Exploring the Interface Between Scientific and Technical Translation and Cognitive Linguistics

The Case of Explicitation and Implicitation

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Declaration of already published sections

Parts of section 2.4.5 concerned with the relevance of linguistics to scientific and technical translation were published in Krüger (2013). Also published in Krüger (2013) were parts of sections 4.5.1.1 and 4.5.1.2 concerned with models of linguistic construal operations, parts of section 4.5.2 concerned with common ground and parts of section 4.5.3.2 on the theory of domains. The same holds for parts of sections 6.4 on the distinction between explicitation/implicitation and explicitness/implicitness and parts of section 6.5.1 and subsections concerned with explicitation and implicitation as cross-linguistic construal operations. Section 6.2.2 on the distinction between S-explicitation and T-explicitation is a summary of an article to be published in December 2014 (Krüger forthcoming). Footnote 1 in chapter 7 was taken from Krüger (2012).

List of abbreviations and acronyms

CCS	Carbon dioxide capture and storage
CDS	Current discourse space
CG	Common ground
CL	Cognitive linguistics
COORETEC	CO_2 reduction technologies for fossil-fuelled power plants
CSTC	Cologne Specialized Translation Corpus
DE	German
DIN	Deutsches Institut für Normung
e-continuum	Explicitness continuum
EN	English
i-continuum	Implicitness continuum
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LA	Langue d'arrivée
LD	Langue de départ
lm	Landmark
LSP	Language for special purposes
SAE	Society of Automotive Engineers
SL	Source language
ST	Source text
STT	Scientific and technical translation
TL	Target language
tr	Trajector
TS	Translation studies
T-semantics	Truth-conditional semantics
TT	Target text
U-semantics	Semantics of understanding

Abstract

This thesis aims to explore the interface between scientific and technical translation (STT) and cognitive linguistics (CL), placing particular emphasis on the translationally relevant phenomena of explicitation and implicitation. The two concepts are regarded as potential indicators of translational text-context interaction, which may be of specific importance in the knowledge-intense field of STT and which can be modelled within the CL framework. Parallel to the microscopic attempt to give a coherent account of explicitation and implicitation in STT from a CL perspective, the thesis follows a macroscopic approach that aims to highlight the wider potential which cognitive linguistics holds for the field of scientific and technical translation. Translationally relevant elements of the CL framework include a coherent and cognitively plausible epistemological basis that explains the stability of scientific knowledge, the concept of common ground, which can be used to model the shared knowledge of specialized discourse communities, the field of cognitive semantics, which has developed tools for modelling the organization and representation of specialized knowledge, and the concept of linguistic construal, which allows the description of various linguistic aspects of STT (explicitation and implicitation among them) from a cognitively plausible perspective.

The first part of the thesis takes a macroscopic perspective, being concerned with scientific and technical translation, cognitive linguistics, the philosophical grounding of the two fields and their interface. The perspective is then narrowed down to the two specific phenomena of explicitation and implicitation, which are reconceptualized in cognitive linguistic terms so as to fit into the overall framework of the thesis. The interface between STT and CL is then illustrated in a qualitative corpus-based investigation of explicitation and implicitation as indicators of text-context interaction in translation. The qualitative discussion of the results of the corpus analysis then brings together the theoretical strands of the thesis.

1 Introduction

"*Scientific and technical translation is part of the process of disseminating information on an international scale, which is indispensable for the functioning of our modern society*."
(Pinchuck 1977:13)

"*Given the general goals of Cognitive Linguistics, one would […] assume that of the linguistic frameworks currently in the limelight, Cognitive Linguistics would have the most to say about translation.*"
(Faber/Ureña Gómez-Moreno 2012:74)

"*We can only understand language if we understand more than language.*"
(Hörmann 1976:210, my translation)

As indicated by the title of the present thesis and illustrated by the three quotes above, the thesis engages with three principal areas of investigation. The main area, in whose name the theoretical and empirical work in this thesis is primarily carried out, is the field of scientific and technical translation (STT). Despite the high societal relevance of this field of translation, as illustrated by Pinchuck's quote above, a brief survey of current translation studies shows that STT is not the most obvious choice of topic since it is often considered to lack the multidimensionality and general appeal of other types of translation. However, having been trained in this field and having worked as a scientific and technical translator for several years, I have already experienced the highly complex nature of scientific and technical translation on many occasions and eventually came to the conclusion – as Jumpelt (1961:186) did quite a while ago – that this high complexity of STT and the considerable demands placed on scientific and technical translators warrant an in depth theoretical exploration of this field in its own right.

An aspect which I was particularly interested in and which may be of high relevance to the knowledge-intense field of STT was the fundamental *underdeterminacy of language* (Carston 2002:19), which entails that, in Hörmann's words above, "we can only understand language if we understand more than language". This means that the overtly or explicitly encoded textual structures on which translators operate are merely the "tip of the iceberg" (Linke/Nussbaumer 2000:435; Prunč 2007:21), while most of the information required in verbal communication is hidden under the water and has to be provided by the context surrounding a given communicative event. This linguistic underdeterminacy may be a particularly pressing concern in STT and scientific and technical discourse in general, which is usually concerned with highly complex subject matters and at the same time

linguistically highly condensed in order to ensure efficient and economic communication within expert communities. Two concepts which seem particularly suited to illustrate both the linguistic underdeterminacy and the resulting text-context interaction in scientific and technical translation and which have already been firmly established in translation studies are the phenomena of explicitation and implicitation, which became the second area of investigation of this thesis.

However, very soon after I started reviewing the literature on explicitation and implicitation, it became obvious that, in order for these concepts to be meaningful and applicable in empirical analyses, a proper theoretical notion of the more fundamental concepts of explicitness and implicitness was required, which unfortunately was often missing in the existing body of work. If we go back to the iceberg metaphor of human communication, it becomes clear that any study evoking the huge body of information hidden under water requires a sound theoretical foundation if it hopes to achieve the much desired comparability and repeatability of its findings or any form of intersubjective consensus among fellow researchers. After all, when talking about things under water, we are talking about things which, in the words of Pym (2005:34), are "paradoxically held to be at once hidden and obviously available to all".

Let me briefly illustrate the epistemic aims of the thesis as perceivable at this juncture with the following rather trivial, yet illustrating example from the scientific/technical corpus to be analyzed in this study:

Depending on the process or power plant application in question, there are three main approaches to *capturing the CO_2 generated from a primary fossil fuel* [...]:
Abhängig vom jeweiligen Verfahren oder Kraftwerkstyp gibt es drei Hauptansätze zur *Abtrennung des* ***bei der Verbrennung*** *eines fossilen Primärenergieträgers* [...] entstandenen CO_2:

This example, which will be taken up again in the thesis, can be considered as a prototypical instance of scientific and technical discourse. The source text information that CO_2 is generated from a primary fossil fuel is rendered more explicitly in the target text, which specifies that CO_2 is generated *from the combustion* of a primary fossil fuel. This gain in information in the target text can in turn be considered a prototypical instance of explicitation since, even though the information is not overly encoded in the source text, we would certainly be inclined to say that is implicit in it or can be inferred from it. Questions that immediately come to mind in this context are, for example: What is the locus of this information that is "hidden" in the source text? Is it part of the "word

meaning" of CO_2 or part of our general world knowledge about CO_2? How is this information organized, and how is it made "prominent" in a given communicative context? When can a piece of information be claimed to be implicit in the source text and when not? Can any informational gain in the TT as compared to the ST be considered as explicitation? And so on.

The highly complex nature of these questions should make it clear that, in order to obtain a coherent picture of explicitation and implicitation in translation, we need a proper theory for modelling knowledge organization, explicitness and (particularly) implicitness in verbal communication. In search for such a theory, I encountered the rich and dynamic framework of cognitive linguistics (CL) (see, for example, Langacker 1987; Croft/Cruse 2004; Evans/Green 2006), which promised some convincing answers to the questions raised above. However, upon closer investigation of the topic I was soon struck by the enormous potential that cognitive linguistics seemed to hold not only for the microscopic investigation of specific translational phenomena such as explicitation and implicitation but for the field of scientific and technical translation as a whole. At the most general level, there is the philosophical basis of cognitive linguistics, which may provide a coherent epistemological account of the perceived success of the scientific enterprise and the stability of scientific knowledge and which may therefore also serve as a solid (and much needed) philosophical grounding for scientific and technical translation. Furthermore, the cognitive linguistic framework and particularly the subfield of cognitive semantics offers various means for modelling the specialized knowledge which underlies scientific and technical discourse and which is generally acknowledged to be of prime importance for successful STT (Krein-Kühle 2003:11; Byrne 2006:1; Faber Benítez 2009:108). Also, cognitive linguistics provides models for capturing the different degrees of technicality of scientific and technical texts as posited in LSP and STT research and for describing, at a more microscopic level, important linguistic aspects of STT – explicitation and implicitation among them – in cognitively plausible terms. In summary, cognitive linguistics seemed to provide a coherent set of theoretical concepts that could capture relevant aspects of some of the most important dimensions of STT. More surprisingly, apart from isolated attempts to apply the framework to literary translation (Tabakowska 1993) and to the general field of specialized translation (e.g. Faber/Ureña Gómez-Moreno 2012), there seemed to exist no large-scale and systematic study exploring the potential interface between cognitive linguistics and translation, let alone scientific and technical

translation.[1] This rather fortunate encounter with the cognitive linguistic framework and the lack of previous detailed work on the interface between CL and STT brought about a shift of focus away from the initially conceived exclusive consideration of STT and explicitation/implicitation – with a linguistic framework as a necessary theoretical adjunct – to considering cognitive linguistics as a third theoretical area of investigation in its own right. This thesis will therefore also attempt to answer the question whether, of all the linguistic frameworks currently on stage, CL does indeed "have the most to say about translation".

The epistemic aims of this thesis can therefore be described as follows: Firstly, the – corpus-based – investigation of explicitation and implicitation in scientific and technical translation is intended to illustrate the interface between text and context in this form of translation. This investigation is intended to illustrate *how* and – to a lesser degree – *why* translators perform this text-context interaction in STT. The analysis should also yield insightful patterns of text-context interaction (as realized by explicitation and implicitation) which can be correlated with parameters such as the translation direction or the degree of technicality of the corpus texts. Secondly, the thesis aims to explore the interface between scientific and technical translation and cognitive linguistics by identifying various relevant aspects of STT and modelling them in cognitive linguistic terms. Thirdly, the thesis aims to show that explicitation and implicitation, although being firmly established and widely studied concepts in translation studies, can also profit from a cognitive linguistic perspective, which may provide better answers to some pertinent issues in explicitation and implicitation research and which also ensures a coherent integration of the two concepts into the overall framework of the thesis. Finally, the empirical analysis is intended to illustrate the overall validity of the proposed framework by discussing the identified explicitation and implicitation phenomena in translational and cognitive linguistic terms, thus bringing the theoretical strands of the thesis together.

The three main areas of investigation of the thesis and its epistemic aims translate into the following overall thesis structure. Chapter 2 is intended to set the overall scene, focusing on scientific and technical translation, its societal relevance and theoretical status. This chapter will also consider relevant textual and extratextual dimensions of STT that will be combined in a three-dimensional classification of scientific and technical texts serving as a point of reference for relevant discussions over the course of the thesis. This chapter

[1] But see the various articles by Halverson on the interface between cognitive linguistics and translation (for example Halverson 2003, 2007, 2010a, 2010b and 2013).

discusses scientific and technical translation primarily from the general perspective of translation studies but it already highlights several aspects of STT that may benefit from a cognitive linguistic perspective. Chapter 3 is intended to serve as a bridge between STT and the CL framework to be illustrated in following chapter. It raises some fundamental epistemological issues facing scientific and technical translation and goes on to describe an alternative to the fundamental objectivist-subjectivist dichotomy between the poles of which STT (and translation studies as a whole) is situated. This alternative account simultaneously serves as the philosophical basis of cognitive linguistics and hence lays the groundwork for the detailed illustration of this framework in the following chapter. Chapter 4 then discusses the basic tenets of cognitive linguistics and critically compares this framework with other approaches to meaning, while always keeping the translational perspective in focus. It will also be concerned with the stability of the account of linguistic meaning adopted by CL and with the possible influence of linguistic relativism in cross-linguistic communication. These issues are of central importance to both the overall field of STT and the more specific phenomena of explicitation and implicitation. The chapter goes on to discuss several theoretical components of the cognitive linguistic framework with special relevance to STT and to the overall epistemic aims of the thesis. Chapter 5 brings together the discussions from the previous three chapters and aims to give a coherent account of the epistemological, textual and contextual dimensions of scientific and technical translation from a cognitive linguistic perspective, also paving the way for the empirical application of the framework in the context of explicitation and implicitation. Chapter 6 is specifically concerned with these two phenomena which, as mentioned before, are understood as possible indicators of text-context interaction in scientific and technical translation. Again, explicitation and implicitation will first be discussed from the point of view of translation studies and will then be modelled from a cognitive linguistic perspective, drawing on various concepts discussed in the previous chapters. Chapter 7 outlines the design of the corpus to be investigated and the methodology of this investigation. While the corpus design is primarily based on various translational aspects discussed in the previous chapters, the methodology – and here especially the difficult notion of the *tertium comparationis* of the translation comparison and the proposed linguistic classification of explicitation and implicitation – draws heavily on the cognitive linguistic framework. In chapter 8, the theoretical strands of the thesis will be brought together in a discussion of the results of the corpus analysis from a translational and a cognitive linguistic perspective. The overall corpus approach of this thesis is primarily

qualitative in nature since explicitation and implicitation are inherently "unruly" phenomena which – without taking an overly reductionist approach – cannot be tied down to specific and predefined linguistic indicators that would lend themselves to an automated and large-scale corpus analysis. The implementation of the cognitive linguistic framework in the thesis led to a further backgrounding of the quantitative dimension in favour of the qualitative discussion of the results in translational and cognitive linguistic terms, which is considered to be the main contribution of the empirical investigation. Of course, the quantitative side of the investigation will not be ignored but the ability to generalize the findings may be somewhat constrained by the relatively small corpus, which reflects the primarily exploratory character of the investigation illustrated above.

Integrating the three components of scientific and technical translation, cognitive linguistics and explicitation and implicitation as well as the epistemic aims associated with these components will be the notion of *linguistic underdeterminacy* illustrated above, which will be a recurring theme running as a common thread through the corresponding chapters of the thesis.

2 Scientific and technical translation

This chapter provides a general overview of the field of scientific and technical translation as the main area of investigation of the present thesis. I will start the discussion by clarifying some persistent terminological issues that often hinder a transparent discourse about STT, before attempting a brief survey of the historical significance of scientific and technical translation and its role in today's highly technology-dependent society. This survey is intended to illustrate the high societal relevance of STT and can at the same time be understood as a call for and a justification of a higher visibility of this field of translation in translation studies. Against this background, the focus will be shifted to the general status of STT in translation studies and the distinctive features that differentiate it from other forms of translation. The theoretical position of STT in the well-known dichotomy of source-text vs. target-text orientation will then be discussed and a prototypical approach to STT will be proposed that aims to reconcile – to some extent – the two poles of this dichotomy. Following this, I will propose a three-dimensional classification of scientific and technical texts which captures various important dimensions of STT and which is specifically tailored to the epistemic aims of this thesis. This classification and STT in general will then be linked to the notion of linguistic underdeterminacy as a recurring theme tying the various topics of the thesis together.

2.1 Issues of terminology

In her article on scientific and technical translation in the second edition of the Routledge Encyclopedia of Translation Studies, Olohan (^{2}2009:246) claims that "[t]he binominal phrase 'science and technology' occurs frequently in corpora of news and academic prose [...] and it is perhaps its familiar nature which leads us very readily to use the term 'scientific and technical translation'." What Olohan is concerned with here is whether these two terms can really be grouped together in any meaningful way when referring to a particular field of translation. Byrne (2012:2) seems to be sceptical with regard to this issue since he draws a clear distinction between *scientific translation* and *technical translation*, using Pinchuck's (1977:13) three key categories of information that provide the material for STT:

1. The results of basic or pure science

2. The results of applied scientific research geared toward solving particular problems

3. The work of technologists, which is intended to create marketable industrial products or processes

Before discussing the issue of scientific *and* technical translation or scientific *vs*. technical translation, let us first consider some definitions of the terms *science* and *technology*. Oxford Dictionaries Online defines science as "the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment", while technology is defined as "the application of scientific knowledge for practical purposes, especially in industry". Brekke (2004:618-619) describes science as "an essentially open-ended effort to uncover, describe, quantify and account for the fundamental non-intentional regularities of the perceivable or cognizable universe" and technology as "an advanced form of tool-based problem solving arising at the point where a practical need or intent is illuminated by theoretical insight" (ibid.:628). Byrne (2006:7-8) gives a very vivid description of the distinction between science and technology with regard to translation, stating that "scientific translation relates to pure science in all of its theoretical, esoteric and cerebral glory while technical translation relates to how scientific knowledge is actually put into practical use, dirty fingernails and all." Salama-Carr (2013:20) makes a less colourful but equally intuitive distinction by referring to Newmark's (1981:155) comparison between the "concept-centred" language of science and the "object-centred" language of technology. However, as intuitive as this distinction may seem at a theoretical level, both Salama-Carr (2013:20) and Byrne (2012:2) note that, in reality, it is more difficult to draw a clear line between scientific and technical texts since it is common for texts to combine elements of both the scientific and the technical realm. This close interrelation between science and technology is highlighted by Brekke (2004:628), who calls technology "the 'worldly' face of science". Also, Pinchuck (1977:13) claims that "today's pure science may be tomorrow's technology" and indeed, it seems that there exists a symbiotic relationship between science and technology that inextricably binds the two fields together. For example, as Pinchuck (ibid.) points out, Faraday's experiments were initially prompted by sheer curiosity but eventually laid the foundations for the industrial application of electrical energy. Looking at the issue from another angle, most of today's scientific experiments cannot be envisaged without the help of technical appliances, such as telescopes and microscopes, which extend our epistemological capacities of basic-level perception and manipulation (Lakoff

1987:298, see 3.3). So, when Byrne (2012:2) claims that technical texts are "designed to *convey* information as clearly and efficiently as possible", while scientific texts "will *discuss*, *analyze* and *synthesize* information with a view to *explaining* ideas, *proposing* new theories or *evaluating* methods", he may in fact be describing a continuum, with science and technology as the two endpoints and applied science covering the middle ground. While keeping in mind this general distinction between science and technology, the symbiotic relationship between the two fields and the hybrid nature of many scientific and technical texts encountered in the real world seem to justify the joint use of the two terms in the designation *scientific and technical translation*.[1] After all, when dealing with texts that can clearly be assigned to one of the two fields, we can still resort to the more specific designations *scientific translation* or *technical translation*.

