESI field for the first (2004-2006) and second (2007-2009) 3-year periods of the dataset and illustrates changes in citation impact. These data should be considered in conjunction with the paper numbers given in Table 4.5.1.

Table 4.6.2 Trends in average citation impact for University of Gothenburg research, 2004-2009

Journal category	Average citation impact (\bar{c}_p)			Overall average citation impact (\bar{c}_p)
	2004-2006	2007-2009	Change†	2004-2009
Agricultural Sciences (AS)	1.27	1.08	↓	1.16
Arts & Humanities (AH)	0.24	1.29	↑	0.81
Biology & Biochemistry (BB)	1.33	1.20	↓	1.27
Chemistry (CH)	1.02	1.04	→	1.03
Clinical Medicine (CM)	1.39	1.44	↑	1.41
Computer Science (CS)	1.56	0.90	↓	1.18
Economics & Business (EB)	0.94	0.93	→	0.93
Engineering (EN)	1.26	1.38	↑	1.32
Environment/Ecology (EE)	1.21	1.14	↓	1.17
Geosciences (GE)	1.05	1.35	↑	1.21
Immunology (IM)	0.99	0.77	↓	0.89
Materials Science (MS)	1.22	1.16	↓	1.18
Mathematics (MA)	0.70	1.02	↑	0.90
Microbiology (MI)	0.99	1.19	↑	1.08
Molecular Biology & Genetics (MG)	0.98	1.22	↑	1.10
Neuroscience & Behavior (NB)	1.34	1.46	↑	1.40
Pharmacology & Toxicology (PT)	1.11	1.42	↑	1.29
Physics (PH)	1.06	1.27	↑	1.16
Plant & Animal Science (PA)	1.33	1.62	↑	1.48
Psychiatry/Psychology (PP)	0.96	1.01	↑	0.99
Social Sciences, general (SO)	1.09	1.08	→	1.09
Space Science (SP)	1.05	0.65	↓	0.82
Overall	1.27	1.36	↑	1.32

† Change has been calculated as $(\sum \text{papers } 2007-2009 / \sum \text{papers } 2004-2006)$,
 ↑ indicates a ratio of > 1.02 , → indicates a ratio < 1.02 but ≥ 0.98 and ↓ indicates a ratio of < 0.98 .

Average citation impact has increased over the last three years of the 6-year time period, 2004-2009 as compared to the first three years. Research in more than two-thirds of individual fields has increased in average citation impact (\bar{c}_p).

The increase in average citation impact in the fields of Physics and Microbiology is associated with a decrease in volume output (Table 4.5.1), potentially indicating selectivity or concentration in these areas.

The average citation impact of research in Mathematics has increased substantially over the period of comparison, however, paper numbers are relatively low meaning any increase in citation impact should be interpreted with caution.

Paper numbers in the fields of Computer Science, Arts & Humanities and Space Science are too low (less than 50) for a meaningful comparison of citation impact.

Table 4.6.3 presents summary bibliometric indicators by ESI field for the University of Gothenburg dataset benchmarked against the Swedish national research base and illustrates the extent to which University of Gothenburg research in particular fields is cited compared to the national benchmark. It should be noted that no papers in the University of Gothenburg dataset are assigned to journal categories used by the ‘Multidisciplinary’ ESI field but there are papers in this category in the Swedish national dataset (Table 4.6.3).

Table 4.6.3 Summary of bibliometric indicators for University of Gothenburg research by ESI field benchmarked against the Swedish national research base, 2004-2009

6-year time period, 2004-2009	P	%P _u	%C _{>exp}	\bar{c}_f
Agricultural Sciences (University of Gothenburg)	188	21.8%	37.8%	1.16
Agricultural Sciences (Sweden)	2,556	22.6%	38.9%	1.45
Arts & Humanities (University of Gothenburg)	48	89.6%	50.0%	0.81
Arts & Humanities (Sweden)	472	83.9%	44.5%	1.06
Biology & Biochemistry (University of Gothenburg)	1,545	17.9%	37.5%	1.27
Biology & Biochemistry (Sweden)	14,895	16.6%	37.8%	1.22
Chemistry (University of Gothenburg)	705	20.1%	29.2%	1.03
Chemistry (Sweden)	12,401	19.9%	35.3%	1.25
Clinical Medicine (University of Gothenburg)	5,551	19.7%	39.5%	1.41
Clinical Medicine (Sweden)	37,283	20.6%	38.7%	1.34
Computer Science (University of Gothenburg)	63	36.5%	36.5%	1.18
Computer Science (Sweden)	2,401	42.0%	32.7%	1.33
Economics & Business (University of Gothenburg)	238	45.4%	34.9%	0.93
Economics & Business (Sweden)	1,921	44.0%	33.2%	1.02
Engineering (University of Gothenburg)	544	24.8%	36.8%	1.32
Engineering (Sweden)	13,762	32.3%	34.3%	1.24

6-year time period, 2004-2009	P	%P_u	%C_{>exp}	\bar{c}_f
Environment/Ecology (University of Gothenburg)	676	21.3%	36.4%	1.17
Environment/Ecology (Sweden)	6,852	21.0%	40.0%	1.39
Geosciences (University of Gothenburg)	487	18.9%	35.5%	1.21
Geosciences (Sweden)	4,909	22.4%	39.6%	1.39
Immunology (University of Gothenburg)	562	17.1%	37.4%	0.89
Immunology (Sweden)	3,735	18.1%	37.9%	1.01
Materials Science (University of Gothenburg)	164	25.0%	34.1%	1.18
Materials Science (Sweden)	4,821	30.2%	34.0%	1.27
Mathematics (University of Gothenburg)	130	45.4%	28.5%	0.90
Mathematics (Sweden)	3,403	38.7%	31.9%	1.10
Microbiology (University of Gothenburg)	382	16.2%	39.3%	1.08
Microbiology (Sweden)	2,996	16.7%	39.1%	1.12
Molecular Biology & Genetics (University of Gothenburg)	956	17.3%	36.3%	1.10
Molecular Biology & Genetics (Sweden)	10,100	14.9%	38.1%	1.23
Multidisciplinary (University of Gothenburg)	0	n/a	n/a	n/a
Multidisciplinary (Sweden)	64	23.4%	21.9%	2.48
Neuroscience & Behavior (University of Gothenburg)	957	15.5%	41.5%	1.40
Neuroscience & Behavior (Sweden)	5,658	16.7%	39.5%	1.28
Pharmacology & Toxicology (University of Gothenburg)	358	19.0%	38.0%	1.29
Pharmacology & Toxicology (Sweden)	3,836	17.6%	40.0%	1.44
Physics (University of Gothenburg)	508	20.9%	33.5%	1.16
Physics (Sweden)	10,159	23.1%	34.6%	1.47
Plant & Animal Science (University of Gothenburg)	843	18.6%	38.1%	1.48
Plant & Animal Science (Sweden)	7,850	22.9%	40.1%	1.37
Psychiatry/Psychology (University of Gothenburg)	548	23.5%	40.5%	0.99
Psychiatry/Psychology (Sweden)	3,870	25.4%	37.8%	1.03
Social Sciences, general (University of Gothenburg)	1,133	37.2%	38.2%	1.09
Social Sciences, general (Sweden)	9,297	36.3%	36.5%	1.14
Space Science (University of Gothenburg)	48	25.0%	35.4%	0.82
Space Science (Sweden)	1,639	16.7%	38.6%	1.32

Research in the fields of Clinical Medicine, Biology & Biochemistry, Neuroscience & Behavior, Plant & Animal Science and Engineering is cited relatively more frequently than is typical for the Swedish national research base.

Research in fields including Chemistry, Environment/Ecology, Physics, Agricultural Sciences and Mathematics is cited relatively less frequently than the Swedish national research base.

The higher relative citation impact in Engineering is notable since the University of Gothenburg publishes a relatively lower percentage of research in this field than does the Swedish research base as a whole (Section 4.5). The University of Gothenburg also publishes a relatively lower percentage of research than the Swedish national research base in the field of Chemistry. In this field, however, research published by the University of Gothenburg has lower relative citation impact.

For the University of Gothenburg, paper numbers in the fields of Arts & Humanities and Space Science are relatively low and indicators for these should be interpreted with caution.

4.7 Impact Profile® for University of Gothenburg papers

Impact Profiles® enable an examination and analysis of the balance of published outputs relative to world average and relative to a reference profile (**Profiling citation impact: A new methodology** (2007), Adams J, *et al.*). This provides much more information about the basis and structure of research performance than conventionally reported averages in citation indices.

An Impact Profile® shows what proportion of papers are uncited and what proportion are in each of eight categories of relative citation rates, normalized to world average (which becomes 1.0 in this graph). Normalized citation rates above 1.0 indicate papers cited more often than world average for the field in which that journal is categorized and in their year of publication.

Attention should be paid to:

- The proportion of uncited papers on the left of the chart
- The proportion of cited papers either side of world average (1.0)
- The location of the most common (modal) group near the centre
- The proportion of papers in the most highly-cited categories to the right, (≥ 4 x world, ≥ 8 x world).

What are uncited papers?

It may be a surprise that some papers are never subsequently cited after publication, even by their authors. This accounts for about half the total global output and almost one quarter of UK output. We cannot tell why papers are not cited. It is likely that a significant proportion of papers remain uncited because they are reporting negative results which are an essential matter of record in their field but make the content less likely to be referenced in other papers. Inevitably, other papers are uncited because their content is trivial or marginal to the mainstream or plain wrong. It should not be assumed that this is the case for all such papers.

There is variation in non-citation between countries and between fields. On the whole, relatively more engineering papers tend to remain uncited than papers in other sciences, indicative of a disciplinary factor as well as a quality/significance factor. There is also an obvious increase in the likelihood of citation over time but most papers that are going to be cited will be cited within a few years of publication.

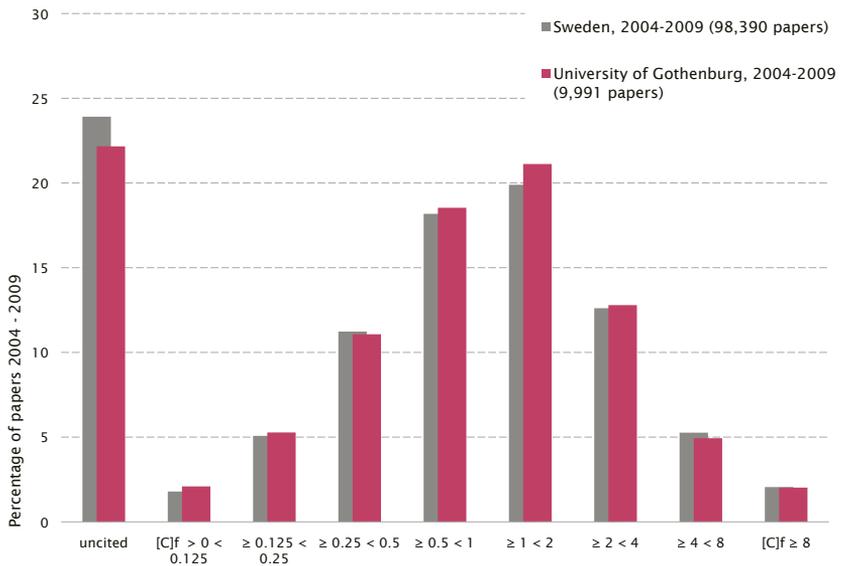
We work on the assumption that relative non-citation rates within a field are one of the indicators of the extent to which a body of work is regarded by others in the same field to be of greater or lesser significance to their subsequent work.

What is the threshold for 'highly cited'?

Thomson Reuters has traditionally used the term 'Highly Cited Paper' to refer to the world's 1% of most frequently cited papers, taking into account year of publication and field. In rough terms, UK papers cited more than 8 times as often as relevant world average would fall into the Thomson Reuters Highly Cited category. About 1-2% of papers (all papers, cited or uncited) typically pass this hurdle. Such a threshold certainly delimits exceptional papers for international comparisons but, in practice, is an onerous marker for more general management purposes.

After reviewing the outcomes of a number of analyses, we have chosen a more relaxed definition for our descriptive and analytical work. We deem papers that are cited more often than 4 times the relevant world average to be relatively highly-cited for national comparisons. This covers the two most highly-cited categories in our graphical analyses. About 5% of total UK papers typically pass this hurdle.

Figure 4.7.1 Impact Profile® for University of Gothenburg research benchmarked against the Swedish national research base, 2004-2009



- A slightly higher percentage of University of Gothenburg research (40.9%) is at least above the world average ($C_f \geq 1.0$) in comparison with the Swedish national research base (39.8%).
- A slightly lower percentage of University of Gothenburg research (22.1%) is uncited in comparison with the Swedish national research base (23.9%).
- The modal impact category for cited papers is $C_f \geq 1 < 2$ for both University of Gothenburg research and the Swedish national research base.
- Overall, the Impact Profile® for University of Gothenburg research is similar to the Swedish national research base.

5. BIBLIOMETRIC ANALYSES OF UNIVERSITY OF GOTHENBURG ACADEMIC UNITS, 2004-2009

This Section evaluates the performance of panels and departments within the University of Gothenburg using a variety of aggregated bibliometric indicators for the period 2004-2009. As in the previous Section these analyses only include articles and reviews (papers) which have been linked to Thomson Reuters Web of KnowledgeSM in the University of Gothenburg database. It is not meaningful to draw conclusions where the departmental output of papers is less than 50; the aggregation units which fall below this threshold are indicated in grey in the analysis. The indicators used in this Section are as follows:

- Number of papers (P) – the total number of article and review document types which have been linked to Thomson Reuters Web of KnowledgeSM database.
- Number of citations (C) – the sum of the citations received by the papers which have been linked to Thomson Reuters Web of KnowledgeSM database (see P).
- Percentage of papers not cited (%P_u) – the percentage of papers which have been linked to Thomson Reuters Web of KnowledgeSM database that are uncited.
- Percentage of research cited more than expected (%C_{>exp}) – the percentage of papers which have been linked to Thomson Reuters Web of KnowledgeSM database that are cited more than expected relative to the journal in which they are published.
- Average field-normalized citation impact (C_f) – the average citation impact relative to the world citation average for the appropriate journal categories. A value of less than 1.0 indicates below-average performance.
- Percentage of papers that are highly-cited (%C_{Hi}) – the percentage of papers that have a paper-level average normalized citation impact of at least four-times the world average.
- Percentage of papers in the world's top 10% (Top10%) – the percentage of the academic unit's papers in the world's top 10% by citations relative to the appropriate journal category. A value of less than 10% indicates a below-average performance.

Papers published in the arts and humanities and the social sciences are typically cited less frequently than papers in natural sciences and engineering. Articles and reviews are not necessarily the preferred modes of research communication for these disciplines. In addition, coverage in Thomson Reuters Web of KnowledgeSM may be less comprehensive for the arts and humanities and for the social sciences than the natural sciences. Therefore, caution should be used when comparing results in bibliometric analysis.

Data presented in the following Tables have been restricted to papers from the University of Gothenburg publications (GUP) database where the database year on the Thomson Reuters Web of KnowledgeSM is between 2004 and 2009. This has meant the exclusion of those GUP database papers with a publication year outside this period. This provides a consistent basis for comparison with global data. In the vast majority of cases, these differences are relatively insignificant but may visibly affect paper counts at departmental level.

Departmental data do not sum to overall panel data and departments and panels can contain duplicate records due to intra-university collaboration. For example, one paper could be co-authored by two departments (or two panels). When counting the number of papers for each department or panel, the paper would be attributed to each, however, such a paper would be counted only once when aggregated at the panel level. If the output at the departmental or panel level were summed, it would equal two. This approach attributes papers without estimating fractional contribution and cannot be used to calculate sums from the parts.

5.1 Bibliometric analysis by panel aggregation

Table 5.1.1 shows the bibliometric indicators for the University of Gothenburg aggregated by panel and by department.

Table 5.1.1 Bibliometric indicators for the University of Gothenburg by panel and department

Panel/department	P	C	%P _u	%C _{>exp}	\bar{c}_f	%C _{hi}	Top 10%
Panel 1 – Philosophy, linguistics and language technology	45	54	75,6%	24.4%	0.67	6.7%	8.9%
Department of Computer Science and Engineering (GU)	13	26	76,9%	30.8%	0.97	7.7%	7.7%
Philosophy, Linguistics and Theory of Science	32	28	75,0%	21.9%	0.56	6.3%	9.4%
Department of Swedish	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Panel 2 – Non-Swedish languages and literature	39	3	94,9%	5.1%	0.09	0.0%	0.0%
Department of Language and Literature	39	3	94,9%	5.1%	0.09	0.0%	0.0%
Panel 3 – Culture, religion and historical studies	31	44	83,9%	9,7%	0,44	3,2%	0,0%
Department of Conservation	3	0	75,0%	0,0%	0	0,0%	0,0%
Department of Cultural Sciences	4	6	81,8%	0,0%	0,26	0,0%	0,0%
Department of Historical Studies	11	35	85,7%	0,0%	0,33	0,0%	0,0%
Department of Literature, History of Ideas and Religion	14	3	100,0%	21,4%	0,64	7,1%	0,0%
Panel 4 – Education	88	224	48,9%	33.0%	1.09	2.3%	5.7%
Department of Education	62	91	53,2%	19.4%	1.01	3.2%	3.2%
Department of Food, Health and Environment	8	88	25,0%	50.0%	1.53	0.0%	12.5%
Department of Work Science	18	45	44,4%	72.2%	1.16	0.0%	11.1%
Panel 5 – Music, drama and literature	4	5	100,0%	50.0%	7.79	50.0%	50.0%
Academy of Music and Drama	2	1	100,0%	50.0%	8.50	50.0%	50.0%
Department of Literary Composition, Poetry and Prose	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Göteborg Organ Art Center	2	4	100,0%	50.0%	7.07	50.0%	50.0%
School of Film Directing	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Panel 6 – Fine and applied arts	2	3	50,0%	0.0%	0.42	0.0%	0.0%
School of Design and Crafts	2	3	50,0%	0.0%	0.42	0.0%	0.0%
School of Photography	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Valand School of Fine Arts	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Panel 7 – Biology	1,199	9,972	27,0%	37.2%	1.46	6.3%	14.4%
Department of Cell and Molecular Biology	248	2,578	22,6%	30.2%	1.21	5.6%	10.5%
Department of Marine Ecology	355	2,777	26,8%	36.9%	1.70	7.6%	16.9%
Department of Plant and Environmental Sciences	294	2,397	28,6%	38.1%	1.60	7.5%	16.3%
Department of Zoology	371	2,712	28,0%	42.3%	1.34	5.1%	14.8%

