



DEPARTMENT OF  
LANGUAGES AND LITERATURES  
ENGLISH

## ENGLISH AT UNIVERSEUM

A Needs Analysis of Communication in English  
at the Science Center *Universeum* in Gothenburg

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**Title:** *English at Universeum: A Needs Analysis of Communication in English at the Science Center Universeum in Gothenburg*

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**Abstract:** The purpose of this study is to investigate how English is used at *Universeum*, the largest science center in Scandinavia, and also to identify any needs for improving the communication in English. To do this, a needs analysis is conducted that identifies the present state of *Universeum*'s English as well as a target situation in which the all the communicative goals for the language are met. In order to triangulate these two situations, the analysis makes use of three separate approaches: a questionnaire, three semi-structured interviews, and a text analysis of sign texts. The analysis shows that English is frequently used, in both written and oral form, in communication with visitors, business partners, and other zoos and science centers, but also between colleagues. The overall level of English is high, but some areas for improvement are identified. The questionnaire and interviews show that formal spoken communication in the form of scheduled guided tours and other activities are needed. The text analysis shows that there are many discrepancies between the signs' Swedish and English texts, and that the English versions are often more complex. The study ends with a table that summarizes the needs and some suggested actions for improvements.

**Keywords:** Needs analysis, Target Situation Analysis (TSA), Present Situation Analysis (PSA), Text analysis, Questionnaire, Interviews, Universeum

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# 1. Introduction

## 1.1 Background

*Universeum* is the largest science center in Scandinavia and one of Sweden's most popular tourist attractions. It opened to the public in 2001 and it is a non-profit company with board members from, among others, *Gothenburg University*, *Chalmers University of Technology*, and the Gothenburg municipality. *Universeum*'s aim is to get children and young people interested in science, technology, nature, and mathematics (*Vårt uppdrag* "Our mission" [online]), but their intended audience includes adults as well.

Even though many of the exhibitions focus on interactivity as a part of the learning process and overall experience, the language directed at visitors also plays an important role. All information given in Swedish on signs throughout the building should be available in English as well, since *Universeum* has many non-Swedish speaking visitors. Also, the employees frequently use English skills such as speaking, listening, and reading, both in communication with visitors and with fellow employees who do not have Swedish as their first language. It seems, then, that a key to successful communication, both with visitors and between employees, is a functional English. However, no analysis of *Universeum*'s English has been conducted, and consequently no analysis of needs for English or improvement on the English already in use. This study attempts to fill that gap.

## 1.2 Aim and research questions

The aim of this study is to investigate the use of English at the Swedish science center *Universeum*, and identify any needs for improvement in its use. This is done through an analysis of the present state of the communication in English matched to an analysis of a target situation where *Universeum*'s English can be used for all its communicative purposes. To triangulate the two situations, a three-fold method was used: a text analysis of twenty-four sign texts from the various exhibitions, a questionnaire asking about the employees' use of English, and three semi-structured interviews with employees. The questionnaire and interview questions can be found in Appendices A and B, respectively. In order to reach the aim, the following research questions have to be answered:

- What should *Universeum* be able to use English for?
- Which communicative tasks do employees at *Universeum* use English for, and how often do they perform these tasks?

- What are the employees' own attitudes towards their English? (E.g. which English communicative skills do they feel comfortable/less comfortable with, which areas do they think they need to improve in.)
- Is the written material in English analyzed here adequate for its various purposes?
- Is the present level of English adequate for meeting the needs of English at *Universeum*, or are there areas in which improvements are needed?

The first question defines the target situation, i.e. the ideal situation in which *Universeum* can use a level of English adequate for all its communicative needs. The next three questions aim to define the present situation. The last question aims to identify any needs for improvements, and is dealt with in the conclusions section (section 5.1).

## 2. Theoretical framework

### 2.1 Previous research

Since no previous needs analysis of the English at *Universeum* has been conducted, such a study cannot be mentioned here. This section instead reviews a few previous needs analyses in other areas as well as a few previous studies on the communication at *Universeum*, which do not focus on the use of English.

#### 2.1.1 Needs analyses

A very large number of needs analyses investigating language needs and language teaching curriculum building have been conducted since the idea of needs analysis was first introduced in the 1920s (West 1994:1). However, since the purpose of the present study concerns only *Universeum*'s English, and not language teaching per se, only a few other needs analyses have been examined in order to achieve an understanding of what a needs analysis is and how it can be conducted.<sup>1</sup>

The model for the present study's research design was provided by Wu & Chin's (2010) investigation of the needs for English in the Taiwanese banking sector. Their investigation is based on a three-fold design that includes a document analysis, a number of semi-structured interviews, and a questionnaire survey. They conclude, among other things, that spoken interaction skills is something that the Taiwanese banking professionals want to take courses in and that these courses should focus on communication strategies and cross-cultural understanding. They also find that self-study is a crucial aspect of learning English for these professionals.

Also considered for the present study was the design of Clement & Murugavel's (2014) investigation of the effectiveness of English language courses offered to engineering students in India. The researchers conclude that there is a large gap between the teaching methodology and the confidence levels of the engineering students, and that this leads to employment problems for the students. Although its aim and results are not relevant for the present study, the investigation's design provided another example of how to conduct a successful needs analysis. Clement & Murugavel based their investigation on a questionnaire, a number of semi-structured interviews, and classroom observations. Similar observations of *Universeum*'s employees using English could have been used in the present study, but a text analysis was chosen instead for two reasons. Firstly, since text signs are the most prevalent

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<sup>1</sup> Although the present study is clearly related to the research field of linguistic landscapes, one of the purposes with the study was to conduct a needs analysis, and therefore theories from the field of linguistic landscapes will not be utilized here.

medium for communication at *Universeum* it was deemed important for the present study to analyze these texts. Secondly, most of the employees' communication in English with visitors is conducted during the summer when the majority of *Universeum*'s non-Swedish speaking visitors arrive, and the present study was written in the winter/spring, so such observations were not deemed time-effective.

For an overview of the history and theories behind needs analysis in language teaching, West (1994) and Khansir & Pakdel (2014) were studied. These two articles also give some suggestions on how to conduct a needs analysis, and in this study some of the steps that West suggests have been followed. For a discussion of West's theories, see section 2.2, and for a discussion of how these were adapted to the present study, see section 2.2.1.

### **2.1.2 Communication at *Universeum***

Although no previous needs analysis of English communication has been conducted at *Universeum*, two studies from different perspectives have been conducted concerning the communication at *Universeum*.

Nyman & Sandahl's (2003) 60-credit MA thesis investigates how scientific communication is directed at children and young people through text signs at *Universeum*. The thesis consists of an analysis of the appropriate language and the best layout for signs, and ends with some recommendations for sign texts and layout. The target group for *Universeum*'s texts is identified as twelve-year-olds, which is also the model reader identified in the present study (for more on the term 'model reader', see section 2.3.2). The analysis of the complexity of English texts in the present study is not influenced by Nyman & Sandahl's analysis of appropriate language, since their analysis was conducted without any text analysis elements. Instead, their analysis is based on theories in child psychology.

Of relevance for the suggestions laid forth in the present study concerning the communication in English are the suggestions presented in Borgvall & Ekfeldt's (2003) BA thesis, which focuses on the communication within a flat organization. They have chosen *Universeum* since it is a typical flat organization in which employees are encouraged to be directly involved in decision making processes. However, their thesis shows that there is a gap between the management and the workers, and that communication is felt to be ineffective and time-consuming. The thesis ends with a few suggestions on how to make the communication more effective. Even though the thesis deals only with inwards communication between management and workers, mainly in Swedish, and not with the outwards communication in English that the present study mainly puts focus on, these



suggestions on how to make the communication more effective are relevant for the suggestions given in the present study. See section 5.1 for further discussion.

## 2.2 Needs analysis theory

It has been pointed out that “needs analysis is, by its very nature, a pragmatic activity” and that it is “based on highly localised situations” (West 1994:2). This is true of the present study, which looks specifically at the needs of English at one Swedish science center. West’s comments imply that a general theoretical basis for such a study would be difficult to pinpoint. However, the concept of needs analysis does have a theoretical basis, and even though the present study does not make use of all the theoretical parts, some mention of that basis should be made here.

West states that the term ‘analysis of needs’ originates in the foreign language teaching in India in the 1920s (1994:1), and since then, needs analysis has been closely tied to language teaching and language acquisition, perhaps especially to the field of ESP (English for Specific Purposes) (Khansir & Pakdel 2014:14).<sup>2</sup> Within the field of language teaching, needs analysis is often used in a rather narrow sense, i.e. it “refers to the activities involved in gathering information that will serve as the basis for developing a curriculum that will meet the learning needs of a particular group of students” (Khansir & Pakdel 2014:7–8). Khansir & Pakdel also state that “the role of needs analysis can be regarded as a ‘device’ the learners use in order to learn” (2014:6). However, this role of needs analysis as such a “device” is perhaps a little simplified. Chambers (1980) problematizes the term ‘needs analysis’ by dividing it into two equally ambiguous terms: ‘needs’ and ‘analysis’. He states that “the term ‘need’ is both ambiguous and imprecise” (1980:26) and that it can mean anything from “necessities” to “desires”. He also states that “any analysis must consist of more than the collation of information” (1980:28). This would imply that the view of needs analysis as the information gathering activity that Khansir & Pakdel describe is incorrect. However, Khansir & Pakdel’s article is of a much later date, and it mirrors the general view of needs analysis within language teaching today, and so for the purpose of the present study the modern view that Khansir & Pakdel describe is of more use. In the present study, though, a slightly different approach to needs analysis is used, which is described in a separate section below.

The activity of a needs analysis is often divided into different parts, of which all or some are used. West (1994) proposes six questions that should be answered when conducting

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<sup>2</sup> Needs analysis is of course not tied only to the field of linguistics. An analysis of needs can, naturally, be done in almost any field, from economics to sports. In this study, however, the term is used to refer only to its use within linguistics.

a needs analysis – and the answers often come through different part-analyses. West's questions are:

- a) What and why? – What needs to be learned and for what purpose? Here one tries to bridge the gap between product-oriented needs (objective needs) and learners' wants (subjective needs). This is in turn divided into a number of approaches, which are described below.
- b) When? – At what point in a language course should a needs analysis be undertaken? West identifies four possible answers: before the course, at the start of it, during it, and after the course.
- c) Who? – Who decides what the language needs are? West states that there are often “three principal parties involved” (1994:6): the teacher, the student, and the company or sponsor behind the language course.<sup>3</sup>
- d) For whom? – Needs analyses are not always carried out for the benefit of the users, but also for the “requirer”, which can be companies or countries needing trained personnel.
- e) How? – Here West lists ten methods with which a needs analysis can be carried out, e.g. through observation of classes, structured interviews, or learner diaries. Some combination of these (or a combination of all of them) is suggested as the best way to perform a needs analysis.
- f) How long? – The length of time taken to perform a needs analysis varies with the methods used and the scale of the analysis.

The division of a) above into a number of different approaches requires further mention. West divides his needs analysis into four sub-analyses: target situation analysis, deficiency analysis, strategy analysis, and means analysis (West 1994:8–12). The target situation analysis investigates the learners' language requirements. The deficiency analysis investigates both the target requirements and the learners' present deficiencies. The strategy analysis looks at *how* learners' should learn. Finally, the means analysis investigates the practicalities, constraints, logistics, and pedagogy surrounding and shaping the learning process.

Wu & Chin (2010:2–3) instead divide their needs analysis into Target Situation Analysis (TSA), Learning Situation Analysis (LSA), and Present Situation Analysis (PSA). Here, the TSA looks at the tasks and activities for which the learners will use the target

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<sup>3</sup> Here it becomes obvious that needs analysis in language teaching often has to do with Business English and ESP, where companies (often in countries where English serves as a business lingua franca, e.g. India, China, Taiwan) want their employees' English to be improved.

language. The LSA includes various factors that may affect the learning process (e.g. previous learning experiences, expectations etc.). The PSA investigates the learners' present use (strengths and weaknesses) of the target language. Their division is based on Dudley-Evans & St John's division where "a TSA includes objective, perceived and product-oriented needs; an LSA includes subjective, felt and process-oriented needs; a PSA estimates strengths and weaknesses in language, skills, learning experiences" (1998:123–124). In this study, the needs analysis is divided into TSA and PSA based on West (1994) and Wu & Chin (2010), as explained below.

### 2.2.1 Needs analysis in the present study

Since the present study does not aim to investigate the learning or teaching needs for *Universeum's* employees, but rather to investigate what needs there might be for improvement of a language already known and used, the needs analysis in the present study does not follow all of the steps described above. However, even though the needs of *Universeum* do not include learning a language, some of West's (1994) questions and approaches are applicable. For example, West's first question "What needs to be learned and for what purpose?" could here be re-phrased as "What needs to be improved to fully meet the communicative purposes of *Universeum's* English?". Also, questions c), d), and e) are of interest. The language needs are decided by *Universeum's* policy that all communication directed at visitors should be available in English<sup>4</sup>, but also, in the present study, by the employees themselves through their answers to the questionnaire and interview questions, and by my own text analysis in which some needs are identified. The question about for whom the needs analysis is carried out receives a two-fold answer: the study itself is carried out for the benefit of the company *Universeum*<sup>5</sup>, but the actual improvements (if any) are carried out for the benefit of the visitors. The question of how the needs analysis is carried out is answered in the methods section below – and even though West's ten methods focus on language teaching, a combination of some of them was used in the present study.

Special mention should be made about the two most important approaches used in the present study, namely Target Situation Analysis (TSA) and Present Situation Analysis (PSA). The TSA in the present study is a combination of West's (1994) target situation analysis and Wu & Chin's (2010) TSA, and it identifies the requirements and goals of *Universeum's* English use. The PSA in the present study mainly follows Wu & Chin's (2010) definition and it identifies the level of English competence at *Universeum* at the start of the present study. It

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<sup>4</sup> This policy does not exist as a written document, but was conveyed to me orally during my internship at *Universeum*.