However, a distinction that should be made for the sake of clarity is that between *technical translation* and *specialized translation*. Olohan ([2]2009:246) notes that the term *technical translation* is often used to refer to the translation of texts outside the fields of science and technology and that some scholars see *technical translation* as a synonym for *specialized translation*. In the same context, Byrne (2006:3) criticizes the tendency to subsume LSP texts from the fields of law, finance or economy under the label *technical translation*. The problem, as Byrne (ibid.) rightly points out, is that "[s]imply because a field or subject area has unique or specialised terminology does not make it technical". For the purpose of the present thesis and in line with Borja et al. (2009:58), I understand *specialized translation* as the translation of texts that serve practical rather than aesthetic purposes.[2] *Specialized translation* can thus be seen as a cover term for various more specific modes of translation, such as legal translation, financial translation and also STT, while *scientific and technical translation* is to be understood in the narrower sense discussed above.

After this brief discussion and clarification of terminological issues pertaining to STT, we will now consider the societal relevance of this field of translation.

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[1] In her pragmatic classification of LSP texts in science and technology, Göpferich (1995:306) makes no distinction between text types pertaining specifically to the fields of science or technology since, according to her, the two fields are separated by a very fuzzy boundary. Concerning text-type conventions, Göpferich (ibid.) also claims that texts from these two fields will exhibit more similarities than differences.

[2] Pinchuck (1977:18) makes a similar distinction between "aesthetic" and "service texts".

2.2 Historical and current significance of scientific and technical translation

Since the invention of writing, translation has always been a key factor in fostering scientific progress across barriers of language and culture. This, in turn, has a profound impact on the shaping and development of human societies. Concerning the importance of translation for the proliferation of scientific knowledge, some scholars, like the Italian Renaissance philosopher Giordano Bruno, went so far as to state that "[f]rom translation, all science has its offspring" (Salama-Carr et al. 1995:101). And indeed, the travel of the "torch of knowledge" (ibid.:102) between major cultural and intellectual centres – from Asia to Greece, from Greece to the Middle East and from there on to Europe, the Americas and finally the entire world – has always been accompanied by "waves of translation activity" (Jumpelt 1961:184; Pinchuck 1977:17) as a prerequisite for the export and import of scientific ideas. Störig (^{3}2007:150) even claims that the whole intellectual history of mankind could be structured in terms of these translation waves. In the following sections, I will briefly elaborate on this "wave metaphor" since it provides a useful background for illustrating the historical significance of scientific and technical translation.

According to Störig (ibid.), there are three prerequisites for a wave of translation activity to occur: (1) there must be a disparity in the intellectual standard of two cultures or language communities; (2) the societal and intellectual development in the culture/language community possessing a lower intellectual standard must have reached a point where a natural demand arises for the reception of external knowledge; (3) the two cultures/communities must come into contact with each other; this contact then provides a vital spark igniting a large-scale exchange of knowledge.

One of the most famous and most frequently cited examples of such translation waves and the accompanying proliferation of knowledge between different cultures is probably the import of the scientific and philosophical works of Ancient Greece into the Muslim-Arab Empire and its re-export from the Muslim-Arab world to medieval Europe (Salama-Carr et al. 1995). Major philosophical and scientific works of Ancient Greece that, around the 9th century, were made available to the Muslim-Arab culture by the Baghdad school of translators of the "House of Wisdom" (either by way of direct translation of the Greek original texts or via already existing Syriac versions of the texts) included, for example, Plato's dialogues and *The Republic*, Aristotle's *Organon*, the complete medical works of Hippocrates and Galen, Euclid's *Elements* and Ptolemy's *Almagest* (ibid.:113, see also Salama-Carr 2006:120). The work of the translators of the Baghdad school was crucial in

the development and consolidation of Arabic as a scientific language and in establishing a new system of thought that would become the foundation of Arabic-Islamic culture (Salama-Carr et al. 1995:113-114). The intellectual stimuli induced by this inflow of knowledge were among the most important factors for the intellectual superiority that the Muslim-Arab culture gained over medieval Europe before another wave of translation activity would restore the balance between the cultures again, eventually tipping it in favour of Europe (Störig [3]2007:150). This considerable intellectual imbalance between the Muslim-Arab culture and the European culture and the pressure felt by European scholars to redress the balance between the two cultures would correspond to the first two requirements of a wave of translation activity as identified by Störig. The spark that would eventually ignite this translation activity (i.e. the contact between the two cultures) came in the form of the reconquest of the Spanish city of Toledo by Christian forces in 1085, which ended the Moorish rule over the city and constituted the first step of the *Reconquista* that ended with the fall of Granada in 1492. A prominent figure in the "reimport" of the Ancient Greek knowledge into Europe was Gerard of Cremona (1114-1187), who profited from the access that European scholars had now regained to the wealth of Arabic-Islamic (and Ancient Greek) knowledge stored in Toledo and who dedicated his life to translating the Arabic versions of the Ancient Greek works into Latin (Störig [3]2007:150). After coming into contact with the works of their cultural ancestors by way of "relais translation", European scholars eventually returned to the original Greek versions of the texts and translated these into Latin as well. This process culminated in the work of William of Moerbeke (1215-1286), who, partly upon request from his famous friend Thomas Aquinas, translated the original Greek texts of Hippocrates and Galen, Archimedes, Heron and Aristotle into Latin (ibid.:151). After this wave of translation activity, the torch of knowledge had passed on again from the Orient to the Occident.

This account of the journey of the Ancient Greek knowledge between Europe and the Muslim-Arab world shows that scientific and technical translation already played an important role in the development of societies and cultures even before translation fully came into its own with Gutenberg's invention of the printing press and the ensuing explosion of the number of books produced (Byrne 2012:3). The decline of Latin as a scientific *lingua franca* and the corresponding rise of vernacular languages in the 17th century saw a growing number of scientists writing in their own languages, making the dissemination of their works on an international scale more complex (Brekke 2004:620; Kelly [2]2009:483). The scientific revolution, which first took shape in 17th century England

– and which saw the birth of the Anglo-Saxon scientific discourse as we know it today (Bennett 2007:159-160) –, and the industrial revolution generated further scientific knowledge that could now be easily codified in books and had to be made available in various languages in order to gain international attention. In the first half of the 20th century, for example, leading physicists Max Planck and Albert Einstein published parts of their works in German, Niels Bohr in Danish and Hideki Yukawa in Japanese. In the field of radiology and medical diagnostics on the other hand, Pierre and Marie Curie published, again in part, in French and Wilhelm Conrad Röntgen in German (Byrne 2012:4). This temporary distribution of scientific and technical discourse over various vernacular languages was interrupted in the 18th century by a brief period of French hegemony and finally ended in the middle of the 20th century with the rise of English as the dominant *lingua franca* of science (Brekke 2004:628). Since the majority of scientists are nowadays being required to publish their findings in English, "pure" scientific translation may, for the time being, be in decline, whereas the demand for technical translation is still on the rise (Olohan [2]2009:246).

This brief historical excursus was intended to illustrate the historical significance of translation in the proliferation of scientific knowledge and the ensuing transformation of whole cultures. To put the significance of scientific and technical translation again into perspective, Byrne (2012:3) points out how impoverished and underdeveloped science would be if every scientific breakthrough through the ages had happened in cultural isolation, without propagating this new knowledge across linguistic and cultural barriers so that it could in turn stimulate new research, inventions and discoveries. It is probably this effect of "cross-fertilization" (Salama-Carr et al. 1995:101) that Fischbach (1992) had in mind when he called translators "the great pollinators of science".

Today, the world is shaped even more drastically by science and technology. The "third industrial revolution", which is associated with the invention of the transistor in 1948 and the ensuing widespread application of microelectronics, has, in recent decades, led to a flood of technical innovations (Schmitt 1999:12). The accompanying increase in the exchange of information, the intensified transfer of knowledge due to the increasingly international character of science and technology, the globalization and diversification of commercial activities and the ever greater sophistication of industrial products has led to an unprecedented demand for scientific and technical translation (Krein-Kühle 2003:13). Particularly in the context of technical translation, this trend is furthered by increasing

legal requirements regarding the availability of multiple language versions of technical documentation accompanying a specific product (Schmitt 1999:12). In the European context, for example, Annex I section 1.7.4 of the Directive 2006/42/EC regulating the health and safety requirement relating to the use of machinery ("Machinery Directive") contains the requirement that "[a]ll machinery must be accompanied by instructions in the official Community language or languages of the Member State in which it is placed on the market and/or put into service." Similar pieces of European legislation which fuel the demand for scientific and technical translation are, for example, Directive 2001/95/EC relating to general product safety or Directive 90/385/EEC relating to medical devices (Byrne 2012:7).

It seems then that the significance of STT may not only be illustrated by pointing out its historical influence on high-level developments on a societal or even global scale. In the light of the recent developments described above, which have led to an extremely high demand for STT, its significance will almost certainly be felt in the immediate reality of professional translators as well since this is generally the field in which they will generate a substantial amount of their income (Byrne 2012:1). According to a study conducted in Germany by Schmitt in the early 1990s, the German translation market is overwhelmingly dominated by LSP texts, about 75% of which are of a technical nature (for a summary of the results, see Schmitt 1999:41). Although the study and its findings are now quite dated, Krein-Kühle (2003:12) assumes that any subsequent changes will have led to an increase instead of a decrease of this already high figure.

2.3 The status of scientific and technical translation in translation studies

As researchers working in the field of scientific and technical translation often point out, this huge significance of STT both at a societal level and at the level of individual translation practice stands in sharp contrast to the scarcity of translational research carried out in this field (e.g. Krein-Kühle 2003:14; Byrne 2006:1; Salama-Carr 2009:43; Salama-Carr 2013:20). Traditionally, STT has been considered as easier or as more straightforward than literary translation[3] due to the "perceived universality of the language of science and/or of scientific thought" (Olohan [2]2009:247) and due to the apparent absence of linguistic or conceptual creativity in this field of translation. Scientific and technical translation, together with specialized translation in general, has therefore often been

[3] See, for example, Wilss (1991:3), Schmitt ([2]1994:252), Horn-Helf (1999:101-102).

reduced to a simple, almost automatic transcoding process. Some scholars, such as Mounin (1967:158), went so far as to claim that scientific translation could eventually be completely automated (see also Arntz 2001:172). This derogatory view of STT and specialized translation in general has a long tradition that can be traced back to Friedrich Schleiermacher, who claimed that in the field of commerce (as a subfield of specialized translation), translation is "little more than a mechanical task which can be performed by anyone who has moderate knowledge of the two languages" (Schleiermacher 1813/^{3}2012:45). What is also interesting is Schleiermacher's justification for his disparaging view of commercial translation since he claims that "[b]usiness dealings generally involve readily apparent, or at least fairly well defined objects; all negotiations are, as it were, arithmetical or geometrical in nature, and numbers and measurements come to one's aid at every step" (ibid.). What is striking with regard to this quote is that, if we disregard his remark on "negotiations", Schleiermacher's description seems to be readily applicable to technology and science, the former dealing with well-defined objects and the latter trying to uncover and to describe regularities in the world, often by resorting to measurements or arithmetical or geometrical operations. Therefore, it seems that Schleiermacher's criticism of commercial translation can also be interpreted as a criticism of STT.

Another philosopher, José Ortega y Gasset, also considers specialized translation and, in this case, particularly scientific translation to be easier or more straightforward than literary translation. According to Ortega y Gasset (1937/2000:50-51), authors of scientific texts translate their thoughts into a pseudolanguage of technical terms, i.e. a terminology, which guarantees a language-independent, almost universal scientific discourse:

> [This terminology] is a *Volapuk,* an Esperanto established by a deliberate convention between those who cultivate that discipline. That is why [scientific] books are easier to translate from one language to another. Actually, in every country these are written almost entirely in the same language. (ibid.:51)

Although Ortega y Gasset seems to entertain a rather idealized notion of terminology and the power of cross-linguistic standardization here (see especially the discussion in 5.2.1 on conceptual variation in science and technology), he certainly has a point in that scientific discourse indeed seems to be based on tightly prestructured frames of reference and – due to the international character of science and technology (Jumpelt 1961:45) – may be subject to less language and culture-specific influences than other forms of discourse. Whether this should lead us to conclude that scientific and technical texts are in any way

easier to translate than, for example, literary or general language texts is another question that will be discussed in the next section. What seems clear, however, is that the views held by these prominent thinkers are to some extent exemplary for the general attitude towards specialized (and often also scientific and technical) translation and it should therefore not come as a surprise that this field "remains relatively unchartered territory within the discipline [of translation studies] and is deemed a less prestigious test case for translation models" (Salama-Carr 2009:43). Over the past few years, the situation has changed slightly and STT has become more visible in translation studies, for example in the form of a proper entry in the second edition of the Routledge Encyclopedia of Translation Studies (Olohan [2]2009) or in the form of a Special Issue "Science in Translation" of *The Translator* (Olohan/Salama-Carr 2011). But as Salama-Carr (2013:20) points out, it seems that this field of translation "is still to acquire its *lettres de noblesse* and to be given its share in anthologies of translation studies".

2.4 Distinctive features of scientific and technical translation

A good reference point for the discussion of distinctive features of scientific and technical translation is the "stratificational" model proposed by Snell-Hornby (e.g. [2]1994:17; [2]1995:32), in which the author attempts to provide an integrated account of the traditional areas of translation (literary translation, general language translation and special language translation) based on a prototypical approach. The model is quite ambitious and, as such, naturally not without its shortcomings (see, for example, Munday [3]2012:119) but it convincingly illustrates some general distinctive features of STT and its relation to other fields of translation. The model adopts a top-down approach, starting from a macroscopic perspective on the previously mentioned three traditional areas of translation (level A in the model) and then moving down to the microscopic level via a prototypology of basic translationally relevant genres (level B), the non-linguistic disciplines linked to the various areas of translation and text types (level C), essential aspects of the translation process itself (level D[4]), the translationally relevant areas of linguistics (level E) and, finally, the relevant phonological aspects of translation (level F).

[4] At level D, (i) refers to the source text, (ii) indicates the relevant quality criteria for translation and (iii) focuses on the function of the translation from a recipient perspective.

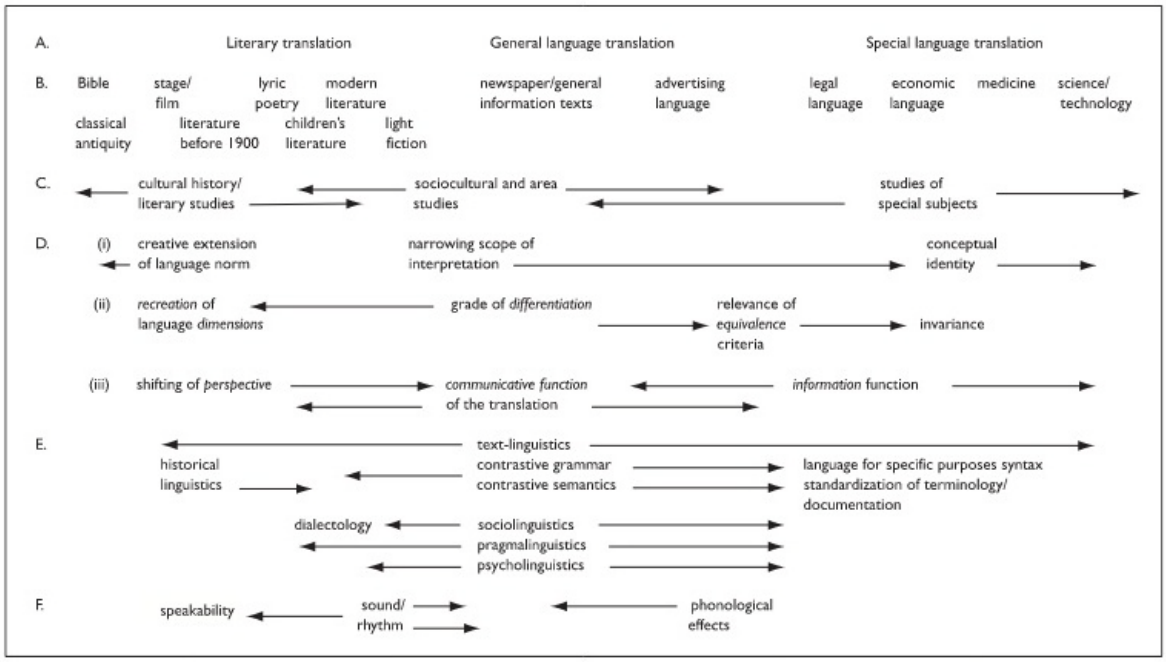

Figure 1: Snell-Hornby's stratificational model of translation studies[5]

In the following sections, we will consider in more detail the relevant levels and sub-levels of this model.

2.4.1 The role of subject-matter knowledge in scientific and technical translation

Starting from the top of this model, STT is considered as a specific form of special language translation or specialized translation (this is in line with the distinction between STT and specialized translation made above). At the level of non-linguistic disciplines with relevance to translation (level C), we find the first distinctive feature of STT, namely that it relies on the study of special subjects underlying the various texts to translate. This has important consequences for the translator and the translation process. For example, Rickheit/Strohner (1993:214-215) point out from a cognitive perspective that readers or hearers of narrative texts, compared to those of expository texts (e.g. scientific and technical texts), generally possess more world knowledge which they can bring to bear in text understanding. Narrative texts usually refer to situations, actional contexts and actions that are more or less well-known by the text recipients, the new elements being primarily the relations between the events described in the text. Expository texts, on the other hand, usually do not only refer to new relations between individual events but to new events altogether (for example in the form of new scientific findings in cutting-edge research).

[5] The figure above was taken from Munday ([3]2012:118).

Also, Jahr (2009:82) points out that scientific and technical knowledge is quite strongly organized in a vertical hierarchy that often encompasses more and much deeper reaching levels than in other disciplines. In order to understand a highly specialized scientific/ technical text, readers normally have to acquire first the basic knowledge at the top of such a hierarchy (since the more specific topic they want to understand is related to this basic knowledge in systematic ways) and then work their way downwards to increasingly more specific levels of knowledge. On the other hand, in literary and general language translation, the knowledge required to understand a given text is normally structured more horizontally and can thus be more readily associated with our general knowledge of the world (see Rickheit/Strohner's claim above). For STT, however, the vertical organization of scientific and technical knowledge translates into the widely accepted but still not trivial fact that translators cannot just rely on their general world knowledge but often need to acquire a considerable amount of subject-matter knowledge if they are to produce high quality translations (Krein-Kühle 2003:11; Byrne 2006:5-6). As Faber/Ureña Gómez-Moreno (2012:83) put it, "[o]nly a fragment of the conceptual system is mentioned in the text, but the translator must rebuild an important part, if not all, in order to obtain a comprehension of the content [to be conveyed]". Due to the vertical organization of such conceptual systems in science/technology, STT generally seems to exhibit a greater "conceptual distance" between the translator and the text than literary or general language translation.