BIBLIOMETRIC ANALYSIS

Table 5.1.1 continued

Panel/department	P	C	%P _u	%C _{exp}	\bar{c}_f	%C _{hi}	Top 10%
Panel 8 – Chemistry and earth sciences	937	6,427	29,3%	32.8%	1.29	7.0%	13.0%
Department of Chemistry	649	4,655	29,4%	32.2%	1.33	7.6%	13.1%
Department of Earth Sciences	268	1,446	30,2%	35.8%	1.17	5.6%	11.6%
Swedish NMR Centre at Göteborg University	37	439	16,2%	24.3%	1.41	5.4%	18.9%
Panel 9 – Mathematics and physics	531	3,507	35,0%	33.7%	1.27	6.2%	13.7%
Department of Mathematical Sciences	68	288	54,4%	33.8%	1.30	7.4%	10.3%
Department of Physics	463	3,219	32,2%	33.7%	1.27	6.0%	14.3%
Panel 10 – Social sciences	484	2,131	41,3%	34.3%	0.95	3.5%	9.3%
Center for Public Sector Research (CEFOS)	13	20	46,2%	38.5%	0.55	0.0%	7.7%
Department of Journalism, Media and Communication	1	0	100,0%	0.0%	0.00	0.0%	0.0%
Department of Political Science	39	113	53,8%	38.5%	1.73	15.4%	23.1%
Department of Psychology	316	1,799	33,2%	37.7%	1.00	2.8%	9.8%
Department of Social Work	37	91	56,8%	24.3%	0.56	0.0%	8.1%
Department of Sociology	36	35	69,4%	16.7%	0.53	2.8%	2.8%
School of Global Studies	40	77	47,5%	32.5%	0.85	5.0%	5.0%
School of Public Administration	8	8	62,5%	25.0%	0.65	0.0%	0.0%
Panel 11 – Biomedicine	1,295	14,698	20,4%	36.1%	1.26	5.6%	11.4%
Clinical Chemistry and Transfusion Medicine	150	1,460	22,0%	38.0%	1.28	4.0%	11.3%
Department of Infectious Medicine	340	2,991	22,9%	36.2%	1.03	4.4%	8.8%
Department of Medical Biochemistry and Cell Biology	369	5,803	19,0%	33.1%	1.42	7.3%	14.4%
Department of Medical Genetics	73	610	23,3%	28.8%	1.53	4.1%	6.8%
Department of Microbiology and Immunology	315	2,930	20,6%	36.5%	1.03	3.8%	8.6%
Department of Pathology	164	2,452	20,1%	39.0%	1.61	9.8%	15.9%
Panel 12 – Clinical sciences	2,159	20,119	25,0%	41.3%	1.52	7.4%	14.5%
Anesthesiology, Biomaterials and Orthopaedics	504	5,289	22,4%	46.2%	1.94	10.1%	18.3%
Dermatology, Plastic Surgery and Otorhinolaryngology	196	1,252	25,0%	44.4%	1.21	5.1%	10.2%
Oncology, Radiation Physics, Radiology and Urology	464	3,546	27,2%	34.7%	1.23	3.7%	9.7%
Section for Surgery	315	3,150	25,1%	34.3%	1.39	5.1%	9.5%
Section for the Health of Women and Children	856	8,150	24,8%	42.1%	1.51	8.3%	15.3%
Panel 13 – Health and care sciences	245	889	42,9%	34.7%	0.95	3.3%	5.7%
Institute of Health and Care Sciences	245	889	42,9%	34.7%	0.95	3.3%	5.7%

Table 5.1.1 continued

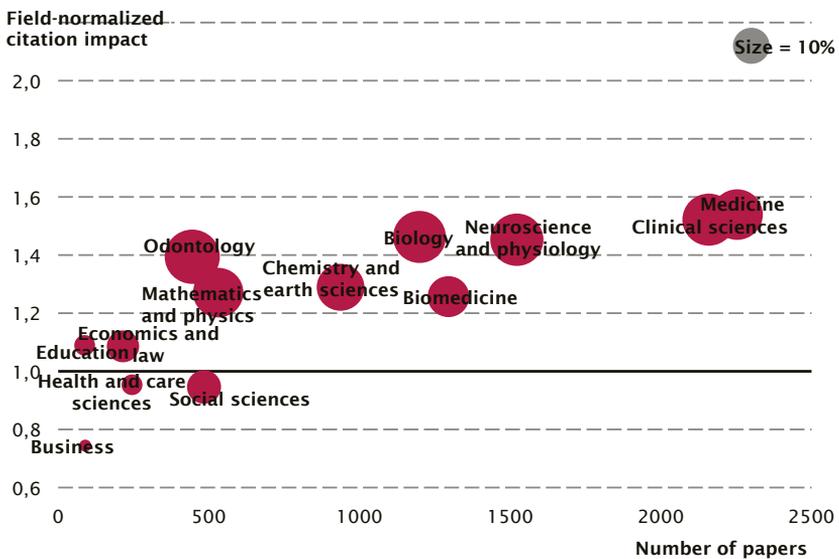
Panel/department	P	C	%P _u	%C _{>exp}	\bar{c}_f	%C _{hi}	Top 10%
Panel 14 – Medicine	2,253	29,843	22,7%	38.6%	1.54	6.9%	14.0%
Centre for Bone and Arthritis Research	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Department of Clinical Nutrition	95	758	23,2%	38.9%	1.00	4.2%	8.4%
Department of Clinical Trials and Entrepreneurship	35	759	17,1%	42.9%	3.96	5.7%	8.6%
Department of Emergency and Cardiovascular Medicine	494	9,587	16,4%	42.3%	1.93	9.9%	19.2%
Department of Internal Medicine	714	10,483	18,6%	38.9%	1.42	6.4%	14.1%
Department of Molecular and Clinical Medicine	438	4,675	29,2%	36.1%	1.82	6.2%	11.6%
Department of Public Health and Community Medicine	489	4,185	32,5%	39.5%	1.39	6.7%	13.3%
Department of Rheumatology and Inflammation Research	245	2,096	19,6%	30.6%	0.92	3.3%	7.8%
Krefting Research Centre	12	6	75,0%	25.0%	0.89	0.0%	0.0%
Wallenberg Laboratory	255	3,112	19,2%	37.3%	1.32	5.1%	14.9%
Panel 15 – Neuroscience and physiology	1,522	14,823	25,4%	39.9%	1.45	7.5%	14.5%
Department of Clinical Neuroscience and Rehabilitation	744	6,699	26,5%	37.4%	1.27	5.8%	12.2%
Department of Pharmacology	182	1,228	23,6%	41.2%	1.28	6.0%	9.9%
Department of Physiology	344	3,609	21,2%	39.0%	1.34	6.4%	12.8%
Department of Psychiatry and Neurochemistry	432	4,888	25,2%	46.3%	1.92	11.6%	20.8%
Panel 16 – Odontology	445	3,497	27,6%	39.8%	1.39	9.4%	15.1%
Institute of Odontology	445	3,497	27,6%	39.8%	1.39	9.4%	15.1%
Panel 17 – Business	90	107	62,2%	23.3%	0.74	4.4%	3.3%
Department of Applied Information Technology (GU)	16	15	68,8%	18.8%	0.69	6.3%	0.0%
Department of Business Administration	51	58	64,7%	19.6%	0.77	5.9%	5.9%
Gothenburg Research Institute (GRI)	33	60	45,5%	33.3%	1.03	3.0%	6.1%
Institute for Innovation and Entrepreneurship	2	0	100,0%	0.0%	0.00	0.0%	0.0%
Panel 18 – Economics and law	215	567	47,0%	34.0%	1.09	6.5%	8.8%
Centre for Finance	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Department of Economic History	4	2	75,0%	25.0%	0.58	0.0%	0.0%
Department of Economics	192	529	46,9%	34.4%	1.08	6.8%	9.4%
Department of Human and Economic Geography	15	28	46,7%	33.3%	0.99	0.0%	0.0%
Department of Law	4	8	25,0%	25.0%	2.26	25.0%	25.0%

The output of papers from individual academic units is compared with their average field-normalized citation impact using ‘bubble charts’, which provide a convenient way to highlight those departments which have high output and high impact, low output and low impact, and so on.

- The X-axis on these diagrams refers to the number of papers (P) where P is at least 50.
- The Y-axis refers to the average field-normalized citation impact (\bar{C}_p) where 1.0 is equal to the field-normalized citation impact average.
- The width of the ‘bubble’ refers to the percentage of papers in the world’s top 10% (Top10%) by citations relative to the appropriate journal category. Each diagram contains a reference bubble (in grey) which is scaled to exactly 10%, i.e. the world reference benchmark.

Figure 5.1.1 visualizes panel data from Table 5.1.1. In the commentary in this Section and sub sections of Section 5.2) we use the term ‘exceptional’ or ‘outstanding’ to indicate an average citation impact increase of at least 0.4 and the term ‘well’ to indicate an average citation impact value of ± 0.2 .

Figure 5.1.1 Paper count, average citation impact and share of papers in the world’s top 10% by panel, 2004-2009



In order of size, Panel 14 – Medicine (1.54), Panel 12 – Clinical sciences (1.52), Panel 7 – Biology (1.46) and Panel 15 – Neuroscience and physiology (1.45) stand out as having both a large number of papers and high average field-normalized cita-

tion impact. Panel 16 – Odontology also has a high average citation impact (1.39) though it has a smaller output of papers.

Panel 8 – Chemistry and earth sciences (1.29), Panel 9 – Mathematics and physics (1.27) and Panel 11 – Biomedicine (1.26) are well above world average citation impact.

Panel 18 – Economics and law, Panel 4 – Education and Panel 10 – Social sciences are around the world average. Panel 17 – Business, with an average citation impact of 0.74 falls well below the world average.

5.2 Bibliometric analysis by panels and departments

The following sections of this report present the panel and department data together in order to analyze departmental areas of relative strength and weakness. They show:

- A summary data Table for the panel and its constituent departments;
- A ‘bubble’ chart showing the relative performance for the panel and its constituent departments where sufficient papers are available.

Figures in Section 5.2 visualize departmental data for individual panels. The axes are set to identical scales throughout in order to visualize differences between panels, and between departments and panels. Panels are shaded in dark red, and departments are shaded in light red.

5.2.1 Philosophy, linguistics and language technology (Panel 1)

Panel/department	P	C	P_u	$C_{>exp}$	\bar{c}_f	C_{hi}	Top10%
Philosophy, linguistics and language technology	45	54	75,6%	24.4%	0.67	6.7%	8.9%
Department of Computer Science and Engineering (GU)	13	26	76,9%	30.8%	0.97	7.7%	7.7%
Philosophy, Linguistics and Theory of Science	32	28	75,0%	21.9%	0.56	6.3%	9.4%
Department of Swedish	0	0	0,0%	0.0%	0.00	0.0%	0.0%

There are insufficient papers for meaningful analysis at either the panel or departmental level.

5.2.2 Non-Swedish languages and literature (Panel 2)

Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Non-Swedish languages and literature	39	3	94,9%	5.1%	0.09	0.0%	0.0%
Department of Language and Literature	39	3	94,9%	5.1%	0.09	0.0%	0.0%

There are insufficient papers for meaningful analysis at either the panel or departmental level.

5.2.3 Culture, religion and historical studies (Panel 3)

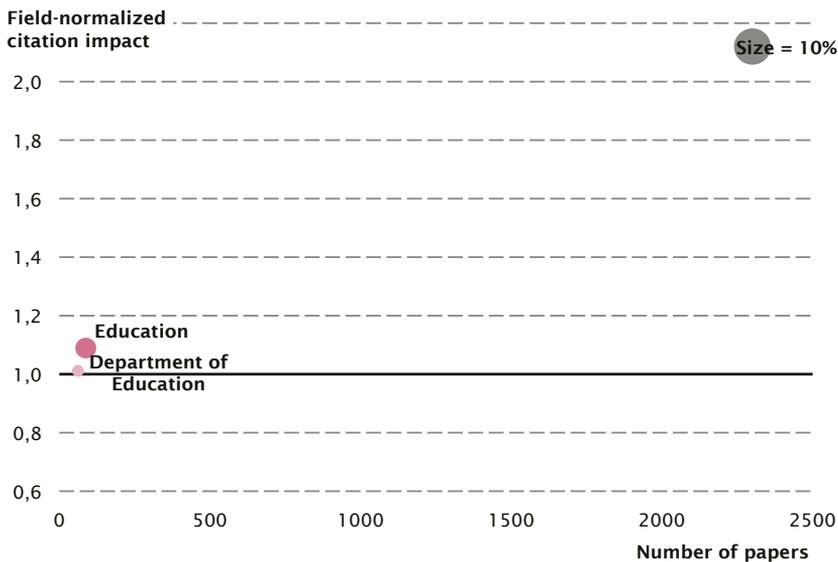
Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Culture, religion and historical studies	31	44	83,9%	9,7%	0,44	3,2%	0,0%
Department of Conservation	3	0	100,0%	0,0%	0	0,0%	0,0%
Department of Cultural Sciences	4	6	75,0%	0,0%	0,26	0,0%	0,0%
Department of Historical Studies	11	35	81,8%	0,0%	0,33	0,0%	0,0%
Department of Literature, History of Ideas and Religion	14	3	85,7%	21,4%	0,64	7,1%	0,0%

There are insufficient papers for meaningful analysis at either the panel or departmental level.

5.2.4 Education (Panel 4)

Panel/department	P	C	P_u	$C_{>exp}$	\bar{c}_f	C_{hi}	Top10%
Education	88	224	48,9%	33.0%	1.09	2.3%	5.7%
Department of Education	62	91	53,2%	19.4%	1.01	3.2%	3.2%
Department of Food, Health and Environment	8	88	25,0%	50.0%	1.53	0.0%	12.5%
Department of Work Science	18	45	44,4%	72.2%	1.16	0.0%	11.1%

Figure 5.2.4 Paper count, average citation impact and share of papers in the world's top 10% within Panel 4, 2004-2009



The Education panel performs slightly above the world average level in terms of average field-normalized citation impact (1.09).

The constituent Department of Education performs at the world average on this indicator (1.01). The samples of papers are insufficient to conduct meaningful analysis on the Department of Food, Health & Environment and the Department of Work Science. The data may nonetheless indicate that the average citation impact of the Education panel is raised, at least in part, by these departments.

The share of papers in the top 10% worldwide is low for the overall panel of Education (5.7%) and the Department of Education (3.2%)

5.2.5 Music, drama and literature (Panel 5)

Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Music, drama and literature	4	5	48,9%	50.0%	7.79	50.0%	50.0%
Academy of Music and Drama	2	1	53,2%	50.0%	8.50	50.0%	50.0%
Department of Literary Com- position, Poetry and Prose	0	0	25,0%	0.0%	0.00	0.0%	0.0%
Göteborg Organ Art Center	2	4	44,4%	50.0%	7.07	50.0%	50.0%
School of Film Directing	0	0	0.0%	0.0%	0.00	0.0%	0.0%

There are insufficient papers for meaningful analysis at either the panel or departmental level.

5.2.6 Fine and applied arts (Panel 6)

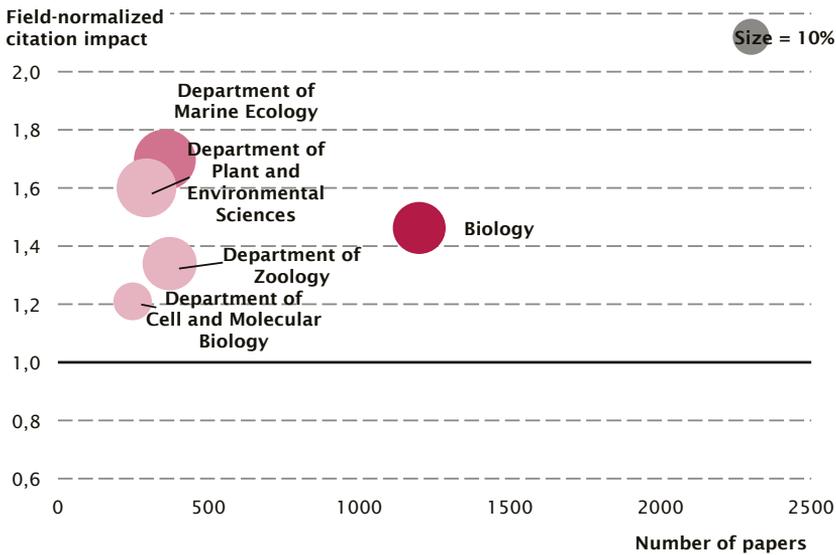
Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Fine and applied arts	2	3	50,0%	0.0%	0.42	0.0%	0.0%
School of Design and Crafts	2	3	50,0%	0.0%	0.42	0.0%	0.0%
School of Photography	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Valand School of Fine Arts	0	0	0,0%	0.0%	0.00	0.0%	0.0%

There are insufficient papers for meaningful analysis at either the panel or departmental level.

5.2.7 Biology (Panel 7)

Panel/department	P	C	P _u	C _{-exp}	c _f	C _{hi}	Top10%
Biology	1,199	9,972	27,0%	37.2%	1.46	6.3%	14.4%
Department of Cell and Mo- lecular Biology	248	2,578	22,6%	30.2%	1.21	5.6%	10.5%
Department of Marine Ecol- ogy	355	2,777	26,8%	36.9%	1.70	7.6%	16.9%
Department of Plant and Environmental Sciences	294	2,397	28,6%	38.1%	1.60	7.5%	16.3%
Department of Zoology	371	2,712	28,0%	42.3%	1.34	5.1%	14.8%

Figure 5.2.7 Paper count, average citation impact and share of papers in the world's top 10% within Panel 7, 2004-2009



The panel of Biology appears as an area of strength for the University of Gothenburg with an average field-normalized citation impact of 1.46, well above world average. It has 14.4% of its papers in the top 10% worldwide.

At a departmental level, the Department of Marine Ecology and the Department of Plant & Environmental Sciences stand out with well above world average citation impacts of 1.70 and 1.60. These departments have 16.9% and 16.3% of their papers in the top 10% worldwide.

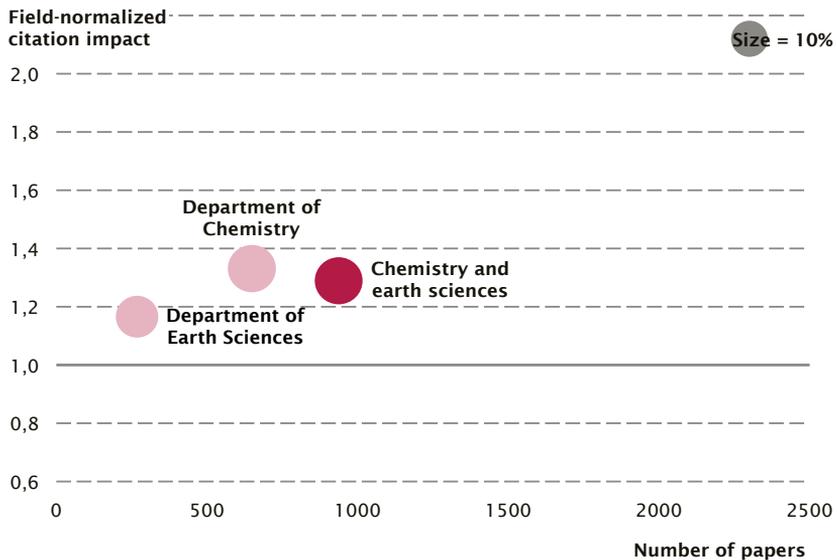
Some 7.6% of the papers of the Department of Marine Ecology are cited more than four times world average. The figure is 7.5% for the Department of Plant and Environmental Sciences.

The Department of Zoology and the Department of Cell and Molecular Biology perform well above world average citation impact (1.34 and 1.21 respectively). The Department of Zoology has 14.8% of its papers in the top 10% worldwide.

5.2.8 Chemistry and earth sciences (Panel 8)

Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Chemistry and earth sciences	937	6,427	29,3%	32.8%	1.29	7.0%	13.0%
Department of Chemistry	649	4,655	29,4%	32.2%	1.33	7.6%	13.1%
Department of Earth Sciences	268	1,446	30,2%	35.8%	1.17	5.6%	11.6%
Swedish NMR Centre at Göteborg University	37	439	16,2%	24.3%	1.41	5.4%	18.9%

Figure 5.2.8 Paper count, average citation impact and share of papers in the world's top 10% within Panel 8, 2004-2009



The Chemistry and earth sciences panel has a well above world average citation impact at 1.29 and 13% of its papers in the top 10% worldwide.