<sup>5</sup> During my internship as a language consultant at *Universeum*, it was suggested that for my BA thesis I conducted a needs analysis of the communication in English.

also makes use of elements from Dudley-Evans & St John's (1998) LSA since it investigates the employees' own, subjective, attitudes towards their English. To sum up, the present study looks at "where they (*Universeum*) are today" and "where they want to be", and where these two do not match up, needs are identified. That is basically how the needs analysis is conducted in the present study.

## 2.3 Terminology

Two terms that are used in the present study, mainly in the text analysis section of the results (section 4.1.3), need to be explained: 'plain English' and 'model reader'.

### 2.3.1 Plain English

Simply put, plain English is a type of English that is "a message, written with the reader in mind and with the right tone of voice, that is clear and concise" (*How to write in Plain English* [online]). It is a simpler (but not oversimplified) style of writing compared to the official style often associated with government departments, insurance companies, and the like. The Plain English Campaign, an organization that saw the light of day in 1979, has provided a style guide with a list of steps that one should follow in order to write plain English. In this document, the main advantages of plain English are stated as: "it is faster to write; it is faster to read; and you get your message across more often, more easily and in a friendlier way" (*How to write in Plain English* [online]). In the present study, the English texts at *Universeum* are analyzed partly with this style guide in mind. Even though *Universeum* and their translators may not know about the style guide, it is a good tool when judging the complexity of English texts.

### 2.3.2 Model reader

The term 'model reader' was introduced by the Italian author and linguist Umberto Eco. He stated that the author of a text has a perceived reader in mind with a certain competence, but also that the text itself shapes both the model reader and that competence (Eco 1979). The theory of the model reader has broadened since then, but the core is still the idea of the author perceiving a certain type of reader. Two "modern" model reader theorists are the Swedish linguist Anders Björkqvall, most famous for his analysis of the model reader in Swedish advertising (Björkqvall 2003), and the Norwegian professor of Language and Communication Johan L. Tønnesson. The latter has widened the theory to include more than one model reader per text (Tønnesson 2004). In the present study, however, the model reader refers to *Universeum*'s perceived reader of the Swedish texts, which is a twelve-year-old (H. Sundqvist, personal communication, Jan. 19, 2015; Nyman & Sandahl 2003:4). There is a

difference between a text's intended audience and its model reader. For example, *Universeum*'s sign texts are intended for all visitors, but when writing them, the authors have a twelve-year-old in mind, with a twelve-year-old's competence, and that is the model reader.

### 3. Material and methods

In this section, the material analyzed and the methods used for the analysis are described. Also, some limitations on both the material and the methods are mentioned.

#### 3.1 Material

Three types of material were analyzed in this study. First are the answers to a questionnaire that was circulated among the employees at *Universeum*. A web link to the questionnaire was emailed to 99 employees, of whom 67 answered all ten questions. For the questions, see Appendix A.

Secondly, three semi-structured interviews were conducted and the answers analyzed. For the interview questions, see Appendix B.

Thirdly, twenty-four sign texts were analyzed. Three signs were chosen randomly from each of the eight major exhibitions: the *Rainforest*, the *Ocean Zone*, *Deadly Beauties*, *Water's Way*, *Nature's Super Powers*, and the *Mammoth*, *Space*, and *Graphene* exhibitions. The signs in each of the exhibitions are visually uniform and therefore three texts from each exhibition were deemed enough to represent the various texts at *Universeum*. Each sign consists of a Swedish text and a British English translation. According to the previously mentioned policy, all information available in Swedish should be available in English too, and vice versa. The communicative purpose of the signs at *Universeum* is either to inform visitors of what the exhibitions contain (and, in some cases, give instructions on how to interact with the exhibitions) or to give practical information such as wheelchair routes, price information or warnings.

#### 3.2 Methods

This study takes both a quantitative and a qualitative approach, in order to triangulate the needs for English at *Universeum*. As Wu & Chin (2010:3) point out, “to achieve a triangulation of sources and reduce method-related bias, recent needs analysis studies tend to collect information from more than one type of informant and use multiple measures”.

For the quantitative part of the analysis, a questionnaire was sent to all 99 employees at *Universeum*, according to an e-mail list provided by *Universeum's* CEO.<sup>6</sup> The recipients belong to all the various work roles at *Universeum*, e.g. guides, aquarists, office staff, and so on, since the goal of the questionnaire was to get an overall view of the employees' needs for English and their general attitudes towards their own English. Questions were asked about

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<sup>6</sup> The questionnaire was composed using the online program *SurveyMonkey* ([www.surveymonkey.com](http://www.surveymonkey.com)) and Figures 1–4 are copied from the website's automatically generated charts, but the Swedish text has been translated into English in the figures.

how often they perform certain English language skills in their work, how they feel about their own English, if they feel they need to improve anything, and if there is anything *Universeum* can do to help them improve. Inspiration for how to phrase the questions came from Wu & Chin 2010. For the full questionnaire, see Appendix A.

The questionnaire as a method for needs analysis has its advantages and disadvantages. Not only is it the most common method for needs analysis (West 1994:7), but it is a good quantitative approach with the chief advantage being objectivity (Gardner & Winslow, in West 1994:7), i.e. that even though subjective attitudes are collected through a questionnaire, the way of measuring the results is objective. However, the usually low return rate (only 7% according to Gardner & Winslow) is a disadvantage. A low return rate was not an issue for the present study, however, since 67 of the 99 respondents answered all ten questions – a return rate of 67%. The comparatively high answer percentage may have to do with the fact that many of the employees at *Universeum* were familiar with me after my eight-week internship. This fact may also affect the answers, but hopefully in a positive way, i.e. that the respondents give more information to me than they would to an unknown questioner. Also, because this needs analysis is something that *Universeum* wanted to have done and because answering the questionnaire might have been seen as beneficial by the employees, the high answer rate is perhaps not so surprising.

As a qualitative complement to the questionnaire, three semi-structured interviews were conducted. Interviews are a good complement to questionnaires, as one can exploit the advantages of both methods (Lagerholm 2013:55, West 1994:8). For the interviews, a number of questions were prepared that were asked in a semi-structured way, allowing the respondents to elaborate a bit on their answers. Questions were asked about what they think of the level of English at *Universeum*, if anything needs to improve, how that could be done etc. For the full set of questions, see Appendix B.

When the web link to the questionnaire was e-mailed to the employees, the employees were also asked to reply to me if they were prepared to participate in an interview. Four employees of different positions said yes. Unfortunately, one was on sick leave when the interview was to take place, and therefore three interviews were conducted. However few, they do provide some qualitative depth to the analysis. The interviews were conducted on three separate occasions, but in the same room and under the same conditions, with only me and the respondent present. Permissions were given to record the interviews, and they were recorded on a mobile phone. No names are given in the study even though all three

interviewees stated that their identities did not need to be made anonymous. Each interview lasted about 15–25 minutes.

The third part in the triangulation is a text analysis of written English presented to visitors in the form of exhibition signs. Two approaches are taken. Firstly, possible discrepancies between the Swedish texts and their English translations are analyzed. Any language errors identified are also mentioned here. Secondly, an analysis is conducted of the complexity of the English translations compared to the Swedish texts. The text analysis focuses on the textual parts of the signs, i.e. it excludes visual elements such as images. However, text layout and font are considered more closely related to the written text and to readability, and are therefore subject to the analysis even though they are, technically, visual elements. Since the text analysis studies individual sign texts, it is a qualitative approach. However, if general issues can be identified, the text analysis may also yield quantitative data.

### 3.3 Limitations

In this section, mention is made of some issues regarding the methods and material, as well as of the limitation of the material. Also, a possible misunderstanding of one of the questionnaire questions is discussed.

#### 3.3.1 Text analysis

As stated above, three signs from each exhibition were deemed enough to represent the written communication at *Universeum*. Also, due to time restraints, it would not have been possible to analyze more than twenty-four texts. Originally, texts from *Universeum*'s website were supposed to be a part of the text analysis, but because a new website was launched right before this study was conducted, English texts from the web were temporarily unavailable. If there had been web text available for analysis, further limitations to the sign texts would have had to be implemented.

However practical it might be to analyze only sign text, two issues arise from basing the text analysis on signs alone: a) it is communication through one medium only – to get a full view of *Universeum*'s written material, it would have been good to analyze web text as well since the web is a frequently used medium; and b) many of the sign texts in English are written by professional translators – meaning that a simple analysis of the language is not that interesting; it only analyzes the language of the translators, not the English proficiency needs at *Universeum*. However, since the analysis focuses on *the communicative purposes* of the texts (i.e. being adequate translations of the Swedish texts, reaching the guests and piquing



their interest, and using a level of English appropriate to the perceived readers), the results become interesting.

### 3.3.2 Questionnaire and interviews

One of the questions in the questionnaire might have been misunderstood by the respondents, namely question 7 (“Which English skills do you think you need to improve in your work?”). The answer alternatives ranged from “Very important” to “Not at all important”, and judging from some individual answers it seems that some of the respondents did not take the question to mean which skills they themselves thought important to improve, but which skills are important for their work. For example, one respondent answered the previous question about how good they think their own English is with “Good” on all options but still answered that everything was “Very important” or “Pretty important” in question 7. This suggests that he or she thought that his or her own English was good, and that the different skills in question 7 are all important in his or her work. If question 7 had been correctly understood, he or she should have answered “Pretty unimportant” or “Not at all important” to improve the skills which he or she was already good at. This could probably have been avoided by wording the answer alternatives differently; something like “I need to improve this” would have been better than “Very important”. However, these “misunderstood” answers might actually be correct and instead mean that the respondents judge their own English to be good but still want to improve their skills. This ambiguity must be kept in mind when analyzing the results from question 7.

As stated above, three interviews were conducted. Originally, four questionnaire respondents agreed to be interviewed, but one of them was ill when the interview was to take place and could not meet at a later date. Unfortunately, the interviewee that could not participate was one whose work includes frequent contact with visitors. A larger number of interviews would have yielded more information, but the three that were conducted still gave enough qualitative data to be relevant for the results.

Both the questionnaire and the interviews ask about the employees’ own attitudes towards their English and the communication in English at *Universeum*. These self-reported and subjective answers may have an impact on the reliability of the results. However, what the present study aims to do is to investigate the employees’ own attitudes, i.e. what they think of their own English, and therefore the methods are justified. A questionnaire directed at non-Swedish speaking visitors could have strengthened or contradicted the results from the employee questionnaire, but such a questionnaire could not be implemented due to time restraints. Further mention of this is made in the future research section (section 5.2).

## 4. Results

This section first establishes the present situation and then the target situation. At the end of the section is a table that summarizes the PSA and the TSA.

### 4.1 Present Situation Analysis

In this section the study analyzes the present use of English at *Universeum*. The questionnaire and interviews asked the employees about the English at *Universeum*, their own use of English, and their attitudes towards their English. The text analysis explores the level of English used in written communication throughout the exhibitions.

#### 4.1.1 Questionnaire

The first question asked about the respondents' first language. This was because any respondents with English as their first language would be filtered out since they use English to such an extent that their answers might skew the results. Two of the respondents stated English as their first language, and so the tables below show the answers of the remaining 65 respondents.<sup>7</sup>

One can clearly see that English is a much used language at *Universeum* simply by walking through the building reading all signs in both Swedish and English. But English is also commonly used by the employees in their work. Out of the 65 respondents to the questionnaire, 31% answered that they use English every day in outwards communication, i.e. with visitors and the like, 28% stated that they use English a few times per week, and 26% stated that they use English a few times each month. Only 15% stated that they rarely use English. These numbers are shown in Figure 1:

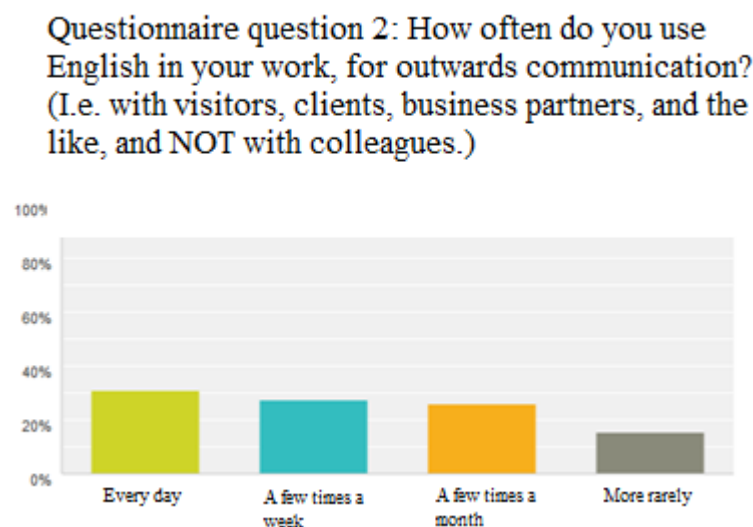
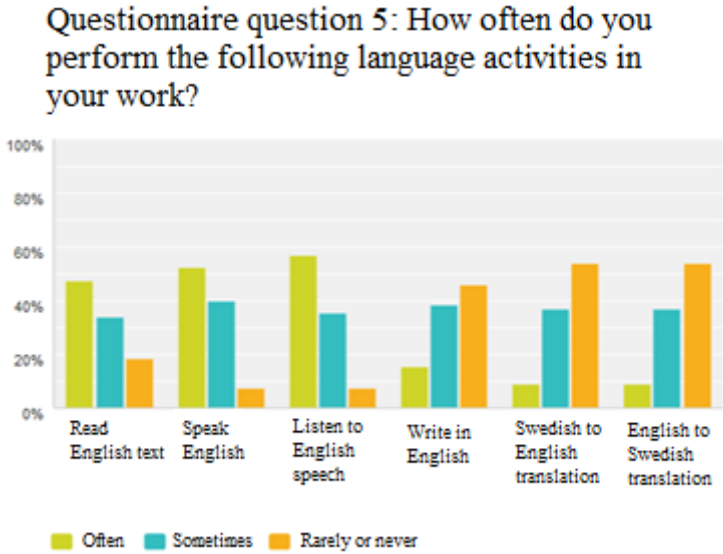


Figure 1 – Results from questionnaire question 2.

<sup>7</sup> As learned from my internship, the two native English speakers communicate almost exclusively in English in their work, and the level of their English is very high, so the removal of their answers from the results was justified.