2.4.2 Stability of meaning in scientific and technical translation

Level D, focusing on the translation process, illustrates some further interesting differences between STT and other areas of translation. Under point (i), which focuses on the understanding of the source text, Snell-Hornby notes an increasingly narrow scope of hermeneutic interpretation from literary to scientific and technical translation. This observation corresponds to the naively evident fact that scientific and technical texts refer to well-defined concepts or objects or to an already prestructured part of reality in which the relations holding between the objects or concepts govern the relations within the text (see Jahr 1996:56). In much the same context, Nussbaumer (1991:168) speaks of an *ordo naturalis* underlying scientific and technical texts and argues that the authors of such texts can therefore delegate the responsibility for the coherence of the text, at least in part, to this prestructured reality. Also, Hoffmann (1988:558) claims that the communicative intention of the author is subordinate to the inner logic of the subject matter of the text and that,

therefore, the organization of this subject matter is reflected in the organization of the text. The notion of a prestructured reality that could serve as a fully stable frame of reference in scientific and technical texts will be scrutinized from a philosophical point of view in the next chapter and will be discussed in the context of STT in chapter 5. For the present discussion, I take it to be pre-theoretically evident that the frames of reference in scientific and technical discourse are much more tightly structured than in other forms of discourse and that this structure, regardless (for now) of its ontological and epistemological status, influences and delimits to a considerable extent the scope of interpretation and consequently the scope of action of authors and translators of scientific and technical texts. This narrow scope of interpretation can be linked to the high stability of (monolingual) meaning that is generally attributed to STT. On the other hand, specifically in literary translation and to a lesser extent in general language translation, the conceptual systems underlying a text are often of an *ad hoc* nature (for example in fictional novels) and therefore less stable, bearing the idiosyncratic imprint of the author. Also, as a specific rhetorical means, such texts may exhibit instances of "intentional polysemy" (see Prunč 2007:128), whereas such polysemy is an unwanted phenomenon in scientific and technical discourse and STT, both of which strive for clarity, efficiency, formalization, standardization, non-contradiction, completeness, objectivity and non-redundancy (Beier 1980:83).[6] Since there is often no tightly structured *ordo naturalis* to which literary or (to a lesser extent) general language texts refer, the admissible scope of interpretation will sometimes be much wider than that in STT.

2.4.3 Invariance of meaning in scientific and technical translation

This leads to point (ii) of this level, which is concerned with various quality criteria for translation. Snell-Hornby claims in this context that equivalence criteria can only be posited "for certain types of special language translation" and that "the notion of invariance can only apply in cases of conceptual identity" (^{2}1995:34).[7] The complex

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[6] Of course, this is an idealized conception of scientific and technical discourse and translation that may not exist in reality in this pure form (see, for example, Salama-Carr (2013) on the notions of *norms* and *power* in the context of scientific and technical discourse/translation). However, it cannot be denied that there are converging efforts to these ends (by the various scientific communities) and that scientific and technical discourse exhibits these features to a much higher degree than other forms of discourse.

[7] Snell-Hornby's model is somewhat misleading here. Conceptual identity is situated at level D (i), which is exclusively concerned with the source text. However, conceptual identity refers to a bipolar relation between

concepts of equivalence and invariance will be discussed, in more detail, in the context of theoretical approaches to STT in 2.5. Since the ideas of invariance and conceptual identity are linked with some profound epistemological issues, such as the nature of concept formation and the influence of linguistic systems on human conceptual systems, they will be taken up again in the cognitive linguistic discussion of scientific and technical translation in chapter 5. By then, we will have laid out the philosophical and linguistic basis of this thesis (chapters 3 and 4) and can tackle these issues in a more informed way. What I want to focus on at this point, again at a rather pre-theoretical level, is the consequences for STT that arise from the assumption of tightly structured conceptual systems underlying scientific and technical texts, as already discussed in the previous section. These consequences are already hinted at in Snell-Hornby's notions of *invariance* and *conceptual identity*. It was claimed that scientific and technical discourse offers only a very narrow scope of interpretation, which can be equated with a high stability of meaning in this form of discourse. Assuming that the relevant conceptual systems in source and target languages are to a large extent congruent (see Scarpa 2002:146; Brekke 2004:620)[8], invariance of meaning is generally deemed to be achievable in STT. Accordingly, STT is considered to be governed by "absolute priority of information content over form and the accuracy of its transmission" (Jumpelt 1961:VII). Regarding the actual translation process, the primary requirement is generally considered to be invariance at the denotational/ content level (Schreiber 1993:72; Fluck [5]1996:136; Brekke 2004:634), at the level of text-external reference[9] (Horn-Helf 1999:250-251) or at the level of (intended) sense (Krein-Kühle 2013:5). Jumpelt (1961:186) points out that the strictness of these requirements for

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source text and target text and would just have to be situated at level D (ii) dealing with translation quality criteria.

[8] This does not mean that we should expect full identity of such conceptual systems in SL and TL. Schmitt ([2]1994:256-259), for example, points out the differences in English and German steel classifications, with differences also pertaining between seemingly identical terms such as *carbon steel* and *Kohlenstoffstahl*. In her contrastive analysis of English and German coal gasification systems, Krein-Kühle (1995) also uncovers various differences between the SL and TL conceptual systems. Besides cases of full conceptual identity or equivalence, we should therefore also expect to find many cases of what General Terminology Theory calls "partial overlapping" of terms (Arntz et al. [6]2009:153). The issue of conceptual asymmetry in STT will be discussed in more detail in chapter 5.

[9] Horn-Helf (1999:109-110) ranks the level of text external reference higher than the denotational level since, according to her, scientific and technical texts are often defective (see also Krein-Kühle 2003:23). Striving for denotational invariance in these cases would entail the transfer of these defects to the target text.

scientific and technical translation clearly differentiates it from other areas of translation and warrants its independent and large-scale investigation.

2.4.4 Communicative function of scientific and technical translation

At level D (iii), which is concerned with the communicative function of translation, Snell-Hornby unsurprisingly claims that the prototypical function of scientific and technical translation is the informative one. In the context of the classification of scientific and technical texts in 2.7, I will discuss Göpferich's (1995) finer subclassification of this informative function of scientific and technical discourse. What I want to point out here is that the informative function (in its different manifestations) is so closely linked to scientific and technical discourse that the variance of this *skopos* seems to be a very peripheral phenomenon in STT, where functional invariance seems to be the norm. If this is the case, we may have a reason for bringing the often-chided concept of equivalence back into the picture, which, in functionalist theories of translation, is understood as "adequacy to a Skopos that requires that the target text serve the same communicative function or functions as the source text, thus preserving 'invariance of function between source and target text' […]" (Nord 1997:36). This may also allow us to again factor in, to a higher degree, the retrospective ST-TT relation of the translational "'double-binding' relationship" (House 1997:29), which, in recent teleological accounts of translation, has often been neglected in favour of an almost exclusively prospective perspective on the function of the translation in the target-language culture. The line of reasoning for bringing the ST-TT relation back into focus in STT is as follows: (a) if a scientific/technical source text refers to a tightly structured frame of reference, allows only a narrow scope of interpretation and thus exhibits a high stability at the level of textual meaning and, (b), if we assume that the respective conceptual systems in the source and target language cultures are largely congruent (thus allowing, at least in principle, invariance of meaning in translation) and finally, (c), if we further assume that invariance of function (i.e. to inform, in the target text, about the same subject matter as presented in the source text) is the prototypical case in STT, then the source text becomes very much alive again as an important factor. After all, it is the information presented in and the frame of reference underlying this text that will, to a considerable extent, guide the translator's composition of the target text.[10] I am not referring here to the linguistic make-up of the ST – which may

[10] However, see the discussion of socioculturally induced shifts of meaning in STT in 2.6.

have to be considerably reshaped if the TT is to function as a high quality translation – but rather to its content, i.e. its reference to a tightly (and interlingually more or less congruently) structured conceptual configuration. This case for keeping the equivalence concept and the ST-TT relation in the picture should neither be interpreted as an attempt to "reenthrone" the source text, nor as an ideologically-guided "re-turn" toward the normative equivalence paradigm of the 1980s, in which the various linguistic levels of the source text seemed to determine quite strictly what a proper translation had to look like. Rather, it is fuelled by practical reflections on the relevant factors of STT, among which are the content of the source text and the effort to render this content as accurately as possible in the target language.

2.4.5 The relevance of linguistics to scientific and technical translation

The last level in Snell-Hornby's model to be commented on here is level E, referring to translationally relevant areas of linguistics. I think it is of general importance to highlight the very fact that different areas of translation and translation studies can still profit from sound linguistic frameworks; an idea that, in the wake of Bassnett and Lefevere's (1990) criticism of linguistic approaches to translation from a cultural studies perspective, has become less and less popular in the discipline. However, as Saldanha (^{2}2009:148) rightly points out:

> [...] much of that criticism assumes a view of linguistics that has long ceased to be representative of current trends in the field and, in particular, of the linguistic theories that have informed the great majority of the discussions of translation at least since the late 1980s and 1990s […].

While acknowledging that different areas of linguistics can provide valuable input to various areas of translation, it is not clear from Snell-Hornby's model whether she only considers text linguistics and work on terminology and languages for special purposes relevant to special language translation since, apart from text linguistics, the arrows for the other areas of linguistics do not extend to this area of translation in her figure.[11] If she intended to restrict the areas of linguistics relevant to specialized translation to text linguistics, LSP and terminology, this would of course run counter to the approach adopted in the present thesis. After all, it is one of the central aims of this thesis to show the

[11] Also, the comments Snell-Hornby makes on her model in various publications (e.g. ^{2}1994:18 ff.; ^{2}1995:33 ff.) do not give any further indication as to which areas of linguistics she actually considers relevant to scientific and technical translation.

considerable potential that the framework of cognitive linguistics offers, at a macroscopic level, for the general field of scientific and technical translation and, at a more microscopic level, for the investigation of linguistic phenomena such as explicitation and implicitation in STT. This call for a linguistic framework is of course not intended to mean that linguistics can provide an exhaustive explanatory tool for all aspects of translation. Functionalism, the theory of translational action and the cultural, social and cognitive turns in translation studies have demonstrated the multilayered nature of translation (which is by no means restricted to the relation between ST and TT) and the multiple perspectives from which it can be studied. At the same time, however, it cannot be ignored that a major part of translation does indeed involve an operation on language and that many interesting translational phenomena (explicitation and implicitation among them) exhibit a linguistic dimension. To make sound statements about these important but by no means exclusive aspects of translation, a grounding in an equally sound linguistic framework is desirable (see also Krüger 2013:291).

2.5 Theoretical approaches to scientific and technical translation

In line with the generally low status of scientific and technical translation in translation studies as compared to the more "interesting" field of literary translation, there have been relatively few explicit attempts at providing comprehensive theoretical accounts specifically concerned with STT (Horn-Helf 1999:102; Krein-Kühle 2003:14; Byrne 2006:22). In his introductory book on scientific and technical translation, Byrne (2012:8 ff.) makes the all too familiar distinction between retrospective perspectives on STT that focus on recreating the source text and prospective perspectives that place the focus on the target text. The underlying dichotomy is of course that between equivalence-based approaches to translation on the one hand and functional and historical/descriptive approaches on the other (see, for example, Halverson 1997:217). I will not again revisit the entire debate between the proponents of both camps here. Instead I will try to identify some particular merits and shortcomings of both approaches from the specific perspective of STT, before proposing an account that attempts to reconcile the advantages of both approaches while at the same time doing justice to the epistemic aims of this thesis.[12]

[12] It has to be pointed out that the equivalence vs. functionalist/descriptivist debate is a theoretical minefield and at the same time extremely complex since the debate has been fought feverishly on both sides since the 1980s, with volumes written on every argument in favour and against the two opposing perspectives. The

According to Byrne (2012:8 ff.), who discusses equivalence-based vs. functionalist approaches (and here specifically skopos theory) from the perspective of STT, equivalence focuses on recreating the source text in some form, thereby highlighting the relation between source text and target text. Early extreme versions of the equivalence concept, which were primarily informed by systemic linguistic or contrastive linguistic theories, assigned a perhaps unreasonably high status to the source text. Here, the basic claim is that the ST is the sole input determining – by way of linguistic transformation or transcoding rules – the creation of the target text, at the detriment of other factors, such as the purpose of the translation or target reader expectations.[13] Examples of such strong linguistically focused equivalence conceptions would be Catford's (1965) theory of translation shifts or Jäger's (1975) translational linguistics. With the rise of text linguistics, these highly reductionist notions of equivalence were generally discarded in favour of more functionally oriented approaches that placed a stronger focus on the communicative character of translation (Siever 2010:55 ff.). While in these approaches there is still a strong relation between a translation and its source text, the source text ceases to be the sole guiding principle for the creation of a target text, and factors of the wider communicative situation can be incorporated. Also, Koller's ([8]2011:218 ff.) five equivalence relations of denotative, connotative, text-normative, pragmatic and formal equivalence highlight the multidimensional character of text and the fact that a source text and its translation can only be equivalent with regard to a certain parameter or dimension. However, the ultimate orientation of translation towards its source text is still often felt to disregard important real-world factors such as time constraints, reader expectations or customer-preferred terminology or style (Byrne 2012:11). Also, multidimensional approaches such as the one proposed by Koller cannot explain which level of equivalence to favour in certain contexts without taking recourse to the purpose of the translation, which still sits somewhat uneasy with most equivalence approaches. Finally, equivalence-based approaches cannot – in fact, they do not attempt to – account for cases in which there simply is no discernible equivalence relation holding between ST and TT or between parts of these texts. In these cases, most equivalence-based approaches would deny the target

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account given here will therefore inevitably be cursory and oversimplified. For a comprehensive equivalence-based perspective on translation studies see Koller ([8]2011), for a functionalist perspective see Reiss/Vermeer ([2]1991) and Nord (1997).

[13] It is these narrow linguistic conceptions of translation that led Bassnett and Lefevere (1990) to question the general usefulness of linguistics for translation studies (see Halverson 2013:33).

text or the respective part of the text its status as translation (since it lacks the definitional equivalence criterion) and would instead classify it as an adaptation.[14] However, in cases where there is indeed a very close relationship between source text and target text (at whatever textual level this relation may hold), equivalence-based approaches do indeed offer valuable theoretical criteria for comparing translations with their originals (Byrne 2012:13). Also, they provide more nuanced yardsticks for the immediate textual work of the translator than the more holistic functional approaches to translation.

These functionalist approaches and here specifically skopos theory fully recognize the wider professional reality of translation (Byrne 2012:11) and, by conceptualizing translation as a specific form of human action, allow for the incorporation of a wealth of extratextual factors in the description and investigation of translation, factors that often cannot be properly captured by equivalence-based approaches. The most radical manifestation of such a holistic and action-based approach is probably Holz-Mänttäri's (1984) model of "translational action", which aims to capture the interplay between the translator and the various other agents involved in the translation process (such as the initiator of the translation, the translation agency and the user and the receiver of the target text) in the wider sociocultural context. In functionalist approaches, the relation between a translation and its source text does not derive from any ST dimension but rather from the purpose or skopos of the translation in the target culture. Accordingly, and this may be one of the disadvantages of such a holistic and teleological approach, the source text has not only been "dethroned" but the ST-TT relation (whatever it may look like) has generally been neglected in favour of wider concerns about the translation process. As Byrne (2012:13-14) rightly claims, while functionalist approaches are extremely useful for capturing important extratextual aspects of the professional reality of translators, they have relatively little to say on how to achieve specific skopoi when the perspective is narrowed down again to the translator creating a specific target text based on a specific source text. Also, the skopos of the translation is derived from a perhaps somewhat overidealized and overtheorized *translation brief*, which, in an ideal world, contains information such as the

[14] This is somewhat problematic for, as Siever (2010:77) points out, in this case a situation may arise where professional translators think that what they produce is a translation only to be told later by a translation theorist that they did not actually translate but rather adapt a text. However, this is not to deny that there has been a quite impressive theoretical body of work published on the distinction between translation and adaptation. The most insightful and sophisticated work in this context is probably Schreiber (1993).

intended text function(s), the addressees, (prospective) time and place of reception, medium and motive for the production and reception of the text (see Nord 1997:60). In reality, however, such a translation brief often consists in quite concise information such as "7000 words technical text till Friday" – as theoretically undesirable and embarrassing as this may be.

2.6 Scientific and technical translation as a prototype category

As mentioned previously, this thesis will not attempt to cut the Gordian knot between equivalence-based and functionalist/descriptive approaches to translation. Instead, I will follow Byrne's (2012:14) pragmatic advice and try to combine the best features of both equivalence-based and functional approaches with regard to STT. To do so, I will start from a very macroscopic perspective and refer to Hermans (1999:48-49) and Prunč (2007:27), who both claim that the idea of an equivalence relation between source text and target text as a defining criterion of translation is a culture-specific notion that emerged in European intellectual life in the late 18th and early 19th century. If we do not want our idea of translation to be a strictly culture-bound concept that has to remain agnostic towards other cultural notions of translation or to deny them their status of translation based on its own culturally shaped assumptions, we should probably discard the idea of equivalence being a *definitional* criterion of translation. Hence, we should also abandon any clear-cut distinction between translation on the one hand and adaptation on the other. As Prunč (ibid.:28) claims, quite rightly in my opinion, the concept of translation must be able to also accommodate those forms of translational action which yield a rather loose relation between ST and TT. At the same time, it cannot be denied that many professional translations in the European context exhibit a rather close relation to their source texts, possibly even more so in the case of STT, where a call for denotational invariance of content seems to be the norm (see 2.4.3 above). I would like to reconcile this fact with the more holistic stance taken above by proposing a prototypical approach to translation in the sense of Halverson (1998, 1999).[15] STT as a prototype category could look like this:[16]

[15] See also Schreiber's (2006) prototypical model of translation types.

[16] The figure was adopted from Halverson (1998:508).