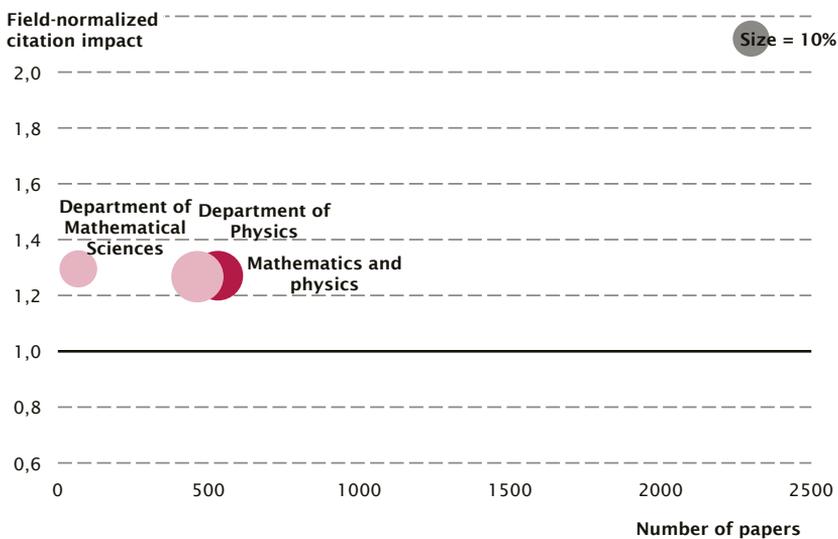
The Department of Chemistry has a higher average citation impact (1.33) than the Department of Earth Sciences (1.17). The Department of Chemistry has 13.1% and the Department of Earth Sciences has 11.6% of their papers in the top 10% worldwide.

The Swedish NMR Centre is not shown in Figure 5.2.8 due to a low volume of papers.

5.2.9 Mathematics and physics (Panel 9)

Panel/department	P	C	P_u	$C_{>exp}$	\bar{c}_f	C_{hi}	Top10%
Mathematics and physics	531	3,507	35,0%	33.7%	1.27	6.2%	13.7%
Department of Mathematical Sciences	68	288	54,4%	33.8%	1.30	7.4%	10.3%
Department of Physics	463	3,219	32,2%	33.7%	1.27	6.0%	14.3%

Figure 5.2.9 Paper count, average citation impact and share of papers in the world's top 10% within Panel 9, 2004-2009



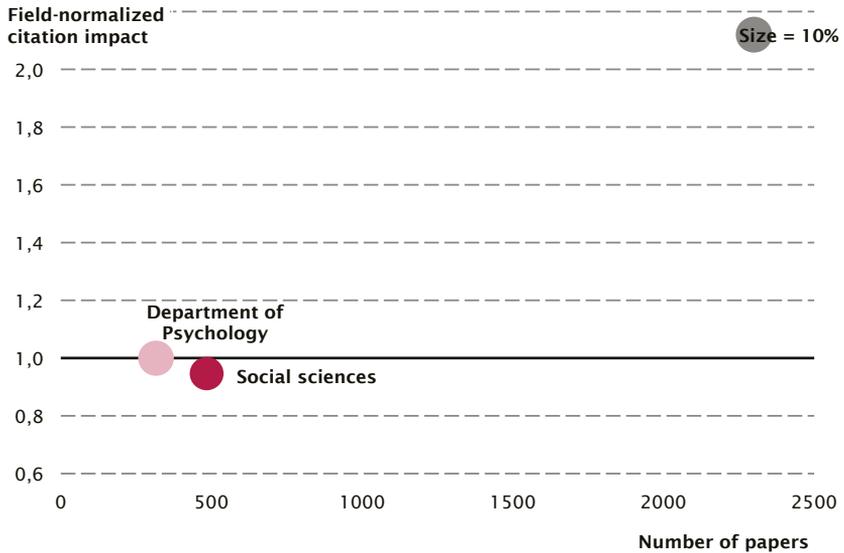
The Mathematics and physics panel performs well above the world average with an average field-normalized citation impact of 1.27 and with 13.7% of its papers in the top 10% worldwide.

The Department of Mathematical Sciences performs well above average with an average citation impact of 1.30, but it does, however, have a small number of papers (68). The Department of Physics also performs well above average with an average citation impact of 1.27.

5.2.10 Social sciences (Panel 10)

Panel/department	P	C	P _u	C _{>exp}	\bar{C}_f	C _{hi}	Top10%
Social sciences	484	2,131	41,3%	34.3%	0.95	3.5%	9.3%
Center for Public Sector Research (CEFOS)	13	20	46,2%	38.5%	0.55	0.0%	7.7%
Department of Journalism, Media and Communication	1	0	100,0%	0.0%	0.00	0.0%	0.0%
Department of Political Science	39	113	53,8%	38.5%	1.73	15.4%	23.1%
Department of Psychology	316	1,799	33,2%	37.7%	1.00	2.8%	9.8%
Department of Social Work	37	91	56,8%	24.3%	0.56	0.0%	8.1%
Department of Sociology	36	35	69,4%	16.7%	0.53	2.8%	2.8%
School of Global Studies	40	77	47,5%	32.5%	0.85	5.0%	5.0%
School of Public Administration	8	8	62,5%	25.0%	0.65	0.0%	0.0%

Figure 5.2.10 Paper count, average citation impact and share of papers in the world's top 10% within Panel 10, 2004-2009



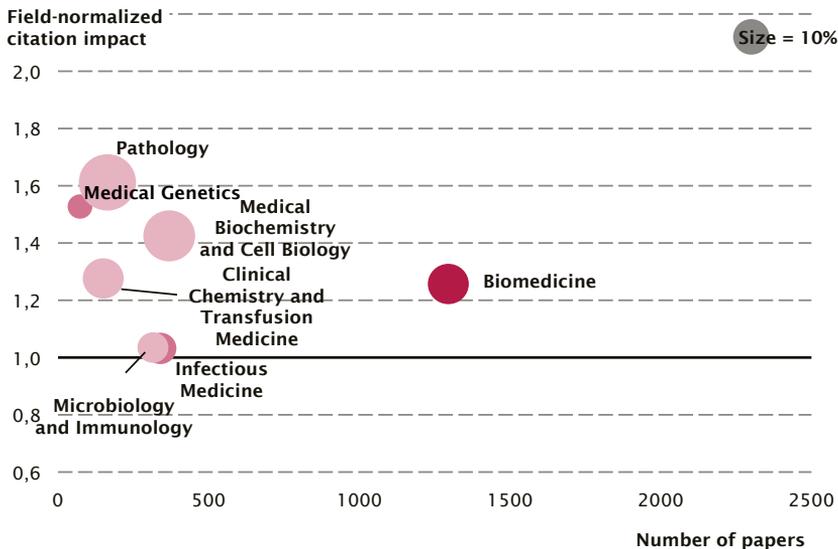
The Social sciences panel performs just below the world average with an average field-normalized citation impact of 0.95 and with 9.3% of its papers in the top 10% worldwide.

Most of the departments in this panel have a low volume of papers. Only the Department of Psychology can be analyzed and it performs at the world average with an average citation impact of 1.00 and 9.8% of its papers in the top 10% worldwide.

5.2.11 Biomedicine (Panel 11)

Panel/department	P	C	P_u	$C_{>exp}$	\bar{c}_f	C_{hi}	Top10%
Biomedicine	1,295	14,698	20,4%	36.1%	1.26	5.6%	11.4%
Clinical Chemistry and Transfusion Medicine	150	1,460	22,0%	38.0%	1.28	4.0%	11.3%
Department of Infectious Medicine	340	2,991	22,9%	36.2%	1.03	4.4%	8.8%
Department of Medical Biochemistry and Cell Biology	369	5,803	19,0%	33.1%	1.42	7.3%	14.4%
Department of Medical Genetics	73	610	23,3%	28.8%	1.53	4.1%	6.8%
Department of Microbiology and Immunology	315	2,930	20,6%	36.5%	1.03	3.8%	8.6%
Department of Pathology	164	2,452	20,1%	39.0%	1.61	9.8%	15.9%

Figure 5.2.11 Paper count, average citation impact and share of papers in the world's top 10% within Panel 11, 2004-2009



The Biomedicine panel performs well above world average with an average field-normalized citation impact of 1.26.

At the departmental level, the Department of Pathology, the Department of Medical Genetics and the Department of Medical Biochemistry & Cell Biology stand out. The Department of Pathology has an average citation impact of 1.61 and 15.9% of its papers in the top 10% worldwide. Almost one-tenth of its papers are cited more than four times the world average. The Department of Medical Biochemistry and Cell Biology has an average citation impact of 1.42 and around 14% of its papers are in the top 10% worldwide.

The Department of Medical Genetics has an average citation impact of 1.53, although it has a smaller number of papers (73) and it does not perform well in either of the indicators concerning the percentage of highly-cited papers.

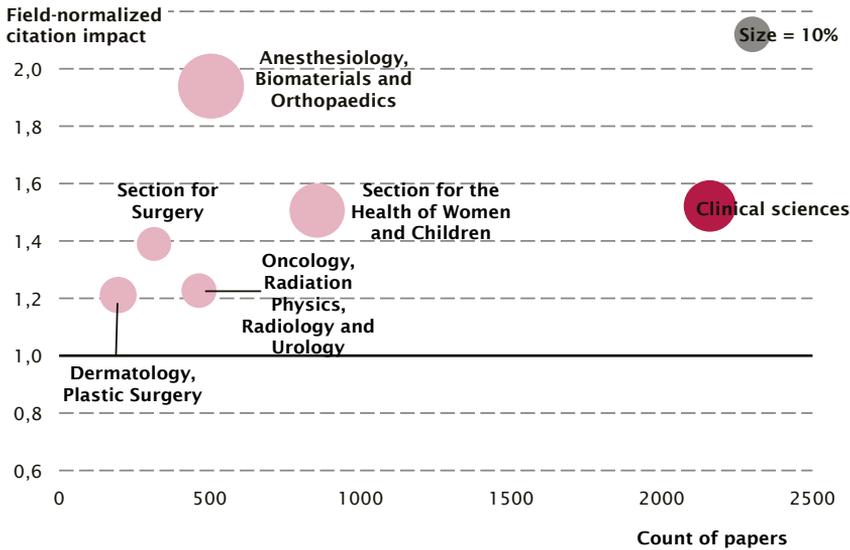
The Department of Clinical Chemistry and Transfusion Medicine has a well above average citation impact of 1.28.

Within this panel, the Department of Infectious Medicine and the Department for Microbiology and Immunology are the weakest, performing around world average with an average citation impact of 1.03 and 0.98 respectively.

5.2.12 Clinical sciences (Panel 12)

Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Clinical sciences	2,159	20,119	25,0%	41.3%	1.52	7.4%	14.5%
Anesthesiology, Biomaterials and Orthopaedics	504	5,289	22,4%	46.2%	1.94	10.1%	18.3%
Dermatology, Plastic Surgery and Otorhinolaryngology	196	1,252	25,0%	44.4%	1.21	5.1%	10.2%
Oncology, Radiation Physics, Radiology and Urology	464	3,546	27,2%	34.7%	1.23	3.7%	9.7%
Section for Surgery	315	3,150	25,1%	34.3%	1.39	5.1%	9.5%
Section for the Health of Women and Children	856	8,150	24,8%	42.1%	1.51	8.3%	15.3%

Figure 5.2.12 Paper count, average citation impact and share of papers in the world's top 10% within Panel 12, 2004-2009



The Clinical sciences panel performs well above world average with an average field-normalized citation impact of 1.52 and a substantial volume of papers (2,159) of which 14.5% are within the top 10% worldwide.

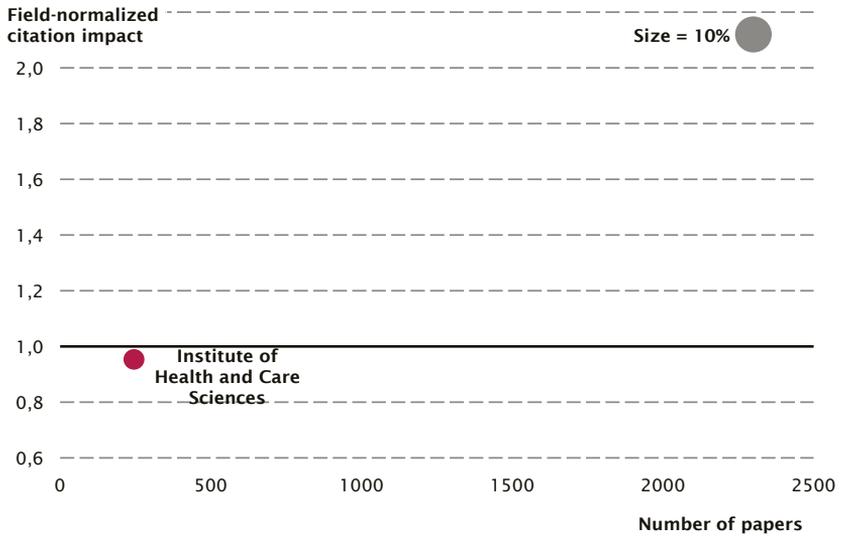
The Section for Anesthesiology, Biomaterials and Orthopaedics has an outstanding average citation impact of 1.94 and 18.3% of its papers in the top 10% worldwide. Some 10.1% of its papers are cited more than four times world average. The Section for the Health of Women and Children also performs well above world average with an average citation impact of 1.51 and 15.3% of its papers in the top 10% worldwide.

The other departments in the panel (Section for Oncology, Radiation Physics, Radiology and Urology, Section for Dermatology, Plastic Surgery and Otorhinolaryngology and Section for Surgery) whilst achieving average citation impacts well above the world average, perform less well than the panel overall both in citation impact and percentages of highly-cited papers.

5.2.13 Health and care sciences (Panel 13)

Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Health and care sciences	245	889	42,9	34.7%	0.95	3.3%	5.7%
Institute of Health and Care Sciences	245	889	42,9	34.7%	0.95	3.3%	5.7%

Figure 5.2.13 Paper count, average citation impact and share of papers in the world's top 10% within Panel 13, 2004-2009

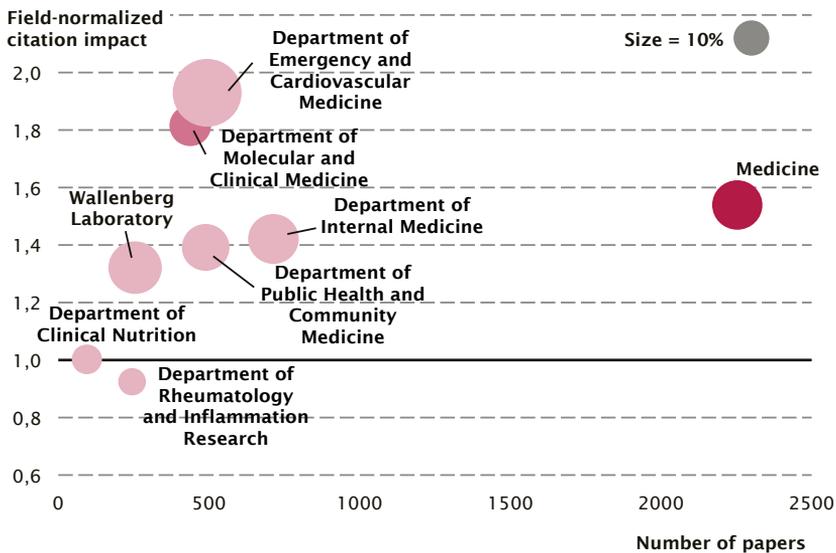


The Institute of Health and Care Sciences has a marginally below world average performance with an average citation impact of 0.95.

5.2.14 Medicine (Panel 14)

Panel/department	P	C	P_u	$C_{>exp}$	\bar{c}_i	C_{hi}	Top10%
Medicine	2,253	29,843	22,7%	38.6%	1.54	6.9%	14.0%
Centre for Bone and Arthritis Research	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Department of Clinical Nutrition	95	758	23,2%	38.9%	1.00	4.2%	8.4%
Department of Clinical Trials and Entrepreneurship	35	759	17,1%	42.9%	3.96	5.7%	8.6%
Department of Emergency and Cardiovascular Medicine	494	9,587	16,4%	42.3%	1.93	9.9%	19.2%
Department of Internal Medicine	714	10,483	18,6%	38.9%	1.42	6.4%	14.1%
Department of Molecular and Clinical Medicine	438	4,675	29,2%	36.1%	1.82	6.2%	11.6%
Department of Public Health and Community Medicine	489	4,185	32,5%	39.5%	1.39	6.7%	13.3%
Department of Rheumatology and Inflammation Research	245	2,096	19,6%	30.6%	0.92	3.3%	7.8%
Krefting Research Centre	12	6	75,0%	25.0%	0.89	0.0%	0.0%
Wallenberg Laboratory	255	3,112	19,2%	37.3%	1.32	5.1%	14.9%

Figure 5.2.14 Paper count, average citation impact and share of papers in the world's top 10% within Panel 14, 2004-2009



The panel of Medicine overall has performed exceptionally well with an average field-normalized citation impact of 1.54. Considering both number of papers and citation impact, it is the leading panel within the University of Gothenburg. Also, it has 14% of its papers in the top 10% worldwide.

The Department of Emergency and Cardiovascular Medicine and the Department of Molecular and Clinical Medicine have performed exceptionally well with average citation impacts of 1.93 and 1.82 respectively.

The Department of Emergency and Cardiovascular Medicine has 19.2% of its papers in the top 10% worldwide, and 9.9% of its papers are cited more than four times the world average.

Within this panel, several departments perform well above world average: The Department of Internal Medicine (1.42), the Department of Public Health and Community Medicine (1.39) and the Wallenberg Laboratory (1.32). All these departments also perform well with regard to percentage of highly-cited papers.

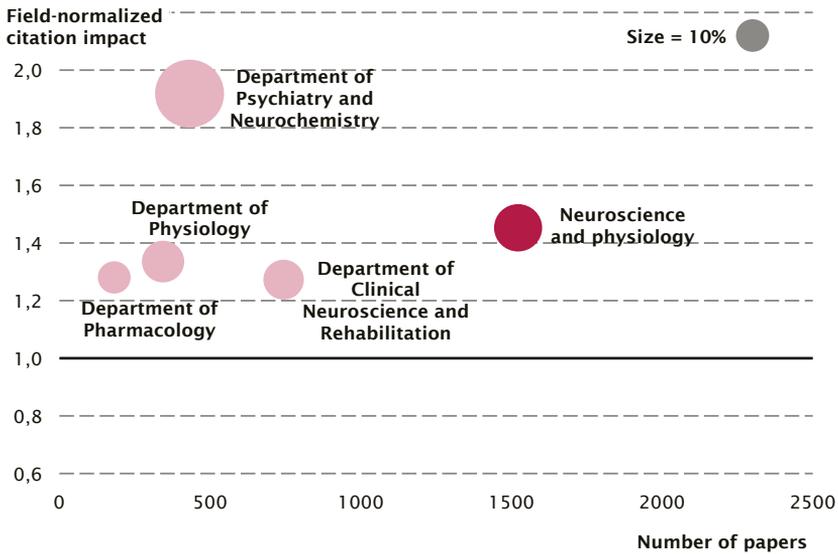
The Department of Clinical Nutrition performs at the world average with an average citation impact of 1.00. Only 8.4% of its papers are in the top 10% worldwide.

Only the Department of Rheumatology and Inflammation Research has performed below world average with an average citation impact of 0.92.