Inwards communication, i.e. with colleagues, is likewise common: 25% speak English every day with their co-workers, 31% do it a couple of times each week, and 12% do it a few times a month. The main difference here is that 32% do it more rarely. This may be because the two employees with English as their first language have the same work role, and those employees who do not share their work may not communicate with them as much as the employees in the same work area.

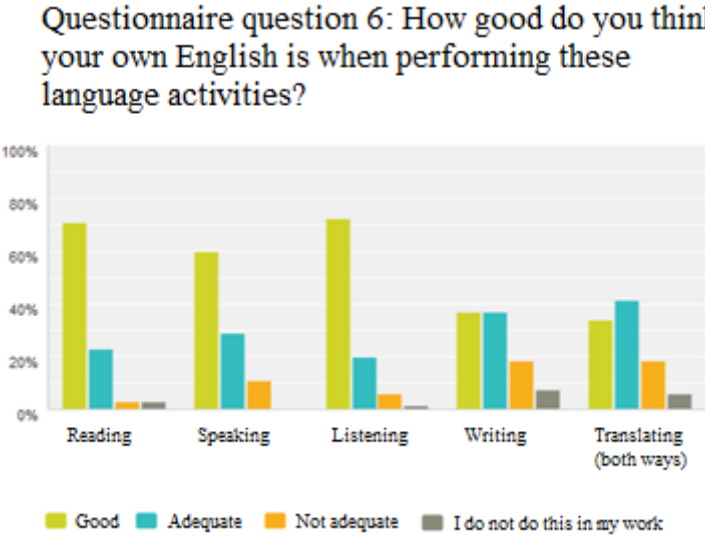
When asked about how often the employees perform specific activities in English, there is a clear division between which activities are often performed and which are rarely or never performed, as seen in Figure 2 below. The most common activity is listening to spoken English (57% “Often”) followed by speaking English (52% “Often”) and reading English text (48% “Often”). Unsurprisingly, since *Universeum* makes use of external translators, the least common activity is translating (54% “Rarely or never” for both Swedish to English and English to Swedish translation). However, 37% stated that they sometimes perform translation work (the same figure for both ways).<sup>8</sup> Also not so common is writing in English (46% “Rarely or never”). The percentage for “Sometimes” is between 34–40% for all tasks.



**Figure 2** – Results from questionnaire question 5. There is a clear division between reading, speaking, and listening often, and writing and translating rarely or never. The middle option, “Sometimes”, is even throughout.

<sup>8</sup> It would be interesting to find out how many of those “in-house” translations actually reach the visitors in the form of signs, web text or the like – and if there is any significant difference in the quality of those translations as opposed to the translators’ work.

The questionnaire showed that *Universeum*'s employees believe that their English is good or at least adequate for their work, which is in line with the notion that Swedes are generally good at English (*EF English Proficiency Index* [online]). The three most common activities as shown in Figure 2 above – reading, speaking, and listening – are also the activities in which the employees judge their English to be the best (see Figure 3 below). For example, as many as 70% state that their English is good when it comes to reading. Also, only 11% believe their spoken English to not be good enough. The figures for writing and translating are somewhat different: around 35% state that their English is good when performing these activities and 18% state that it is not adequate.



**Figure 3** – Results from questionnaire question 6. A majority of the employees answered that their English is “Good” when reading, speaking, and listening. The figures are somewhat more even for writing and translating.

The questionnaire also asked if the employees actively try to practice their English on a regular basis in their free time by attending courses, reading English books, going to language cafés, or the like. 45% answered that they do, with an even 18% for the options “No”, “No, but I have” and “No, but I want to/should do it”.

There was one open-ended question asking the employees if they thought it important for *Universeum* to communicate in English, and also to specify why or why not. All 65 respondents thought it important and most stated the fact that *Universeum* has many non-Swedish speaking visitors as the reason, but some also gave other reasons. For example, it is important because *Universeum* “participates in many different international situations and conferences” [my translation]. Other reasons given include English speaking business

partners, competition with other science centers, giving a serious and modern impression, avoiding exclusion, and creating an interest for the English language among Swedish students.

#### 4.1.2 Interviews

In this sub-section, the answers to the interview questions concerning the Present Situation are analyzed. The three interviewees are called A, B, and C when referred to individually.

The first question asked about *Universeum's* use of English in general. All three interviewees stated that *Universeum* generally uses English for communication with visitors. A and B also mentioned communication with business partners as well as with other facilities similar to *Universeum*, such as zoos and science centers. B said that “when it comes to animals, we are constantly interacting with other facilities, almost always in English”. C stated that English is mostly used in informal conversation [when it comes to the oral use of English, my comment], since there are no scheduled activities in English. However, A mentioned that when *Universeum* hosts events (e.g. dinner parties for business partners), a guided tour in English is an option for the guests.<sup>9</sup>

When asked about how good the English language skills of the employees need to be, A and C both answered that one should be able to keep up a conversation without too many interruptions or pauses (although it is unclear exactly what that means). According to C, it is important to be able to talk about one's specific area, e.g. ichthyology, but it is equally important to be able to maintain an everyday conversation. Also, C said that when hiring people, *Universeum* does not test their English skills in any way – it is assumed that people with a university degree are good at English. Swedes are generally good at English, according to A, and the key is to not be afraid of speaking English – perhaps a good way to think is that “the guest's Swedish is worse than my English”. According to B, up to 30% of the visitors during the summer are non-Swedish, and a “very high level of English” is needed, both on signs and when it comes to informal communication, in order to make the visit smooth for non-Swedes. However, B also stated that the communicative purpose, i.e. that the recipient understands what is being said, determines the level of English needed. With children, one needs to be able to explain things well and in detail, whereas young people and adults understand broader concepts.

As a follow-up question, the interviewees were asked if the level of English needed differs between the various work roles. They answered that it generally does not. However, A mentioned that some work roles face visitors less than others, e.g. the economy department –

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<sup>9</sup> Scheduled activities in English are being prepared for implementation this summer (2015).

but they may instead have contact with business partners, and so, according to A, their English skills are probably good.

When asked if the employees at *Universeum* meet these needs today (i.e. if their English is good enough), A and B said that in general, the level of English is high, whereas C said that it is difficult to judge since there are no scheduled activities to use as a ground for judgment.

Finally, the interviewees were asked if they receive any feedback from visitors and/or business partners about how well the communication in English works. B said that they do not since it is taken for granted that it works: “Whether they’re a visitor, someone from another facility or a contractor, they all almost expect that you speak English.” Interviewee A had no personal experience of getting feedback, which was taken to mean that the communication worked just fine. However, C stated that they do not receive feedback on how well the communication works, but they do get feedback when it is missing. For example, C has been asked about guided tours in English and has had to admit that there are none, which of course is not appreciated.<sup>10</sup>

#### 4.1.3 Text analysis

The text analysis takes two approaches. First is an analysis of any discrepancies between the Swedish sign texts and their English translations. Mention is also made of possible language errors. Since the translations are mostly written by professional translators, the focus is not on the language itself, but the *language use* when considering the texts’ purposes – being good translations, containing all the information given in Swedish, piquing the visitors’ interest, using British English (according to *Universeum*’s policy) and being appropriate for the model reader. Then follows an analysis of the complexity of the English translations compared to the Swedish texts, also with the texts’ communicative purposes and model reader in mind.

Before going into the text analysis, the term ‘text’ needs to be defined. The term can mean many different things, and often do so to different people. The complexity of the term is made explicit by the Swedish text analysts Lennart Hellspång and Per Ledin:

[Texts] have many faces and levels, ranging from language to content, from surface to depth, from separate parts to coherent wholes. At the same time, they have an inner order – they show patterns and regularities. [...] texts always come to us in fixed circumstances. Therefore, they must not be viewed in isolation. (Hellspång & Ledin 2010:41) [My translation.]

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<sup>10</sup> When this happened last summer (2014), a special guided tour in English was offered, and that was the start of the project that leads to scheduled activities in English this summer (2015).

In the Language Consultancy Program, the importance of defining and problematizing the term is stressed. However, in the text analysis below, ‘text’ is not used in such a complex way as described above. This is for simplicity’s sake, and also because such a complex view of the term is not needed for the purpose of the present study. Below, I use ‘text’ to mean two things. Firstly, it means the whole sign, i.e. both the Swedish and English textual versions, but excluding visual elements such as images (although text layout and font are analyzed). Secondly, it means each single language version – but then it is specified as either “the Swedish text” or “the English text”. A distinction is also made between a text’s heading and the text body, even though, technically, they are both part of the ‘text’. In such cases, the distinction is made explicit by a mention of “heading” and/or “text body”.

### ***Discrepancies between text versions***

Here, all the chosen signs are analyzed, exhibition by exhibition, with focus on differences between the Swedish original text and the English translation. Identified language errors are also mentioned. At the beginning of each section, a short introduction to the exhibition is given. See Appendix C for photos of the sign texts.

#### ***Deadly Beauties***

This exhibition shows snakes and spiders that are lethal to humans. There is a “species information sign” under each terrarium and also a couple of more general information signs. One sign of the latter kind is about how animals feel about humans and how we humans should treat animals. The Swedish text is divided into four short paragraphs, divided so because they express four slightly different lines of thought – the notion of one idea per paragraph seems to have been followed. The English text only has two paragraphs, and the division between the two has been made in the middle of what is the second paragraph in Swedish, i.e. what is considered one paragraph in Swedish (because it consists of one idea) is considered as the end of one paragraph and the beginning of another in English, splitting the idea and thus making the text more complex to grasp (see Appendix C, picture 1). Also, the last Swedish sentence (and paragraph) has been left out in the English version.

Also on this sign, the Swedish word “stör” has been translated into “pester”, which in this circumstance may not be the best word to use. The Oxford English Dictionary defines “pester” as to “trouble, bother, or annoy (a person) persistently, esp. with petty and reiterated questions or requests”, and that is not what is referred to here (humans “pestering” animals). It would probably be better to use “disturb”.

The species sign about the Gaboon viper does not show any discrepancies between the two languages. There is, however, an error in the English text. In the heading, the snake is called “Gabonviper”, but the correct term, “Gaboon viper”, is used in the text body.

The species sign about the eastern diamondback rattlesnake differs in layout between the versions. The Swedish text is divided into two paragraphs in one column whereas the English text is divided into three paragraphs in two columns. The two last paragraphs in English express two slightly different ideas, thus the division here seems preferable to the Swedish where two ideas have been put into one paragraph (see Appendix C, pictures 4 and 5). There are, however, no language based discrepancies.

### *The Graphene Exhibition*

This exhibition comes from *Chalmers University of Technology*, one of *Universeum*'s co-founders, and is a rather technical showcase of the substance graphene and the technology made available since its discovery. The exhibition consists of one large module with many separate pictures and texts.

The first text is a kind of introductory text, explaining in short what graphene can do now, and possibly in the future. The only difference between the Swedish and English versions is in the heading, where the English version seems to be the one that better conveys the meaning. The Swedish heading reads “Grafen har bara ett enda atomlager av kol.” and the English “Graphene is a layer of carbon just one atom thick.”. A direct translation of the Swedish text reads “Graphene only has one atom layer of carbon.” which is perhaps not incorrect, but not as accurate as the English version.

In a text about how graphene functions in the human body, the English version is slightly longer because it adds an explanatory sentence at the end of the first paragraph.

The third text from this exhibition is a short text mentioning graphene as a heat conductor. There are no discrepancies between the two versions.

### *The Mammoth Exhibition*

This is a temporary exhibition about the Ice Age and the creatures most typical of it, such as the mammoth, the woolly rhinoceros, the cave bear, and the saber tooth cat.

On a sign dealing with the saber tooth, or Smilodon, and its relation to felines today, there is a minor discrepancy. When the Swedish text mentions modern felines, it says only “kattdjur” (= felines) where the English text says “big cats”, which is more accurate considering the text is about the Smilodon's relation to modern day lions and tigers. There are also a few errors in the English translation: the Swedish “släkte” (= genus) is translated as



“group”, which is not the correct scientific term; the Swedish “förutom” (= apart from) is translated as “as well as”; and the Swedish “frambenen” (= the forelegs) is translated as “the front legs”.

The second text from this exhibition is about the size of various kinds of mammoths. There is a difference in the paragraph order between the Swedish and English versions (see Appendix C, pictures 12 and 13). The first paragraph is the same, but the second Swedish paragraph is in the English version found at the end of the third paragraph – and what is the end of the third paragraph in Swedish makes up the second English one. These sentences, thus, have been swapped for no apparent reason. Perhaps the best way to order the text would be to use the Swedish version but only swap the second and third paragraphs – i.e. to first write about the various kinds of mammoths and then explain how to measure their height. The same order should, naturally, be used in the translation. Also, here too, the Swedish “frambenen” has been translated into “the front leg” – this time in the singular.

The final text from this exhibition, about why the mammoths became extinct, also shows a difference between the paragraphs in the two versions (see Appendix C, pictures 14 and 15). The Swedish text consists of three paragraphs, where the second one is only one sentence long. This sentence is placed at the end of the first paragraph in the English version, and that text thus consists of only two paragraphs. The placement of that sentence at the end of the first paragraph is preferable because it is connected to the idea expressed in the first paragraph. There is also a discrepancy between the two headings: the Swedish uses the singular “mammuten” where the English uses the plural, with an article, “the mammoths”. They both work as generic terms, and so do the plural in Swedish or the singular in English, and therefore the same form could have been used for consistency.

### *Nature's Super Powers*

This exhibition presents various “super powers” found in nature (e.g. camouflage and night vision) and shows how we humans try to reproduce them with our technology. It also lets visitors try out some of them in innovative ways.