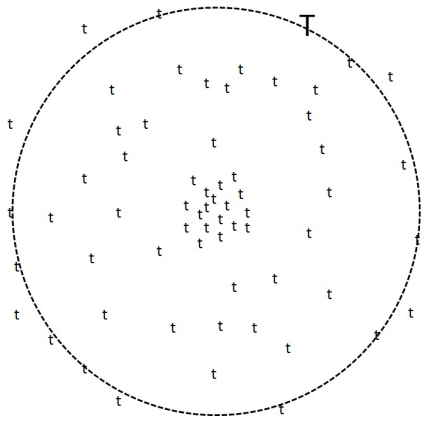

Figure 2: STT as a prototype category

Such a prototypical approach would, on the one hand, have the advantage of a fuzzy category boundary (as indicated by the dotted line), which would relieve us of the task of making a principled distinction between translation and adaptation. On the other hand, a prototype approach to translation acknowledges that there are asymmetries among the category members (as indicated by the cluster of instances in the centre), meaning that some members are more central to the category while others are more peripheral (Halverson 1998:510; Prunč 2004:263). We could then say that the central members in the prototype category of STT are characterized by invariance of (informative) function and therefore tend to exhibit a very close relation to their source texts at the denotational/content level. We could further say that this prototypically close ST-TT relation warrants the incorporation of the equivalence concept to theoretically capture this relation, with the theoretical value of this equivalence concept probably diminishing the closer we move toward the periphery of the category, where category members tend to exhibit a rather loose ST-TT relation.[17] The equivalence concept used for modelling prototypical STT in the sense described above should be broadly compatible with

[17] Halverson (2010a:16) points out that "prototypes vary across cultures and times" and that "the exemplars of translations that are found at any given time or place may be considered more or less prototypical, relative to the shared conceptualization of the relevant language community at the time" (a similar view is held by Chesterman 2004:43). This means that, in different cultures and at different times, the centre-periphery structure of prototype categories may be different from the one proposed here, where a close ST-TT relation is claimed to be located towards the centre of the category. This culture dependence of prototype categories makes sure that the prototypical approach to translation opted for in this study is reconcilable with the holistic stance on translation taken at the beginning of this section, and it should also alleviate concerns that a prototype approach will marginalize the "Other" and eventually "stifle research in translation studies", as feared by Tymoczko (2006:20).

functionalist approaches, so as to make this account of STT compatible with more holistic perspectives on translation. Such a dynamic equivalence model which exhibits some affinity with the functionalist camp has been proposed by Schreiber (1993) and Albrecht (2005) and was applied to STT by Krein-Kühle (e.g. 2003, 2013). The model can be graphically presented as follows:

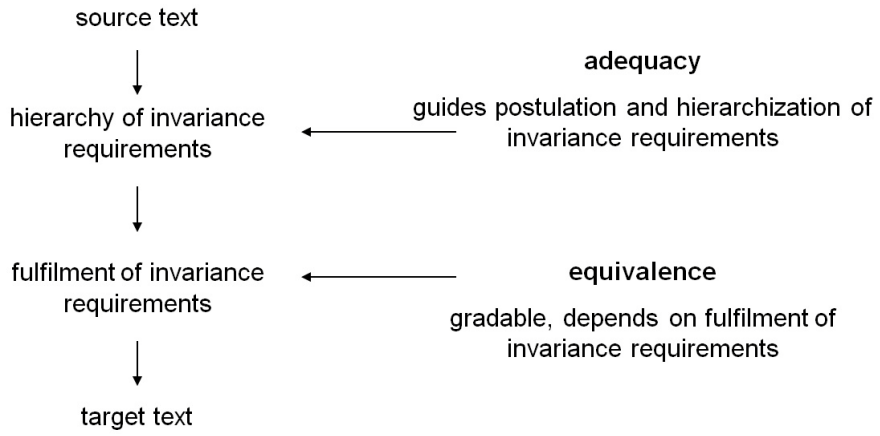

Figure 3: Albrecht and Schreiber's equivalence model[18]

This model contains one important notion that has been largely ignored so far (*adequacy*) and one that has been used at a rather pre-theoretical level (*invariance*). Adequacy is a central notion of skopos theory, and its incorporation into the equivalence model above (although in a more moderate form) ensures the desired basic compatibility of this model with functionalist approaches. In skopos theory, adequacy refers to the relation between source text and target text that is established when the skopos of the translation is consistently followed in the translation process (Reiss/Vermeer ^{2}1991:139).[19] In the model above, adequacy guides the postulation and hierarchization of invariance requirements to be fulfilled in translation, which, according to Schreiber (1993), can lead to hierarchizations such as primacy of form, primacy of content, primacy of author intention

[18] The figure is based on Albrecht (2005:36).

[19] Both Albrecht and Schreiber adopt a narrower version of skopos and the adequacy concept. For Albrecht (2005:35), adequacy means adequacy to the function of the source text. He therefore rejects an important claim of skopos theory, i.e. that the skopos of a translation (relative to which adequacy is established) can be stipulated independently of the source text. Schreiber (1993:61) seems to follow a more target-text oriented approach since for him adequacy is related to the time, purpose and addressees of a translation (not its source text). However, Schreiber (ibid.:61-62) restricts the purpose or skopos of a translation to invariance requirements, while skopos theory explicitly allows for variance requirements, for example in the case of functional variance.

and primacy of effect. A high degree of equivalence would be achieved when there is an equally high degree of invariance with regard to the factors established prior to the translation.[20] The notion of invariance refers to "those elements which remain unchanged in the process of translation" (Bakker et al. [2]2009:269). The invariance concept was adopted from structural linguistics and is an integral part of equivalence-based theories of translation (Siever 2010:198). The concept, although widely invoked in translation studies and intuitively comprehensible, raises some quite fundamental ontological and epistemological questions. The difficulties associated with this concept are also recognized by Schreiber (1993:57), who introduces his notion of *degree of equivalence* to do justice to the fact that invariance requirements can normally only be fulfilled in an *approximate* manner. I will address the issues involved in the invariance concept in more detail in 5.5, after having laid out the philosophical and cognitive linguistic underpinnings of the thesis.

Based on this dynamic equivalence model and with specific emphasis on STT, Krein-Kühle (2013:5, boldface removed) defines equivalence as

> […] a qualitative complete text-in-context-based concept. It refers to the translational relation between a complete source text and a complete target text, both of which are embedded in a specific domain-related context, and implies the preservation of ST sense/intended sense or 'das Gemeinte' [what is meant] (the invariant) [...] in the TT using TL linguistic means, the best possible selection of which must have been achieved at the syntactic, lexical-semantic, terminological-phraseological, and textual levels. These levels are hierarchically interrelated and subject to pragmatic aspects […].

In line with the prototypical considerations above, Krein-Kühle posits the ST sense/intended sense[21] as the highest ranking invariant in the hierarchy proposed above. However, Krein-Kühle does not treat STT or translation in general as a prototype concept but rather follows the general equivalence approach in making a clear distinction between

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[20] There is an important distinction here between Albrecht's and Schreiber's approach. For Albrecht (2005:36), equivalence remains a definitional criterion of translation, while Schreiber (1993:55) uses the concept primarily as a measure of the quality of translations.

[21] With the notion of *intended sense*, Krein-Kühle does justice to Horn-Helf's (1999:109-110) concerns that denotational invariance may not be desirable in the case of defective source texts. In non-defective scientific and technical texts, denotational meaning would normally equal referential meaning. In the case of such an ST defect, one would then move from the level of (denotational) sense to the level of (referential) intended sense in translation. This is taken to mean that the author *intended* to encode the referential meaning in the text but failed to do so (for whatever reasons), thus creating a rift between referential and denotational meaning which has to be remedied at the expense of the latter in translation.

translation and adaptation (e.g. Krein-Kühle 2013:4). The requirement concerning "the best possible selection" of "TL linguistic means" also indicates that Krein-Kühle understands equivalence as a qualitative and not as a definitional criterion of translation, situating her account of equivalence closer to Schreiber's than to Albrecht's approach. What is crucially important with regard to the above equivalence concept is that, although Krein-Kühle mentions "the preservation of ST sense/intended sense or 'das Gemeinte' [what is meant]", this is not taken to mean that the level of meaning – whether denotational or referential – will always be the highest ranking invariant in STT since this hierarchization is "subject to pragmatic aspects". With regard to these pragmatic aspects, Krein-Kühle (forthcoming) points out that her equivalence concept "subsumes adequacy [...] in terms of time, purpose and TL readership", which is again reminiscent of Schreiber's more target-text oriented approach to equivalence. And indeed, there are various cases where sociocultural or pragmatic differences between SL and TL cultures require another highest-ranking invariant than referential or denotational meaning if the translation is to serve the same function as the source text (see Reinart 2009:293). For example, in a specialized translation course, my students had to translate a technical description of wind turbines published by the US Department of Energy. The text was intended to inform an interested layperson audience about the general application of wind energy and contained the following information:

[The generator is usually] an off-the-shelf induction generator that produces 60-cycle AC electricity.

If the translation into German is to serve the same function as the original, the information *60 cycle* would have to be changed to *50 Hz* in German since the grid frequency in Europe is 50 Hz, whereas it is 60 Hz in North America. This difference in the frames of reference of SL and TL culture therefore requires a pragmatically induced shift of meaning that has to be theoretically accounted for. The meaning dimension should therefore be regarded as the *primary* invariant to be achieved in prototypical STT, while wider sociocultural or pragmatic factors may at every instance require a different hierarchization of invariance requirements.[22]

[22] A more comprehensive discussion of socioculturally determined shifts of meaning in specialized translation can be found in Reinart (2009:272 ff.).

I would like to very briefly recap the theoretical approach proposed here. We started from a very holistic perspective that does not make a principled distinction between translation and adaptation and thus allows for a plethora of possible relations between source text and target text. It was then argued that, from a prototypical perspective, certain members of the category of translation (or the subcategory of STT) may have a more central status (i.e. are more prototypical) than others, and that prototypical STT is characterized by invariance of (informative) function and therefore tends to exhibit a close ST-TT relation at the denotational/content level. This close ST-TT relation can be theoretically captured by the equivalence concept. Equivalence, as understood here, is not a definitional criterion of translation but it is rather used to make qualitative statements about the degree of invariance that is perceived to exist between certain dimensions of a ST-TT pair. The equivalence model developed by Albrecht and Schreiber and extended in the context of STT by Krein-Kühle was proposed for this purpose since it a) reflects the multidimensional nature of text by requiring a hierarchization of different invariant requirements and b) claims that the choice and hierarchization of these requirements is guided by adequacy considerations, which are ultimately derived from target culture concerns.[23] This adequacy concept provides a – still somewhat tentative – interface with functional approaches to translation. Equivalence, in this model, comes in degrees, taking account of the fact that invariance requirements can normally not be fulfilled completely but only approximately. We thus have a flexible approach that does not claim to cover the totality of translation but "merely" prototypical STT as understood here. This equivalence concept and the corresponding invariance requirements allow for theoretically sound statements about the close ST-TT relation at the content level that is to be expected in STT, taking into account, however, that the meaning dimension is merely the *primary* and not the *absolute* invariant to be achieved in STT. Finally, the insight that these invariance requirements are ultimately guided by adequacy considerations ensures that the source text does not become an overly determinant factor in translation, that various target culture considerations can be incorporated and that there is a basic compatibility with functionalist approaches to translation.

Finally, I would like to point out that the insistence on a prototypically close ST-TT relation at the content level in STT is not only due to altruistic concerns about the greater

[23] Recall, however, that Albrecht understands adequacy as referring to the function of the source text, while Schreiber and Krein-Kühle link adequacy to the time, purpose and addressees of the target text.

good of STT. This issue is also stressed for reasons that are more associated with the specific epistemic aims of the present thesis pertaining to the analysis of explicitation and implicitation as indicators of text-context interaction. For any contrastive study of explicitation and implicitation, which, put quite simply, investigates implicit meanings in the ST that have been explicitly verbalized in the TT and vice versa, requires a rather close correspondence at the content level in order to yield meaningful results (although this is often not specifically acknowledged by the corresponding studies).[24] So, both from the perspective of STT and from the perspective of explicitation and implicitation, it is important to keep the ST-TT relation very much in focus. However, the explicitation/ implicitation perspective also entails that corresponding analyses will focus on such cases where invariance of meaning is deemed to exist (albeit with different levels of explicitness/implicitness), while intentionally disregarding such cases where there is a variance in meaning (as illustrated in the generator example above). This issue will be further discussed in 5.5.

2.7 A three-dimensional classification of scientific and technical texts

In the following sections, I will propose a three-dimensional classification of scientific and technical texts that is intended to capture several of the insights into STT gained so far. The classification is intended to provide structure to the field of STT to be investigated in this study and to yield various points of contact with cognitive linguistics and explicitation/implicitation as the other two important areas of investigation of the thesis.

As a specific form of human interaction, scientific and technical discourse is an inherently multifaceted and multidimensional field that lends itself to classification from various perspectives. In the systemic linguistic phase of early LSP research, for example, we find the well-known horizontal classification of languages for special purposes according to the underlying domains or subject matters, yielding categories such as the language of science/academia, the language of technology and the language of institutions (Roelcke [3]2010:31). Vertical classifications, on the other hand, differentiate between different levels

[24] Albrecht (2005:164) stresses this trivial but important fact in the general context of translation comparisons (see also Chesterman 1998:30). Also, Becher (2011:81) points out in his study on explicitation and implicitation that "[i]f a target text deviates considerably from its source text […] there will be many passages where sentences or parts of sentences have been omitted, added or rearranged, making the identification of shifts difficult or even impossible".

of abstraction within a single domain/subject matter, as for example in Hoffmann's typology of language of theoretical science, language of experimental science, language of applied science and technology, language of production and language of consumption (Hoffmann [2]1985:64-70). Recent classifications focus more on the use-related character of LSP texts and propose various LSP genres, such as monographs, scientific articles, textbooks, or popularizing newspaper articles (e.g. Gläser 1990; Göpferich 1995). In a more multidimensional approach which bears some resemblance to the classification proposed below, Vargas (2005) develops a pragmatic text typology which is structured along a situational dimension – based on the Hallidayan register model – and along a functional/genre-oriented dimension, based on Göpferich's (1995) pragmatic classification of LSP texts in science and technology.

2.7.1 The three dimensions of the classification

With the epistemic aims of the present thesis in mind, an eclectic classification of scientific and technical discourse will be proposed which combines some of the elements discussed above and which is structured along three interrelated dimensions. These are 1) the primary text function, 2) the subject-matter competence of the discourse participants and 3) the degree of technicality.

2.7.1.1 Text function

The classification of texts according to their function is very common both in LSP research and in translation studies. In TS, the most widely applied model is probably Reiss' ([2]1983) text typology of *informative*, *expressive*, *operative* and *multi-media* texts.[25] With particular emphasis on scientific and technical texts, Göpferich (1995, 1998a) proposes a further subclassification of Reiss' informative function, which, according to Göpferich (1998a:89) is the primary communicative function in scientific and technical discourse (see 2.4.4). At the first level of her model, Göpferich proposes four LSP text types according to the four primary informative functions *juridical-normative*, *progress-oriented actualizing*, *didactic-instructive*, and *compilation* (Göpferich 1995:309). Juridical normative texts serve to establish a legal basis or an unambiguous standard of reference of some sort by conveying

[25] Reiss' model has sometimes been criticized for its lack of granularity since it only distinguishes between three text functions (Munday [3]2012:115). In current linguistics, Bühler's language functions (which form the basis of Reiss' model) have generally been discarded in favour of the speech act typology of Austin and Searle (see Prunč 2007:82).

legal claims or information aimed at achieving uniformity in a given field. Progress-oriented actualizing texts, on the other hand, convey information that is geared toward the advancement of science and technology. These texts are always concerned with new research results/findings, which may also take the form of a (re)evaluation of already established knowledge. The information conveyed by didactic-instructive texts serves the purpose of practical application or intellectual enrichment/entertainment, while compilation texts provide a survey of the information conveyed in the other three text types and make the respective knowledge accessible to the readers (see Göpferich 1995:308-309). At the second and third levels of her model, Göpferich makes a further distinction between theory- and practice-oriented texts and the means of information presentation. The fourth and fifth levels distinguish between various primary and secondary genres, such as norms and patent specifications (juridical-normative texts), research reports and articles in learned journals (progress-oriented actualizing texts), textbooks and operating instructions (didactic-instructive texts) and encyclopaedias and lexicons (compilation texts). For the purpose of the present thesis, we will only adopt the first level of Göpferich's model, which, as described above, differentiates texts according to their primary function.

2.7.1.2 Subject-matter competence of the discourse participants

The participants in scientific and technical discourse can also be approached from multiple perspectives, for example sociological or psychological, allowing statements about the participants' social status, their personal relation, their cultural backgrounds, intellectual capacities, etc. (see Roelcke [3]2010:19-20). The perspective that I will focus on is the subject-matter competence of the discourse participants with regard to the topic of the discourse, which can result in a symmetrical or an asymmetrical communicative situation. A symmetrical communicative situation, from the perspective of professional competence, would be expert-to-expert communication in the same field or intra-disciplinary communication (Möhn 1979). Asymmetrical communicative situations would arise in expert-to-expert communication in a different field/inter-disciplinary communication or in expert-to-layperson communication/extra-disciplinary communication.[26] Of course, the three

[26] The notion of *expert* is a constant in this classification since, as Vargas (2005:306, referring to Cabré 1999:153-154) points out, "only those participants who have a specific knowledge in a professional field acquired through learning can produce and intervene in the production-reception process of a specialised communication." This means that, in order to be qualified as specialized communication, the author or

dimensions of intra-disciplinary, inter-disciplinary and extra-disciplinary communication form the well-known triad of specialized communication established in LSP research (see Roelcke [3]2010:20).[27]

Although this classification is widely accepted in LSP research and translation studies, it is also slightly problematic. When we compare two or more discourse participants with regard to their subject-matter competence, this competence is always established with reference to a given topic, usually the topic of the discourse in which the participants engage. However, the discourse topic, relative to which the subject-matter competence of the participants is established, only serves as a point of reference in expert-to-expert/intra-disciplinary and in expert-to-layperson/extra-disciplinary communication. In expert-to-expert communication in a different field/inter-disciplinary communication, on the other hand, the focus is shifted from the discourse topic to a somewhat detached comparison of the general subject-matter competence of the discourse participants. However, if we want to retain the subject matter underlying a given discourse as a fixed reference point, we should probably introduce a change of terminology and label this mode of communication *expert-to-semi-expert communication* instead, thus making it clear that we establish their subject-matter competence with reference to the discourse topic (this is in line with Vargas' (2005:307) approach to the issue). One participant in this form of discourse would then be a full subject-matter expert in the topic at hand, while the other participant would be a semi-expert in this topic.[28] This would also allow us to get rid of the cumbersome prepositional phrases *in the same field* and *in a different field*, thus making the English designations more concise.