5.2.15 Neuroscience and physiology (Panel 15)

Panel/department	P	C	P _u	C _{>exp}	\bar{c}_f	C _{ni}	Top10%
Neuroscience and physiology	1,522	14,823	25,4%	39.9%	1.45	7.5%	14.5%
Department of Clinical Neuroscience and Rehabilitation	744	6,699	26,5%	37.4%	1.27	5.8%	12.2%
Department of Pharmacology	182	1,228	23,6%	41.2%	1.28	6.0%	9.9%
Department of Physiology	344	3,609	21,2%	39.0%	1.34	6.4%	12.8%
Department of Psychiatry and Neurochemistry	432	4,888	25,2%	46.3%	1.92	11.6%	20.8%

Figure 5.2.15 Paper count, average citation impact and share of papers in the world's top 10% within Panel 15, 2004-2009



The panel of Neuroscience and physiology has performed well above world average with an average field-normalized citation impact of 1.45 and with a substantial volume of papers (1,522).

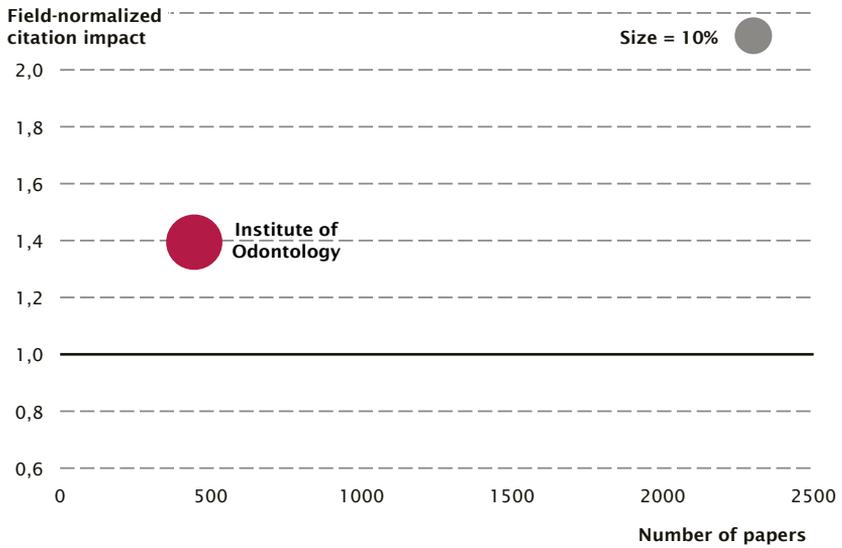
Within this panel, however, the Department of Psychiatry and Neurochemistry stands out with an outstanding average citation impact of 1.92 and 20.8% of its papers in the top 10% worldwide and 11.6% of its papers cited more than four times world average.

It is worth noting that all departments within this panel perform well above world average: The Department of Physiology has an average citation impact of 1.34, Department of Pharmacology (1.28) and the Department of Clinical Neuroscience and Rehabilitation (1.27).

5.2.16 Odontology (Panel 16)

Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Odontology	445	3,497	27,6%	39.8%	1.39	9.4%	15.1%
Institute of Odontology	445	3,497	27,6%	39.8%	1.39	9.4%	15.1%

Figure 5.2.16 Paper count, average citation impact and share of papers in the world’s top 10% within Panel 16, 2004-2009



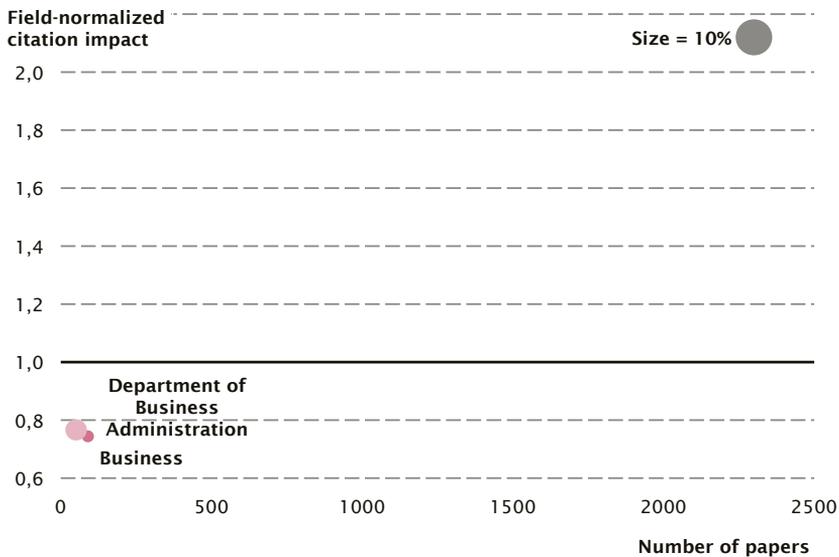
The Institute for Odontology has a high average field-normalized citation impact of 1.39, although it has a relatively low volume of papers (445).

It has 15.1% of its papers in the top 10% worldwide, and 9.4% of its papers are cited more than four times world average.

5.2.17 Business (Panel 17)

Panel/department	P	C	P_u	$C_{>exp}$	\bar{c}_i	C_{hi}	Top10%
Business	90	107	62,2%	23.3%	0.74	4.4%	3.3%
Department of Applied Information Technology (GU)	16	15	68,8%	18.8%	0.69	6.3%	0.0%
Department of Business Administration	51	58	64,7%	19.6%	0.77	5.9%	5.9%
Gothenburg Research Institute (GRI)	33	60	45,5%	33.3%	1.03	3.0%	6.1%
Institute for Innovation and Entrepreneurship	2	0	100,0%	0.0%	0.00	0.0%	0.0%

Figure 5.2.17 Paper count, average citation impact and share of papers in the world's top 10% within Panel 17, 2004-2009



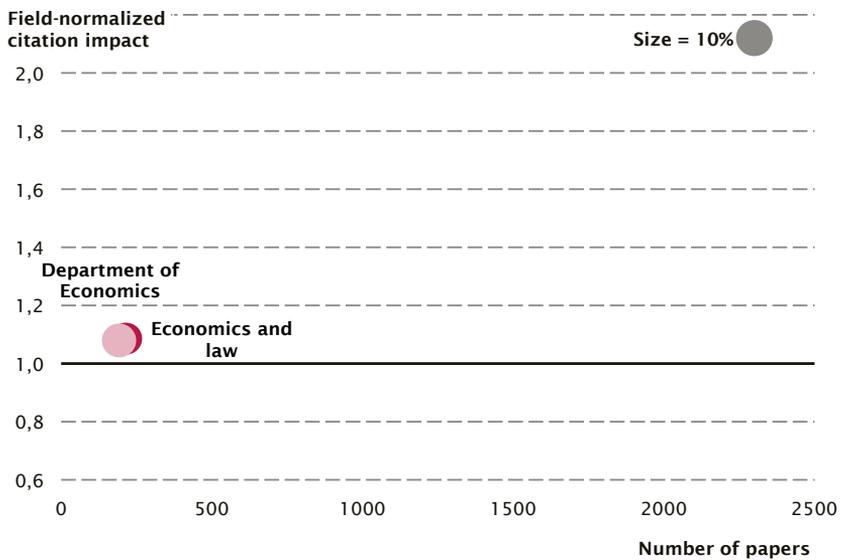
The panel for Business has the lowest average field-normalized citation impact at the panel level (0.74), which is well below world average.

Paper volumes are too low to meaningfully analyze departmental performance with the exception of the Department of Business Administration which also has a low average citation impact (0.77) which is well below world average.

5.2.18 Economics and law (Panel 18)

Panel/department	P	C	P _u	C _{-exp}	\bar{c}_f	C _{hi}	Top10%
Economics and law	215	567	47,0%	34,0%	1.09	6.5%	8.8%
Centre for Finance	0	0	0,0%	0.0%	0.00	0.0%	0.0%
Department of Economic History	4	2	75,0%	25.0%	0.58	0.0%	0.0%
Department of Economics	192	529	46,9%	34.4%	1.08	6.8%	9.4%
Department of Human and Economic Geography	15	28	46,7%	33.3%	0.99	0.0%	0.0%
Department of Law	4	8	25,0%	25.0%	2.26	25.0%	25.0%

Figure 5.2.18 Paper count, average citation impact and share of papers in the world's top 10% within Panel 18, 2004-2009



The Economics and law panel performs slightly above world average with an average field-normalized citation impact of 1.09.

The Department of Economics is the only department with a sufficient volume of papers for analysis. Its performance is also just above world average with an average citation impact of 1.08 and 9.4% of its papers in the top-10% worldwide.

5.3 Summary

The following panels at the University of Gothenburg have an average field-normalized citation impact which is above the institutional average (1.32) and the national average (1.32):

- Panel 14 – Medicine (1.54)
- Panel 12 – Clinical sciences (1.52)
- Panel 7 – Biology (1.46)
- Panel 15 – Neuroscience and physiology (1.45)
- Panel 16 – Odontology (1.39)

At the departmental level, the following departments stand out as having an average field-normalized citation impact which is above the institutional average (1.32) and the national average (1.32):

- Section for Anesthesiology, Biomaterials and Orthopaedics (1.94)
- Department of Emergency and Cardiovascular Medicine (1.93)
- Department of Psychiatry and Neurochemistry (1.92)
- Department of Molecular and Clinical Medicine (1.82)
- Department of Marine Ecology (1.70)
- Department of Pathology (1.61)
- Department of Plant and Environmental Sciences (1.60)
- Department of Medical Genetics (1.53)
- Section for the Health of Women and Children (1.51)
- Department of Medical Biochemistry and Cell Biology (1.42)
- Department of Internal Medicine (1.42)
- Institute of Odontology (1.39)
- Department of Public Health and Community Medicine (1.39)
- Section for Surgery (1.39)
- Department of Zoology (1.34)
- Institute of Neuroscience and Physiology, Department of Physiology (1.34)
- Department of Chemistry (1.33)

At the panel level, the University of Gothenburg has a relatively low average field-normalized citation impact, below the world average, in the following:

- Panel 17 – Business (0.74)
- Panel 10 – Social sciences (0.95)
- Panel 13 – Health and care sciences (0.95)

At the departmental level, the following departments are below world average citation impact:

- Department of Business Administration (0.77)
- Department of Rheumatology and Inflammation Research (0.92)

6. NATIONAL NORWEGIAN BIBLIOMETRIC PUBLICATION CHANNEL ANALYSIS FOR UNIVERSITY OF GOTHENBURG RESEARCH OUTPUTS

This Section analyzes the research output of the University of Gothenburg using the national Norwegian bibliometric indicators. Journals and publishers are classified as either level 0, level 1 (normal) or level 2 (prestigious) and the relative proportion of publications falling into these classes is used as an indicator of quality (**An Outline of the Bibliometric Indicator Used for Performance-Based Funding of Research Institutions in Norway** (2009), Schneider JW). Publications classified as either level 1 or 2 are termed ‘scientific’.

Of the 35,039 publications in the University of Gothenburg database, 26,757 have been assigned a Norwegian bibliometric indicator level by the University. (Of these, 88 were not submitted in the original data extract and so are not included in the following analyses). The total includes 7,769 publications which have been examined and assigned to level 0 – these are referred to in the Tables below as level 0 (assigned). The remaining publications not examined are expected to have a low likelihood of yielding points.

Table 6.1 shows the number of publications from the Gothenburg University database assigned to each of the three Norwegian bibliometric indicator levels, at the institutional level.

- Overall, nearly 17% of the University of Gothenburg’s publications are classified as level 2. Level 2 publications represent 23.6% of ‘scientific’ publications i.e. publications assigned to either level 1 or 2;
- This compares favorably with publicly available data for Norwegian universities for a similar time period (for example the University of Oslo has just over 20% of its publications at level 2 and the universities of Trondheim and Bergen have less than 15% of their publications at level 2 (**A Model for Assessment of the Publication Output at Research Institutions** (2008), Sivertsen G);
- There are no consistent trends in the relative percentages of level 1 and level 2 publications over the 6-year time-period (Table 6.2).

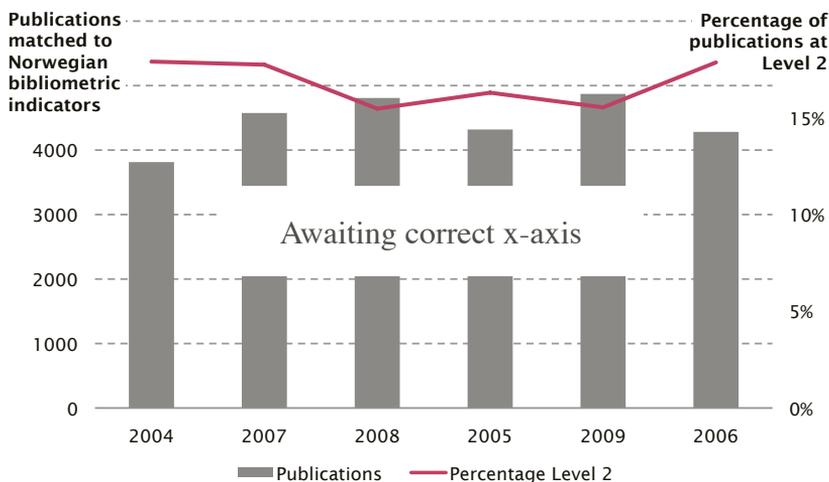
Table 6.1 Norwegian bibliometric indicator levels for University of Gothenburg publications, 2004-2009

Norwegian bibliometric indicator level	Number of publications	Percentage of assigned publications
Level 0 (assigned)	7,769	29.1%
Level 1	14,435	54.1%
Level 2	4,465	16.7%
Total	26,669	100.0%

Table 6.2 Norwegian bibliometric indicator levels for University of Gothenburg publications by year, 2004-2009

Norwegian bibliometric indicator level	2004	2005	2006	2007	2008	2009
Level 0 (assigned)	28.6%	29.9%	30.1%	29.2%	27.2%	29.8%
Level 1	53.5%	52.4%	54.4%	54.5%	57.3%	52.3%
Level 2	17.9%	17.7%	15.5%	16.3%	15.5%	17.9%
Level 2 as percentage of 'scientific' publications (levels 1 + 2)	25.1%	25.3%	22.1%	23.0%	21.3%	25.5%

Figure 6.1 Number of University of Gothenburg publications assigned to a Norwegian bibliometric indicator level and the percentage of these at level 2 by year, 2004-2009



The Norwegian model seeks to construct a bibliometric indicator which is simple, transparent and equally applicable to different research fields (**An Outline of the Bibliometric Indicator Used for Performance-Based Funding of Research Institutions in Norway** (2009), Schneider JW). To this end, publications are weighted to publication type and level of publication channel. The journal rankings are revised annually and the appropriate Norwegian national research councils determine which publication channels belong to each level. Points are awarded for three categories of publication type with a monograph attracting more points than a scholarly article in a peer-reviewed journal. Finally, the indicator used fractional author contribution counts. It has been reported that such a measure might reduce collaboration between institutions, especially international collaboration, but to date this has not been apparent in the Norwegian model.

A full Table of the specified publication channel analysis indicators based on the national Norwegian bibliometric indicator system is provided in the Data Tables in Annex 3 and the Excel file which accompanies this report.

Table 6.3 shows the number of publications classified as either level 1 or level 2 (i.e. 'scientific') and these as a percentage of 'scientific' publications (i.e. levels 1 and 2 together) by department. Also shown are the Norwegian points aggregated by department. Norwegian points are calculated taking into account the assigned level of the publication, the document type and the fractionalized author contribution. Norwegian points are low where the numbers of publications in a departmental aggregation are low and, consequently, are indicative of 'research power' rather than 'excellence' *per se*.

There is a general pattern evident in the data in Table 6.3. The percentage of publications that are assigned to the 'prestigious' category, level 2, is about 20-25% of 'scientific' publications (i.e. levels 1 and 2 together) for most of the panels. Departments performing research in science and medicine tend to have a greater proportion of their publications classified as level 2 than those performing research in social sciences or the arts and humanities. To some extent these proportions will be affected by the subject coverage of the Norwegian classifications, and this is likely to reflect the distinctive research culture of these areas.

If we consider this range of 20-25% level 2 as a reference point or 'working benchmark' then we can see that a number of the departments fall appreciably above or below that range. In general, that difference appears to be associated with higher and lower normalized citation scores shown in Table 5.1.1 but there are some differences between panels that require careful interpretation.

For example, the Medicine panel (14) has an average impact of 1.54 and 24.7% level 2 outputs. Within this panel, Emergency and Cardiovascular Medicine has an average impact of 1.93 and 31.5% level 2 papers. By contrast, Rheumatology and

Inflammation Research has an average impact of 0.92 and 19.1% level 2 papers. Within Panel 12 – Clinical sciences, the average citation impact (1.52 for the panel overall) of the five departments is consistently good or very good but the percentage of papers at level 2 is clearly above 20% in only one case. This means that comparisons between these two panels, Medicine (14) and Clinical sciences (12) would come out with slightly different interpretations if they used only citation indicators or only Norwegian bibliometric indicators.

The average citation impact of Panel 7 – Biology is 1.46 and that of Panel 9 – Mathematics and physics is 1.27. However, the percentage of journals at level 2 is 22.5%, with some variation by department, for Biology while it is much higher at nearly 40% for Mathematics and physics.

The panel of Chemistry and earth sciences (8) also has a high share of level 2 (27.9% overall) although its average citation impact (1.29) is similar to Biology. It seems surprising that the contrasts between the core sciences should be so marked. This variation may suggest that the assignment of journals to levels 1 and 2 is not necessarily consistent across panel areas.

Also evident, despite an assertion that the Norwegian model accounts for the typical inadequacies of research evaluation using bibliometric indicators, are that the panels and departments in social sciences and visual and performing arts still ‘perform’ less well than the natural sciences. The Fine and applied arts panel (6) has only just over 10% of its publications assigned to level 2.

Particular caution needs to be exercised when sample sizes are small, or when evaluation touches on smaller units. In these instances the different indicators may produce very different answers because of outlier data points. For example, the Department of Clinical Trials and Entrepreneurship has an exceptionally high average citation impact (3.96) but has only 12.5% of its papers at level 2. It will be noted that its total sample is fewer than 50 items, so this divergent outcome suggest that this is too small a sample for reliability.

These two approaches to research performance indicators are complementary. They should not be expected to have a perfect correlation but they should be reasonably closely related in cognate research areas because the banding of journals, the acceptance by referees of a paper into a journal, and the citation of those papers by other academics represents a series of modes of peer review and endorsement. However, some papers published in the most esteemed journals are not necessarily then cited frequently by other research. The combination of evaluation from these different stages of ‘knowledge development’ provides an overall synthesis which will refine interpretation for the experienced expert.