There is a text about locusts, and how they never crash even though they fly very close to each other in swarms, and it shows three linguistic discrepancies. Firstly, the heading in Swedish uses the singular “Gräshoppan” where the English uses the plural “Grasshoppers”. These both work as generic terms, but in order to avoid inconsistency, the plural could have been used in Swedish, or the singular in English – all work as generic terms. Secondly, the Swedish text states that the locusts, when swarming, keep a distance to each other of about three decimeters, whereas in the English text it says “three centimeters”. That is quite a

difference, and the error is probably in the Swedish text, since the “super power” here is that they never crash even though they fly very close together – and three decimeters is not that close. Thirdly, the first sentence in the English version seems a bit awkward since different terms are used within the sentence to refer to the same insect (“Locusts, a type of grasshopper, fly in swarms of up to one billion grasshoppers.”). The Swedish word for “locust” is “vandringssgräshoppa” (= migrating grasshopper), and so there is no discrepancy between the headline’s grasshopper and the grasshopper in the text body. In the English text, where the headline has “Grasshoppers” but the first paragraph begins by mentioning locusts, the result is the awkward first sentence. A solution to this would have been to simply use “Locusts” in the heading and text body, and skip the subordinate clause in the first sentence.

A text about camouflage shows only a minor discrepancy, in the heading. The Swedish heading reads simply “Kamouflage” but the English reads “About camouflage”. This is not an important difference, of course, but one may wonder why it was necessary to put the “About” there at all.

A text about solar energy seems to have been overlooked in the proof reading process, both in Swedish and in English. The Swedish word for ethanol cars (= etanolbilar) is misspelled as “etenolbilar”, and there are three grammatical errors in the English text. The first is an “is” missing in the sentence “When you press the button to the left you will see how much space needed to grow wheat that becomes ethanol.”. The second and third are found in the sentence “When you press the button to the right you can see how large area with solar cells are needed.”. It should read “how large *an* area with solar cells *is* needed”. However, the texts show no discrepancies between versions.

### *The Ocean Zone*

In the *Ocean Zone*, which is *Universeum*’s aquarium hall, there are a few signs that mostly consist of species information texts. On a sign with information about the scarlet cleaner shrimp, there are a number of discrepancies, both between the text versions and between sections within each version (see Appendix C, picture 22). The beginning of the second paragraph in Swedish is not present in the English version, perhaps because it deals with another Swedish name for the shrimp, which does not exist in English. After that, however, information is given about the shrimp’s coloring, and that should go into the English text, but it has also been left out. Also, there are grammatical differences between the shrimp’s name within each version. The Swedish name in the heading is not the same as in the text body (an

‘s’ is missing in the heading), and in the English text capital letters are used in the name at the beginning of the first paragraph but not at the beginning of the third paragraph.

On a sign with information about the Megalodon (or “Megatooth Shark”, as *Universeum* calls it in English), there are differences in paragraph layout. The Swedish text body is made up of four paragraphs, expressing four slightly different ideas, whereas the English text body only has two, thus joining ideas together into the same paragraph. Also, the last sentence (and, as it happens, the last paragraph) in Swedish is not translated at all. This sentence explains the scientific name Megalodon, and since *Universeum* has chosen to call the shark “Megatooth Shark” in English, they might have felt this sentence to be redundant. However, since the name Megalodon is the most common in English (almost four times as common judging from an English language Google search on “megalodon” and “megatooth shark”), it might have been better to call it that and include the last sentence in the English text.

A similar difference in paragraph layout between the Swedish and English versions is present on a sign about geckos (see Appendix C, pictures 23 and 24). The Swedish text body is made up of five paragraphs whereas the English text body only has three. The division in the Swedish text seems to be made between what is considered to be different ideas expressed. However, the second and third paragraphs arguably deal with the same idea, and could be joined as in the English version. This, however, makes the English version’s middle paragraph twice as long and not as readable as the Swedish text. The sentences in English are also longer and therefore more complex; often what is split into two sentences in Swedish is only one in English, as in these examples:

Bindningarna kan lätt lösas genom “avskalning”, som när man drar av en tejpremsa.  
På så sätt kan geckoödlan gå i taket.  
The bonding is easily released by “curling away”, similar to peeling away a strip of adhesive tape – this way, geckos can walk on ceilings.

Geckoödlor finns ofta i närheten av människor. De gör god nytta genom att hålla nere insektsantalet.  
Geckos are often found living close to humans where they are useful since they help keep the insect population down.

Furthermore, the English text includes more scientific information than the Swedish one. For example, the tiny hairs on the gecko’s feet that enable it to climb ceilings are specified in the English text as “setae”, which is not done in the Swedish text. The English text also mentions that “the ends of the tiny hairs are split into billions of elastic hairs”, which in the Swedish

text is reduced to “tack vare miljoner [meaning millions, not billions – my remark] av häftpunkter”.

### *The Rainforest*

One of *Universeum*'s main attractions is the indoor rainforest with many different plants and animal species from the Amazonian jungles. Some of the information displayed in this exhibition comes in the form of flip sheets with text and images. These flip sheets are going to be replaced by modern technology and therefore this analysis does not deal with the information given in them, only with information given on signs.

On a sign about the electric eel, most of the English text is missing – or rather, most of the Swedish text has not been translated. Only the first paragraph in Swedish has been translated, and there are a few discrepancies between the versions. For example, at the end of the paragraph in Swedish, it is simply stated that the eel's muscle cells function like a battery. In the English text it is explained that the muscle cells (written incorrectly as “musclecells”) store electricity and produce an electrical discharge. No mention of this discharge is made in the Swedish text. Why only one of four Swedish paragraphs has been translated is puzzling, especially since this is a permanent sign that has been around for a while.

The second text from the *Rainforest* is a directions sign, showing the way to an exit for those who need to take the elevators to the lower level of the *Rainforest* (since the staircase by the sign is inaccessible for wheelchairs and prams). The Swedish text reads “Här kan du gå ut och ta hissen till nedre delen av Regnskogen”, which means “Here you can exit and take the lift to the lower level of the Rainforest”. But that is not what it says in the English version. Instead, the much less personal “Outside-lift to the lower level of the Rainforest” is used. Even though this is perfectly good British English, it does not convey the friendliness of the Swedish version. Given that the model reader is a twelve-year-old (or a non-English speaking person), the friendlier and more explanatory direct translation would probably have been preferable, especially from a Plain English-perspective where the use of “you” and active verbs are advocated (*How to write in Plain English* [online]).

On a sign with information about the “Frog Mountain” there are discrepancies between the versions, both in paragraph layout and text content (see Appendix C, picture 27). Both versions consist of three paragraphs, but they are divided differently. What makes up the first two paragraphs in Swedish (because they express two different ideas) is one paragraph in English, and the final Swedish paragraph has in turn been divided into two in the English version. A possible reason for this difference in layout is that the English text contains more information than the Swedish, rendering it longer. If the extra information was taken away,

the paragraph layout could probably follow the Swedish version, making the two versions more uniform.

### *The Space Exhibition*

This exhibition consists of many different modules, dealing with a number of different subjects, e.g. the space station ISS, space shuttles, and weight and mass on different planets. Most of the modules let the visitor take on the perspective of an astronaut, e.g. in feeling the force of a space rocket taking off, trying to turn handles in (fake) zero-gravity, or reading about what it is like to wash one's hair on a space station.

One smaller module is about the cosmic background radiation, and how that can be shown in a cloud chamber. On the module is a sign with information about the cloud chamber. The text body does not show any significant discrepancies between the Swedish and English versions. However, below the main text body are four small pictures showing different kinds of particle traces that the visitor should look for in the cloud chamber, and beside these are four shorter texts that show many discrepancies between versions (see Appendix C, picture 29). For example, the Swedish “ $\alpha$ -partiklar” is not written out like the English “Alpha ( $\alpha$ ) particles”; the Swedish word “spår” is alternately translated as “traces”, “trails”, and “tracks”; and the sentence order is reversed in two of the translations. Also, in two of the Swedish sentences, periods are missing.

Inside one of the modules built like a part of a space station, there is a sign about work conditions on the space station. The Swedish and English versions do not differ in content or layout. There are, however, two errors in the English text. The word “here” is misspelled as “hear” in “hear on Earth”. Also, “tons” is used where “tonnes” would be more correct, since it refers to metric tons and since it is more common in British English to use “tonnes” in this narrow sense.

Inside another of the modules built like a section of a space station, there is a sign about Christer Fuglesang, Sweden's first astronaut. There are no discrepancies between the Swedish and English text versions on this sign. However, the American spelling of “program” has snuck into the otherwise British English text.

### *Water's Way*

This exhibition is laid out like a trip through Sweden from north to south (although one can walk the other way if one chooses) and it showcases many of Sweden's plant and animal species. The focus is on watercourses, lakes, and seas, and therefore many of the species live close to, or in, water (there are, for example, many species of fish and frogs). As in the

*Rainforest*, some of the information here comes in flip sheets that are going to be replaced by more modern display alternatives (i.e. tablets). Therefore, that information is not part of this analysis – only sign texts are.

The first sign contains information about the sand lizard. There is only one discrepancy between the Swedish and English versions: at the beginning of the second paragraph, the Swedish text mentions the sand lizard in the singular (“Sandödlan”), whereas the English text uses the plural as the generic term (“Sand Lizards”), even though the singular “The Sand Lizard” was used as the generic term in the first paragraph. Since the next sentence begins with “It”, the singular would be preferable (see Appendix C, picture 34). There is also a grammatical error in the English text’s last sentence: “The species has suffering [should be *suffered*] a serious decline and is now classified as vulnerable.”

The second sign from this exhibition contains information about the grass snake. There are a number of issues with this sign. Firstly, capital letters are used in the snake’s name in the text body but not in the heading (“Why does the grass snake stink?”). Secondly, the order of the last two sentences in the Swedish text has been reversed in the English version, and a subordinate clause has been added to one of these sentences in English. Thirdly, the Swedish “de ljusa fläckarna” (= the bright spots) is translated as “the cream to yellowish collar”. Finally, the Swedish “Giftet” (= The venom/toxin/poison – depending on circumstances) is translated as “The poison” when it should be “The venom” since the text deals with snakes.

The last sign from *Water’s Way* is about frogs’ sounds. The most obvious discrepancy is the fact that the Swedish text is set in one column, whereas the English text is set in two. The heading is written with capital letters in a big font at the top of the sign – but only in Swedish. To find the English heading, one has to look to the sign’s center left (see Appendix C, picture 36). Perhaps it would have been better to put the English heading directly below the Swedish, since one now has to be pretty close to the sign to be able to read what it is about in English. Also, the Swedish “Kan du?” (= Can you?) is translated as “Try it!”.

### *Summary*

As a summary, Table 1 below shows the number of occurrences for the various types of discrepancies and errors found in the text analysis. Note that the Swedish texts are always considered to be the original from which the English translations deviate. Thus, “Text missing” means that something that is there in the Swedish text is missing from the English translation, and “Information added” means that something that is *not* there in the Swedish text exists in the English version. Note also that all discrepancies that relate purely to the translation process are listed under “Translation errors”, even though they might not be errors

per se but smaller discrepancies such as the addition of the “About” in the camouflage text from *Nature’s Super Powers*.

**Table 1: Types of discrepancies and their occurrences**

A total of 53 language errors or discrepancies were found in the 24 sign texts analyzed.

TYPE OF DISCREPANCY	NUMBER OF OCCURRENCES
Text missing	4
Information added	6
Translation errors	17
Grammatical errors or misspellings	10
Layout discrepancies	11
Version-internal discrepancies	5

### ***The complexity of Universeum’s English texts***

As stated previously, the model reader of *Universeum’s* Swedish texts is a twelve-year-old. The model reader of the English texts is not specified in the same way; it is merely said that all Swedish texts should be translated into English. One may assume, then, that the model reader for the English texts is the same. Another, perhaps more feasible, alternative is that the model reader for the English texts, even if not specified, is thought of as a tourist or visitor not able to understand Swedish – regardless of age. Either way, I would argue that the English texts should be just as simple and straightforward as the Swedish ones. However, as the text analysis above showed, it is sometimes the case that the English texts add information, put two sentences together into one longer, and have a denser paragraph layout than the Swedish texts, often combining two different ideas into one paragraph. In this section, these issues are explored further, along with the issue of difficult words adding to the complexity of the texts.

Some examples of the English texts adding information that is not there in the Swedish texts were shown above. In the *Rainforest*, on the sign about the “Frog Mountain”, information is added about poison arrows, and the Latin name of one frog species is also added to the text body. These additions render the text longer and more complex, and it also creates a problem in the paragraph layout.

The sign about geckos, found in the *Ocean Zone*, is another example of how adding scientific information renders the English text more complex than the Swedish. If there is no need to mention the scientific name for the gecko’s tiny feet hairs (“setae”) in the Swedish text, there should be no need to do so in the English version.

However, the addition of information can sometimes make a text easier to understand. This is the case with one of the texts in the *Graphene* exhibition. In the text about how graphene functions in the human body, an explanatory sentence is added at the end of the first paragraph in the English version (see Appendix C, pictures 7 and 8). The sentence starts with a connective and explanative adverbial “When you did this,” which makes the information easier to understand. It is an example of what Reichenberg (2011) calls ‘causality’ [my translation], which is a way to bind sentences together for better understanding of a text. Indeed, many instances of this causality is seen in the Swedish texts, as well as in the English translations, because it is one of the ways in which texts can be adapted to their recipients – and that is what much of the writing of *Universeum*’s Swedish texts is about, i.e. to adapt a scientifically written original text to the twelve-year-old model reader. The trick seems to be to not add too much information, at least not any information that makes the text more difficult to comprehend. The real point here, though, is that it seems self-evident that no additional information should be added to a text that is supposed to be a translation. If there is something in the translation that needs to be explained by adding information, that problem should have been solved in the original before translating.<sup>11</sup>

Another issue that makes some of the English texts more complex than the Swedish ones is that some English sentences are longer than their Swedish counterparts, often because what is divided into two sentences in Swedish is written in one long sentence in English. Given that sentences are often longer in English than in Swedish, the problem here lies in that what are really two separate ideas have been joined together in one sentence in the English versions, rendering them more complex. The gecko sign in the *Ocean Zone* is an example of this, as shown in the block quotes above. The first point on the list of ways to make writing clearer that the Plain English Campaign provides is “Keep your sentences short” (*How to write in Plain English* [online]). The joining of two sentences (and especially two ideas) into one longer sentence when translating is an unnecessary move that typically makes the translation more difficult to read.