This three-fold classification of expert-to-expert, expert-to-semi-expert and expert-to-layperson communication is obviously rather coarse-grained (i.e. there is a continuum of

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speaker must have expert status with regard to the topic covered, while the subject-matter competence of the recipients may vary.

[27] This three-fold classification was first proposed in German LSP research (Möhn 1979) and therefore has a fixed terminology in German (*fachinterne*, *interfachliche* and *fachexterne Kommunikation*). In English LSP research, such a straightforward terminology seems to be lacking, thus requiring somewhat cumbersome paraphrases such *as expert-to-expert communication in the same field/in a different field* or loan translations such as *inter-* and *intra-disciplinary communication*, which are not widely used in the English literature on the topic.

[28] Usually because s/he is a full expert in another field which overlaps to a considerable extent with the field in question, or because his/her professional role requires a reasonable degree of competence in this field.

degree of competency between expert, semi-expert and layperson) but it captures three prototypical communicative scenarios in scientific and technical discourse and translation that are relevant from a theoretical and a practical perspective alike. From a theoretical point of view, expert-to-expert communication may, for example, exhibit a stronger lexical or syntactic compression as compared to expert-to-layperson communication. From a practical point of view, this translates into the fact that the translator may need a higher degree of subject-matter knowledge when translating expert-to-expert discourse.

It remains to be pointed out that, moving from expert-to-layperson to expert-to-expert communication, the group of intended recipients becomes increasingly smaller. While the layperson audience in expert-to-layperson communication can be a potentially very large and heterogeneous group of intended recipients, expert-to-expert communication generally takes places within much smaller, more homogeneous and more sharply delimited discourse communities (Göpferich 1995:311). In the same vein, the knowledge required to take part in the three modes of communication above becomes increasingly specialized and well-delimited moving toward the expert-to-expert pole.[29] The intended recipients and the knowledge requirements of specific forms of scientific and technical discourse are covered, to a certain extent, by the third dimension of the proposed classification.

2.7.1.3 Degree of technicality

This third dimension is primarily concerned with the degree of technicality of a scientific/technical text. This parameter correlates very closely with the subject-matter competence of the discourse participants since texts in expert-to-expert communication tend to exhibit a very high degree of technicality, whereas expert-to-layperson communication is generally characterized by a rather low degree of technicality. With reference to the horizontal and vertical dimensions established in LSP research, Arntz (2001:195) posits two factors determining the degree of technicality of a given text. The first factor is the (vertical) complexity of the subject matter/topic of the text. This vertical degree of complexity is a function of the frequency and complexity of technical terms and

[29] In this context, we could also employ the notion of "communicative distance", which is normally used to refer to the physical distance between the discourse participants (v. Hahn 1983:76 ff., see also Stolze 2009:51). With reference to the subject-matter competence, we could then say that expert-to-expert discourse is characterized by a small communicative distance whereas the communicative distance in expert-to-layperson discourse is considerably wider.

other semiotic signs (figures, tables, diagrams) in the text. While the frequency of technical terms correlates with the terminological density of the text, term complexity mirrors the technical depth with which the topic is treated[30], as does the complexity of nonlinguistic signs such as figures or tables (Arntz 2001:196). The second factor determining the degree of technicality of a text is the (horizontal) specialization of the text in a given domain. The horizontal specialization can be determined by analyzing the terminology used in a text and by establishing whether the terms belong to a specific domain (*direktes Fach*), a superordinate domain (*Rahmenfach*) or a more basic domain (*Grundlagenfach*). The rationale for this horizontal parameter is the fact that the frequency of basic terms decreases with an increasing degree of specialization of a text.

Based on these vertical and horizontal parameters, Arntz (ibid.:203-204) develops a ranking scale for the degree of technicality/difficulty of scientific and technical texts and correlates these degrees with specific genres, intended recipients and knowledge requirements. The scale contains eleven degrees of technicality, ranging from encyclopaedias and popular science texts to standards, patents and application reports. Since, to my knowledge, this very insightful ranking scale had not yet been introduced into English discourse on translation studies[31], I decided to include an English translation of the full scale on the next page.

[30] Usually, the further down in a lexical taxonomy we move, the more complex the corresponding lexical concepts become. Compare, for example, the basic-level term *detector*, which exhibits a considerably lower conceptual complexity than its hyponym *low capacitance small-area silicon diode detector* (see Arntz 2001:202).

[31] However, see Krein-Kühle (2003:70), who uses this scale as one parameter in her corpus design.

degree of difficulty	genre(s)	intended recipients	required specialized knowledge
I	encyclopaedias, popular science texts	laypersons with a general interest in science and technology	little or no specialized knowledge
II	general works of reference in the fields of science and technology	persons with a specific interest in science and technology	general specialized knowledge at a basic level
III	works of reference in a scientific/technical subfield	persons with a specific interest in a scientific/technological subfield	knowledge in a scientific/technical subfield
IV	introductory handbooks and introductory textbooks	persons interested in systematically presented/systematic basic knowledge	knowledge of scientific basics
V	practice-oriented works of reference in a scientific/technical subfield	persons interested in the practice of a scientific/technical subfield	practical knowledge in a scientific/technical subfield
VI	advertising articles in learned journals, product information	potential users in a professional context	applied scientific/technical knowledge
VII	articles in learned journals	experts interested in very specific areas of a scientific/technical subfield	thorough theoretical and applied knowledge in a scientific/technical subfield
VIII	installation manuals and assembly instructions	experts in a very specific area of a scientific/technical subfield working in an applied context	detailed applied knowledge in a specific area of a scientific/technical subfield
IX	academic textbooks	students, scientists working in a scientific/technical subfield	thorough theoretical knowledge in science and technology
X	research reports	scientists concerned with theoretical issues	complex and detailed theoretical knowledge in science and technology
XI	standards, patents, application reports	engineers responsible for system planning	very detailed theoretical and applied knowledge in science and technology

Table 1: Degrees of technicality/difficulty of scientific and technical texts according to Arntz

In this scale, expert-to-layperson communication would probably cover the degrees of technicality I to III/IV, ranging from little or no specialized knowledge to knowledge in a scientific/technical subfield or knowledge of scientific basics. Texts at levels III and IV would probably be intended for highly informed laypersons who, especially at level IV, may already approach semi-expert status. Expert-to-semi-expert communication would

roughly cover the degrees of technicality V to VI, ranging from practical knowledge in a scientific/technical subfield to applied scientific/technical knowledge. Expert-to-expert communication would then cover the degrees of technicality VII[32] to XI, ranging from thorough theoretical and applied knowledge in a scientific and technical subfield to a combination of very detailed theoretical and applied knowledge. While correlating the different forms of specialized communication to the different degrees of technicality as reflected in the required specialized knowledge and the intended recipients is rather straightforward, this is not the case with regard to the proposed genres, which may show a considerable variation in their respective degrees of technicality. For example, the research report investigated by Krein-Kühle (2003) is clearly an instance of expert-to-expert communication exhibiting a very high degree of technicality (ibid.:68), while the research reports included in the scientific/technical corpus of the present thesis have instead been classified as expert-to-semi-expert communication exhibiting a medium degree of technicality (see 7.1.3.2). Also, articles in learned journals, which in Arntz' scale are situated at the lower end of expert-to-expert communication, can exhibit a considerably higher degree of technicality. For example, the specialized article included in the corpus of this thesis has been classified as a prime example of expert-to-expert communication that would be situated somewhere between levels IX and X of Arntz' scale. So while Arntz' classification may be somewhat problematic with regard to the proposed genres[33] (which should perhaps be understood in a prototypical sense here), he offers a very fine grained grid of intended recipients and knowledge prerequisites that can readily be linked to the modes of expert-to-expert, expert-to-semi-expert and expert-to-layperson communication discussed above.

2.7.2 Overview of the classification

The three-dimensional classification of scientific and technical texts proposed for the purpose of the present thesis can be graphically presented as follows:

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[32] Note that this is the first level at which Arntz refers to the intended recipients as "experts".

[33] Göpferich (1995:311) points out that genres such as patent specifications are inherently geared toward a very restricted group of recipients, while didactic-instructive texts (such as textbooks, operating instructions, etc.) are addressed towards a much more heterogeneous readership. It follows that some genres (such as patents) can be assigned a rather fixed degree of technicality, while other genres may show a stronger variation in this regard, making it more difficult to assign them a fixed place in Arntz' scale.

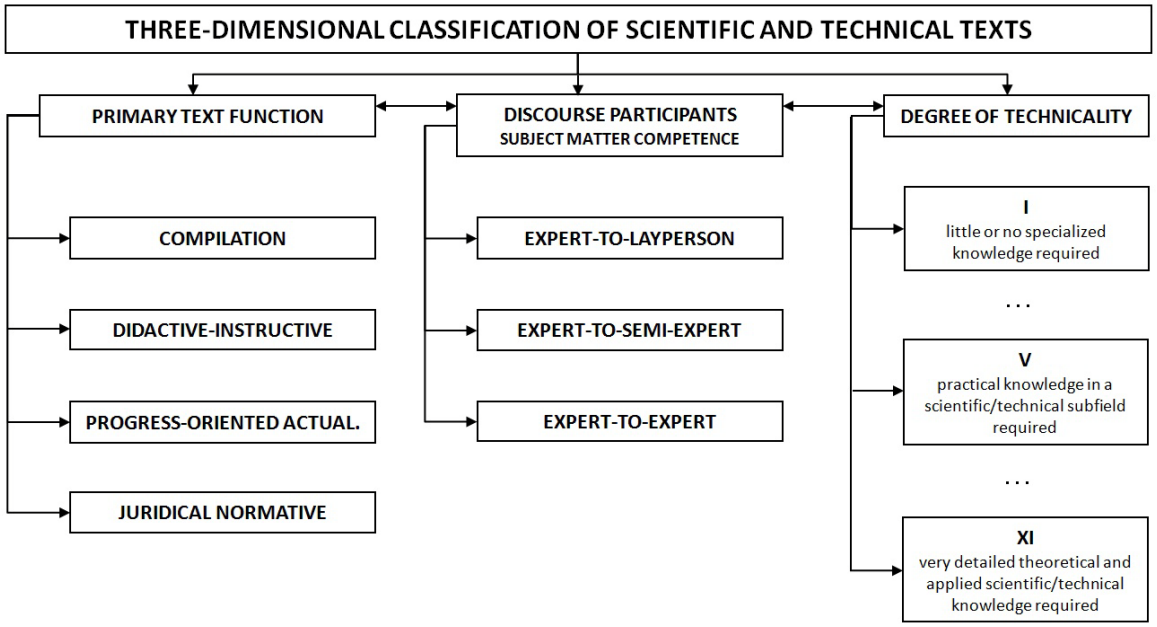

Figure 4: Three-dimensional classification of scientific and technical texts

The three dimensions of this classification are of course closely interrelated, as signified by the bidirectional arrows between the primary text function, the subject-matter competence of the discourse participants and the degree of technicality of the texts. The classification has been arranged in such a way that, for each dimension, we start with a low degree of technicality in the top range of the classification, which increases as we move down the three dimensions. For example, compilation texts, providing access to knowledge conveyed by the other three text types of Göpferich's model, can be classified as expert-to-layperson communication, requiring little or no specialized knowledge on the part of the recipients (which form a rather open-ended set of people) and thus exhibiting a fairly low degree of technicality.[34] Didactic-instructive and progress-oriented actualizing texts are situated somewhere in the middle of the technicality continuum. Depending on the intended audience (which may be more heterogeneous than in expert-to-expert discourse but at the same time much more restricted than in expert-to-layperson discourse), these texts will lean more toward the expert-to-semi-expert or toward the expert-to-expert pole. Juridical normative texts, on the other hand, can almost exclusively be considered as expert-to-expert communication, requiring very detailed theoretical and applied scientific/technical knowledge on the part of the recipients, which form a much more

[34] For example, the encyclopaedia as a prototypical genre of Göpferich's compilation text type is also assigned the lowest degree of technicality in Arntz' scale.

restricted group than in expert-to-layperson and expert-to-semi-expert communication. During the course of the present thesis, this three-dimensional classification will feature extensively as a reference point for the discussion of knowledge requirements and communicative configurations in scientific and technical translation.

2.8 Scientific and technical translation and linguistic underdeterminacy

To conclude this chapter, I would like to focus on an aspect which has already been highlighted in the introductory chapter of this thesis and which demonstrates considerable relevance to both scientific and technical translation in general and to the various epistemic aims of the present thesis. This aspect goes by the name of *linguistic underdeterminacy* (e.g. Carston 2002:19, see also chapter 1) and is the theoretical label for the trivial but nevertheless important fact that, in human communication, we generally understand more than the actual words uttered or written (see also Hörmann 1976:210). Put another way, we need to bring additional knowledge to underdetermined or impoverished linguistic structures if we want to give them a coherent interpretation. As Carston (2002:19) rightly points out, the idea of linguistic underdeterminacy is widely accepted and not seriously disputed by anyone but perhaps the "most rabid 'language is all' social semiotician[s]". A metaphor which is often applied in this context is the *iceberg metaphor* according to which textual surface structures are only the tip of the iceberg in meaning construction, the larger part of this iceberg being hidden under the surface (Linke/Nussbaumer 2000:435; Prunč 2007:21). A second popular metaphor is the rhetorical figure of *synecdoche* in its *pars pro toto* version, expressing the fact that the textual surface structures represents merely a part of a larger whole, this whole being the actual sense or meaning of the text (Lederer 2003:52-53, 2010:176-177). For the time being, the notion of linguistic underdeterminacy will be discussed from a general and not from a specific theoretical perspective and the focus will be on some of its consequences for STT. As a recurring theme of the thesis, the concept will then be taken up again in the context of cognitive linguistics and explicitation and implicitation, thereby being continuously theoretically enriched.

At the most general level, linguistic underdeterminacy entails that translators of scientific and technical discourse need to acquire a reasonable amount of – strongly vertically organized – domain knowledge in order to arrive at a coherent interpretation of the source text based on which they create a target text (see 2.4.1). The issue at stake is described very clearly in this quote from Faber Benítez (2009:108), in which we encounter one of the metaphors illustrated previously:

The information in scientific and technical texts is encoded in terms or specialized knowledge units, which can be regarded as access points to more complex knowledge structures. As such, they only mark the tip of the iceberg. Beneath the waters stretch the tentacles of a many-splendored conceptual domain, which represents the implicit knowledge underlying the information in the text.

The notion of linguistic underdeterminacy can be incorporated in a straightforward way into the classification of scientific and technical texts proposed above. Symmetrical communicative situations in expert-to-expert discourse will probably be characterized by a very high degree of linguistic underdeterminacy (for example in the form of ellipses or lexical or syntactic compression, see Fijas 1998:393; Hoffmann 1998:421) since the discourse participants share a large amount of relevant knowledge that does not have to be explicitly verbalized in communication, thus underlying the information in the text in implicit form. This follows from Grice's (1975) cooperative principle and especially from his maxim of relation, according to which one should not make one's contribution more informative than required.[35] The generally high degree of linguistic underdeterminacy in expert-to-expert discourse is also linked to the high degree of technicality exhibited by texts belonging to this form of discourse. As we can see from Arntz' scale above, the specialized knowledge required to understand scientific and technical texts becomes more extensive as the degree of technicality of these texts increases. This knowledge is precisely that knowledge which is shared between experts in a given field and can thus remain largely implicit in their communication. This insight is in line with Krein-Kühle's (2003:11) observation in the context of STT that "the higher the degrees of specialization and abstraction, the lesser the clarity for the translator".

In other words, then, the hidden part of the communicative iceberg tends to be quite large in expert-to-expert communication. On the other hand, in expert-to-semi-expert and expert-to-layperson discourse, the degree of linguistic underdeterminacy and hence the invisible part of the iceberg generally decreases since there is a decreasing amount of relevant shared knowledge between the discourse participants and, accordingly, more and more information has to be linguistically encoded to ensure the understanding of the text.[36]

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[35] A related concept would be Clark's (1992:201-202) notion of *audience design*.

[36] Of course, there is a level at which expert-to-expert discourse will be less underdetermined or more specific than expert-to-semi-expert and expert-to-layperson discourse. This level pertains to the actual states of affairs discussed, which will certainly be more specific than in the other forms of discourse. For example, the term *low capacitance small-area silicon diode detector* (Arntz 2001:202) is in a way more specific or less

2.9 Chapter summary

This chapter provided a general overview of the field of scientific and technical translation. After clarifying some issues of terminology and tracing the historical and current significance of scientific and technical translation, the relatively low status of STT in translation studies was illustrated. Based on Snell-Hornby's stratificational model, we then discussed various distinctive features of STT, such as its strong dependence on subject-matter knowledge, the relevance of notions such as stability and invariance of meaning and the primary communicative function of STT. In this context, we also elaborated on the general relevance of linguistic frameworks to the field of STT. Then, the position of STT between the two poles of source and target text orientation was discussed prior to sketching a prototypical account of STT which attempts to combine the best features of both source and target-text oriented approaches and provides the flexibility to emphasize various dimensions of STT according to specific epistemic aims. To provide more structure to the field of STT to be discussed and analyzed in this thesis, a classification of scientific and technical texts was proposed along the three dimensions of text function, subject-matter competence and degree of technicality. In the following chapters, this classification will serve as a central reference point for the discussion of knowledge requirements and communicative configurations in STT. The chapter concluded with a discussion of STT and linguistic underdeterminacy. It was shown that the underdeterminacy concept could be linked to the classification proposed previously and that the degree of linguistic underdeterminacy may correlate with the degree of technicality and the communicative configuration underlying a text. The next chapter will move to a higher level of abstraction and discuss a philosophical grounding for scientific and technical translation and cognitive linguistics, at the same time providing a bridge between the two fields.

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underdetermined that the basic-level term *detector*. At another level, expert-to-expert discourse will however be more underdetermined since the expert knowledge required to understand these more specific states of affairs will usually not be encoded in the text.

3 A philosophical grounding for scientific and technical translation and cognitive linguistics

The present chapter is intended to serve as a bridge between the field of scientific and technical translation surveyed in the previous chapter and the framework of cognitive linguistics, which will be illustrated in the next chapter and which will be proposed as a sound and fruitful linguistic basis for STT. The discussion of the distinctive features of STT in 2.4 has shown that this form of translation is commonly associated with complex notions such as narrow scopes of interpretation and the ensuing stability of meaning, conceptual identity or invariance of meaning. However, the different stances taken on these notions in translation studies are based on deeply rooted ontological and epistemological assumptions, which are not often made explicit in theoretical discourse (see Halverson 1997:207-208). Also, it should come as no surprise that considerable tension exists between notions such as stability or invariance of meaning – which are in fact central tenets of STT (see 2.4.2 and 2.4.3) – and many current approaches to translation which have emerged in the wake of the cultural and sociological turns in translation studies. While STT seems to be operating on highly structured and stable frames of reference, postmodernist approaches to translation stress the historical and social contingency of meaning and the principled indeterminacy of human communication, which does not sit particularly well with the idea of stable frames of reference, narrow scopes of interpretation and stability and invariance of meaning.