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Table 6.3 Norwegian bibliometric indicators for University of Gothenburg

Panel/department	Level 1 publications	Level 2 publications	Norwegian points
Panel 1 – Philosophy, linguistics and language technology	405 (76.0%)	128 (24.0%)	509.3
Department of Computer Science and Engineering (GU)	89 (87.3%)	13 (12.7%)	63.1
Philosophy, Linguistics and Theory of Science	213 (81.6%)	48 (18.4%)	303.0
Department of Swedish	107 (61.1%)	68 (38.9%)	143.2
Panel 2 – Non-Swedish languages and literature	287 (73.6%)	103 (26.4%)	523.6
Department of Language and Literature	287 (73.6%)	103 (26.4%)	523.6
Panel 3 – Culture, religion and historical studies	678 (83.6%)	133 (16.4%)	1026,1
Department of Conservation	43 (93.5%)	3 (6.5%)	22,1
Department of Cultural Sciences	189 (81.1%)	44 (18.9%)	319.8
Department of Historical Studies	149 (83.2%)	30 (16.8%)	232.7
Department of Literature, History of Ideas and Religion	297 (83.7%)	58 (16.3%)	451.5
Panel 4 – Education	585 (82.4%)	125 (17.6%)	769.6
Department of Education	494 (81.4%)	113 (18.6%)	697.6
Department of Food, Health and Environment	19 (90.5%)	2 (9.5%)	11.1
Department of Work Science	72 (87.8%)	10 (12.2%)	60.8
Panel 5 – Music, drama and literature	47 (85.5%)	8 (14.5%)	37.4
Academy of Music and Drama	19 (82.6%)	4 (17.4%)	15.0
Department of Literary Composition, Poetry and Prose	0 (0.0%)	1 (100.0%)	3.0
Göteborg Organ Art Center	28 (90.3%)	3 (9.7%)	19.4
School of Film Directing	0 (0.0%)	0 (0.0%)	0.0
Panel 6 – Fine and applied arts	26 (89.7%)	3 (10.3%)	26.8
School of Design and Crafts	21 (91.3%)	2 (8.7%)	15.1
School of Photography	5 (100.0%)	0 (0.0%)	10.7
Valand School of Fine Arts	0 (0.0%)	1 (100.0%)	1.0
Panel 7 – Biology	1298 (77.6%)	375 (22.4%)	1227.0
Department of Cell and Molecular Biology	211 (68.3%)	98 (31.7%)	257.8
Department of Marine Ecology	413 (82.4%)	88 (17.6%)	322.1
Department of Plant and Environmental Sciences	332 (81.2%)	77 (18.8%)	260.1
Department of Zoology	425 (77.7%)	122 (22.3%)	387.0

Table 6.3 continued

Panel/department	Level 1 publications	Level 2 publications	Norwegian points
Panel 8 – Chemistry and earth sciences	892 (72.1%)	346 (27.9%)	1010.0
Department of Chemistry	550 (68.5%)	253 (31.5%)	684.0
Department of Earth Sciences	338 (80.7%)	81 (19.3%)	291.2
Swedish NMR Centre at Göteborg University	21 (52.5%)	19 (47.5%)	34.8
Panel 9 – Mathematics and physics	466 (60.1%)	310 (39.9%)	661.5
Department of Mathematical Sciences	79 (69.3%)	35 (30.7%)	114.2
Department of Physics	387 (58.5%)	275 (41.5%)	547.3
Panel 10 – Social sciences	1396 (77.8%)	398 (22.2%)	1953.8
Center for Public Sector Research (CEFOS)	73 (83.9%)	14 (16.1%)	101.4
Department of Journalism, Media and Communication	56 (82.4%)	12 (17.6%)	76.3
Department of Political Science	212 (73.1%)	78 (26.9%)	354.3
Department of Psychology	459 (79.4%)	119 (20.6%)	410.0
Department of Social Work	173 (79.7%)	44 (20.3%)	233.5
Department of Sociology	189 (77.8%)	54 (22.2%)	291.6
School of Global Studies	184 (70.8%)	76 (29.2%)	384.7
School of Public Administration	100 (92.6%)	8 (7.4%)	102.0
Panel 11 – Biomedicine	1228 (73.8%)	436 (26.2%)	1019.6
Clinical Chemistry and Transfusion Medicine	154 (77.8%)	44 (22.2%)	93.8
Department of Infectious Medicine	372 (84.0%)	71 (16.0%)	218.1
Department of Medical Biochemistry and Cell Biology	293 (64.7%)	160 (35.3%)	306.1
Department of Medical Genetics	60 (65.2%)	32 (34.8%)	53.5
Department of Microbiology and Immunology	294 (75.0%)	98 (25.0%)	229.8
Department of Pathology	158 (70.9%)	65 (29.1%)	118.2
Panel 12 – Clinical sciences	2514 (79.3%)	657 (20.7%)	1965.6
Anesthesiology, Biomaterials and Orthopaedics	656 (79.7%)	167 (20.3%)	545.0
Dermatology, Plastic Surgery and Otorhinolaryngology	240 (82.8%)	50 (17.2%)	154.4
Oncology, Radiation Physics, Radiology and Urology	529 (81.1%)	123 (18.9%)	345.6
Section for Surgery	372 (80.0%)	93 (20.0%)	272.3
Section for the Health of Women and Children	891 (77.3%)	262 (22.7%)	648.4
Panel 13 – Health and care sciences	418 (75.0%)	139 (25.0%)	463.4
Institute of Health and Care Sciences	418 (75.0%)	139 (25.0%)	463.4

BIBLIOMETRIC ANALYSIS

Table 6.3 continued

Panel/department	Level 1 publications	Level 2 publications	Norwegian points
Panel 14 – Medicine	2473 (75.3%)	811 (24.7%)	2231.0
Centre for Bone and Arthritis Research	0 (0.0%)	0 (0.0%)	0.0
Department of Clinical Nutrition	117 (81.3%)	27 (18.8%)	75.5
Department of Clinical Trials and Entrepreneurship	42 (87.5%)	6 (12.5%)	18.0
Department of Emergency and Cardiovascular Medicine	523 (68.5%)	241 (31.5%)	357.4
Department of Internal Medicine	717 (75.2%)	236 (24.8%)	516.1
Department of Molecular and Clinical Medicine	492 (76.3%)	153 (23.7%)	386.5
Department of Public Health and Community Medicine	575 (79.1%)	152 (20.9%)	422.1
Department of Rheumatology and Inflammation Research	237 (80.9%)	56 (19.1%)	200.1
Krefting Research Centre	13 (92.9%)	1 (7.1%)	6.8
Wallenberg Laboratory	234 (67.4%)	113 (32.6%)	248.3
Panel 15 – Neuroscience and physiology	1739 (76.6%)	531 (23.4%)	1504.6
Department of Clinical Neuroscience and Rehabilitation	906 (80.4%)	221 (19.6%)	661.7
Department of Pharmacology	168 (76.7%)	51 (23.3%)	152.9
Department of Physiology	337 (71.2%)	136 (28.8%)	296.0
Department of Psychiatry and Neurochemistry	481 (72.7%)	181 (27.3%)	394.0
Panel 16 – Odontology	529 (76.7%)	161 (23.3%)	566.1
Institute of Odontology	529 (76.7%)	161 (23.3%)	566.1
Panel 17 – Business	514 (79.0%)	137 (21.0%)	686.1
Department of Applied Information Technology (GU)*	147 (85.0%)	26 (15.0%)	83.0
Department of Business Administration*	237 (80.9%)	56 (19.1%)	307.8
Gothenburg Research Institute (GRI)*	174 (74.7%)	59 (25.3%)	283.2
Institute for Innovation and Entrepreneurship*	6 (37.5%)	10 (62.5%)	12.0
*) NB! data corrected compared to printed version!			
Panel 18 – Economics and law	523 (78.8%)	141 (21.2%)	760.5
Centre for Finance	27 (81.8%)	6 (18.2%)	23.7
Department of Economic History	33 (78.6%)	9 (21.4%)	51.1
Department of Economics	316 (78.8%)	85 (21.2%)	399.2
Department of Human and Economic Geography	52 (81.3%)	12 (18.8%)	69.9
Department of Law	96 (76.2%)	30 (23.8%)	240.3

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ANNEX 1 BIBLIOMETRICS AND CITATION ANALYSIS

Bibliometrics are about publications and their citations. The field has emerged from ‘information science’ and refers to analyses and methods used to study and index texts and information.

Publications cite and are cited by other publications. This provides linkages and networks. Many links are likely to be related to significance or impact. Meaning is determined from keywords and content. Citation analysis and content analysis are therefore commonly used bibliometric methods. Historically, bibliometric methods had been used to trace relationships amongst academic journal citations. Bibliometrics now are increasingly important in indexing research performance. Bibliometric data have particular characteristics of which the user should be aware, and these are considered here.

Journal papers (publications, sources) report research work. Papers refer to or ‘cite’ earlier work relevant to the material being reported. New papers are cited in their turn. Papers that accumulate more citations are thought of as having greater ‘impact’, interpreted as significance or influence in their field. Citation counts are therefore recognized as a measure of impact, which can be used to index the excellence of the research from a particular group, institution or country.

The origins of citation analysis as a widespread tool of research performance can be traced to the mid-1950s, when Eugene Garfield proposed the concept of citation indexing and introduced the Science Citation Index, the Social Sciences Citation Index and the Arts & Humanities Citation Index, produced by the Institute of Scientific Information (currently the Science business of Thomson Reuters).

Most impact measures use average citation counts from groups of papers, because some individual papers may have unusual or misleading citation profiles. These outliers are diluted in larger samples.

A1.1 Data source

The data used by *Evidence* come from Thomson Reuters databases, including the Thomson Reuters Web of Science, a single source collated to the same standard and therefore providing a level of comparability not found in other databases. These data are also valuable because they can readily be disaggregated by field, by year, by country and by institution. The Web of Science is part of a larger entity, the Thomson Reuters Web of KnowledgeSM, focusing on research published in journals and conferences in science, medicine, arts, humanities and social sciences. The Web of

Science was primarily regarded as an awareness and information retrieval tool but has an increasingly important secondary use for citation analysis and bibliometrics for research evaluation. Coverage is both current and retrospective in the sciences, social sciences, arts and humanities, in some cases back to 1900. Within the research community these data are often still referred to by the acronym 'ISI'

Unlike other databases, the Thomson Reuters Web of KnowledgeSM and underlying databases are selective, that is, the journals abstracted are selected using rigorous editorial and quality criteria. The authoritative, multidisciplinary content covers over 10,000 of the highest impact journals worldwide, including Open Access journals and over 110,000 conference proceedings. The abstracted journals actually encompass the majority of significant scientific reports and, more importantly, an even greater proportion of the scientific research output which is cited. This selective process ensures that the citation counts remain relatively stable in given research fields and do not fluctuate widely from year to year, which increases the usability of such data for performance evaluation.

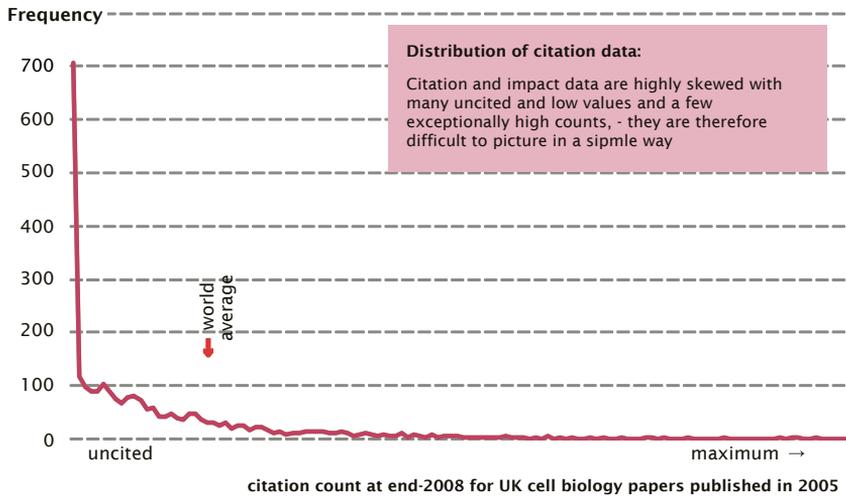
Evidence, now as part of Thomson Reuters, has extensive experience with databases on research inputs, activity and outputs and has developed innovative analytical approaches for benchmarking and interpreting international, national and institutional research impact.

A1.2 Citation counts

A publication accumulates citation counts when it is referred to by more recent publications. Some papers get cited frequently and many get cited rarely or never, so the distribution of citations is highly skewed.

Why are so many papers never cited? Certainly some papers remain uncited because their content is of little or no impact, but that is not the only reason. It might be because they have been published in a journal not read by researchers to whom the paper might be interesting. It might be that they represent important but 'negative' work reporting a blind alley to be avoided by others. The publication may be a commentary in an editorial, rather than a normal journal article and thus of general rather than research interest. Or it might be that the work is a 'sleeping beauty' that has yet to be recognized for its significance.

Other papers can be very highly cited: hundreds, even thousands of times. Again, there are multiple reasons for this. Most frequently cited work is being recognized for its innovative significance and impact on the research field of which it speaks. Impact here is a good reflection of quality: it is an indicator of excellence. But there are other papers which are frequently cited because their significance is slightly



different: they describe key methodology; they are a thoughtful and wide-ranging review of a field; or they represent contentious views which others seek to refute.

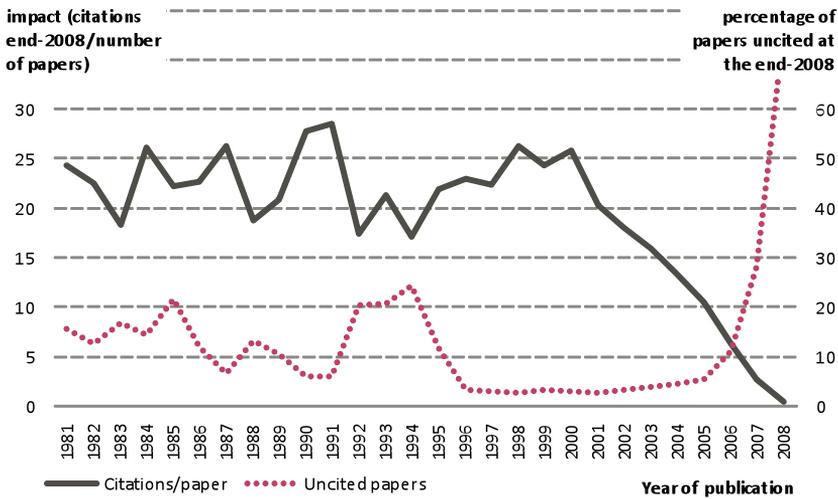
Citation analysis cannot make value judgments about why an article is uncited nor about why it is highly cited. The analysis can only report the citation impact that the publication has achieved. We normally assume, based on many other studies linking bibliometric and peer judgments that high citation counts correlate on average with the quality of the research.

The figure shows the skewed distribution of more or less frequently cited papers from a sample of UK authored publications in cell biology. The skew in the distribution varies from field to field. It is to compensate for such factors that actual citation counts must be normalized against a world baseline.

A1.3 Time factors

Citations accumulate over time. Older papers therefore have, on average, more citations than more recent work. The graph below shows the pattern of citation accumulation for a set of 33 journals in the journal category Materials science, Biomaterials. Papers less than eight years old are, on average, still accumulating additional citations. The citation count goes on to reach a plateau for older sources. Normalization accounts for differences in citation accumulation rates in rapidly moving fields and in slower moving fields by using the year appropriate world average though care should still be taken with data based on the most recent year as this can be very volatile. This is principally due to raw citation counts necessarily being an integer, typically 1, whereas the world average will be a fraction.

The graph shows that the percentage of papers that have never been cited drops over about five years. Beyond five years, between 5% and 10% or more of papers remain uncited.



Account must be taken of these time factors in comparing current research with historical patterns. For these reasons, it is sometimes more appropriate to use a fixed 5-year window of papers and citations to compare two periods than to look at the longer term profile of citations and of uncitedness for a recent year and an historical year.

A1.4 Discipline factors

Citation rates vary between disciplines and fields. For the UK science base as a whole, ten years produces a general plateau beyond which few additional citations would be expected. On the whole, citations accumulate more rapidly and plateau at a higher level in biological sciences than physical sciences, and natural sciences generally cite at a higher rate than social sciences.

Papers are assigned to disciplines (journal categories or research fields) by Thomson Reuters, bringing cognate research areas together. The journal category classification scheme has been recently revised and updated. Before 2007, journals were assigned to the older, well established Current Contents categories which were informed by extensive work by Thomson and with the research community since the early 1960s. This scheme has been superseded by the 251 Thomson Reuters Web of KnowledgeSM journal categories which allow for greater disaggregation for the growing volume of research which is published and abstracted.

Papers are allocated according to the journal in which the paper is published. Some journals may be considered to be part of the publication record for more than one research field. As the example below illustrates, the journal *Acta Biomaterialia* is assigned to two journal categories: Materials science, Biomaterials and Biomedical Engineering.

Very few papers are not assigned to any research field and as such will not be included in specific analyses using normalized citation impact data. The journals included in the Thomson Reuters databases and how they are selected are detailed here <http://scientific.thomsonreuters.com/mjl/>.

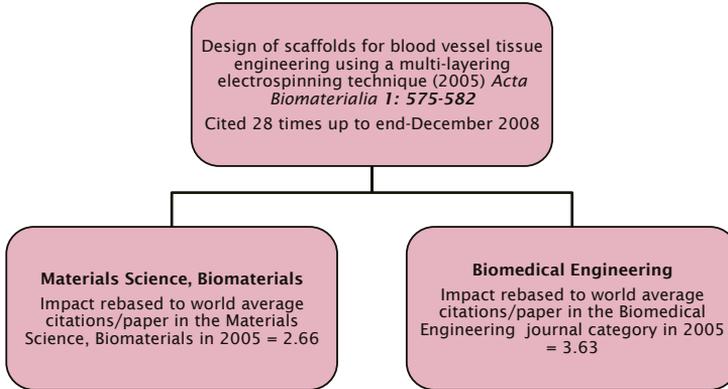
Some journals with a very diverse content, including the prestigious journals Nature and Science were classified as Multidisciplinary before 2007. The papers from these Multidisciplinary journals are now re-assigned to more specific research fields using an algorithm based on the research area(s) of the references cited by the article.

A1.5 Normalized citation impact

For the reasons given above, all analyses must take both field and year into account. In other words, because the absolute citation count for a specific article is influenced by its field and by the year it was published, we can only make comparisons of indexed data after normalizing with reference to these two variables. In addition, the type of publication will influence the citation count. For example, a review will typically be cited more frequently than an article, and both of these types will tend to be cited more than editorials or meeting abstracts. Consequently, only citation counts from reviews and articles are used in calculations of impact. The most common normalization factors are the average citations per paper for the year and either the field or journal in which the paper was published. This normalization is also referred to as ‘rebasings’ the citation count.

Impact is therefore most commonly analyzed in terms of ‘normalized citation impact’, or NCI. The following schematic illustrates how the normalized citation impact is calculated at paper level and journal category level.

This article in the journal *Acta Biomaterialia* is assigned to two journal categories: Materials science, Biomaterials and Biomedical Engineering. The world average baselines for, as an example, Materials science, Biomaterials are calculated by summing the citations to all the articles and reviews published worldwide in the journal *Acta Biomaterialia* and the other 32 journals assigned to this category for each year, and dividing this by the total number of articles and reviews published in the journal category. This gives the category-specific normalized citation impact (in the above example the category-specific NCI for Materials Science, Biomaterials is 2.66 and the category-specific



NCI for Biomedical Engineering is higher at 3.63). Most papers (nearly two-thirds) are assigned to a single journal category whilst a minority are assigned to more than 5.

Citation data provided by Thomson Reuters are assigned on an annual census date referred to as the Article Time Period. For the majority of publications the Article Time Period is the same as the year of publication, but for a few publications (especially those published at the end of the calendar year in less main-stream journals) the Article Time Period may vary from the actual year of publication.

World average impact data have been sourced from the Thomson Reuters National Science Indicators baseline data for 2008.

A1.6 Average impact

As noted above, the distribution of citations amongst papers is highly skewed, many papers are uncited and a very few papers accumulate extensive citation counts. Historically, research performance has been indexed using average impact (normalized as described to a world average that accounts for time and discipline).

An average may be misleading, however, if assumptions are made about the distribution of the data beneath it. Almost all research activity metrics are skewed: many low performance values and a few exceptionally high values. In reality, therefore, the average impact tends to be significantly different from either the median or mode in the underlying distribution.