The discrepancy analysis showed many examples of differences in the layout of the paragraphs of the two language versions. This is probably due to sign space and the fact that the font is often bigger in the Swedish versions. Because the English texts are often given less space on the signs, it becomes necessary to squeeze them together, often resulting in fewer and longer paragraphs than in the Swedish texts – which adds to the complexity. Even more

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<sup>11</sup> Except, of course, when some specific word or term is used in the original language for which no real translation exists in the target language – then the addition of explanatory words are needed. That is, however, not the case with the sign texts analyzed here.



problematic is when the joining of two paragraphs equals joining two separate ideas together that should really be expressed in two separate paragraphs. Furthermore, the English texts are often italicized, which also renders them more difficult to read.

One more thing adds to the complexity of the English texts, and that is the use of difficult words or phrases. For example, on the text about the cloud chamber from the *Space* exhibition, the Swedish “små partiklar” (= small/tiny particles) is translated as “minute particles”, which is perhaps too difficult a phrase to use when considering the text’s actual readers. Another example is the use of “furthermore” on the sign about the eastern diamondback rattlesnake from *Deadly Beauties*, instead of the much simpler “also”. The fourth point on the Plain English Campaign list is “Use words that are appropriate for the reader” (*How to write in Plain English* [online]), and I would argue that the use of difficult words and phrases like the ones mentioned here are not appropriate for the actual readers of *Universeum*’s English texts.

To sum up, some of the English texts at *Universeum* show a more complex language than their Swedish counterparts, and that is unfortunate when considering the actual readers of the texts. These English texts may be on an appropriate level for adult English speakers, perhaps of a certain educational degree, but they are possibly too complex for English speaking children, and for adults with a comparatively low level of English proficiency.

## 4.2 Target Situation Analysis

As the Present Situation Analysis showed, communication in English is important at *Universeum*. It is a much used language: in communication with visitors through spoken dialogue and through writing on signs and on the web; in communication with business partners and other facilities; and in internal communication among the employees. The employees stated that these are the areas for which the language should be used, and they also generally judged themselves to be good or adequate at using English. But does *Universeum*’s English need to be improved or is there anything else that English should be used for? These questions were answered in the questionnaire and interviews.

### 4.2.1 Questionnaire

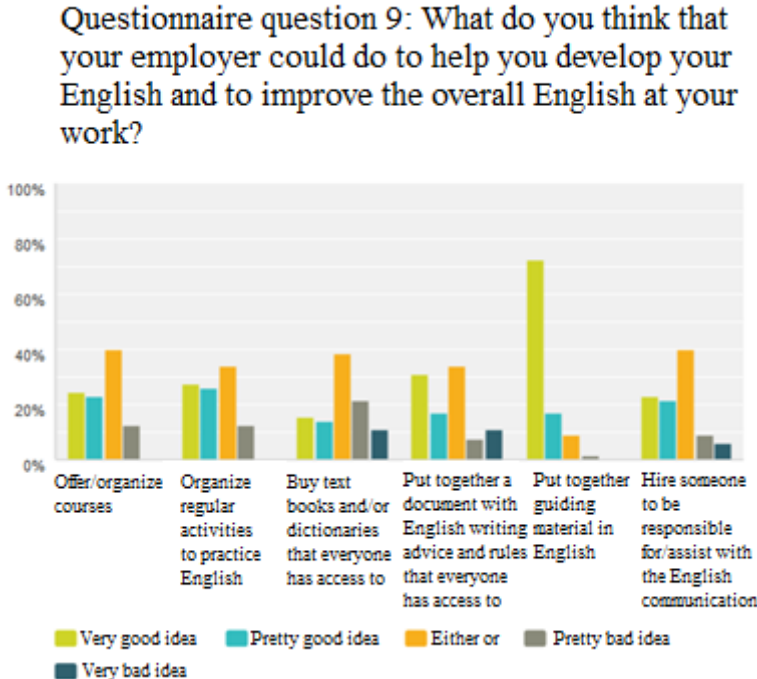
Two of the questionnaire questions dealt with the future of *Universeum*’s English. Question 7 asked which English skills the respondents thought they needed to improve but, as mentioned in the limitations section above, this question may have been wrongly understood to mean which skills they thought important in their work. Therefore, a certain caution is needed when analyzing this question. The four top rated skills (answered with either “Very important” or “Pretty important”) are conversation, guiding in English, vocabulary, and understanding

spoken English. Pronunciation also had a high value for “Pretty important” (39%), but lower for “Very important”. It seems, then, that oral communication in English is an area that many of the employees either want to improve in or consider important in their work.

Written communication is not considered as important, since translation (both ways) and scientific writing or writing of factual texts all had low values for “Very important” and “Pretty important”. Also, many employees do not need these skills at all for their work (for example, 20% answered that they do not have to write factual texts).

The two skills that had the highest value for “Not at all important” (9% each) were reading and everyday writing (e.g. e-mails and simpler information texts).

The second question that dealt with the future of *Universeum*’s English was question 9, which asked what the respondents thought that *Universeum* could do to help them improve and develop their English. The respondents were given six options plus an open commentary field for further suggestions. The option “Either or” got rather high values throughout, suggesting perhaps that the employees did not care that much for the options given. One option sticks out, though: 72% considered it a “Very good idea” to put together guiding material in English.<sup>12</sup> The answers are shown in Figure 4:



**Figure 4** – Results from questionnaire question 9. A majority of the respondents considered it a “Very good idea” to put together guiding material in English.

<sup>12</sup> At the time of writing, the Swedish guiding material had just been translated into English.

Regular activities to practice English also seem like something the employees would appreciate, since 28% answered “Very good idea” and 26% considered it a “Pretty good idea”. Also, two of the four comments to the question specifically mentioned such activities as good ideas, e.g. staff get-togethers where everyone has to speak English.

One of the comments further suggested that a *Universeum*-specific dictionary be put together, containing technical terms, animal species names, and anatomy terms that are frequently used at *Universeum* but are difficult to find in an ordinary dictionary.

#### 4.2.2 Interviews

When asked about whether there are any other areas in which *Universeum* should use English, all three interviewees answered that guided tours in English should be a scheduled activity. Also, interviewee C mentioned that species lists should be available, e.g. by the tanks in the *Ocean Zone*, both for the visitors to read and for the guides to study so that they know the animals’ English names. Interviewee B laid forth the idea that *Universeum* should be teaching more scientific concepts in English to Swedish students after the age of twelve. At least it should be offered as an option. According to B, since English is the primary language in the sciences and the technological fields, and since employers (even if based in Sweden) want employees to be proficient in English, “it’s important that we align English and science together, starting at a young age”. Also, B said that if young people are hesitant to go into these fields, the language might create an additional barrier. Therefore, teaching more subject material in English to students may “further break down the stigma of science and technology”.

When asked if *Universeum*’s English needs to be improved, A and C both answered that it generally could be improved. It is C’s opinion that English sign texts often have been given low priority and that it would now be good to actively put focus on the language – English translations should be a routine when developing new activities. Interviewee A said that smaller issues can be solved “in-house” with the help of the experts among the employees, and the employees with English as their first language, but that for bigger issues, e.g. written communication with clients, it would be good to hire someone from the outside. On the contrary, B said that *Universeum*’s English does not generally need to be improved, but stated that there are areas in which a better service could be provided.

### 4.3 Summary of results

Table 2 below summarizes the present state of *Universeum*'s English and the target situation in which all the communicative goals of *Universeum*'s English are met. In the conclusions section below, a column is added to this table, specifying the needs and suggested actions.

**Table 2: Summary of the present situation and the target situation**

Note that even though none of the respondents mentioned it because it is already planned, I have listed the lack of an English version of the website here. Also note that the frequency of English use is not listed; the high frequency of English use at *Universeum* is, however, a ground for claiming that improvements are important.

PRESENT SITUATION	TARGET SITUATION
Good overall use of English	Improved overall use of English
Spoken communication mostly informal	Formal spoken communication also, e.g. guided tours in English
Most sign text translated into English; signs showing many discrepancies between text versions; English text versions sometimes more complex than Swedish versions	All sign text properly translated into English, without significant discrepancies or differences in complexity
No scheduled activities in English	Scheduled activities in English, e.g. teaching in English for Swedish students, guided tours
Little or no feedback received	Feedback from visitors received
No English version of website	English version of website

## 5. Conclusions and future research

### 5.1 Conclusions

English is a much used language at *Universeum*. All the information on signs that is available in Swedish should also be available in English. English is further used in oral communication with visitors, business partners and other similar facilities, and in inwards communication, i.e. between colleagues, since *Universeum* has non-Swedish speaking employees. Therefore, a functional English is a key to good communication at *Universeum*.

However important the language may be, no analysis of *Universeum*'s English or the potential needs to improve it has previously been conducted. The present study has aimed to fill that gap, and in order to do so a needs analysis was performed that established the present state of *Universeum*'s English along with a target situation in which all the communicative goals for the language are met. To triangulate these situations, the analysis used three separate approaches: a questionnaire, three semi-structured interviews, and a text analysis of sign texts. The results of the Present Situation Analysis can be summarized in the following points:

- English is a much used language in both outwards (a combined 59% for “Every day” and “A few times a week”) and inwards (a combined 55%) communication.
- There is a clear division between which tasks are often performed and which are performed more rarely: reading, speaking, and listening are very common whereas writing and translating are not as common.
- The common tasks are also the tasks that the employees judge themselves good at: between 60–70% believe they are good at reading, speaking, and listening. The figures for writing and translating are more evenly dispersed between the answer options.
- 45% of the employees regularly practice their English outside of work.
- All 65 respondents thought it important for *Universeum* to communicate in English, for a number of reasons, the large number of non-Swedish speaking visitors being the most mentioned reason.
- Spoken English is mostly used in informal communication due to the lack of scheduled activities in English.
- The interviewees stated that employees should be good enough at English to be able to keep up a conversation without too many interruptions or pauses, although exactly what that means is unclear.
- Due to the large number of non-Swedish speaking visitors, especially during the summer, a high level of English is needed on signs as well as in oral communication, in order to make

the visit smooth for non-Swedes. The needed level of English does not generally differ between work roles.

- The level of English is judged to be good in general, but perhaps the judgment is difficult to back up since there are no scheduled activities to use as a ground for judgment.
- Feedback on how well the communication works is not received (it is taken for granted that it works), but feedback when English is missing has been received.
- In the twenty-four sign texts analyzed, a total of fifty-three issues of varying grades were found. Some were minor discrepancies; others were more serious flaws such as translation errors or entire chunks of text missing.
- Some of the English translations are more complex than their Swedish counterparts. They can have longer and more complex sentences and paragraphs, added information, or use unnecessarily difficult words. That makes them somewhat inadequate for their communicative purposes.

The PSA answered research questions two, three, and four (see section 1.2). The first question, what *Universeum* should be able to use English for, was answered through the Target Situation Analysis (TSA). It showed that even though the level of English is good at *Universeum*, it can still be improved, and there are areas in which a better service can be provided or where English is lacking. The fifth and final research question asked if there are areas in which improvements are needed, and this study has identified a few such areas.

The overall use of English may be improved through regular activities to practice English, such as staff get-togethers where English has to be spoken. Also, a *Universeum*-specific dictionary could be a useful tool for employees learning and practicing the English words for specific anatomical and technical terms used at *Universeum*. Spoken English should be used in formal situations also, such as scheduled guided tours or other activities. This is for the benefit of both *Universeum* and its visitors, since such activities could also function as a basis for gathering feedback and for future assessments of the English proficiency. Finally, the English translations of the Swedish sign texts show enough problems to warrant them subject of an overhaul to improve the language.

When making these suggestions for improvements, it is interesting to compare them with the suggestions that Borgvall & Ekfeldt (2003) make, even though their suggestions have to do with internal communication between management and workers. One of their suggestions for more effective communication is to make the formal communication channels (such as meetings) more structured (2003:29). This problem in the internal communication is

one that resonates with the lack of structured formal outwards communication mentioned in the present study. Also, feedback is mentioned as an important part in successful communication (2003:28), and so it is in the present study – feedback from visitors about how the communication in English works is an important step in the improvement work.

The present study has analyzed the use of English at *Universeum* and has identified a number of needs for improvement. The study's results, along with the identified needs and some suggestions for improvements are summarized in Table 3 below. The table page may be separated from this study and used as a checklist when working on the improvements.

## **5.2 Future research**

In future studies, other kinds of material can be analyzed, such as e-mails or telephone communication conducted in English. Due to time restraints, that was not possible to include in the present study. The questionnaire in the present study asks about e-mail writing and communication in general, including telephone calls, so these materials are in part covered, but not fully analyzed.

Another kind of material that would have been very interesting for the present study, but that unfortunately could not be implemented due to time restraints, is a questionnaire directed at non-Swedish speaking visitors, asking them about their language needs and what they think of *Universeum*'s English. Such a questionnaire could form a valuable add-on to the present study, and should be kept in mind for future research.

**Table 3: Summary of the present situation, the target situation, the identified needs, and some suggested actions to redress those needs**

PRESENT SITUATION	TARGET SITUATION	NEEDS AND SUGGESTED ACTIONS
Good overall use of English	Improved overall use of English	Improve overall English use, e.g. through courses or regular staff activities, or by writing a <i>Universeum</i> -specific dictionary; perhaps implement a consideration of English skills when hiring new staff
Spoken communication mostly informal	Formal spoken communication also, e.g. guided tours in English	Implement formal spoken communication, e.g. guided tours, lectures in English
Most sign text translated into English; signs showing many discrepancies between text versions; English text versions sometimes more complex than Swedish versions	All sign text properly translated into English, without significant discrepancies or differences in complexity	Do an inspection and overhaul of existing signs; implement English as a routine when planning new activities and signs
No scheduled activities in English	Scheduled activities in English, e.g. teaching in English for Swedish students, guided tours	Implement scheduled activities in English, e.g. optional teaching in English and guided tours in English
Little or no feedback received	Feedback from visitors received	Gather feedback from visitors in connection with activities in English
No English version of website	English version of website	Translate website into English



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## 7. Appendices

### 7.1 Appendix A: Questionnaire questions

The questionnaire was written in Swedish since the great majority of employees at *Universeum* have Swedish as their first language. The questions have here been translated.