In light of these considerations, it seems reasonable to extend the discussion of STT with a philosophical dimension and to analyze the epistemological assumptions underlying the contrasting accounts sketched above. The alternative philosophical account presented in the second part of this chapter is intended to reconcile some of these contrasting assumptions and, at the same time, it will serve as the philosophical basis for the cognitive linguistic framework illustrated in the next chapter. The aim of the present chapter is thus twofold. On the one hand, it aims to give a coherent account of the underlying epistemological assumptions of STT, so that the conception of STT entertained in this thesis can be situated in relation to approaches from other theoretical backgrounds. On the other hand, it paves the way for the discussion of cognitive linguistics which will, at several points, fall back on the philosophical foundation laid in the present chapter. The three elements – STT, cognitive linguistics and their shared philosophical basis – will then be brought together in chapter 5, which will provide a cognitive linguistic perspective on

relevant aspects of scientific and technical translation. I will start the discussion by sketching the fundamental philosophical dichotomy underlying the contrasting assumptions mentioned above. It is in relation to this dichotomy that the alternative philosophical approach endorsed by this thesis has to be seen.

3.1 The fundamental dichotomy: objectivism vs. subjectivism

The general issue at stake can be traced back to the Cartesian mind-body dualism of *res cogitans* (the mental substance) and *res extensa* (the corporeal substance), according to which the human mind is fundamentally separated from the external world (Simon [5]2011:11). If we accept this schism between the mind and the world, it can lead to quite strikingly opposing ontological and epistemological conclusions. This opposition is most basically reflected in the dichotomy constituted by the two poles of objectivism and subjectivism and their respective accounts of metaphysics, human cognition and language.

3.1.1 Objectivism

Broadly speaking, objectivist metaphysics posits the dominance of the *res extensa* and claims that the world is uniquely, correctly, and completely prestructured in terms of entities, properties (essential and accidental ones) and relations between entities, with this structure existing independently of any human conceptualization (Lakoff 1987:159). According to this account, the human mind can function as a mirror of nature and the symbols used in thought and language correspond to entities and categories in the objectively prestructured world (ibid.:162). Knowledge, in the objectivist paradigm, consists in the correct conceptualization and categorization of objects in the world and the relations holding between those objects and categories (ibid.:163). Human concepts are treated as mental representations of these objects and categories in the world (ibid.:165). Accordingly, the accuracy of a human conceptual system is measured in terms of its capacity – borrowing Plato's metaphor – to "carve nature at the joints" (ibid.:309), i.e. its capacity to uncover and reflect the distinctions already given in the objective structure of the world. However, within the objectivist paradigm, human conceptual systems cannot create any new joints since they are already predetermined by the world. According to objectivist metaphysics, then, "[t]he world is the way it is" (ibid.:164), and humans can either succeed or fail to conceptualize and categorize it correctly. Objectivist metaphysics posits a "God's Eye view" of reality (ibid.:260, referring to Putnam 1981:49) from which we can correctly and completely describe "the way the world is".

Based on the tenets of objectivist metaphysics, objectivist cognition claims that humans reason in terms of abstract symbols, which are made meaningful by corresponding to entities and categories in the world. Following a nativist account of objectivist cognition, human conceptual systems are innate and have the capacity to correspond correctly to the world, while on an empiricist account, these conceptual systems are acquired through accurate perception of the prestructured world (Lakoff 1987:164). In both nativist and empiricist accounts of objectivist cognition, the external world places tight or even determining constraints on the categories of mind formed by humans (ibid.:165).

Similarly, objectivist semantics claims that linguistic meaning arises either from the correspondence between linguistic expressions and the world (noncognitivist objectivist semantics) or from the correspondence between linguistic expressions and concepts in the form of symbols of thought, which in turn get their meaning from their capacity to correspond to entities and categories in the world (cognitivist objectivist semantics) (Lakoff 1987:168). A prime example of an objectivist account of language and meaning is the paradigm of formal semantics and, especially here, the approach of truth-conditional semantics. Truth-conditional semantics is based on the correspondence theory of truth according to which a truth bearer (which could, for example, be a sentence expressed in a natural language) is said to be true if it corresponds to some 'state of affairs in the world' (see Evans/Green 2006:446). According to truth-conditional semantics, the meaning of a sentence can be equated with its truth conditions as regards the correspondence of the sentence (or, more precisely, the proposition expressed by the sentence) with some state of affairs in the world (ibid.). At the level of word meaning, there is another parallel to objectivist metaphysics, i.e. the formal-semantic distinction between Aristotelian *essentialia* and *accidentialia*. The *essentialia* correspond to the essential/definitional properties of an objectively given entity in the real world and constitute the dictionary meaning of the word. The *accidentialia*, on the other hand, represent the contingent properties of such an entity and are treated as encyclopaedic or pragmatic information (Marmaridou 2000:45).[1]

[1] The same distinction can be found in General Terminology Theory (see Arntz et al. ^{6}2009:57).According to Faber Benítez (2009:111), this terminological framework conceives concepts "as abstract cognitive entities that refer to objects in the real world", which would be in line with the objectivist paradigm.

In translation studies, the influence of objectivist metaphysics and language is present, for example, in equivalence-based approaches which posit a language-external *tertium comparationis*[2] as a common reference point for source text and target text (see Siever 2010:65 ff.). An example of such an account would be Catford (1965), who posits a *situation* as a shared extralinguistic reality to which both source text and target text must be relatable (see Aschenberg 1999:23; Kenny [2]2009:97). If this *tertium comparationis* is equated with an objectively (hence language and mind-independently) prestructured world and languages are treated as codes which merely differ in their surface-representation of this pregiven structure, then it seems reasonably straightforward to posit the objective meaning of the source text as an invariant that is to be recreated in the target text. At a more general theoretical level, an objectivist influence is discernible in those theories which try to uncover the *essentialia* of translation, i.e. theories which ask what translation is and how it can be delimited from non-translation (see Halverson 1997:220). Such theories usually work with the classical Aristotelian model of categorization based on necessary and sufficient conditions to make, for example, a distinction between translation and adaptation. Proponents of such theories are, among others, Catford and especially Wilss (1982), who is concerned with the *science of translation* (Halverson 1997:220).

3.1.2 Subjectivism

The opposite of objectivism with its prestructured world serving as a fixed reference point for human cognition and language is posited by the subjectivist paradigm, which is quite pervasive in contemporary thought in the form of the postmodernist enterprise and which places special emphasis on the *res cogitans* of the Cartesian dichotomy. Parallel to the objectivist paradigm, subjectivism claims that human concepts are fundamentally separated from the world (Lakoff/Johnson 1999:95). However, from the subjectivist perspective, this separation entails that human conceptual systems are neither structured by any inputs from external reality (as opposed to empiricist objectivist cognition), nor do they have the capacity to correspond correctly to the world (as opposed to nativist objectivist cognition). Since, in the subjectivist paradigm, the world and its possible structure cease to provide anchor points for human cognition, human theories and beliefs become free-floating,

[2] Since the present thesis involves a comparative analysis between source texts and target texts, it will also work with *a tertium comparationis* (see 7.2.1). However, this *tertium comparationis* will have a different ontological and epistemological status than its predecessors in early equivalence-based approaches.

radically *relative* constructs which, due to the absence of any Archimedean point of reference, cannot be compared in terms of their more or less successful description, explanation or prediction of phenomena in the world. While in the objectivist paradigm, the prestructured external world exercises a determining influence on cognition, subjectivism reverses the roles and claims that it is human cognition which is (solely) responsible for the emergence of any structure, thus *constructing* reality in the first place.[3] Since the external world does not constrain the process of reality construction in any significant way and since this construction process is performed by individual human beings, each having different paracultural, diacultural and idiocultural backgrounds, there are bound to exist (possibly radically) different versions of reality, reflected in often incommensurable conceptual systems. Going back to Plato's metaphor of conceptual systems "carving nature at its joints", we could say that according to a subjectivist account of metaphysics and cognition, humans can never know the "real" joints of nature at which to carve and that it is the act of carving itself (done by human beings establishing conceptual systems) that creates the only meaningful joints to which we can have access. Since carving up the world is essentially an individual process, there will be different versions of the world with different arrangements of joints, and we cannot be sure which of these arrangements works best.

Language, from this perspective, loses its capacity to represent reality in any way and becomes a social construct that merely *pretends* to represent reality; it serves as an instrument for people in society to construct a social reality (Budin 2007:61). As a result, linguistic meaning is, to a large extent, claimed to be arbitrary, relative and historically contingent (Lakoff/Johnson 1999:5). Also, any interpretation of meaning is exclusively subject to idiosyncratic factors since "there is nothing about the world or people that fixes these interpretations" (ibid.:466). In addition to relativism and constructivism, another pillar of the postmodernist paradigm is the notion of *indeterminacy* (see, for example, Budin 2007:66). According to Pym (2010:94), who traces the indeterminacy concept back to Heisenberg's *Uncertainty Principle*, we can never assume to have reached a stable

[3] This is not to say that the subjectivist paradigm rejects the existence of an external world independently of human beings and their conceptual systems. This existence is not seriously doubted even in strong subjectivist approaches (except perhaps in metaphysical solipsism). What is at stake is more the question of whether humans can have any meaningful or privileged epistemological access to this Kantian "thing in itself", which is generally denied in the subjectivist paradigm.

understanding of a given state of affairs. Instead, we always have to account for ambiguity, vagueness and the possibility of alternative interpretations.

The foundations of the subjectivist paradigm laid out above should sound quite familiar to anyone acquainted with the current tenets in translation studies. As opposed to objectivism, which has declined in translation studies in parallel with the equivalence paradigm since the 1980s, subjectivism/postmodernism has, in the wake of the cultural and social turns, gained considerable momentum in TS (Arrojo 1998:42; Prunč 2007:305-306). Some of the research stimulated by this paradigm has had such a huge influence in TS that the results of this research were in fact fed back to the source disciplines, causing for example a "translational turn" in cultural studies (Bachmann-Medick [3]2009:26). With Derrida's (e.g. 1994) theory of *Deconstruction*, a more radical postmodernist approach has also left its mark in TS. In line with the general subjectivist tenets, Deconstruction denies any stable association between signifier and signified and thus fundamentally calls into question the stability of textual meaning, focusing instead on revealing contradictions beneath the textual surface and developing these contradictions towards complete aporia (Prunč 2007:254). Again, one of the major consequences of this line of thought is the radical subjectivity or individuality of any interpretation of meaning since, according to the Deconstructionist account, meaning resides in "systems of binary oppositions between free-floating signifiers" (Lakoff/Johnson 1999:465), not fixed by anything in the outside world. Pym's (2010) work on indeterminacy in translation can also be seen as standing in the wider subjectivist/postmodernist tradition. His claim that "[w]hatever we say will be only one of many possible variations on what we think we mean, and what others make of our words will be only one of many possible interpretations" (ibid.:95) can be seen as axiomatic for the whole postmodernist paradigm.

In the light of this discussion, the tension between subjectivist/postmodernist approaches to translation and the idea of *conceptual stability* and *stability/invariance of meaning* postulated in the context of STT should indeed be hardly surprising.[4] At present, it seems that the subjectivist/postmodernist paradigm has gained the philosophical upper hand in translation studies, the more so since, as Halverson (2013:62) rightly points out, "a clear

[4] Also, investigations of explicitation and implicitation will have a hard time within the postmodernist paradigm since, according to Pym's claim above, we will hardly reach any intersubjective consensus on which information is actually implicit in a given source text and can be made explicit in the target text in a process of explicitation.

alternative to a relativist epistemology has not been fully worked out or adequately articulated [in translation studies]".

3.2 The embodied realist alternative

The epistemological consequences of the objectivist and subjectivist paradigms traced above could be described as follows. Objectivism entails a very high stability of the world as understood and conceptualized by human beings due to the objective prestructuring of the world and the (determining) influence of this structure on human conceptual systems. While humans may entertain different conceptualizations of certain phenomena in the world, these conceptualizations can be evaluated in terms of the suitability for representing these phenomena since there exists an Archimedean point of reference in the form of objectively prestructured reality. Subjectivism, on the other hand, entails quite the opposite, i.e. a very high instability of the world as reflected in different and probably incommensurable human conceptual systems. Since the objective world ceases to be a potential standard of comparison, we have to live with the fact that there is no meaningful way of comparing and evaluating these different conceptual systems in terms of their capacity to fit the world.

For scientific and technical translation, this creates a quite difficult situation. On the one hand, it suffers from the often lamented low regard and lack of interest shown in translation studies. This may result from the feeling that STT is easier or more straightforward than other forms of translation (see 2.3) since it is perceived to be based on tightly structured frames of reference, which are much easier to accommodate in the objectivist than in the subjectivist paradigm. On the other hand, STTs privilege (or curse) of operating on such stable frames of reference is denied by postmodernist approaches to translation, which stress the significant subjective influence on the emergence of any structure whatsoever. From this perspective, STTs strive for the precise transmission of stable meanings would be futile from the start. It seems then that, from a philosophical perspective, STT is caught between two stools. Being a subfield of translation studies, it certainly cannot ignore the subjectivist challenge raised by the prevalent postmodernist approaches but at the same time, due to the nature of its frames of reference, it cannot – and should not – disregard the objectivist undertow prevalent in the scientific enterprise.

However, there may be a way out of this impasse. We could ask, for example, whether we really have to choose between the two opposing paradigms and their claims about

metaphysics, cognition and language, even if we may intuitively feel that the answer may lie somewhere in the middle, between complete (potential) stability and complete arbitrariness of our dealings with the world. And if we feel that both the objectivist and the subjectivist paradigm may fail to give a coherent account of the way in which humans experience and make sense of the world, we may also ask whether the fundamental Cartesian dichotomy between the human mind and the world – which lies at the heart of the subjectivist-objectivist dichotomy traced above – may be a false one. This is in fact the central claim made by embodied realism, a dialectical alternative to Cartesian dualism which will be illustrated in the following sections and which will, at the same time, be proposed as the philosophical basis of the present thesis.

3.2.1 Origins in cognitive science

The impetus for the development of embodied realism was provided by the findings of second-generation cognitive science (Lakoff/Johnson 1999:89). First-generation research in this discipline had been heavily influenced by the analytical tradition of Anglo-American philosophy (ibid.:75), which centred around the objectivist pole of the Cartesian dualism. In first-generation cognitive science, the human mind was therefore treated as a disembodied concept that could be reduced to its cognitive functions, an ”abstract computer programme that could be run on any appropriate hardware” (ibid.:76). The concept of the disembodied mind, which was derived primarily from philosophical theorizing, was eventually called into question by empirical cognitive research which showed evidence of a strong dependence of human conceptual structure on bodily experiences and the intrusion of imaginative processes like metaphor, imagery, prototypes, frames, etc. into human conceptualization (ibid.:77). Below, I present three central findings and claims of second-generation cognitive science which will serve as reference points for the following discussion:[5]

- Conceptual structure arises from the sensorimotor experience of humans and the neural structures giving rise to it.

- There exists a “basic level” of concepts that arises in part from human motor schemas and human capacities for gestalt perception and image formation.

[5] For a comprehensive list of the claims and findings of second-generation cognitive science see Lakoff/ Johnson (1999:77).

- The human brain projects activation patterns from sensorimotor areas to higher cortical areas. These projections allow humans to conceptualize abstract concepts on the basis of inferential patterns used in sensorimotor processes that are directly tied to the body.

According to these claims, the human mind is not a disembodied entity but rather stands in a functional relation to its environment by way of embodied sensorimotor experience. The rationalist view of the mind as propagated by first-generation cognitive science is therefore discarded in favour of an empiricist approach (Evans/Green 2006:44). The cornerstone of this empiricist view of the human mind is the notion of *embodied experience*, which has direct consequences for human cognition. For, if human experience is embodied and experience stands in some form of functional relation to cognition, human cognition must be embodied as well. Also, if human experience and cognition are embodied, this has to be philosophically accounted for, which is precisely what embodied realism accomplishes. In the following sections, I will discuss in some detail the notions of *embodied experience* and *embodied cognition*, before showing how their ontological and epistemological consequences have shaped the philosophy of *embodied realism*.

3.2.2 Embodied experience

The notion of *embodied experience* is primarily reflected in the first claim posited above. The basic idea is that humans do not simply experience objective phenomena in the external world but that the experience of such phenomena is mediated by or "filtered" through the human body. Consequently, due to the nature of the human body, we experience and view the world from a species-specific perspective and thus a human construal of reality will be mediated to a significant extent by bodily characteristics (Evans/Green 2006:45). "Experience" is not understood here in any narrow sense but rather as "the totality of human experience and everything that plays a role in it—the nature of our bodies, our genetically inherited capacities, our modes of physical functioning in the world, our social organization, etc." (Lakoff 1987:266).

Various aspects of our experience will, for example, be determined by our "biological morphology" (Evans/Green 2006:45), in combination with the nature of the external world with which we interact. An often cited example is gravity, which is an objective feature of the world. However, human experience of gravity (and thus our concept of gravity) is determined by the nature of the human body and by the habitat in which humans live. Hummingbirds, for example, whose biological morphology is radically different from that of humans (i.e., they have wings), will experience gravity in a very different way. Another

popular example is that of colour (Lakoff/Johnson 1999:23). Colour, as experienced and conceptualized by human beings, is not uniquely a feature of the external world, but arises again from human sensorimotor coupling with our world. Factors in the external world contributing to human colour experience are the wavelengths of reflected light and the given lighting conditions, whereas the factors internal to the human body are our visual system and the neural circuitry connected to this system (ibid.). Other organisms have a different visual system and will thus experience colour in a different way. Therefore, the nature of the human visual apparatus, which is one manifestation of our physical embodiment, will determine the nature and range of human visual experience (Evans/Green 2006:45).