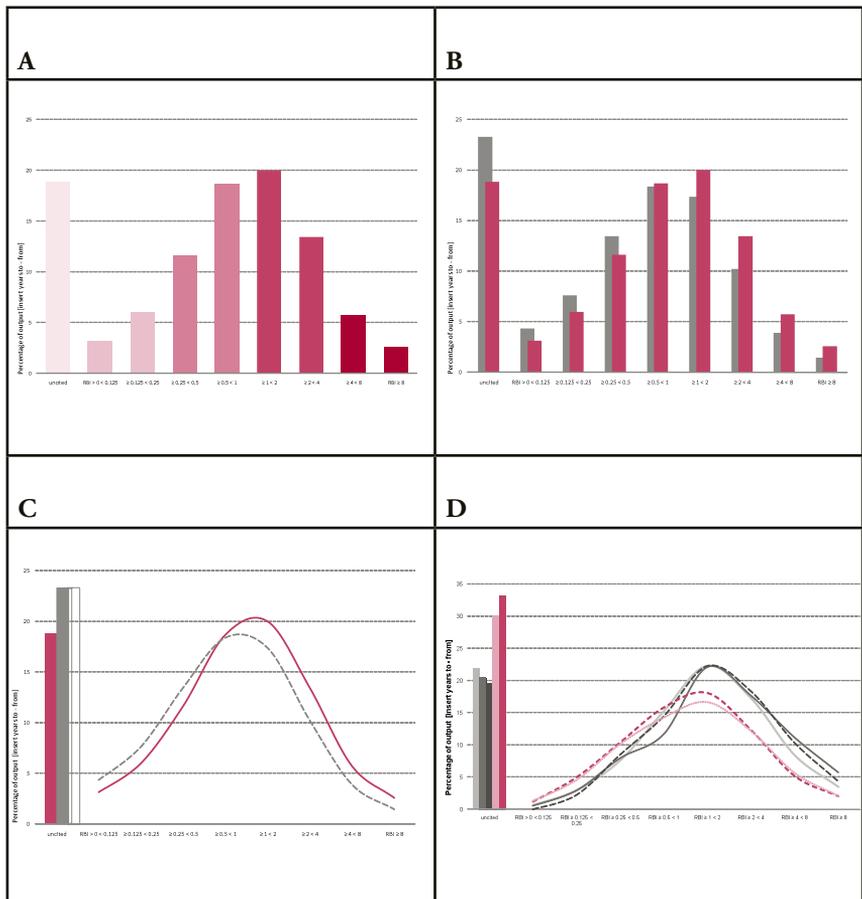
The average (normalized) impact can be calculated at an individual paper level where it can be associated with more than one journal category. It can also be calculated for a set of papers at any level from a single country to an individual researcher's output.

Thus, in the example above, the average NCI of the *Acta Biomaterialia* paper can be given as 3.15.

A1.7 Impact Profiles®

Evidence has developed a bibliometric methodology which shows the proportion of papers that are uncited and the proportion that lie in each of eight categories of relative citation rates, normalized to world average. An Impact Profile® enables an examination and analysis of the strengths and weaknesses of published outputs relative to world average and relative to a reference profile. This provides much more information about the basis and structure of research performance than conventionally reported averages in citation indices.

The Impact Profile® histogram can be presented in a number of ways which are illustrated below.



Papers which are ‘highly-cited’ are defined as those with an average normalized citation impact (NCI) greater than or equal to 4.0, i.e. those papers which have received greater than or equal to four times the world average number of citations for papers in that subject published in that year.

The proportion of uncited papers in a dataset can be compared to the benchmark for the UK, the USA or any other country. Overall, in a typical 10-year sample, around one-quarter of papers have not been cited within the 10-year period, the majority of these, of course, are those that are most recently published.

A: is used to represent the total output of an individual country, institution or researcher with no benchmark data. Visually it highlights the numbers of uncited papers (weaknesses) and highly cited papers (strengths).

B & C: are used to represent the total output of an individual country, institution or researcher (client) against an appropriate benchmark dataset (benchmark). The data are displayed as either histograms (B) or a combination of histogram and profile (C). Version C prevents the 'travel' which occurs in histograms where the eye is drawn to the data most offset to the right, but can be less easy to interpret as categorical data.

D: illustrates the complexity of data which can be displayed using an Impact Profile®. These data show research output in defined journal categories against appropriate benchmarks: client, research field X; client, research field Y; client, research field Z; benchmark, research field X+Y; benchmark, research field, Z.

Impact Profiles® enable an examination and analysis of the balance of published outputs relative to world average and relative to a reference profile. This provides much more information about the basis and structure of research performance than conventionally reported averages in citation indices.

An Impact Profile® shows what proportion of papers are uncited and what proportion are in each of eight categories of relative citation rates, normalized to world average (which becomes 1.0 in this graph). Normalized citation rates above 1.0 indicate papers cited more often than world average for the field in which that journal is categorized and in their year of publication.

Attention should be paid to:

- The proportion of uncited papers on the left of the chart
- The proportion of cited papers either side of world average (1.0)
- The location of the most common (modal) group near the centre
- The proportion of papers in the most highly-cited categories to the right, (≥ 4 x world, ≥ 8 x world).

What are uncited papers?

It may be a surprise that some journal papers are never subsequently cited after publication, even by their authors. This accounts for about half the total global output for a typical, recent 10-year period. We cannot tell why papers are not cited. It is likely that a significant proportion of papers remain uncited because they are reporting negative results which are an essential matter of record in their field but make the content less likely to be referenced in other papers. Inevitably, other papers are uncited because their content is trivial or marginal to the mainstream. However, it should not be assumed that this is the case for all such papers.

There is variation in non-citation between countries and between fields. For example, relatively more engineering papers tend to remain uncited than papers in other sciences, indicative of a disciplinary factor. There is also an obvious increase in the likelihood of citation over time but most papers that are going to be cited will be cited within a few years of publication.

What is the threshold for ‘highly cited’?

Thomson Reuters has traditionally used the term ‘Highly Cited Paper’ to refer to the world’s 1% of most frequently cited papers, taking into account year of publication and field. In rough terms, UK papers cited more than eight times as often as relevant world average would fall into the Thomson Highly Cited category. About 1-2% of papers (all papers, cited or uncited) typically pass this hurdle. Such a threshold certainly delimits exceptional papers for international comparisons but, in practice, is an onerous marker for more general management purposes.

After reviewing the outcomes of a number of analyses, we have chosen a more relaxed definition for our descriptive and analytical work. We deem papers that are cited more often than four times the relevant world average to be relatively highly-cited for national comparisons. This covers the two most highly-cited categories in our graphical analyses.

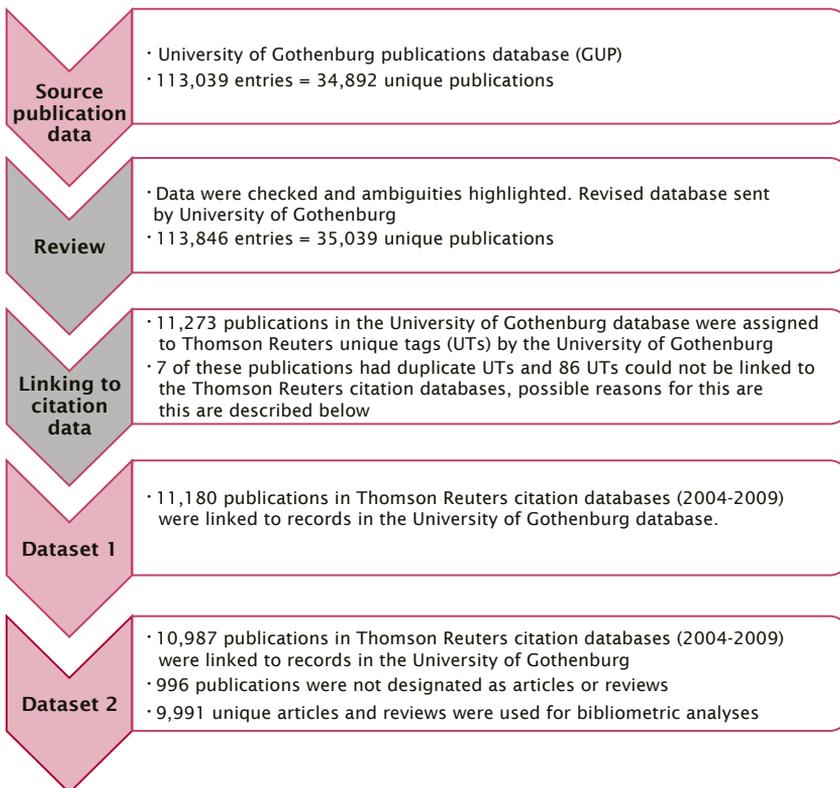
ANNEX 2 METHODOLOGY AND DEFINITIONS OF BIBLIOMETRIC INDICATORS USED IN THIS STUDY

A2.1 University of Gothenburg publication datasets

Publications data were sourced from the University of Gothenburg publications database (GUP) supplied to *Evidence*, Thomson Reuters.

A schematic showing the characteristics of the University of Gothenburg publications database and the associated Thomson Reuters citation data is shown in Figure A2.1.1 below.

Figure A2.1.1 Schematic for the process of assigning Thomson Reuters citation data to publications by the University of Gothenburg



As described in Figure A2.1.1 it was not possible to link 86 of the Thomson Reuters UTs provided in the University of Gothenburg database to the Thomson Reuters Web of KnowledgeSM. The details of these records have been provided in the Excel file which accompanies this report. A manual examination of some of these records suggests that these omissions may be due to a rounding in GUP of the Thomson Reuters UT. For example, it would appear that the UT 000260670500020 provided in the University of Gothenburg database may actually refer to UT 000260670500015 in the Web of KnowledgeSM data. These papers have therefore not been included in the analyses.

All records in the GUP database have an indicated publication year between 2004 and 2009. A small percentage (1.7%) of these records linked to publications which were abstracted into Thomson Reuters citation databases outside this time period.

Almost all of these publications were abstracted into Thomson Reuters citation databases in 2010. At the time of writing, world citation baselines for 2010 are not available. Since the normalized citation impact of papers abstracted into Thomson Reuters citation databases in 2010 cannot be calculated without these baselines the dataset used in the main bibliometric analyses described in this report (Section 4 and Section 5) was restricted to all publications abstracted into Thomson Reuters citation databases between 2004 and 2009 (Dataset 2, Figure A2.1.1).

Some of the indicators provided in the Excel file which accompanies this report, however, are not reliant on world baseline citation counts and refer to the full dataset of GUP linked in Thomson Reuters citation databases (Dataset 1; Figure A2.1.1). Both datasets are detailed above.

Citation counts for Dataset 2 have been sourced from the Thomson Reuters citation databases which underlie the Web of KnowledgeSM for 2009 and individual citation counts for the 9,991 articles and reviews have been normalized using standard methodology and the Thomson Reuters National Science Indicators (NSI) database for 2009.

The normalized citation impact data presented here will not cover proceedings, meeting abstracts, books, chapters in books or grey literature such as reports. They therefore capture only a specific part of the total output from the University of Gothenburg over the period, but this part is usually recognized as describing the most direct contribution to the research base.

All papers from the University of Gothenburg have been accounted for in data processing.

A2.2 University of Gothenburg citation data

For this project, citation data have been sourced from the databases underlying Thomson Reuters Web of KnowledgeSM, the world's leading citation database. The authoritative, multidisciplinary content covers over 11,500 of the highest impact journals worldwide, including Open Access journals and over 110,000 conference proceedings. Coverage is both current and retrospective in the sciences, social sciences, arts and humanities, in some cases back to 1900. Within the research community these data are often still referred to by the acronym 'ISI'. *Evidence*, Thomson Reuters has extensive experience with databases on research inputs, activity and outputs and has developed innovative analytical approaches for benchmarking and interpreting international, national and institutional research impact.

Research publications have been linked to the citation databases through the Thomson Reuters unique tag (UT) provided by the University of Gothenburg. Through this linkage each publication can be assigned to one or more journal categories which can be used in bibliometric analyses as a proxy for research fields. These journal categories are useful as the basis for bibliometric analysis because they are well-established and informed by collaboration with the research community since inception. Papers from prestigious, 'multidisciplinary' and general medical journals such as *Nature*, *Science*, *The Lancet*, *BMJ*, *The New England Journal of Medicine* and the *Proceedings of the National Academy of Sciences (PNAS)* are assigned to specific categories based on the journal categories of the references cited in the article. The journals included in the Thomson Reuters Web of KnowledgeSM databases and how they are selected are detailed here <http://scientific.thomsonreuters.com/mjl/>.

Citations are subsequent references made to an article by later publications. Highly cited work is recognized as having a greater impact and *Evidence* has shown that high citation rates are correlated with other measures of research excellence (**Maintaining Research Excellence and Volume: A report by Evidence Ltd to the Higher Education Funding Councils for England, Scotland and Wales and to Universities UK** (2002), Adams J, Jackson L, Law G, Mount D, Reeve N, Smith DN and Wilkinson D).

A summary of citation indicators used in this report is given in Section A2.5.

A2.3 Thomson Reuters Essential Science Indicator fields

For analyses by research field (Section 4) publications have been mapped to 23 broad research areas using the 22 Thomson Reuters Essential Science Indicators (ESI) fields and an additional field of Arts & Humanities. This mapping is based on journal categories. The journal in which a publication appears is assigned to one or more Thomson Reuters Web of KnowledgeSM journal categories and every article within that journal is assigned to that category. Publications have been mapped via the journal to ESI fields using a standard aggregation of Thomson Reuters Web of KnowledgeSM journal categories to these fields. ESI fields (listed below) are useful for describing the research of large, multi-disciplinary research-active organizations, such as universities, on a level that is informative for management purposes.

- Agricultural Sciences
- Biology & Biochemistry
- Chemistry
- Clinical Medicine
- Computer Science
- Economics & Business
- Engineering
- Environment/Ecology
- Geosciences
- Immunology
- Materials Sciences
- Mathematics
- Microbiology
- Molecular Biology & Genetics
- Multidisciplinary
- Neuroscience & Behavior
- Pharmacology & Toxicology
- Physics
- Plant & Animal Science
- Psychology/Psychiatry
- Social Sciences, general
- Space Science

Definitions of the scope of ESI fields are detailed here:
<http://sciencewatch.com/about/met/fielddef/>.

A2.4 Source Data

Initial dataset - number of author-publications pairs	113,039
Number of unique publications	34,892
Revised dataset - number of records	113,846
Number of records (unique)	35,039
Linked using Thomson Reuters UT (Unique Tag)	
2004 - 2010	11,180
2004 - 2009	10,987
Publications not designated 'articles' or 'reviews'	996
Total number of unique papers for bibliometric analysis	9,991
With departmental data	9,927

Time Period

The time period to be covered by this report was 2004-2009. However, the University of Gothenburg database contained records which when linked to the Thomson Reuters Web of KnowledgeSM were outside this time period and so excluded from analyses. In supplied documentation these are referred to as 'ALL'. Where the records are within the time period, these are referred to as '04-09'.

Aggregations using Panel/department

Departmental data were provided on the University of Gothenburg database; at three levels - the school, the department and the sub-department which were assigned to RED10 panel numbers from 1 to 18. An aggregation ID (1-71) was attached to each department. The data provided in the Data Tables in Annex 3 and in the Excel file which accompanies this report are at the departmental/aggregation ID level.

Departmental data will not sum to overall University of Gothenburg totals as publications may be produced by more than one department.

A2.5 Indicators and data definitions

The following indicators are used in this report:

- Number of papers (P) – the total number of article and review document types which have been linked to Thomson Reuters Web of KnowledgeSM database.
- Number of citations (C) – the sum of the citations received by the papers which have been linked to Thomson Reuters Web of KnowledgeSM database (see P).
- Percentage of papers not cited (%P_u) – the percentage of papers which have been linked to Thomson Reuters Web of KnowledgeSM database that are uncited.
- Percentage of research cited more than expected (%C_{>exp}) – the percentage of papers which have been linked to Thomson Reuters Web of KnowledgeSM database that are cited more than expected relative to the journal in which they are published.
- Average field-normalized citation impact (\bar{C}_f) – the average citation impact relative to the world citation average for the appropriate journal categories. A value of less than 1.0 indicates below-average performance.
- Percentage of papers that are highly-cited (%C_{Hi}) – the percentage of papers that have a paper-level average normalized citation impact of at least four-times the world average.
- Percentage of papers in the world’s top 10% (Top10%) – the percentage of the academic unit’s papers in the world’s top 10% by citations relative to the appropriate journal category. A value of less than 10% indicates a below-average performance.

The following indicators have been supplied in the Data Tables in Annex 3 and in the Excel file which accompanies this report:

Table A2.5.1 Quantitative analysis of the publication database for the whole university and citation analysis based on the Thomson Reuters Web of KnowledgeSM database

Abbreviation	Name	Description
P	Number of unique publications	Number of publications published by the aggregation as defined by the University of Gothenburg Publications Database.
Frac P	Number of fractionalized publications	Number of publication fractions published by the aggregation as defined by the University of Gothenburg Publications Database (each publication is divided by the number of authors and only author fractions connected to the aggregation is counted).
P _{art}	Number of unique papers	Number of unique publications in the document types refereed article and review published by the aggregation as defined by the University of Gothenburg Publications Database.

Abbreviation	Name	Description
P_{WoS}	Number of unique publications found in the Thomson Reuters Web of Knowledge SM database	Number of publications published by the aggregation as defined by the intersection of the University of Gothenburg Publications Database and the analyzable part of the Thomson Reuters Web of Knowledge SM database.
$\% \text{ WoS} = P_{\text{WoS}} / P$	Percentage indexed in the Thomson Reuters Web of Knowledge SM	Percentage of total publications which are found in the analyzable part of the Thomson Reuters Web of Knowledge SM database.
Frac P_{WoS}	Number of fractionalized publications found in the Thomson Reuters Web of Knowledge SM database	Number of fractionalized publications published by the aggregation as defined by the intersection of the University of Gothenburg Publications Database and the analyzable part of the Thomson Reuters Web of Knowledge SM database.
C	Number of citations (including self-citations)	Number of citations recorded to all Thomson Reuters Web of Knowledge SM papers up to the day of analysis. Self-citations (citations made by authors with at least one author name in common with the analyzed authors) included.
$C - C_s$	Number of citations (excluding self-citations)	Number of citations recorded to all Thomson Reuters Web of Knowledge SM papers up to the day of analysis. Self-citations (citations made by authors with at least one author name in common with the analyzed authors) excluded.
C_s	Percentage of self-citations	Percentage of total citations which are self-citations (citations made by authors with at least one author name in common with the analyzed authors).
P_u	Percentage of publications not cited	Percentage of Thomson Reuters Web of Knowledge SM -papers analyzed which had not received any citation, excluding self-citations.
\bar{c}	Average citation per publication	Number of average citations an article received.
\bar{H}_j	Average journal citation impact	Reference value for the average citation rate of all papers published in the journals in which a research unit has published (the research unit's journal set), self-citations excluded.
H_f	Average field citation score	Reference value of the average citation rate of all papers in the subfields in which the research unit is active. Also indicated as the world citation average in those subfields or 'world subfield average', self-citations excluded.
$[\bar{c}]_j$	Journal normalized citations	Impact of a research unit's papers, compared to the average citation rate of the research unit's journal set.
$[\bar{c}]_f$	Field-normalized citations	Impact of a research unit's papers, compared to the world citation average in the subfields in which the research unit is active.
\bar{c}_f	Average normalized citation score	Comparable to CPP/FCS ^m , but generated by calculating the average of the C/FCS of the individual analyzed publications.
$[\bar{c}]_{jp}$	Field normalized journal citations	Impact of the journals in which a research unit has published (the research unit's journal set), compared to the world citation average in the subfields covered by these journals.
Top10%	Percentage of papers in top10% most cited papers	Percentage of papers published in the top 10% most cited papers in the respective field.