1. Which is your first language (“mother tongue”)?

a) Swedish   b) English   c) Other

2. How often do you use English in your work, for outwards communication? (I.e. with visitors, clients, business partners, and the like, and NOT with colleagues.)

a) Every day   b) A few times a week   c) A few times a month   d) More rarely

3. Do you think that it is important for *Universeum* to communicate outwards in English?

Why/Why not? [Open answer.]

4. How often do you use English in your work, for inwards communication? (I.e. with colleagues.)

a) Every day   b) A few times a week   c) A few times a month   d) More rarely

5. How often do you perform the following language activities in your work?

i) Read English text (e.g. factual texts, instructions, e-mails, and so on)

ii) Speak English

iii) Listen to spoken English

iv) Write in English (translation not included)

v) Swedish to English translation

vi) English to Swedish translation

a) Often                      b) Sometimes                      c) Rarely or never

6. How good do you think your own English is when performing these language activities?

i) Reading

ii) Speaking

iii) Listening

iv) Writing

v) Translating

- a) Good      b) Adequate      c) Not adequate      d) I do not do this in my work

7. Which English skills do you think you need to improve in your work?

- i) Conversation (e.g. small talk with visitors)
- ii) Guiding in English
- iii) Pronunciation
- iv) Listening to/understanding spoken English
- v) Information gathering from English sources (e.g. books, internet, colleagues, via telephone or e-mail, and so on)
- vi) Reading/understanding written English
- vii) Vocabulary
- viii) Grammar
- ix) Everyday writing (e.g. e-mails, simpler informative texts)
- x) Scientific writing or writing of factual texts
- xi) Swedish to English translation
- xii) English to Swedish translation

- a) Very important      b) Pretty important      c) Either or  
d) Pretty unimportant      e) Not at all important      f) Do not need this in my work

8. Do you yourself regularly try to develop your English in your free time, e.g. by attending courses, reading English books, visiting language cafés, or the like?

- a) Yes      b) No      c) No, but I have      d) No, but I want to/should do it

9. What do you think that your employer could do to help you develop your English and to improve the overall English at your work? If you have any further suggestions, please write them in the comment space.

- i) Offer/organize courses
- ii) Organize regular activities to practice English (not courses but smaller, regular practices)
- iii) Buy text books and/or dictionaries that everyone has access to
- iv) Put together a document with English writing advice and rules that everyone has access to
- v) Put together guiding material in English
- vi) Hire someone to be responsible for/assist with the English communication (e.g. by writing material, translating, or support/coach co-workers in their use of English)

- a) Very good idea      b) Pretty good idea      c) Either or

d) Pretty bad idea                      e) Very bad idea

10. Before we language consultant students did our internship at *Universeum*, did you know that language consultants existed? (By “language consultants” are here meant trained language specialists that beside translation work also offer a wide range of services, e.g. proofreading, adapting texts to different recipients, language advice, specialized courses, assessing software and other language resources, etc.)

a) Yes                      b) No

## 7.2 Appendix B: Interview questions

These are the questions used in the interviews.

1. How is English used at *Universeum* today? For which types of communication and how widespread is it?

2. Would you say that there is something more for which *Universeum* should use English? What would that be and how could it be done? (If no, do you think that you meet the visitors' needs of English communication today? Why?)

3. How good do the English language skills of *Universeum*'s employees need to be? Is there any difference between different work roles? In which way?

4. Would you say that you meet these needs today? Why/why not?

5. Would you say that *Universeum*'s English needs to be improved? Why/why not? Are there certain areas that need to be improved more than others? Which? How could that be done?

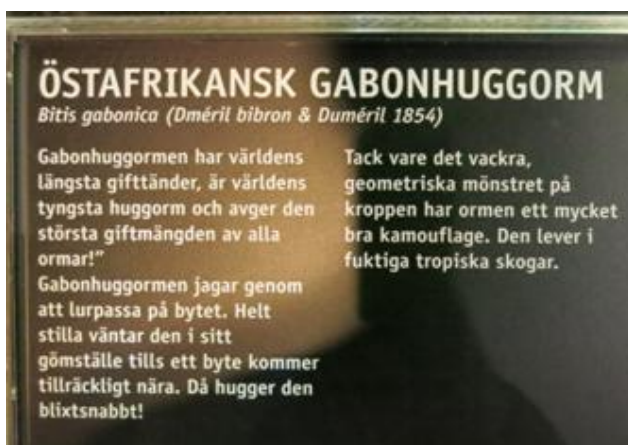
6. Do you receive feedback from visitors and/or business partners about how well the communication in English works? Positive and negative. How do you usually get it and what is it about? Can you give an example of such a situation?

## 7.3 Appendix C: Photos of sign texts

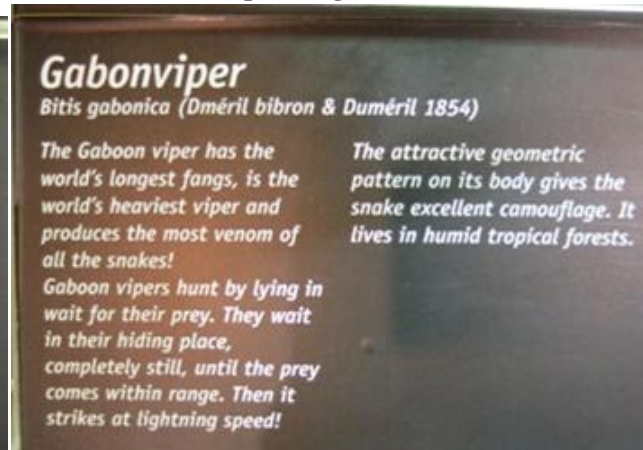
Picture 1: What do the animals think about us humans?



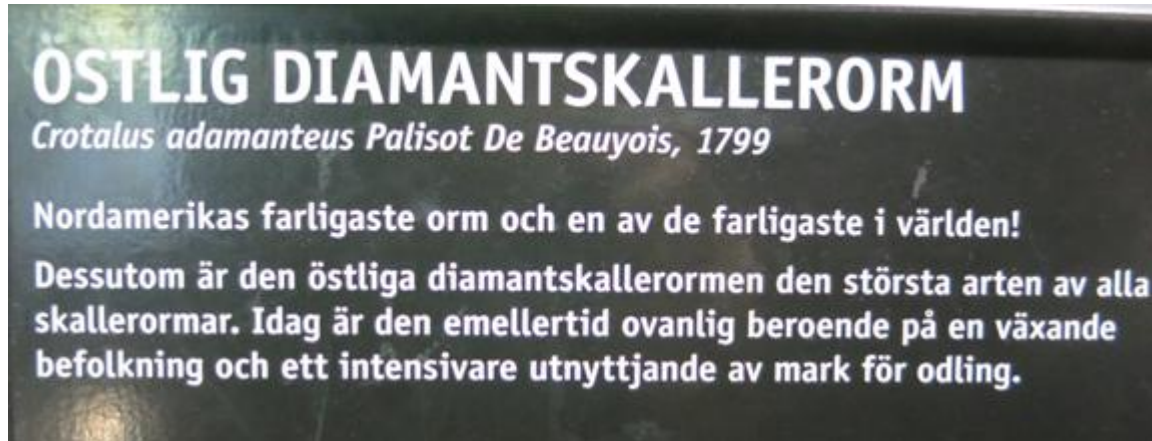
Picture 2: Gaboon viper (Swedish)



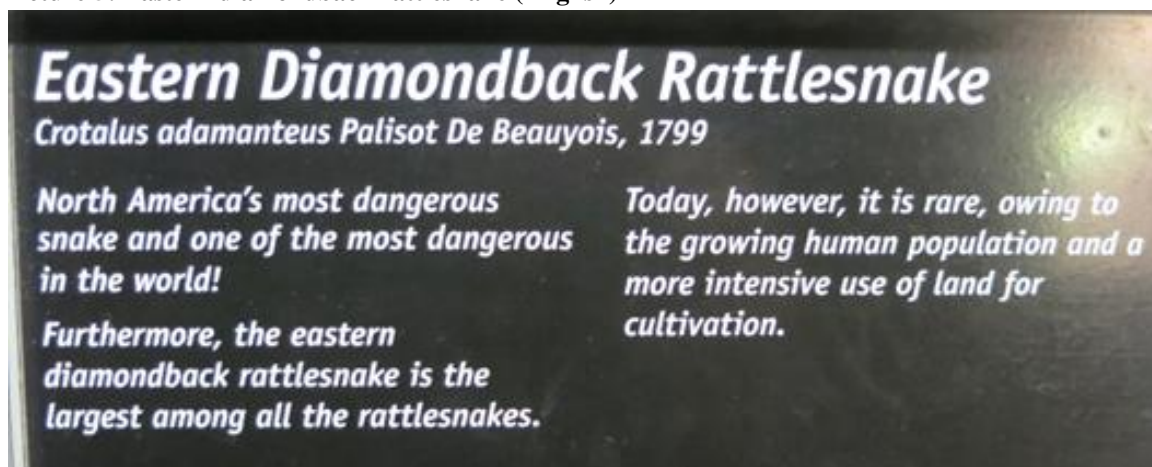
Picture 3: Gaboon viper (English)



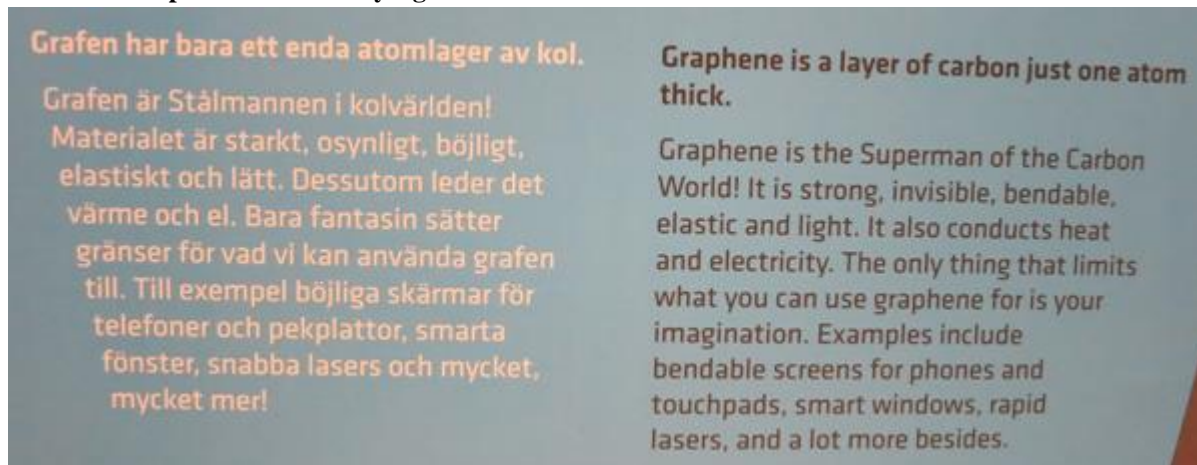
Picture 4: Eastern diamondback rattlesnake (Swedish)



Picture 5: Eastern diamondback rattlesnake (English)



Picture 6: Graphene introductory sign



Picture 7: Is graphene safe? (Swedish)

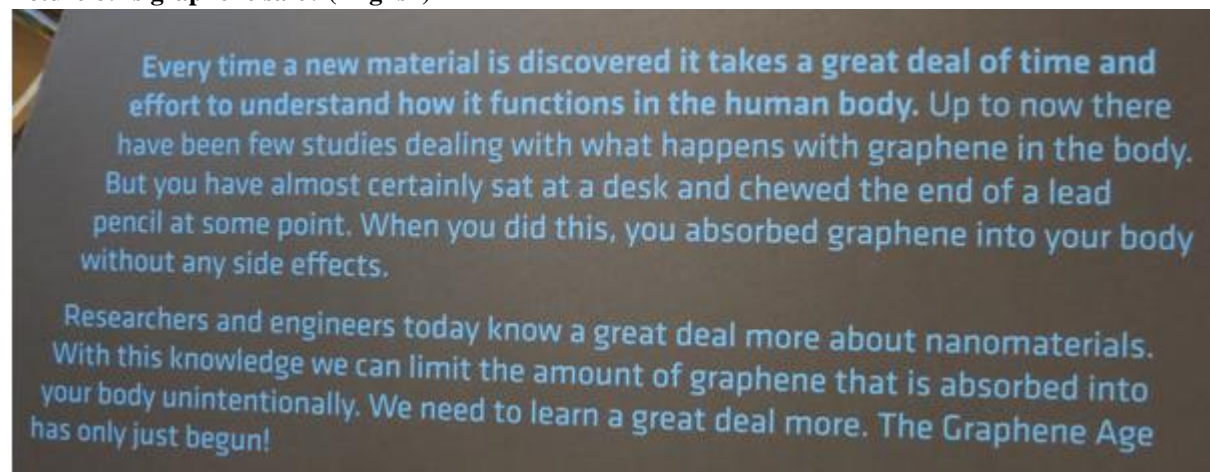


**Är GRAFEN säkert?**  
**Is GRAPHENE safe?**

*Varje gång ett nytt material upptäcks så tar det mycket tid och arbete för att förstå hur det verkar i människokroppen. Än så länge finns det få studier vad som händer med grafen i kroppen. Men du har säkert suttit och tuggat på en blyertspenna någon gång och fått i dig grafen utan biverkningar.*

*Forskare och ingenjörer vet mycket mer om nanomaterial idag. Med den kunskapen kan vi begränsa att du oavsiktligt får i dig grafen. Men vi behöver lära oss mycket mer. Grafenåldern har bara börjat!*

Picture 8: Is graphene safe? (English)



**Every time a new material is discovered it takes a great deal of time and effort to understand how it functions in the human body.** Up to now there have been few studies dealing with what happens with graphene in the body. But you have almost certainly sat at a desk and chewed the end of a lead pencil at some point. When you did this, you absorbed graphene into your body without any side effects.

Researchers and engineers today know a great deal more about nanomaterials. With this knowledge we can limit the amount of graphene that is absorbed into your body unintentionally. We need to learn a great deal more. The Graphene Age has only just begun!