In summary, embodied experience implies that humans do not simply experience objective phenomena in the external world which, in the next step, would be imposed upon our conceptual systems. Instead, human experience of phenomena in the world is mediated by the biological morphology and the physiology of the human body, i.e. the experience of these phenomena occurs through a filter (in the form of the human body) and only after this filtering process can they have any bearing on human conceptual systems. The following link is then posited between embodied experience and embodied cognition: It is claimed that human concepts, which are situated at the cognitive level, are structured and meaningful because this conceptual structure – or at least a significant part of it – is embodied, i.e. it is tied to and arises from preconceptual structure, which is situated at the level of human experience (Lakoff 1987:267). Lakoff claims that there are at least two kinds of preconceptual structure to bodily experience, *image-schematic* or *imagistic structure* and *basic-level structure*. These two types of preconceptual structure – which will be elaborated in more detail in the next section – are imposed on our experience (ibid.:270) and are therefore responsible for our structured embodied experience. As a consequence, this experience has a direct bearing on the structure of human conceptual systems.

3.2.3 Embodied cognition

The notion of *embodied cognition* follows from the idea of embodied experience and covers all three claims illustrated above. The consequences that embodied experience has for human cognition are summarized by Evans/Green (2006:46):

[T]he concepts we have access to and the nature of the 'reality' we think and talk about are a function of our embodiment: we can only talk about what we can perceive and conceive, and the things that we can perceive and conceive derive from embodied experience. From this point of view, the human mind must bear the imprint of embodied experience.

It follows that many human concepts arise out of a combination of objective factors in the external world (e.g. gravity) and the nature of the human body (e.g. our physiology and our biological morphology), which, as discussed above, mediates the experience of these objective factors. More precisely, it is claimed that the two preconceptual structures identified above (i.e. imagistic structure and basic-level structure) give rise to two types of directly meaningful concepts, namely *image-schematic concepts* and *basic-level concepts* (ibid.:302).

An image schematic concept, or simply *image schema*, is understood as "a recurring, dynamic pattern of our perceptual interactions and motor programmes that gives coherence and structure to our experience" (Johnson 1987:xiv). Examples of image schemas would be rudimentary concepts such as BALANCE, CONTACT, or CONTAINER, which are directly meaningful because they are linked to and derived from preconceptual structured experience as a result of human sensorimotor coupling with the world (Evans/Green 2006:46). The term *image* is borrowed from psychology, where *imagistic experience* is used to refer to experience that is directly derived from and related to the external world. Imagistic experience (which is also called *sensory experience*) therefore relates to all kind of human sensory-perceptual experience and is not restricted to the visual domain. This kind of experience is contrasted with *introspective* or *internal subjective experience* such as feelings or emotions (ibid.:178). The term *schema* is important as well because it points out that image schemas are not detailed but rather very abstract concepts[6] that form from recurring embodied experience. For example, the meaning of the word *container*, which is

[6] Langacker (2008:32) claims that image schemas are "basic, "preconceptual" structures that give rise to more elaborate and more abstract conceptions." This seems to be a misinterpretation. Image schemas derive from preconceptual structure; they cannot be equated with it. An image schema itself is not preconceptual but rather a directly meaningful concept because it is derived from preconceptual embodied experience. Langacker's misinterpretation is probably due to an unfortunate choice of terminology by Lakoff (1987:267), who calls his first type of preconceptual experience "kinesthetic image-schematic structure". Since the notion of *concept* is already present in the term *schema*, it is misleading to use it in designating a kind of preconceptual structure. To avoid such confusion, I will not talk of *image-schematic structure* but rather of *imagistic structure* (see above).

motivated by the image schema CONTAINER, is much more schematic than the meaning of more specific words like *cup* or *bottle* (Evans/Green 2006:179). Abstract image schemas like CONTAINER can then give rise to more specific concepts; for example, lexical concepts associated with prepositions like *in*, *into*, *out*, *out of*, etc. are all related to the CONTAINER schema. Given the (to a large extent) common physiology of human beings, it is claimed that the imagistic structuring of bodily experience will be constant for all human beings (Lakoff 1987:302). The notion of *image schema* illustrates quite well the relation between embodied experience and embodied cognition. For example, it is claimed that the functional asymmetry of the vertical axis of the human body[7], coupled with gravity as an objective feature of the external world[8], is a structured preconceptual experience which, due to its permanent recurrence, gives rise to an UP-DOWN image schema (Evans/Green 2006:178). Given the constant physiology of human beings, this UP-DOWN schema can be claimed to capture universal features of spatial relations as experienced by humans (Lakoff/Johnson 1999:463).

The notion of a *basic level*[9] of concepts (see the second claim above) serves to answer the question why human categories of mind often seem to fit the categories of the world (Lakoff 1987:270; Lakoff/Johnson 1999:26-27), thus making an objectivist account of metaphysics and cognition so intuitively appealing in everyday life. For example, we have categories like *chair*, *table*, *house*, *car*, etc., which seem to correspond to – or mirror – clearly delimited categories existing in the external world. The answer provided by second-generation cognitive science is that humans have developed a class of categories "that optimally fit our bodily experiences of entities and certain extremely important differences in the natural environment" (Lakoff/Johnson 1999:27). The concepts representing these categories are situated at the basic level, which is generally considered to be cognitively salient or privileged (see Lakoff/Johnson 1999:27 ff.; Mihatsch 2006:43; Cruse [3]2011:61). It is at this basic level that "people function most efficiently and successfully in dealing with discontinuities in the natural environment" (Lakoff 1987:269).

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[7] Which is a result of our physiology: we walk upright, having the head at the top and the feet at the bottom of our body.

[8] For example, as a consequence of gravity, we have to stoop in order to pick up unsupported objects which have fallen to the ground and look up to follow the path of objects that rise.

[9] The notion of *basic level* discussed here corresponds to the one developed in prototype theory (e.g. Rosch et al. 1976).

The basic level is, for example, characterized by the fact that it is the highest level at which category members can be recognized by gestalt perception, i.e. by the perception of overall shape. For example, we can assign an overall shape to a chair or table but not to a general piece of furniture. Probably as a consequence of this gestalt perception, the basic level is also the highest level at which a category can be represented by a single mental image. Again, we can have a mental image of a chair or a table but there is no mental image of a general piece of furniture. It is also the level at which humans use similar motor actions for interacting with category members. For example, we have similar motor programmes for interacting with cars but our motor programmes for dealing with different vehicles (which encompass, for example, cars and bicycles) will vary considerably. And finally, the basic level is also the level at which most of human knowledge is organized. For example, we generally associate much more detailed information with cars than with vehicles in general.[10] These different features of the basic level are responsible for the basic-level structure of human embodied experience, which in turn motivates the formation of basic-level concepts. As with image-schemas, it is claimed that the principles guiding basic-level structure and thus the formation of basic-level concepts is also universally valid, although some variation is assumed with regard to the particular concepts formed (Lakoff 1987:302).

The formation and existence of basic-level concepts serves again to well illustrate the link between human embodied experience and embodied cognition. For example, our motor programmes for interacting with chairs and tables are functionally related to our biological morphology and our overall physiology.[11] These characteristics of the human body, in combination with the nature of the external world with which we interact, gives rise to the preconceptual basic-level structure of our embodied experience, which in turn motivates

[10] According to Tabakowska (1993:38), basic level terms such as *motor* serve as points of reference from which lexical hierarchies expand along the vertical dimension of lower and higher specificity. While the knowledge above the basic level gets more and more schematic, the knowledge below this level is generally deemed to be expert knowledge (Lakoff/Johnson 1999:28).

[11] The motor programme of an ant or an elephant with regard to tables and chairs will be quite different from that of humans.

the formation of basic-level concepts. These concepts can therefore be seen as "cognitive anchor points" in our dealings with the world.[12]

To summarize the discussion so far: Humans are "coupled" with the world via their embodied sensorimotor experience. This external world influences the structuring of our conceptual systems (as opposed to the subjectivist view, which assigns the sole responsibility for the emergence of structure to the conceptualizer) but it will not objectively determine it since our experience of the world is channelled through and mediated by the morphology and physiology of the human body (as opposed to the empiricist objectivist view, according to which the external world imposes its objective structure on human conceptual systems). This bi-directional relation is illustrated by the following quote by Evans/Green (2006:263):

> [W]hile the environment partly delimits and thus determines the nature of the categories we create, these categories are also partly delimited by the nature of the interaction between human experiencers and their environment.

A last important point to make is that embodied cognition is not restricted to the realm of directly meaningful concepts which are derived from structured preconceptual experience. Rather, it is claimed that directly embodied concepts such as image schemas also structure more abstract concepts and conceptual domains (Evans/Green 2006:46). These abstract conceptual structures are claimed to be systematically related to directly meaningful structures, which makes them indirectly meaningful (Lakoff 1987:285). This idea is directly linked to the third claim of second-generation cognitive science illustrated above. Since there are two types of structured preconceptual experience, there are also two ways in which this preconceptual structure influences abstract conceptual systems. Firstly, at the level of image schemas, there are processes of conceptual projection from the physical domain to abstract domains. Secondly, based on basic-level concepts, there is a projection from corresponding basic-level categories to superordinate and subordinate categories (Lakoff 1987:268).

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[12] Lakoff (1987:270) points out in this context that basic-level concepts exhibit a much richer structure than image schemas, which, as their name implies, only possess a very schematic conceptual content. Also, basic-level concepts exist not only for objects but also for actions (e.g. running, walking or eating) and for properties (e.g. tall, short, hard, soft) (ibid.:271).

A detailed study of the processes of conceptual projection that operate based on image schemas can be found in Lakoff/Johnson's (1999) work on *conceptual metaphor*. As an example, consider the image schema UP-DOWN discussed above. By way of conceptual projection, this directly meaningful concept can provide structure for more abstract concepts that are not directly tied to embodied experience. A good example would be the primary metaphor *More is Up*, (as in *Stock prices rose considerably last week*). In this example, a basically subjective judgement of quantity is conceptualized in terms of a specific sensorimotor experience, i.e. the vertical orientation of the human body (ibid.:47, 51).

There seems to be no comparable research enterprise that investigates the second projection process described above; i.e. the projection from basic-level categories to superordinate and subordinate categories. What this type of projection process seems to imply is the following: Since basic-level structure and the basic-level concepts motivated by this structure serve as cognitive anchor points in human interaction with the world, it is these concepts that will usually be formed first and will show the highest intersubjective stability (due to the universal validity of the principles pertaining to basic-level structure). It is from these anchor points that human knowledge about a specific domain is expanded. This can either happen in the upward direction, by establishing commonalities of various types between different basic-level concepts, abstracting away from their differences and eventually grouping them together in a superordinate category. Or it can happen in the downward direction, when humans are not satisfied with the amount of knowledge gathered at the basic level of a given domain and start to investigate this domain with higher granularity. This will inevitably lead to the discovery of further differences that will ultimately be reflected in the formation of more fine-grained concepts at the subordinate level. The conceptual systems formed at the superordinate or subordinate level will generally show more variation than at the basic level since they exhibit a greater distance from the preconceptual structure that motivates the formation of basic-level concepts.

3.2.4 Embodied realism

Lakoff and Johnson (1999) have translated the findings of second-generation cognitive science and the consequences that follow from embodied experience and embodied cognition into the philosophy of *embodied realism*.[13] Embodied realism, which has its

[13] In the previous work of the two authors, this philosophy was also known as *experiential realism* or *experientialism* (Lakoff/Johnson 1980; Lakoff 1987).

roots in the works of the two philosophers of mind John Dewey (1925) and Maurice Merleau-Ponty (1962) (Lakoff/Johnson 1999:97), transcends the previously illustrated dichotomy of objectivism and subjectivism and aims to give an alternative account of ontology and human epistemology that tries to do justice to both the structure and stability that we intuitively feel exists in the external world and to the constructive effort that humans bring to the development and structuring of their conceptual systems. By going beyond the fundamental subjectivist-objectivist dichotomy and stressing the human coupling with the world via our embodiment, embodied realism is fundamentally opposed to the Cartesian dualism of *res cogitans* and *res extensa*, which is at the heart of said dichotomy. Johnson and Lakoff (2002:249) give the following account of their theory:

> Embodied realism, as we understand it, is the view that the locus of experience, meaning, and thought is the ongoing series of embodied organism-environment interactions that constitute our understanding of the world. According to such a view, there is no ultimate separation of mind and body, and we are always "in touch" with our world through our embodied acts and experiences.

The ideas of embodied experience and embodied cognition illustrated previously are clearly discernible in this quote, as is the functional coupling of humans and the world via an "ongoing series of embodied organism-environment interactions". Having established this link between embodied experience, embodied cognition and embodied realism, we will now consider some specific characteristics of this philosophical account.

Embodied realism is first and foremost a form of "basic realism" (Lakoff 1987:158) since it commits to the existence of a real world external to human beings[14] and to the possibility and existence of stable knowledge of this external word. Embodied realism also posits a link of some sort between human conceptual systems and aspects of this external reality and it rejects the postmodernist "anything goes" stance, according to which one conceptual system is as good as any other in making sense of the world.[15] While being a form of basic realism, the embodied realist account rejects the possibility of any form of "external realism" (called "metaphysical realism" by Putnam 1981:49) that would allow "one true and complete description of 'the way the world is'" (Lakoff 1987:260) from a God's Eye

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[14] As mentioned before, this claim is not seriously doubted even in strong subjectivist approaches. What is at stake is whether humans can have any meaningful or privileged epistemological access to this reality.

[15] Scarpa (2002:147) claims that experientialism/embodied realism entails a postmodernist perspective. This does not seem to be an admissible interpretation since embodied realism tries to delimit itself as strongly from subjectivism/postmodernism as it does from objectivism (see, for example, Lakoff/Johnson 1999:5-6).

perspective. Such an external realism is obviously closely linked to the objectivist paradigm sketched above. According to internal realism, human understanding of the world in terms of objects, properties and relations among these objects (as posited by objectivist metaphysics) is "an imposition of our conceptual schemes upon external reality" (ibid.:262), meaning that an understanding of reality is structured by human conceptual systems. Lakoff (ibid.) illustrates the internal/embodied realist rejection of a *single* correct description of reality or entities in the world with the trivial example of a chair, which, although it exists in the real world, can be described *correctly* from different perspectives, i.e. based on different conceptual schemes or systems. For example, given human capacity for gestalt perception, we will experience and thus describe the chair as a single bounded entity (and probably form a corresponding basic-level concept of it), whereas at the molecular level it is a vast collection of molecules and not a single bounded entity at all. According to Lakoff, both descriptions are *correct* but they are based on different conceptual schemes. The chair, then, is real with regard to both schemes but it has a different status in each of them. Instead of an omnipotent God's Eye perspective, embodied realism thus entails an inescapable *perspectivation* of human understanding of the world and hence of human conceptual systems.[16]

While the idea of an imposition of conceptual schemes upon external reality and the possibility of multiple correct descriptions of phenomena based on different conceptual schemes may initially sound like a subjectivist position[17], embodied realism crucially claims that human embodiment ensures that our conceptual systems stay "very much in touch with the world" (Lakoff/Johnson 1999:44). Therefore, human experience and human cognition are not purely internal phenomena but rather "constrained at every instant by the real world of which we are an inextricable part" (Lakoff 1987:263). Also, which human conceptual schemes are plausible or even possible and how successful these conceptual

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[16] An example of such perspectivation would be the granularity with which a certain state of affairs is perceived. This capacity for coarse or fine-grained perception and conceptualization is captured in cognitive linguistics by the notion of *linguistic construal* (see 4.5.1) and will feature prominently in the discussion and investigation of explicitation and implicitation from a cognitive linguistic perspective. This is just intended as an example of how the high-level philosophical theorizing in this chapter can be linked to the more worldly concerns of the remaining thesis.

[17] Recall that in empiricist objectivism, it is the converse, i.e. the objective structure of the external world is imposed on human conceptual systems. Also, in metaphysical realism, there is only one correct description of a given phenomenon.

schemes can serve their purpose is crucially dependent on the nature of the phenomena of the external world that these schemes refer to. As Evans/Green (2006:263) put it, "[w]hile our interaction with the world is one determinant of level of categorisation, the world itself provides structure that also partly determines categorisation". Indeed, the detailed discussion of preconceptual structure, which is responsible for the formation and existence of directly meaningful image-schematic and basic-level concepts, was intended to show that human conceptual systems are not "free-floating" but rather anchored in the world in important ways. These two preconceptual anchor points are a function of the human embodiment and thus central to the embodied realist epistemology.

The dialectical nature of embodied realism should have become clear by now. The central notion of human embodiment and its bearing on human conceptual systems closes the gap created by the Cartesian mind-body dualism. Objectivism as one extreme point of the resulting dichotomy is rejected since a disembodied God's Eye perspective on an objectively prestructured world is not possible in the embodied realist account. Also, the idea that objectively given structure is imposed on human conceptual systems independently of any human conceptualization is untenable since the preconceptual structure that we experience and which influences the emergence of our conceptual systems is partly a function of our embodiment. As was shown above, the intuitive appeal of objectivist metaphysics is due to human preconceptual experience of basic-level structure, which gives rise to basic-level concepts. Again, this preconceptual structure is partly a function of human embodiment and thus cannot be claimed to have any objective status in the metaphysical sense.

The subjectivist claim that conceptual systems emerge without any significant input from this external world is therefore also difficult to sustain. From the embodied realist perspective, there are at least two fundamental anchor points in the form of image schemas and basic-level concepts that tie human cognition to the external world (see the discussion above). Also, the possibility to structure more abstract domains in terms of these directly meaningful concepts ensures that this tie is not restricted to the material level. The epistemological access of humans to the external world is thus secured. However, by rejecting the objectivist God's Eye view, by stressing the inescapable perspectivation of human conceptualization and by acknowledging that phenomena may be correctly or plausibly described based on different conceptual schemes, embodied realism allows a

limited form of relativism, while any form of strong or total relativism is ruled out (Lakoff 1987:268).

Going back one last time to Plato's metaphor of "carving nature at the joints", embodied realism would probably make the following claim: Nature provides multiple potential joints to carve at but different joints lend themselves to carving with different kinds of knives. As a function of their embodiment, humans possess a specific kind of knife (representing their epistemic capacity) and by virtue of this knife they are oriented towards nature in a specific way. They are thus successfully equipped to carve nature at specific joints, while other potential joints will not lend themselves to carving using this knife (they may be too small, too big, too hard, etc.). By carving at potential joints, we create them in a sense but our ability to carve is influenced both by nature itself and its potential joints and by the makeup of our knife. If, during the carving, we hit "bone or nothing at all" (Lakoff 1987:309), the corresponding conceptual system does not fit the world and has to be abandoned for a better one.