A2.6 Norwegian bibliometric indicators

Norway uses a bibliometric indicator to make decisions on the allocation of funds to research institutions. This indicator is also used elsewhere to evaluate research performance. The indicator categorizes publications and then awards them a number of points based on this. Firstly, the publications are classified by type:

- Papers in ISSN titles (e.g. scholarly articles in a journal, etc.)
- Papers in ISBN titles (e.g. scholarly articles in an anthology, etc.)
- ISBN titles (e.g. monographs).

The publications are further classified by the publication pattern of the journal in which they appear or the publisher of the title. There are three levels of journals / publishers: level 0, level 1 (normal) or level 2 (prestigious). Points are awarded to publications based on the scheme described in Table A2.1; level 0 publications receive no points.

Table A2.6.1 Norwegian bibliometric indicator point allocations

Norwegian bibliometric indicator publication points	Level 1	Level 2
Scholarly articles in a journal etc (ISSN)	1	3
Scholarly articles in an anthology etc (ISBN)	0.7	1
Monographs (ISBN)	5	8
Department of Physiology	344	3,609

Because publications may have several authors, not all of which are based at the institution being evaluated, they are counted fractionally to determine the publication points score. This means that a paper with four authors, only one of which is based at the institution of interest, will only receive a quarter of the total points for that publication.

University of Gothenburg publications were classified according to the document type provided in the database. Lists of level 1 and level 2 journals and publishers were downloaded from the Norsk Samfunnsvitenskapelig Datatjeneste website (<http://dbh.nsd.uib.no/kanaler/>). Journals were matched solely based on their ISSN. However publishers could only be matched directly by name. Some manual data cleaning was therefore necessary on the University of Gothenburg data. Of the 35,039 publications in the database 10,617 could be assigned a Norwegian bibliometric indicator level, however, there are no data available to suggest whether this level of coverage is typical.

After revision of these data, the University of Gothenburg provided a file of pubid to Norwegian level (nor_level_red10.xls). This file contained 26,757 unique pubids which have been assigned a Norwegian bibliometric indicator level by the

University. (Of these, 88 were not submitted in the original data extract and so are not included in the analyses in Section 6). The total includes 7,769 publications which have been examined and assigned to level 0 – these are referred to in tables as level 0 (assigned). The remaining publications not examined are expected to have a low likelihood of yielding points.

The Data Tables in Annex 3 and the Excel file which accompanies this report provides the following indicators for the University of Gothenburg at the department level:

Table A2.6.2 Norwegian bibliometric indicator and related data for the University of Gothenburg

Abbreviation	Name	Description
P	Number of unique publications	Number of publications published by the aggregation as defined by the University of Gothenburg Publications Database.
P_{ref}	Number of unique articles, book chapters and books	Number of unique publications in the document types refereed article, review, book chapter and book published by the aggregation as defined by the University of Gothenburg Publications Database.
P_{Norway}	Number of unique papers considered scientific in the Norwegian system	Number of publications published in channels defined as scientific (level 1 or 2) in the Norwegian system.
$\% \text{ Norway} = P_{Norway} / P$	Percentage analyzable in the Norwegian system	Percentage of total publications which are analyzable on the scientific level 1 or 2 according to the Norwegian system.
Frac P_{Norway}	Number of fractionalized publications considered scientific in the Norwegian system	Number of fractionalized publications published in channels defined as scientific (level 1 or 2) in the Norwegian system.
N	Norwegian points	Sum of Norwegian points for the period.
% Level 1	Percentage of Frac P-Norway found on Level 1	Percentage of fractionalized publications which are found in higher quality level journals or publishers (level 1).
% Level 2	Percentage of Frac P-Norway found on Level 2	Percentage of fractionalized publications which are found in higher quality level journals or publishers (level 2).
% articles	Percentage of Frac P-Norway defined as journal articles	Percentage of fractionalized publications defined as journal articles according to the Norwegian system.
% anthologies	Percentage of Frac P-Norway defined anthology articles	Percentage of fractionalized publications defined as anthology articles according to the Norwegian system.
% monographs	Percentage of Frac P-Norway defined monographs	Percentage of fractionalized publications defined as monographs according to the Norwegian system.

BIBLIOMETRIC ANALYSIS

Section 6 of this report provides summary data describing patterns of publishing at different levels by the University of Gothenburg. The data are for whole publication counts (as opposed to fractional counts) for the University as a whole and by department, and describe trends in the overall pattern over time.

ANNEX 3 DATA TABLES

Table A3.1 University of Gothenburg publication and fractional publication counts

Department/Aggregation Unit	P	Frac P
Panel 1 – Philosophy, linguistics and language technology		
Department of Computer Science and Engineering (GU)	168	103.01
Philosophy, Linguistics and Theory of Science	858	779.99
Department of Swedish	474	426.62
Panel 2 – Non-Swedish languages and literature		
Department of Language and Literature	1160	1118.54
Panel 3 – Culture, religion and historical studies		
Department of Conservation	220	185.6
Department of Cultural Sciences	980	934.30
Department of Historical Studies	654	611.43
Department of Literature, History of Ideas and Religion	1108	1066.48
Panel 4 – Education		
Department of Education	1936	1727.88
Department of Food, Health and Environment	120	86.30
Department of Work Science	242	156.93
Panel 5 – Music, drama and literature		
Academy of Music and Drama	185	175.53
Department of Literary Composition, Poetry and Prose	23	22.33
Göteborg Organ Art Center	123	114.84
School of Film Directing	9	9.00
Panel 6 – Fine and applied arts		
School of Design and Crafts	217	209.83
School of Photography	83	70.42
Valand School of Fine Arts	68	67.00
Panel 7 – Biology		
Department of Cell and Molecular Biology	399	230.34
Department of Marine Ecology	713	400.89
Department of Plant and Environmental Sciences	713	440.21
Department of Zoology	783	445.23

Table A3.1 continued

Department/Aggregation Unit	P	Frac P
Panel 8 – Chemistry and earth sciences	892 (72.1%)	346 (27.9%)
Department of Chemistry	996	583.03
Department of Earth Sciences	880	592.41
Swedish NMR Centre at Göteborg University	42	18.03
Panel 9 – Mathematics and physics		
Department of Mathematical Sciences	182	119.44
Department of Physics	808	428.52
Panel 10 – Social sciences		
Center for Public Sector Research (CEFOS)	277	245.53
Department of Journalism, Media and Communication	549	490.82
Department of Political Science	1129	989.48
Department of Psychology	1120	729.89
Department of Social Work	1088	944.51
Department of Sociology	714	661.43
School of Global Studies	817	895.32
School of Public Administration	427	373.04
Panel 11 – Biomedicine		
Clinical Chemistry and Transfusion Medicine	221	87.48
Department of Infectious Medicine	524	229.64
Department of Medical Biochemistry and Cell Biology	557	279.59
Department of Medical Genetics	108	48.62
Department of Microbiology and Immunology	457	226.55
Department of Pathology	243	93.66
Panel 12 – Clinical sciences		
Anesthesiology, Biomaterials and Orthopaedics	1034	558.45
Dermatology, Plastic Surgery and Otorhinolaryngology	336	174.20
Oncology, Radiation Physics, Radiology and Urology	728	331.19
Section for Surgery	536	246.91
Section for the Health of Women and Children	1308	607.20
Panel 13 – Health and care sciences		
Institute of Health and Care Sciences	781	496.33

Table A3.1 continued

Department/Aggregation Unit	P	Frac P
Panel 14 – Medicine		
Centre for Bone and Arthritis Research	0	0.00
Department of Clinical Nutrition	184	86.91
Department of Clinical Trials and Entrepreneurship	56	21.18
Department of Emergency and Cardiovascular Medicine	825	293.75
Department of Internal Medicine	1058	451.26
Department of Molecular and Clinical Medicine	748	362.02
Department of Public Health and Community Medicine	981	504.27
Department of Rheumatology and Inflammation Research	328	190.49
Krefting Research Centre	14	6.03
Wallenberg Laboratory	376	188.48
Panel 15 – Neuroscience and physiology		
Department of Clinical Neuroscience and Rehabilitation	1502	852.08
Department of Pharmacology	275	155.33
Department of Physiology	578	279.61
Department of Psychiatry and Neurochemistry	751	339.29
Panel 16 – Odontology		
Institute of Odontology	821	501.44
Panel 17 – Business		
Department of Applied Information Technology (GU)	342	255.73
Department of Business Administration	924	756.17
Gothenburg Research Institute (GRI)	548	437.44
Institute for Innovation and Entrepreneurship	42	20.58
Panel 18 – Economics and law		
Centre for Finance	64	40.58
Department of Economic History	261	234.92
Department of Economics	1046	831.36
Department of Human and Economic Geography	222	195.11
Department of Law	334	311.25

Table A3.2 continued

Department/Aggregation Unit	P	P _{art}	P _{wos}	$\frac{P_{wos}}{P_{art}}$	Frac P _{wos}	C	C-C _s	C _s	P _u	\bar{c}	$\bar{\mu}_j$	$\bar{\mu}_f$	$[\bar{c}]$	$[\bar{c}]_f$	\bar{c}_f	$[\bar{c}]_{fp}$	Top 10%	
Panel 6 – Fine and applied arts																		
School of Design and Crafts	217	7	2	0.9%	2.00	3	3	0.0%	50.0%	1.50	6.87	3.06	0.22	0.49	0.42	2.25	0.0%	
School of Photography	83	0	0	0.0%	0.00	0	0	0.0%	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%	
Valand School of Fine Arts	68	0	0	0.0%	0.00	0	0	0.0%	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%	
Panel 7 – Biology																		
Department of Cell and Molecular Biology	399	287	249	62.4%	135.32	3,561	2,962	16.8%	22.6%	10.40	11.77	9.13	0.88	1.14	1.21	1.20	10.5%	
Department of Marine Ecology	713	491	359	50.4%	182.34	3,910	2,878	26.4%	26.8%	7.82	7.42	5.23	1.05	1.49	1.70	1.27	16.9%	
Department of Plant and Environmental Sciences	713	383	299	41.9%	159.39	3,646	2,763	24.2%	28.6%	8.15	7.01	5.51	1.16	1.48	1.60	1.15	16.3%	
Department of Zoology	783	478	373	47.6%	200.95	3,796	2,808	26.0%	28.0%	7.31	6.42	5.70	1.14	1.28	1.34	0.99	14.8%	
Panel 8 – Chemistry and earth sciences																		
Department of Chemistry	996	769	655	65.8%	363.05	6,704	4,712	29.7%	29.4%	7.17	7.79	5.96	0.92	1.20	1.33	1.20	13.1%	
Department of Earth Sciences	880	400	277	31.5%	151.30	2,109	1,537	27.1%	30.2%	5.40	5.87	5.03	0.92	1.07	1.17	1.11	11.6%	
Swedish NMR Centre at Göteborg University	42	40	37	88.1%	16.38	631	483	23.5%	16.2%	11.86	14.10	8.29	0.84	1.43	1.41	1.58	18.9%	
Panel 9 – Mathematics and physics																		
Department of Mathematical Sciences	182	106	69	37.9%	44.01	474	347	26.8%	54.4%	4.24	3.67	2.35	1.15	1.80	1.30	1.48	10.3%	
Department of Physics	808	617	466	57.7%	219.53	4,415	3,249	26.4%	32.2%	6.95	8.31	5.84	0.84	1.19	1.27	1.35	14.3%	

Table A3.2 continued

Department/Aggregation Unit	P	P _{art}	P _{wos}	$\frac{P_{wos}}{P_{wos}}$	Frac P _{wos}	C	C-C _s	C _s	P _u	\bar{c}	$\bar{\mu}_j$	$\bar{\mu}_f$	$[\bar{c}]$	$[\bar{c}]_f$	\bar{c}_f	$[\bar{c}]_{fp}$	Top 10%	
Panel 10 – Social sciences																		
Center for Public Sector Research (CEFOS)	277	46	14	5.1%	11.87	32	29	9.4%	46.2%	1.54	1.92	3.13	0.80	0.49	0.55	0.58	7.7%	
Department of Journalism, Media and Communication	549	25	1	0.2%	0.33	0	0	0.0%	100.0%	0.00	4.39	1.93	0.00	0.00	0.00	1.32	0.0%	
Department of Political Science	1,129	100	39	3.5%	33.67	176	153	13.1%	53.8%	2.90	1.91	1.71	1.52	1.70	1.73	1.01	23.1%	
Department of Psychology	1,120	456	322	28.8%	159.37	2,605	2,057	21.0%	33.2%	5.69	5.58	5.54	1.02	1.03	1.00	0.93	9.8%	
Department of Social Work	1,088	142	38	3.5%	23.88	135	114	15.6%	56.8%	2.46	2.50	3.15	0.98	0.78	0.56	0.74	8.1%	
Department of Sociology	714	121	38	5.3%	32.31	58	46	20.7%	69.4%	0.97	1.85	2.89	0.52	0.34	0.53	0.63	2.8%	
School of Global Studies	817	122	41	5.0%	39.67	114	86	24.6%	47.5%	1.93	2.38	2.99	0.81	0.64	0.85	0.77	5.0%	
School of Public Administration	427	38	9	2.1%	4.70	12	7	41.7%	62.5%	1.00	3.28	3.80	0.31	0.26	0.65	0.83	0.0%	
Panel 11 – Biomedicine																		
Clinical Chemistry and Transfusion Medicine	221	193	155	70.1%	52.24	2,106	1,643	22.0%	22.0%	9.73	9.22	8.03	1.06	1.21	1.28	1.05	11.3%	
Department of Infectious Medicine	524	441	348	66.4%	134.67	4,095	3,101	24.3%	22.9%	8.80	8.15	9.33	1.08	0.94	1.03	0.83	8.8%	
Department of Medical Biochemistry and Cell Biology	557	438	377	67.7%	162.16	7,623	6,276	17.7%	19.0%	15.73	13.88	10.05	1.13	1.57	1.42	1.31	14.4%	
Department of Medical Genetics	108	88	76	70.4%	27.27	1,019	834	18.2%	23.3%	8.36	9.79	6.61	0.85	1.26	1.53	1.51	6.8%	
Department of Microbiology and Immunology	457	383	326	71.3%	146.06	3,984	3,048	23.5%	20.6%	9.30	10.50	9.53	0.89	0.98	1.03	1.04	8.6%	
Department of Pathology	243	217	165	67.9%	56.94	3,380	2,813	16.8%	20.1%	14.95	11.69	8.91	1.28	1.68	1.61	1.24	15.9%	

Table A3.2 continued

Department/Aggregation Unit	P	P _{art}	P _{vos}	$\frac{P_{vos}}{P_{art}}$	Frac P _{wos}	C	C-C _s	c _s	P _u	$\bar{\epsilon}$	$\bar{\mu}_j$	$\bar{\mu}_r$	$[\bar{c}]_j$	$[\bar{c}]_r$	\bar{c}_i	$[\bar{c}]_{ip}$	Top 10%	
Panel 12 – Clinical sciences																		
Anesthesiology, Biomaterials and Orthopaedics	1,034	815	509	49.2%	248.13	7,510	6,425	14.4%	22.4%	10.49	7.09	5.88	1.48	1.79	1.94	1.11	18.3%	
Dermatology, Plastic Surgery and Otorhinolaryngology	336	272	197	58.6%	76.88	1,775	1,414	20.3%	25.0%	6.39	5.19	6.01	1.23	1.06	1.21	0.81	10.2%	
Oncology, Radiation Physics, Radiology and Urology	728	644	474	65.1%	205.14	5,211	4,201	19.4%	27.2%	7.64	7.32	7.81	1.04	0.98	1.23	0.89	9.7%	
Section for Surgery	536	475	319	59.5%	135.10	4,398	3,677	16.4%	25.1%	10.00	7.93	7.93	1.26	1.26	1.39	0.92	9.5%	
Section for the Health of Women and Children	1,308	1,098	863	66.0%	351.45	11,477	9,272	19.2%	24.8%	9.52	7.38	6.64	1.29	1.43	1.51	1.03	15.3%	
Panel 13 – Health and care sciences																		
Institute of Health and Care Sciences	781	484	257	32.9%	129.59	1,335	1,132	15.2%	42.9%	3.63	3.61	3.33	1.01	1.09	0.95	0.99	5.7%	
Panel 14 – Medicine																		
Centre for Bone and Arthritis Research	0	0	0	0.0%	0.00	0	0	0.0%	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%	
Department of Clinical Nutrition	184	143	95	51.6%	37.95	1,059	889	16.1%	23.2%	7.98	7.07	7.48	1.13	1.07	1.00	0.91	8.4%	
Department of Clinical Trials and Entrepreneurship	56	48	39	69.6%	12.77	1,129	1,032	8.6%	17.1%	21.69	11.71	10.20	1.85	2.13	3.96	1.12	8.6%	
Department of Emergency and Cardiovascular Medicine	825	743	498	60.4%	137.68	12,461	10,706	14.1%	16.4%	19.41	13.91	9.93	1.40	1.95	1.93	1.37	19.2%	
Department of Internal Medicine	1,058	942	724	68.4%	282.88	13,573	11,401	16.0%	18.6%	14.68	11.45	9.35	1.28	1.57	1.42	1.18	14.1%	
Department of Molecular and Clinical Medicine	748	634	448	59.9%	188.74	6,800	5,919	13.0%	29.2%	10.67	8.47	6.10	1.26	1.75	1.82	1.33	11.6%	
Department of Public Health and Community Medicine	981	705	495	50.5%	212.79	5,876	4,816	18.0%	32.5%	8.56	6.52	5.56	1.31	1.54	1.39	1.14	13.3%	
Department of Rheumatology and Inflammation Research	328	293	255	77.7%	134.54	2,886	2,348	18.6%	19.6%	8.56	9.16	9.92	0.93	0.86	0.92	0.86	7.8%	
Krefting Research Centre	14	14	12	85.7%	5.03	33	19	42.4%	75.0%	0.50	0.74	0.57	0.68	0.88	0.89	1.18	0.0%	
Wallenberg Laboratory	376	346	258	68.6%	125.48	4,225	3,505	17.0%	19.2%	12.20	12.35	9.59	0.99	1.27	1.32	1.26	14.9%	