Picture 9: Graphene conducts heat



**GRAFEN leder värme**  
**GRAPHENE conducts heat**

**Grafen är en fantastisk vämeledare.** Det är en perfekt egenskap för tekniska prylar som fungerar bäst när de är kalla. Till exempel din dator!

En LED lampa med grafen ser ut nästan som en vanlig glödlampa, men lampan blir inte varm. Grafen gör att det mesta av elen blir till ljus istället för att slösas bort på onödig värme. Energisnålt och praktiskt!

**Graphene is a fantastic heat conductor.** This is a perfect property for technical devices that work best when they are cold. Your computer for example!

A LED bulb containing graphene looks just like a normal bulb but doesn't become hot. Graphene means that most of the electrical energy is transformed into light instead of wasteful heat. Energy-efficient and practical!



Picture 10: Smilodon (Swedish)

## ÄR SMILODON SLÄKT MED LEJON OCH TIGRAR?

Smilodon hör till släktet sabeltandade tigrar. Men den är inte nära släkt med något av de kattdjur som lever idag, varken tigrar eller lejon.

Förutom jättetänderna fanns mycket annat som skiljde sabeltandade tigrar från moderna kattdjur. Sabeltandade tigrar hade mycket kraftigare muskler på frambenen. Svansen var kort och de var mycket duktiga hoppare.

Picture 11: Smilodon (English)

## IS THE SMILODON RELATED TO LIONS AND TIGERS?

Smilodons are part of a group known as sabre-toothed tigers. But they are not closely related to any of the big cats living today, including tigers and lions.

As well as the giant teeth, there are lots of other things that set sabre-toothed tigers apart from modern big cats. Sabre-toothed tigers had much bigger muscles on their front legs. They had a short tail and were very good at jumping.

Picture 12: Mammoth sizes (Swedish)

## HUR STORA VAR MAMMUTARNA?

Den ullhåriga mammuten som du ser framför dig blev mer än tre meter i mankhöjd. Alltså ungefär som en afrikansk elefant.

Mankhöjden mäts från marken och upp till den högsta punkten rakt ovanför frambenen.

Det fanns ännu större mammutar, till exempel kejsarmammut och stäppmammut. De hade en mankhöjd på nästan fyra och en halv meter!

Picture 13: Mammoth sizes (English)

## HOW BIG WERE THE MAMMOTHS?

The woolly mammoth in front of you grew to more than three metres in height at the withers. That is about the same as an African elephant.

But there were bigger mammoths, such as the Columbian mammoth and the steppe mammoth.

They were almost four and a half metres tall at the withers! That is measuring from the ground up to the highest point right above the front leg.

Picture 14: Mammoth extinction (Swedish)

## VARFÖR DOG MAMMUTEN UT?

Istiden tog slut och det blev varmare. Mammuten var anpassad till ett liv i snö och kyla. Det nya klimatet gjorde livet svårt för mammuten.

Dessutom jagades mammuten av människor.

Alla mammutar dog ut utom en art av dvärgmammut som levde långt norrut på Wrangels ö i Norra ishavet. Den sista mammuten dog för bara 3 700 år sedan.

Picture 15: Mammoth extinction (English)

## WHY DID THE MAMMOTHS DIE OUT?

The Ice Age ended and the climate warmed up. The mammoth was adapted to living in the snow and cold. The new climate made life hard for the mammoth. The mammoth was also hunted by humans.

All the mammoths died out except for one species of dwarf mammoth, which lived way up north on Wrangel Island in the Arctic Ocean. The last mammoth died out just 3,700 years ago.

Picture 16: Grasshoppers (Swedish)

## Gräshoppan krockar aldrig

Vandringsgräshoppor flyger i svärmar på upp till en miljard gräshoppor. Hela tiden håller de ett avstånd på ungefär tre decimeter till närmsta grannen. När de startar är de ännu närmare, men ändå krockar de aldrig med varandra! Hur är det möjligt?

Picture 17: Grasshoppers (English)

## Grasshoppers never crash

Locusts, a type of grasshopper, fly in swarms of up to one billion grasshoppers. Throughout their entire flight, they keep a distance of about three centimetres from their nearest neighbour. When they take off, they are even closer to each other - but they still never crash! How is this possible?

Picture 18: Camouflage (Swedish)

## KAMOUFLAGE

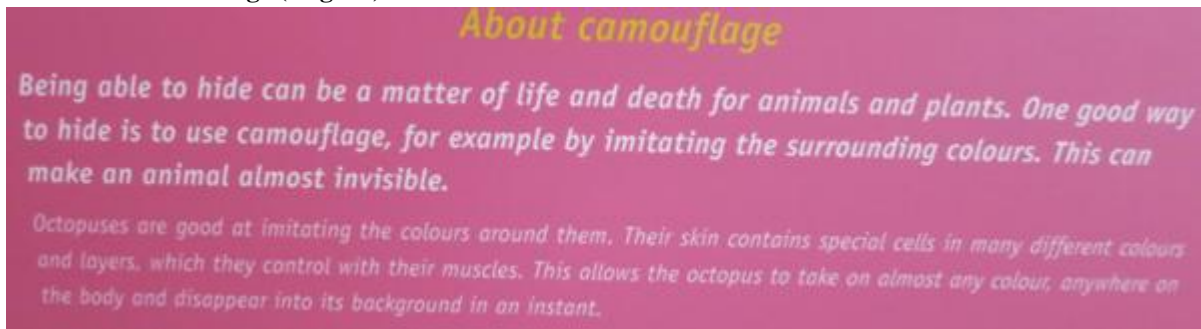
För djur och växter är det livsviktigt att kunna gömma sig. Ett bra sätt är att kamouflera sig, till exempel genom att härma färger omkring sig. På så sätt kan djuret bli nästan osynligt.

Bläckfiskar är bra på att härma färger omkring sig. Deras hud innehåller särskilda celler i många olika färger och lager, som de styr med hjälp av muskler. På så sätt kan bläckfisken få nästan vilken färg som helst, var som helst på kroppen och sekundsnabbt försvinna mot bakgrunden.

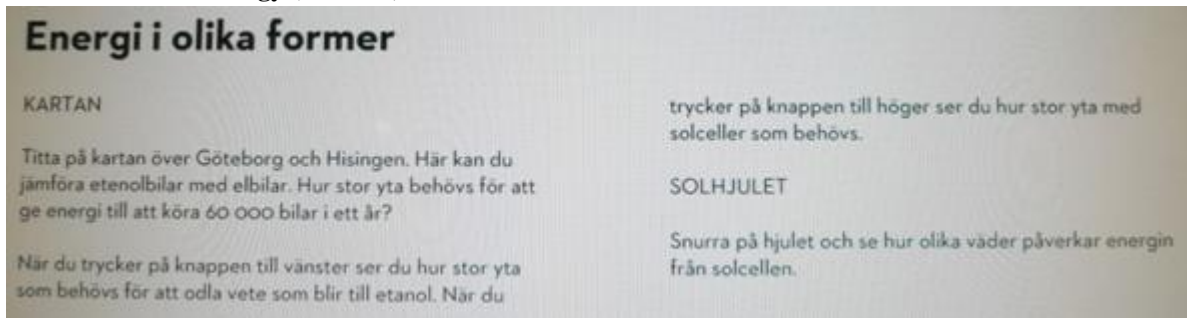
Kan du se bläckfisken i bilderna nedan?

*Look closely at the pictures. Can you see the octopus?*

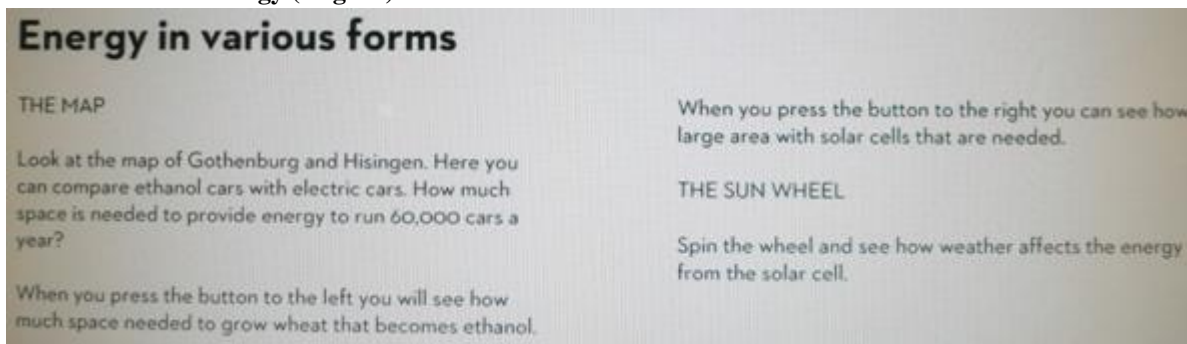
Picture 19: Camouflage (English)



Picture 20: Solar Energy (Swedish)



Picture 21: Solar Energy (English)



Picture 22: Scarlet Cleaner Shrimp

# Scharlakanröd putsarräka

## Scarlet Cleaner Shrimp

Den scharlakansröda putsarräkan lever på korallrev i Röda havet och de tropiska delarna av Indiska oceanen.

Den kallas ibland skunkputsarräka på grund av sina ränder som är en signal till både artfränder och till fiskar som den vill erbjuda sina tjänster.

Räkan är allätare men lever till stor del av parasiter och döda hudrester som den plockar av de fiskar som besöker den för att bli rengjorda.

En grupp putsarräkor sätter ofta upp en gemensam rengöringsstation på en korall dit det ibland bildas en kö av fiskar som väntar på att få sina irriterande hudparasiter bortplockade. Även fiskar som gärna äter andra räkararter låter snällt putsarräkan rensa kropp och gälar, till och med inne i munhålan utan att äta upp den.

Den scharlakansröda putsarräkan har en mycket ovanlig könsutveckling. Den börjar sitt liv som hane men när den blir äldre utvecklar den även äggstockar och äggledare och fungerar därefter som både hane och hona. (Detta kallas *protandrisk simultan hermafroditism*.)


*The Scarlet Cleaner Shrimp lives in the coral reefs of the Red Sea and the tropical areas of the Indian Ocean.*

*The shrimp is an omnivore, but prefers eating parasites and dead skin that it picks off the fish that visit it to be cleaned.*

*A group of cleaner shrimp often set up a joint cleaning station on some coral. Sometimes fish queue up to get rid of their irritating skin parasites!*

*Even fish that like to eat other species of shrimp will let the cleaner shrimp clean their body and gills, and even their mouth, without eating them up.*

*The scarlet cleaner shrimp has a very unusual gender cycle. It starts life as a male, but as it gets older it also develops ovaries and fallopian tubes. After that, it functions as both a male and a female (a state called protandric simultaneous hermaphroditism).*



Picture 23: Gecko (Swedish)

# Geckon – ödlan som använder nan

Geckoödlor kan klättra uppför alla väggar, springa på ett innertak och hänga kvar i taket i en enda fot. Det är nanotekniken som gör det möjligt.

Geckoödlans fot är täckt med tunna hår som är så mjuka att de på många håll kan komma underlaget bara någon nanometer nära. En mycket svag molekylär kraft kan bära ödlan tack vare miljoner av häftpunkter.

Bindningarna kan lätt lösas genom "avskalning", som när man drar av en tejprensa. På så sätt kan geckoödlan gå i

taket. Materialforskare hoppas redan på ett syntetiskt "geckolin"-material.

### Om geckoödlor


Geckoödlor finns i världens tropiska och varma områden, från öken till tropisk regnskog. De blir mellan 3 och 40 cm långa.

Geckoödlor finns ofta i närheten av människor. De gör god nytta genom att hålla nere insektsantalet. Madagaskargeckon som bor i terrariet äter dessutom frukt.

Picture 24: Gecko (English)

*The gecko – the lizard that uses nanotechnology*

*Gecko lizards can climb all walls, run across ceilings and even hang upside down from the ceiling by one foot only. This is all down to nanotechnology.*



*The feet of the Gecko are covered with tiny hairs (setae) that are so soft they can get as close as a nanometre to a surface – the ends of the tiny hairs are split into billions of elastic hairs. Thanks to these elastic hairs (adhesive points), it takes only a very weak molecular force to support the lizard. The bonding is easily released by “curling away”, similar to peeling away a strip of adhesive tape - this way, geckos can walk on ceilings. Materials research scientists already hope to be able to produce a synthetic “geckolin” material.*

**ABOUT GECKOS**

*Geckos are found in hot tropical climates throughout the world - from deserts to tropical rainforests. They range in size from 3 to 40 cm long. Geckos are often found living close to humans where they are very useful since they help keep the insect population down. The Madagascar gecko living in this terrarium also eats fruit.*

Picture 25: Electric Eel

I Sydamerikas mörka flodvatten lurar darrålen på sitt byte. Den nästan blinda fisken, som egentligen inte är en ål utan en karpfisk, orienterar sig, försvarar sig och jagar med hjälp av elektricitet. Hela bakkroppen är full av muskelceller som är seriekopplade och tillsammans fungerar ungefär som ett batteri.

**SIMMAR BÅDE BAKÅT OCH FRAMÅT**  
De 25 första centimetrarna av darrålens kropp innehåller alla organ, resten av kroppen är det stora batteriet som darrålen skapar elektriciteten med. Om du tittar noga kan du se att darrålar saknar stjärtfena. Istället har de en jättelång analfena som de rör på när de vill simma. Darrålen kan simma både framåt och bakåt och behöver inte slå med kroppen som riktiga ålar brukar göra, utan kan vara rakt utsträckt. Det gör att den får ett stabilt elektriskt fält

runt sig och bättre kan känna av sin miljö.

**MÅSTE UPP TILL YTAN**  
Darrålen har dåligt utvecklade gälar och måste därför komma upp till ytan för att andas. Munnen innehåller mängder av fina blodkärl som tar upp syret i luften. Om du ser en darrål vid ytan är den nog uppe och hämtar luft.

**DARRÅLENS GÅTA**  
Darrålar är intressanta djur som det forskas mycket om. De kan reparera kroppsdelar. Till och med skelett och nerver kan återbildas efter skador. Hur detta går till vet man inte idag, men hittar forskarna lösningen kan det komma att betyda mycket, särskilt för sjukvården. I Sydamerika använder lokalbefolkningen fett från darrålar som medicin vid ledbesvär och av fiskköttet tillagas goda maträtter.