Table A3.2 continued

Department/Aggregation Unit	P	P _{art}	P _{vos}	$\frac{P_{vos}}{P_{vos}^{pos}}$	Frac P _{v_{os}}	C	C-C _s	C _s	P _u	\bar{c}	$\bar{\mu}_j$	$\bar{\mu}_f$	$[\bar{c}]_j$	$[\bar{c}]_f$	\bar{c}_i	$[\bar{c}]_{ip}$	Top 10%	
Panel 15 – Neuroscience and physiology																		
Department of Clinical Neuroscience and Rehabilitation	1,502	1,028	750	49.9%	335.77	9,390	7,652	18.5%	0.0%	9.00	7.85	7.00	1.15	1.29	1.27	1.05	12.2%	
Department of Pharmacology	275	213	185	67.3%	90.56	1,824	1,426	21.8%	26.5%	6.75	6.88	6.83	0.98	0.99	1.28	0.93	9.9%	
Department of Physiology	578	433	346	59.9%	141.69	4,882	3,722	23.8%	23.6%	10.49	10.37	9.06	1.01	1.16	1.34	1.08	12.8%	
Department of Psychiatry and Neuro-chemistry	751	631	447	59.5%	171.67	7,650	5,847	23.6%	21.2%	11.31	7.84	6.10	1.44	1.86	1.92	1.19	20.8%	
Panel 16 – Odontology																		
Institute of Odontology	821	637	450	54.8%	252.09	4,800	4,044	15.8%	27.6%	7.86	6.08	5.27	1.29	1.49	1.39	1.09	15.1%	
Panel 17 – Business																		
Department of Applied Information Technology (GU)	342	74	16	4.7%	7.48	36	30	16.7%	68.8%	0.94	1.93	2.29	0.49	0.41	0.69	0.80	0.0%	
Department of Business Administration	924	169	52	5.6%	40.03	110	92	16.4%	64.7%	1.14	1.56	1.74	0.73	0.65	0.77	0.77	5.9%	
Gothenburg Research Institute (GR)	548	97	33	6.0%	23.67	100	87	13.0%	45.5%	1.82	2.35	2.55	0.77	0.71	1.03	0.86	6.1%	
Institute for Innovation and Entrepreneurship	42	3	2	4.8%	1.25	1	1	0.0%	100.0%	0.00	0.59	0.63	0.00	0.00	0.00	0.92	0.0%	
Panel 18 – Economics and law																		
Centre for Finance	64	31	1	1.6%	0.33	0	0	0.0%	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%	
Department of Economic History	261	19	5	1.9%	3.50	8	6	25.0%	75.0%	0.50	0.68	0.41	0.74	1.21	0.58	1.02	0.0%	
Department of Economics	1,046	328	196	18.7%	136.27	867	701	19.1%	46.9%	2.76	2.90	2.65	0.95	1.04	1.08	0.97	9.4%	
Department of Human and Economic Geography	222	57	16	7.2%	12.40	53	38	28.3%	46.7%	1.87	1.79	2.10	1.04	0.89	0.99	0.78	0.0%	
Department of Law	334	63	4	1.2%	2.33	11	11	0.0%	25.0%	2.00	4.11	5.04	0.49	0.40	2.26	0.78	25.0%	

Table A3.3 Bibliometric indicators for University of Gothenburg publications – Norwegian publication channel analysis

Department/Aggregation Unit	P	P _{ref}	P _{Norway}	$\frac{\% \text{ Norway}}{P} = \frac{P_{\text{Norway}}}{P}$	Frac P _{Norway}	N	% Level 1	% Level 2	% articles	% monographs	% anthologies	
Panel 1 – Philosophy, linguistics and language technology												
Department of Computer Science and Engineering (GU)	168	68	65	38.7%	44.8	63.1	81.4%	18.6%	75.3%	4.6%	20.1%	
Philosophy, Linguistics and Theory of Science	858	344	234	27.3%	206.1	303.0	80.5%	19.5%	54.4%	6.2%	39.3%	
Department of Swedish	474	188	130	27.4%	122.2	143.2	46.8%	53.2%	37.8%	2.0%	60.2%	
Panel 2 – Non-Swedish languages and literature												
Department of Language and Literature	1397	719	309	22.1%	294.8	523.6	71.9%	28.1%	61.3%	11.8%	26.9%	
Panel 3 – Culture, religion and historical studies												
Department of Conservation	220	77	31	14.1%	22	22.1	94.1%	5.9%	62.1%	0.0%	37.9%	
Department of Cultural Sciences	1217	401	212	17.4%	201.3	319.8	80.0%	20.0%	33.9%	12.7%	53.4%	
Department of Historical Studies	654	309	141	21.6%	126.7	232.7	82.0%	18.0%	38.9%	17.4%	43.7%	
Department of Literature, History of Ideas and Religion	1108	472	288	26.0%	276.3	451.5	82.7%	17.3%	36.5%	13.2%	50.3%	
Panel 4 – Education												
Department of Education	1936	764	568	29.3%	486.8	697.6	81.0%	19.0%	40.7%	8.1%	51.2%	
Department of Food, Health and Environment	120	42	19	15.8%	12.1	11.1	97.7%	2.3%	58.6%	0.0%	41.4%	
Department of Work Science	242	106	76	31.4%	49.7	60.8	92.2%	7.8%	33.0%	7.0%	60.0%	
Panel 5 – Music, drama and literature												
Academy of Music and Drama	185	34	13	7.0%	11.2	15.0	77.6%	22.4%	64.1%	0.0%	35.9%	
Department of Literary Composition, Poetry and Prose	23	11	1	4.3%	1.0	3.0	0.0%	100.0%	100.0%	0.0%	0.0%	
Göteborg Organ Art Center	123	56	22	17.9%	19.9	19.4	98.0%	2.0%	7.0%	5.0%	88.0%	
School of Film Directing	9	1	0	0.0%	0.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	

Table A3.3 continued

Department/Aggregation Unit	P	P _{ref}	P _{Norway}	$\frac{\% \text{Norway}}{P} = \frac{P_{\text{Norway}}}{P}$	Frac P _{Norway}	N	% Level 1	% Level 2	% articles	% monographs	% anthologies	
Panel 6 – Fine and applied arts												
School of Design and Crafts	217	45	8	3.7%	8.0	15.1	75.0%	25.0%	50.0%	12.5%	37.5%	
School of Photography	83	21	4	4.8%	3.0	10.7	100.0%	0.0%	0.0%	66.7%	33.3%	
Valand School of Fine Arts	68	7	1	1.5%	1.0	1.0	0.0%	100.0%	0.0%	0.0%	100.0%	
Panel 7 – Biology												
Department of Cell and Molecular Biology	399	297	295	73.9%	158.5	257.8	68.0%	32.0%	95.7%	0.3%	4.0%	
Department of Marine Ecology	713	509	494	69.3%	241.8	322.1	82.4%	17.6%	97.1%	0.0%	2.9%	
Department of Plant and Environmental Sciences	714	421	390	54.6%	205.8	260.1	84.4%	15.6%	94.7%	0.0%	5.3%	
Department of Zoology	783	519	510	65.1%	271.1	387.0	76.6%	23.4%	90.0%	0.0%	10.0%	
Panel 8 – Chemistry and earth sciences												
Department of Chemistry	1001	793	785	78.4%	425.1	684.0	70.0%	30.0%	97.6%	0.4%	2.0%	
Department of Earth Sciences	886	436	401	45.3%	212.9	291.2	84.6%	15.4%	95.5%	1.8%	2.7%	
Swedish NMR Centre at Göteborg University	42	41	40	95.2%	17.5	34.8	50.2%	49.8%	98.1%	0.0%	1.9%	
Panel 9 – Mathematics and physics												
Department of Mathematical Sciences	182	109	108	59.3%	69.2	114.2	67.3%	32.7%	96.4%	0.7%	2.9%	
Department of Physics	808	632	617	76.4%	297.8	547.3	58.5%	41.5%	97.6%	0.3%	2.0%	
Panel 10 – Social sciences												
Center for Public Sector Research (CEFO)	277	157	81	29.2%	76.9	101.4	81.8%	18.2%	49.7%	3.9%	46.4%	
Department of Journalism, Media and Communication	786	252	61	7.8%	52.6	76.3	81.0%	19.0%	37.1%	8.7%	54.2%	
Department of Political Science	1129	440	269	23.8%	231.2	354.3	74.1%	25.9%	33.1%	11.0%	55.9%	
Department of Psychology	1120	605	558	49.8%	312.3	410.0	82.2%	17.8%	73.3%	2.7%	23.9%	
Department of Social Work	1088	305	207	19.0%	147.2	233.5	80.5%	19.5%	59.9%	9.7%	30.4%	
Department of Sociology	714	304	230	32.2%	204.9	291.6	77.5%	22.5%	49.1%	6.3%	44.7%	
School of Global Studies	817	308	236	28.9%	265.0	384.7	69.9%	30.1%	40.7%	7.8%	51.5%	
School of Public Administration	427	171	102	23.9%	80.0	102.0	93.1%	6.9%	26.5%	10.0%	63.5%	

Table A3.3 continued

Department/Aggregation Unit	P	P _{ref}	P _{Norway}	$\frac{\% \text{Norway}}{P} = \frac{P_{\text{Norway}}}{P}$	Frac P _{Norway}	N	% Level 1	% Level 2	% articles	% monographs	% anthologies	
Panel 11 – Biomedicine												
Clinical Chemistry and Transfusion Medicine	221	202	198	89.6%	71.3	93.8	82.6%	17.4%	89.1%	0.0%	10.9%	
Department of Infectious Medicine	524	458	433	82.6%	165.5	218.1	84.6%	15.4%	98.8%	0.3%	0.9%	
Department of Medical Biochemistry and Cell Biology	557	444	432	77.6%	186.8	306.1	67.8%	32.2%	98.4%	0.0%	1.6%	
Department of Medical Genetics	108	91	90	83.3%	33.5	53.5	69.5%	30.5%	95.5%	0.0%	4.5%	
Department of Microbiology and Immunology	457	398	378	82.7%	172.1	229.8	81.5%	18.5%	94.9%	0.0%	5.1%	
Department of Pathology	243	224	219	90.1%	77.1	118.2	73.6%	26.4%	95.8%	0.6%	3.6%	
Panel 12 – Clinical sciences												
Anesthesiology, Biomaterials and Orthopaedics	1034	842	810	78.3%	392.1	545.0	80.2%	19.8%	96.4%	0.1%	3.5%	
Dermatology, Plastic Surgery and Otorhinolaryngology	336	279	275	81.8%	121.3	154.4	85.6%	14.4%	94.8%	0.0%	5.2%	
Oncology, Radiation Physics, Radiology and Urology	728	669	644	88.5%	264.8	345.6	84.2%	15.8%	96.6%	0.0%	3.4%	
Section for Surgery	536	477	464	86.6%	200.7	272.3	82.1%	17.9%	99.6%	0.0%	0.4%	
Section for the Health of Women and Children	1308	1146	1126	86.1%	479.3	648.4	81.7%	18.3%	95.3%	0.1%	4.7%	
Panel 13 – Health and care sciences												
Institute of Health and Care Sciences	781	551	538	68.9%	319.6	463.4	76.7%	23.3%	84.4%	0.7%	14.9%	
Panel 14 – Medicine												
Centre for Bone and Arthritis Research												
Department of Clinical Nutrition	184	150	139	75.5%	57.9	75.5	84.4%	15.6%	97.7%	0.0%	2.3%	
Department of Clinical Trials and Entrepreneurship	56	48	48	85.7%	16.3	18.0	94.8%	5.2%	100.0%	0.0%	0.0%	
Department of Emergency and Cardiovascular Medicine	825	769	752	91.2%	250.0	357.4	76.4%	23.6%	94.2%	0.0%	5.8%	
Department of Internal Medicine	1058	966	947	89.5%	377.1	516.1	81.1%	18.9%	96.7%	0.0%	3.3%	
Department of Molecular and Clinical Medicine	748	652	631	84.4%	281.0	386.5	80.4%	19.6%	96.8%	0.0%	3.2%	
Department of Public Health and Community Medicine	981	726	705	71.9%	313.7	422.1	82.7%	17.3%	97.7%	0.2%	2.1%	
Department of Rheumatology and Inflammation Research	328	294	290	88.4%	155.7	200.1	85.4%	14.6%	99.7%	0.0%	0.3%	
Krefting Research Centre	14	14	14	100.0%	6.0	6.8	93.4%	6.6%	100.0%	0.0%	0.0%	
Wallenberg Laboratory	376	350	342	91.0%	165.1	248.3	74.6%	25.4%	98.4%	0.0%	1.6%	

Table A3.3 continued

Department/Aggregation Unit	P	P _{Ref}	P _{Norway}	$\frac{\% \text{ Norway}}{P} = \frac{P_{\text{Norway}}}{P}$	Frac P _{Norway}	N	% Level 1	% Level 2	% articles	% monographs	% anthologies	
Panel 15 – Neuroscience and physiology												
Department of Clinical Neuroscience and Rehabilitation	1502	1116	1073	71.4%	528.6	661.7	86.3%	13.7%	91.2%	0.2%	8.6%	
Department of Pharmacology	275	218	216	78.5%	108.5	152.9	79.0%	21.0%	96.2%	0.0%	3.8%	
Department of Physiology	578	449	435	75.3%	184.7	296.0	69.3%	30.7%	96.2%	0.0%	3.8%	
Department of Psychiatry and Neurochemistry	751	672	651	86.7%	274.8	394.0	74.4%	25.6%	90.3%	0.2%	9.5%	
Panel 16 – Odontology												
Institute of Odontology	821	716	673	82.0%	388.5	566.1	76.6%	23.4%	90.4%	0.4%	9.2%	
Panel 17 – Business												
Department of Applied Information Technology (GU)	342	118	106	31.0%	72.8	83.0	84.4%	15.6%	58.3%	0.0%	41.7%	
Department of Business Administration	924	378	281	30.4%	213.8	307.8	80.1%	19.9%	51.9%	8.9%	39.2%	
Gothenburg Research Institute (GRI)	548	276	228	41.6%	181.0	283.2	72.1%	27.9%	39.5%	11.0%	49.5%	
Institute for Innovation and Entrepreneurship	42	16	16	38.1%	9.0	12.0	44.4%	55.6%	25.0%	5.6%	69.4%	
Panel 18 – Economics and law												
Centre for Finance	64	36	33	51.6%	18.1	23.7	77.9%	22.1%	87.1%	0.0%	12.9%	
Department of Economic History	261	98	38	14.6%	32.3	51.1	82.0%	18.0%	35.1%	13.9%	51.0%	
Department of Economics	1046	422	386	36.9%	274.5	399.2	78.9%	21.1%	80.4%	3.3%	16.3%	
Department of Human and Economic Geography	222	97	62	27.9%	52.6	69.9	81.9%	18.1%	77.5%	2.9%	19.7%	
Department of Law	334	198	119	35.6%	111.8	240.3	77.2%	22.8%	25.8%	27.3%	46.9%	

ANNEX 4 RESTRUCTURING WITHIN THE FACULTY OF EDUCATION (PANEL 4)

Two departments within the Education panel in the University of Gothenburg recently reorganized and formed four new departments (July 1, 2010). The University requested that these four new units be analyzed separately using similar data and these results are presented in this Annex.

The original departments in the Education panel were:

- Department of Education
- Department of Food, Health & Environment
- Department of Work Science

The latter, Department of Work Science, has not been affected by the restructuring, the other two departments have been restructured to form four new departments:

- Department of Education and Special Education
- Department of Education, Communication and Learning
- Department of Food and Nutrition, and Sport Science
- Department of Pedagogical, Curricular and Professional Studies

Table A4.1 Bibliometric analyses of University of Gothenburg academic units, 2004-2009: restructured Faculty of Education (Panel 4)

Panel/department	P	C	%P _u	C _{>exp}	\bar{c}_f	% \bar{c}_{hi}	Top10%
Education	88	224	14,2%	33.0%	1.09	2.3%	5.7%
Department of Education and Special Education	23	67	25,0%	21.7%	0.53	0.0%	0.0
Department of Education, Communication and Learning	26	39	43,5%	19.2%	1.45	7.7%	7.7%
Department of Food and Nutrition, and Sport Science	8	129	80,8%	50.0%	1.53	0.0%	12.5%
Department of Pedagogical, Curricular and Professional Studies	14	57	21,4%	14.3%	0.92	0.0%	0.0%
Department of Work Science	18	45	25,0%	72.2%	1.16	0.0%	11.1%

The Panel 4 – Education panel performs slightly above the world average level in terms of average field-normalized citation impact (1.09).

The constituent departments, the Department of Education, Communication and Learning and the Department of Food and Nutrition, and Sport Science, perform

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well above the world average on this indicator (1.45 and 1.53 respectively), however, papers numbers are low.

The share of papers in the top 10% worldwide is low for the overall panel of Education (5.7%) but good for the Department of Food and Nutrition, and Sport Science and the Department of Work Science.

Table A4.2 Norwegian bibliometric indicators for the restructured Faculty of Education (Panel 4)

Panel/department	Level 1 publications	Level 2 publications	Norwegian points
Panel 4 - Education	585 (82.4%)	125 (17.6%)	769.6
Department of Education and Special Education	222 (82.2%)	48 (17.8%)	267.3
Department of Education, Communication and Learning	157 (74.8%)	53 (25.2%)	250.6
Department of Food and Nutrition, and Sport Science	39 (92.9%)	3 (7.1%)	22.9
Department of Pedagogical, Curricular and Professional Studies	112 (88.2%)	15 (11.8%)	162.5
Department of Work Science	72 (87.8%)	10 (12.2%)	60.8

The Department of Education, Communication and Learning has more than one-quarter of its publications assigned to prestigious publication channels (level 2 – 25.2%). This analysis is in broad agreement with data from citation analyses presented in Table A4.1.

Table A4.3 Publication and fractional publication counts for the restructured Faculty of Education (Panel 4)

Department	P	Frac P
Panel 4 - Education		
Department of Education and Special Education	879	757.46
Department of Education, Communication and Learning	592	507.42
Department of Food and Nutrition, and Sport Science	209	161.82
Department of Pedagogical, Curricular and Professional Studies	428	363.14
Department of Work Science	242	156.93

Table A4.4 Bibliometric indicators for the restructured Faculty of Education (Panel 4) – Thomson Reuters Web of KnowledgeSM citation data

Department/Aggregation Unit	P	P _{art}	P _{wos}	$\frac{P_{wos}}{P}$	$\frac{Frac P_{wos}}{P_{wos}}$	C	C-C _s	c _s	P _u	τ	P _j	P _r	[c]	[c] _i	τ_i	[c] _{ip}	Top 10%	
Panel 4 – Education (from July 1, 2010)																		
Department of Education and Special Education	879	120	23	2.6%	15.76	67	58	16.3%	25.0%	1.87	3.39	3.48	0.69	0.54	0.53	0.77	0.0%	
Department of Education, Communication and Learning	592	97	27	4.6%	21.28	39	33	33.3%	43.5%	0.46	1.12	0.75	0.64	0.61	1.45	1.03	7.7%	
Department of Food and Nutrition, and Sport Science	209	22	8	3.8%	2.67	129	98	21.6%	80.8%	11.00	6.65	5.66	2.04	1.94	1.53	0.94	12.5%	
Department of Pedagogical, Curricular and Professional Studies	428	55	15	3.3%	7.57	57	49	11.1%	21.4%	2.57	4.11	2.43	0.72	1.06	0.92	1.28	0.0%	
Department of Work Science	242	45	18	7.4%	6.25	100	54	46.0%	25.0%	2.50	1.40	1.75	1.79	1.43	1.16	0.69	11.1%	

Table A4.5 Bibliometric indicators for the restructured Faculty of Education (Panel 4) – Norwegian publication channel analysis

Department/Aggregation Unit	P	P _{ref}	P _{Norway}	$\frac{P_{Norway}}{P}$	$\frac{Norway}{P_{Norway}}$	N	% Level 1	% Level 2	% articles	% monographs	% anthologies
Panel 6 – Fine and applied arts											
Department of Education and Special Education	879	340	259	29.5%	214.0	267.3	82.6%	17.4%	39.4%	4.8%	55.8%
Department of Education, Communication and Learning	592	261	197	33.3%	164.3	250.6	73.5%	26.5%	43.0%	7.8%	49.2%
Department of Food and Nutrition, and Sport Science	209	74	31	14.8%	23.3	22.9	94.5%	5.5%	57.1%	0.0%	42.9%
Department of Pedagogical, Curricular and Professional Studies	428	154	121	28.3%	93.2	162.5	89.3%	10.7%	36.8%	17.8%	45.4%
Department of Work Science	242	106	76	31.4%	49.7	60.8	92.2%	7.8%	33.0%	7.0%	60.0%