**A high-voltage fish!**  
*The Electric Eel lives in the muddy rivers of the South American jungle. This unusual fish is practically blind, and relies on electricity to find its way around, to defend itself and to hunt its prey. Most of its body consists of specialised muscle cells which are coupled together in series to store electricity and produce an electrical discharge.*

Picture 26: Directions sign

Här kan du gå ut och ta hissen  
till nedre delen av Regnskogen  
*Outside-lift to the lower level of the Rainforest*

Picture 27: Frog Mountain

De tre giftigaste arterna av pilgiftgroda tillhör släktet Phyllobates. De finns på Andernas västsluttning och längs Colombias västkust. I västra Colombia gnider indianerna in sina pilspetsar med hudsekret från dessa grodor, så att bytet förlamas.

*The three most poisonous species of Poison Arrow frogs belong to the genus Phyllobates. Along the west coast of Colombia, the native Indians still use the secretions from one of these frogs, P. terribilis, to tip their arrows with. Game shot with these poisoned arrows may not die immediately, but it is enough to render them helpless so the hunters*

Öster om Anderna förgiftar indianerna istället sina pilar med växtgiftet curare för att göra sina pilar giftiga. Men genom tillgång till moderna skjutvapen har bruket av förgiftade pilar blivit alltmer sällsynt.

*can get close enough to kill them by other means.*

*East of the Andes, native hunters tip their arrows with the plant-derived poison curare. Through access to modern firearms, the used of poison-tipped arrows has become increasingly rare.*

Picture 28: The Cloud Chamber (Swedish)

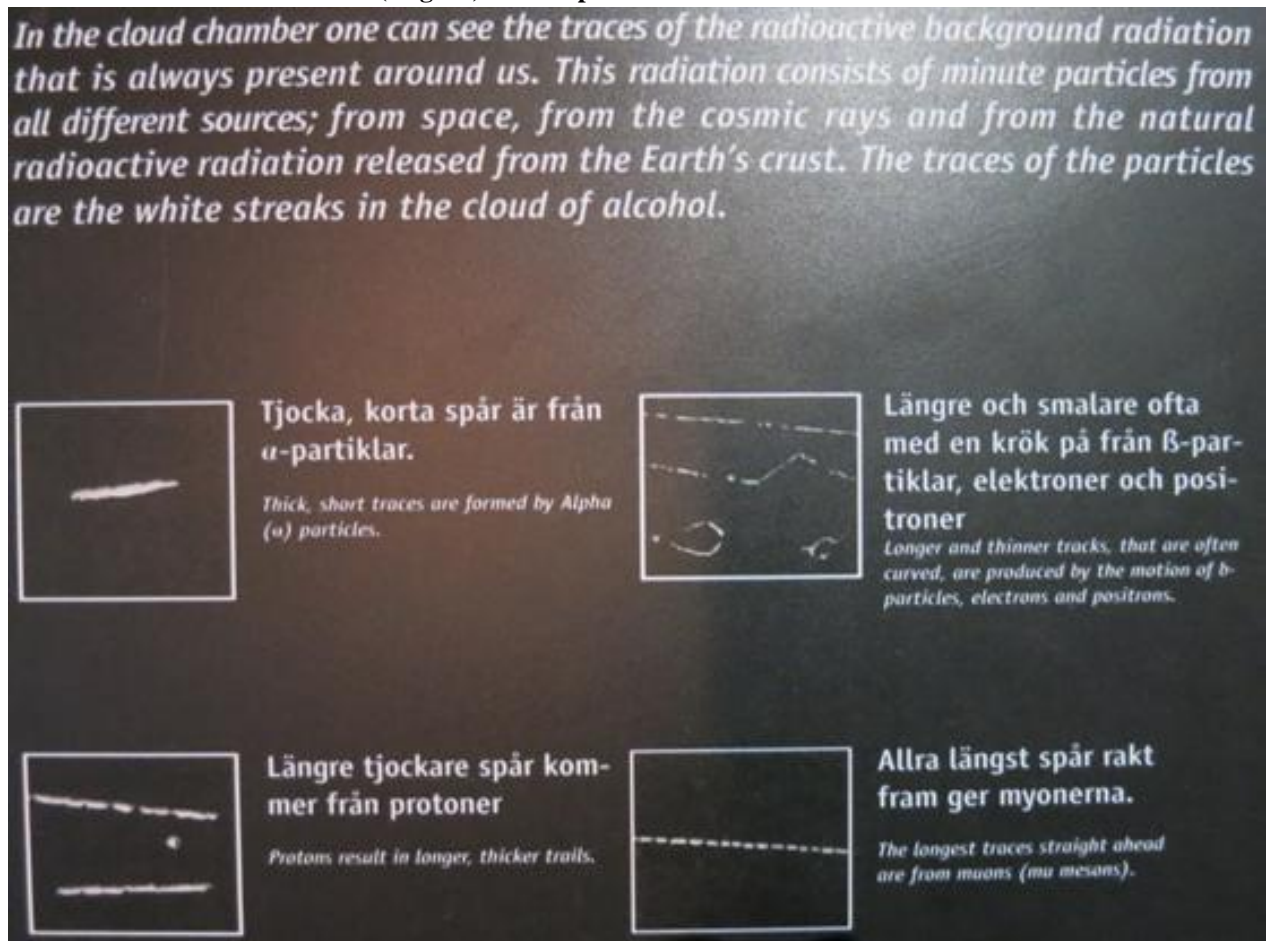
# DIMKAMMAREN

## *The Cloud Chamber*

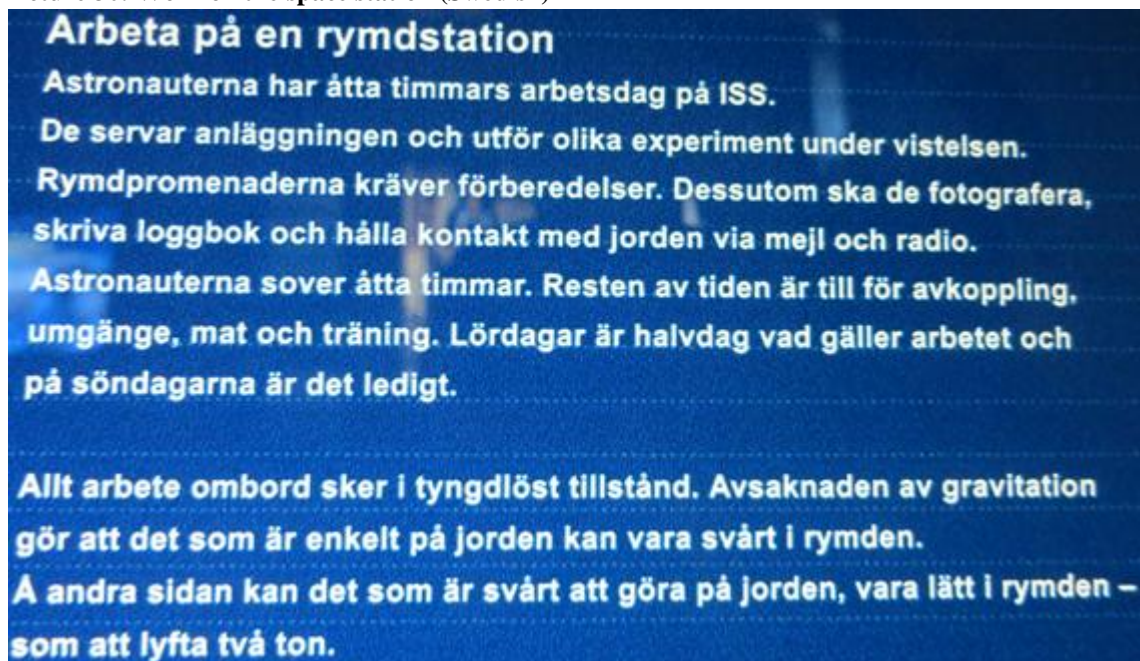
I dimkammaren syns spåren av den radioaktiva bakgrundsstrålning som vi har runt oss hela tiden. Strålningen består av små partiklar som kommer från alla håll; från rymden, den kosmiska strålningen och från den naturliga radioaktiva strålningen inifrån jorden.

Spåren av partiklarna är de vita strecken i dimman av alkoholen.

Picture 29: The Cloud Chamber (English) + small pictures



Picture 30: Work on the space station (Swedish)



Picture 31: Work on the space station (English)

**Work on the space station**

The astronauts work an eight hour day on the ISS. They service the facility and carry out experiments during their time there. Spacewalks require lots of preparation. In addition, they are required to take photos, write a log and maintain contact with Earth via e-mail and radio. The astronauts sleep for eight hours. The rest of the time is used for relaxing, socialising, eating and exercising. Saturday is a half work day and Sundays are free days.

All work on board has to be done in weightlessness. The lack of gravity makes things that are easy to do on Earth difficult in space. On the other hand, something that is really hard to accomplish here on Earth can be an easy task in space. For example, a person lifting two tons.

Picture 32: Sweden's first astronaut (Swedish)

**Sveriges förste astronaut**

Christer Fuglesang utsågs 2002 till medlem av besättningen STS-116/ISS-12A.1. I december 2006 gjorde han sin jungfruresa till den internationella rymdstationen ISS. Han är dessutom den förste europé som är utbildad både till rysk kosmonaut och amerikansk astronaut. År 1992 antogs Christer Fuglesang till det europeiska rymdprogrammet European Space Agency, ESA. Mellan 1993 och 1996 tränade han med ryska kosmonauter på deras center i Stjärnstan.

ESA förflyttade 1996 Christer Fuglesang till NASA och Johnson Space Center Astronaut Office i Houston. Där avslutade han i april 1998 sin amerikanska astronaututbildning med kompetens som NASA Mission Specialist för de amerikanska rymdfärjorna.

Christer Fuglesang är född 1957 i Stockholm. Efter studenten 1975 på Bromma gymnasium läste han teknisk fysik vid Kungliga Tekniska Högskolan. Sexton år senare blev han docent i experimentell partikelfysik vid Stockholms universitet. År 1999 utsåg Umeå universitet Christer Fuglesang till hedersdoktor i teknik och naturvetenskap.

Picture 33: Sweden's first astronaut (English)

**Sweden's first astronaut**

In 2002, Christer Fuglesang became a member of the crew of STS-116/ISS-12A.1. In December 2006, he made his maiden voyage to the ISS. He is also the first European to be trained as both a Russian cosmonaut and American astronaut. In 1992, Christer Fuglesang was accepted into the European Space Agency's (ESA) program. Between 1993 and 1996 he trained with Russian cosmonauts at their centre in Star City, Russia.

In 1996, the ESA moved Christer Fuglesang to NASA and the Johnson Space Center Astronaut Office in Houston. There, in April 1998, he completed his American astronaut training as a NASA Mission Specialist for the US space shuttles.

Christer Fuglesang was born in 1957 in Stockholm. After completing high school at Bromma in 1975, he studied engineering physics at the Royal Institute of Technology. Sixteen years later, he became associate professor in particle physics at Stockholm University. In 1999, Umeå University awarded Christer Fuglesang an honorary doctorate in science and engineering.



Picture 34: Sand Lizard

**SANDÖDLA**  
*Sand Lizard*  
(*Lacerta agilis*)

Sandödlan känner du igen på band- eller fläckmönstret längs ryggen och på fläckarna som liknar ögon på sidan av kroppen. Hanen är vackert grön på våren.

Sandödlan är dagaktiv och lever i öppna sandiga områden, övergivna grustag och på hållmarker. Den är vanligast i sydligaste Götaland.

Arten går starkt tillbaka och klassas idag som sårbar.

*The Sand Lizard is recognised by the pattern of stripes or spots along its back and by the eye-spots along the side of its body. The male has a fine green colour in the spring.*

*Sand Lizards are active by day and live in open sandy areas, abandoned gravel pits and rocky terrain. It is most common in southern Götaland.*

*The species has suffering a serious decline and is now classified as vulnerable.*

Picture 35: Grass Snake

**SNOK**  
*Grass Snake*  
(*Natrix natrix*)

## Varför stinker snoken?

Snoken har inga gifttänder och räknas därför inte till giftormarna. Den har faktiskt giftkörtlar men den kan inte skada en människa. För att försvara sig spelar den istället död och luktar illa. Giftet används till att bedöva tunnhudade bytesdjur som grodor och paddor.

Snoken är också duktig på att simma och fånga fisk. Du känner igen en snok på de ljusa fläckarna i nacken.

Den lever mest på land och honan lägger ofta sina ägg i komposthögar.

*Why does the grass snake stink?*

*The Grass Snake has no fangs and is not considered a venomous snake. Indeed, it has poison glands but it can't harm a human. Its only defence is to play dead and to smell awful. The poison is used to stun prey with thin skin such as frogs and toads.*

*It's a good swimmer and can even catch fish. The Grass Snake spends most of its time on land and the female often lays her eggs in a compost heap in the garden, where it gets nice and warm. You can tell the Grass Snake by the cream to yellowish collar around the back of its neck.*

Picture 36: Frogs' sounds

# GREPPA GRODSNACKET



Varje grodart har sitt eget läte, precis som hos fåglar. Man kan lära sig känna igen grodarter genom att lyssna på dem när de spelar.

**Kan du?**

Grodorna skapar sitt läte genom att pressa luft från lungorna via stämbanden till ett par så kallade vokalsäckar i munhålan. De fungerar som resonanslådor som förstärker ljudet så att det hörs bättre. För det mesta används ljuden av hanarna för att locka till sig honor, men vissa grodor kan även använda olika ljud för att varna för faror.

*Learning frog language*

*Every species of frog has its own call, just like birds do. You can learn to tell different frog species apart by listening to them calling. Try it!*

*Frogs make their calls by squeezing air from their lungs past their vocal chords to a pair of so-called vocal sacs in their*

*mouths. These are thought to function as resonance chambers which amplify the sound so that it carries further. Mostly it is the males who call to attract the females, but certain frogs also use sounds to warn others of danger.*