3.3 Embodied realism and science

Embodied realism also has important things to say about the epistemological power of science, which, with the rise of the historical/descriptive approach to scientific change and the hermeneutic philosophy of science (see Halverson 1997:219-220), has occasionally been fundamentally called into question. The issue at stake can again be traced back to the fundamental objectivism-subjectivism dichotomy. Scientific objectivism claims that there is "only one fully correct way in which reality can be correctly divided up into objects, properties, and relations" (Lakoff 1987:265) and that it is the task of science to uncover this absolutely true categorization of the world. From this objectivist perspective, we possess scientific knowledge "when our scientific theories fit the objective facts of the world" (ibid.:297). On the other hand, postmodern accounts strive to undermine science's claim of objectivity and instead emphasize its social, cultural and historical contingency. It was especially Kuhn's (1962) influential work on *The Structure of Scientific Revolutions* which made a convincing claim that scientific theories – at least those that have existed till now – are not exact mirrors of objectively given things in the world, that scientific progress is not linear but undergoes times of crisis and revolution and that these revolutions bring about a change of theories and a reconceptualization of entire disciplines (see Chalmers [3]1999:108). Postmodern accounts of science accept the idea of indeterminacy (see Pym's work above) as a given feature of the world and therefore embrace the investigation of

vagueness, ambiguity, etc., while for modernist science, such vagueness and ambiguity are obstacles on the way to adjusting scientific theories to the objective facts of the world (Budin 2007:66-67). At different times in human history, scientific objectivism seemed to have attained its goal to provide an absolutely stable and correct description of "the way the world is". For example, the American physicist and Nobel laureate Albert Abraham Michelson claimed at the turn of the twentieth century that "[o]ur future discoveries [in physics] must be looked for in the sixth place of decimals" (see Störig [3]2007:492). He referred to the immense success of Newtonian mechanics, which seemed to be capable of explaining all processes of movement found in nature. Once evidence of the existence of the famous "light-bearing ether" was found, the Newtonian explanations would be applicable to optical (as well as magnetic and electric) phenomena as well, thus providing an encompassing physical theory of the way the world is (see Isaacson 2008:92). However, Michelson's quote came only shortly before Albert Einstein's *annus mirabilis*, which brought about a fundamental reconceptualization of Newtonian physics, or a scientific revolution in Kuhnian terms. However, while Kuhn nonetheless acknowledged the success of science in establishing highly structured and stable conceptual systems with an equally high explanatory power with regard to phenomena in the material world (Lakoff/Johnson 1999:92), more radical approaches in the post-Kuhnian tradition of philosophy of science have relegated the scientific enterprise to "just one more philosophical narrative with no privileged status to any other philosophical narrative" (Lakoff/Johnson 1999:88-89).

It seems, however, that accepting this radical rejection of the epistemological power of science would mean throwing out the baby with the bath water. For even if scientific objectivism may not be tenable, there is no denying the extraordinary success of the natural sciences and the scientific method since the seventeenth century (see Chalmers [3]1999:xx) and the already mentioned conceptual stability brought about by the scientific endeavour, even if this conceptual stability must always be regarded as preliminary and not as absolute. The epistemological challenge raised by objectivist and subjectivist accounts of science is stated quite clearly by Laudan (1990:166, quoted from Halverson 1999:18):

> [W]e find ourselves in a situation where our only contact with the world is mediated by our concepts. We posit certain beliefs or theories to make sense of that mediated world. If those beliefs or theories were entirely free-floating (as [the relativist] believes them to be) and reflected nothing whatsoever about the world itself, then it would be unthinkable that they would enable us to manipulate the world as effectively as we can [...] the explanation of the success of science is going to have to be told in terms of the ways in which our interaction with nature puts strong constraints on our systems of belief.

Especially the last sentence of Laudan's quote should sound familiar from the discussion so far. It seems then that "the success of science" can – at least partly – be explained within the embodied realist account.

The philosophical stance of embodied realism toward science is as follows: Firstly, by rejecting the overall objectivist paradigm, embodied realism also rejects any form of scientific objectivism and the search for absolute truths from a God's Eye perspective. However, it endorses *scientific realism*, which is not to be equated with *scientific objectivism* (Lakoff 1987:176). Scientific realism "merely" claims that there is a real physical world and that scientific knowledge of this physical world is possible "within appropriate standards set by communities of scientists" (ibid.).[18] Scientific realism assumes that "the world is the way it is" but it acknowledges that there may be different scientifically correct ways of describing or conceptualizing reality based on different conceptual schemes (ibid.:265). This is reminiscent of the discussion of internal realism above and in line with the inescapable perspectivation of human – and therefore also scientific – access to the world as posited by embodied realism. What embodied realism brings to scientific realism is an epistemologically plausible explanation of the high stability of scientific knowledge, by linking it to basic-level structure as one of the two preconceptual structures tying human conceptual systems to the world. Of course, human interaction with the world in the context of science takes place not in the form of *internal subjective experience* but in the form of *imagistic experience*, which is directly derived from and related to the external world (see the discussion in 3.2.3). Recall now the embodied realist claim that human interaction with their imagistically experienced environment is characterized by a high stability at the basic-level due to the cognitive saliency of this level in terms of gestalt perception, mental imagery, motor programmes, and knowledge organization. It is also claimed that this cognitive saliency of the basic level and the high stability of the corresponding basic-level concepts is universally valid for all humans. Human basic-level knowledge is derived from basic-level interaction with the immediate physical environment, for example through perceiving, touching or manipulating (Lakoff 1987:297). This stable knowledge, which is organized in the form of

[18] This characterization of scientific realism seems to be at odds with Chalmers' (^{3}1999:238) understanding of the term. According to Chalmers, scientific realism "aims at true statements about what there is in the world and how it behaves at all levels […]". This description seems to fit Lakoff's characterization of scientific objectivism.

basic-level concepts, is taken to be "true", unless there is a very good reason to believe otherwise (ibid.:299). Embodied realism now claims that scientific instruments extend human basic-level abilities for perceiving, observing, manipulating, etc. (Lakoff/Johnson 1999:29).[19] For example, basic-level perception in the visual domain is extended by instruments like telescopes and microscopes, which consistently "turn things that previously couldn't be seen into basic-level percepts" (Lakoff 1987:298). Telescopes and microscopes thus move phenomena which previously lay outside the realm of human perception (such as the rings of Saturn or the structure of cells, ibid.:298-299) to the basic level and thus allow a privileged interaction with these phenomena from a human point of view. The same is true for various delicate probing instruments, such as lasers, that allow a basic-level manipulation of objects that would not normally be accessible to humans (Lakoff/Johnson 1999:29). In embodied realist terms, this technologically extended basic-level structure which becomes available for human interaction within the context of science is one of the crucial factors for the success of science since it imports the stability found at the basic level into the scientific enterprise and eventually into scientific knowledge. This is underlined by the following quote from Lakoff (1987:299) on our knowledge about cells:

> As we technologically extend our basic-level abilities to perceive and to manipulate, our understanding of organisms as being made up of cells remains unchallenged. It is stable and remains so because of the large number of observations of cell structure made through microscopes and the large number of manipulations of cell structure brought about through various technological extensions of our basic-level capabilities. Our knowledge of the existence of cells seems secure, as secure as any knowledge is likely to be.

It is important to point out in this context that the embodied realist claim concerning the technological extension of human basic-level abilities can be directly linked to the much-praised scientific method since, with the extended abilities of observation and manipulation, embodied realism covers two important cornerstones of this method. Of course, there are other aspects of the scientific method which are not covered by embodied realism, such as the tight control of observation and manipulation processes by means of experiments, scientific standards requiring the reproducibility of such experiments and the call for extensive and converging evidence for some theory prior to this theory's acceptance by the scientific community as codifying any stable knowledge about the world. However, the account of *scientific embodied realism* (Lakoff/Johnson 1999:90)

[19] This is reminiscent of the discussion of the symbiotic relationship between science and technology in 2.1.

sketched above provides a coherent link between a cognitively plausible and intuitively appealing philosophical account of ontology and human epistemology and the success and conceptual stability of the scientific enterprise without requiring any privileged God's Eye perspective on the way the world is. We must bear in mind, however, that science is an inherently human endeavour and will therefore always be constrained by the perspective that humans can have on certain phenomena – as technologically extended as this perspective may be. As Lakoff (1987:265) concludes, "that is the best we can do – and it's pretty good. Good enough to provide us with reasonable standards for stable scientific knowledge."

For scientific and technical translation, this means that, at a general philosophical level, we may indeed have an epistemologically secured justification to fall back on stable frames of reference underlying scientific and technical discourse and are thus safeguarded, to a reasonable extent, against subjectivist/postmodernist advances with their claims of relativism, indeterminacy, etc. However, the universality of human basic-level experience and cognition does not automatically entail the universality of the resulting conceptual systems. It is well-known from contrastive terminology work and from practical scientific and technical translation that conceptual systems in science and technology are generally not fully congruent between different cultures but exhibit several types of asymmetry. This is due to the fact that universal human basic-level abilities are of course only one factor contributing to the emergence of conceptual systems, which will also be subject to more worldly influences such as social, cultural, linguistic and even economic factors.[20] How translators deal with such asymmetries and whether stable conceptualizations in the SL culture that have a symmetric pendant in the TL culture will, in every case, be recreated or held invariant in the target text[21] will also be subject to much more situation-bound and practical concerns, which cannot be accounted for in high-level philosophical theorizing. Thus, it seems that what we can realistically expect as a contribution of embodied realism to STT is a coherent high-level explanation for a relatively stable epistemological basis of the scientific enterprise from a human point of view and a sound philosophical basis for explaining aspects of STT in the cognitive linguistic framework to be discussed in the next chapter. The actual emergence of scientific and technical conceptual systems and the specific actions of translators in actual ST translation contexts will, however, exhibit a less

[20] See, for example, Arntz et al. ([6]2009:180). This issue will be discussed in more detail in chapter 5.

[21] See the discussion of potential socioculturally induced shifts of meaning in STT in 2.6.

straightforward and more “untidy” character, which lacks the philosophical elegance illustrated above.

3.4 Chapter summary

This chapter discussed embodied realism as a philosophical grounding for scientific and technical translation and cognitive linguistics. The discussion started from the Cartesian mind-body dualism and the resulting dichotomy of objectivism vs. subjectivism. While objectivism claims that human conceptual systems are subservient to a completely prestructured and objectively given world, subjectivism posits the dominance of human conceptual systems by claiming that it is human cognition which is primarily responsible for the emergence of any structure in the world. Embodied realism was shown to transcend this dichotomy by positing the embodiment of human experience and cognition, which leads to a dialectical relationship between structure in the world and human abilities to perceive this structure and to form corresponding conceptual systems. The functional coupling of humans with the world via human embodiment entails that it is neither the world nor human cognition alone that is responsible for the emergence of conceptual systems but that these systems arise out of the interaction between the two poles. Scientific embodied realism claims that human basic-level abilities for perceiving, observing, manipulating, etc. are technologically extended by scientific instruments such as telescopes, microscopes and lasers. This technological extension of basic-level abilities implies that the conceptual stability found at the basic level is imported into the scientific enterprise and eventually into scientific knowledge. It was claimed that scientific embodied realism provides a coherent high-level link between a cognitively plausible and appealing philosophical account of ontology and epistemology and the stability of the scientific enterprise. While this entails that scientific and technical translation may indeed fall back on stable frames of reference and is thus reasonably safeguarded from criticisms of subjectivist/postmodernist accounts questioning this stability, there is ample evidence that scientific and technical conceptual systems are not fully congruent across different cultures. Embodied realism can therefore be taken to provide a high-level explanation for a relatively stable epistemological basis of science and technology. However, the actual formation of conceptual systems in this field will show a certain degree of variation due to influences that fall outside the scope of high-level philosophical theorizing.

The next chapter will present the framework of cognitive linguistics, which is based on the philosophical account of embodied realism.

4 The framework of cognitive linguistics

Having discussed the philosophy of embodied realism as both a potential philosophical basis for scientific and technical translation and as the specific philosophical underpinnings of cognitive linguistics, I will now give a detailed account of the cognitive linguistic framework. This account will serve as a basis for both the cognitive linguistic perspective on scientific and technical translation established in chapter 5 and for the cognitive linguistic account of explicitation and implicitation and the empirical investigation of the two concepts in chapters 6 and 8 respectively.

Cognitive linguistics stands in the functionalist tradition of linguistics and was developed in the 1970s, primarily as a countermovement to the then predominant formalist approaches in the tradition of Chomskyan Grammar. Its principal aim is to provide a holistic account of language in terms of general human cognitive abilities, such as attention, memory, perception, etc. (see Schwarz ^{2}1996:52 ff.; Dirven ^{2}2002:76). CL is not one unified linguistic theory but rather a specific approach to language taken by various researchers who share a common set of perspectives, guiding principles and assumptions. Based on this shared ground, a diverse range of different theories has been developed, often complementary and overlapping, sometimes competing with each other (see Evans/Green 2006:3). The present thesis is primarily based on Langacker's (1987, 1991, 2008) Cognitive Grammar, which is arguably the most comprehensible and most influential cognitive linguistic theory to date. Other cognitive linguistic models introduced in this chapter which fall outside Cognitive Grammar, such as Clark's common ground and Fillmore's frame semantics, share the same basic principles as the Langackerian approach and can therefore be readily integrated into it.

The chapter is structured as follows: Starting from a top-down perspective, I will first give a brief overview of three major approaches to meaning and the cognitive linguistic stance toward these approaches. This is intended to situate cognitive linguistics within the wider field of general linguistic theories. At the same time, this survey serves to make transparent the basic linguistic commitments made with regard to the account of scientific and technical translation proposed in this thesis. After this general overview, the focus will be shifted to more specific aspects of the CL framework which are relevant to the overall epistemic aims of this thesis. The last part of the chapter then discusses various specific theoretical components of CL that are directly relevant to the proposed account of STT and

the analysis of explicitation and implicitation in the second part of this study. Given the nature of the present topic, the discussion will, at some points, delve deeper into linguistic issues that may not show any readily perceivable connection to translation. I still consider this discussion to be necessary because it illustrates in detail the linguistic basis of this thesis (both at the more general level of scientific and technical translation and at the more specific level of explicitation and implicitation), so that its theoretical framework and empirical findings can be compared with that of translational approaches which are based on different linguistic frameworks. Also, despite the linguistic bias of parts of the following discussion, the overall translational perspective will be preserved throughout the chapter.

4.1 Three approaches to meaning

In his comparison of cognitive linguistics with other major linguistic theories, Taylor (2002:186 ff.) makes a distinction between three general approaches to linguistic meaning. These approaches differ in their claims about the actual locus and hence the nature of linguistic meaning and can roughly be assigned to the three endpoints of the semiotic triangle:

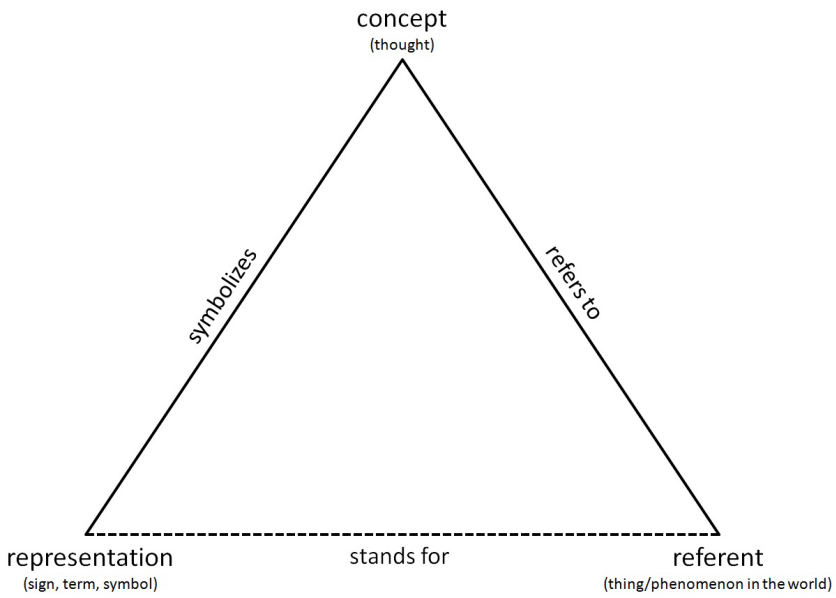

Figure 1: Three approaches to meaning based on the semiotic triangle

The first major approach to linguistic meaning to be illustrated here is the *language-world approach*, which is situated at the lower right corner of the triangle. According to this approach, the locus of linguistic meaning resides in the relationship between linguistic expressions and some state of affairs in the external world. According to the direction of

this relation, the language-world approach makes a distinction between a *semasiological* perspective (from language to the world; which states of affairs can be designated by a given linguistic expression?) and an *onomasiological* perspective (from the world to language; which linguistic expressions can be used to designate a given state of affairs?).[1] The general idea of matching linguistic expressions with states of affairs in the world shows a strong correlation with truth-conditional semantics, which claims that meaning equals the truth conditions of a proposition expressed by a sentence with regard to its correspondence with some state of affairs in the world. As such, it stands in the tradition of the objectivist paradigm discussed in the previous chapter. While cognitive linguistics recognizes the huge relevance of this relation between linguistic expressions and phenomena in the world for any comprehensive theory of meaning, it is claimed that there are several problems involved in reducing the nature of linguistic meaning to this relation alone. The most relevant problem is probably that meaning cannot be exhaustively characterized by reducing it to the relation between expressions and their referents. For example, as Taylor (2002:189) convincingly claims, knowledge of the word *carburettor* involves much more than the competence to identify a carburettor under the bonnet of a car, e.g. knowledge about its functional relation to an internal combustion engine, about types of carburettors, their size, weight, etc. This knowledge, which may be more or less central to characterizing the meaning of *carburettor*, (and which may have to be evoked in a given translational context) cannot be properly accounted for within the language-world approach and is normally assigned to the broader field of pragmatics. A second important objection raised by CL against absolutizing the language-world approach is that truth-conditionally equivalent propositions (describing the same state of affairs) can generally be linguistically encoded in various ways. As Taylor (ibid.) points out, from a truth-conditional perspective the sentences *Someone stole her diamonds from the Princess* and *The Princess was robbed of her diamonds* express the same proposition but the situation is conceptualized in different ways in the two sentences. By merely matching the two sentences with the state of affairs described, we would, for example, miss the semantic (and hence perhaps translationally relevant!) difference between the active and the passive construction and between the two verbs *rob* and *steal* (ibid.). Cognitive linguistics, on the other hand, captures these semantic differences with the important concept of *linguistic*

[1] This distinction between a semasiological and an onomasiological approach is also quite prevalent in General Terminology Theory (see Arntz et al. ^{6}2009:189).

construal (see 4.5.1). This concept operates at a much finer-grained level than formalist approaches and can explain, from a cognitively plausible perspective, why the two sentences above are semantically non-equivalent although they both, according to truth-conditional semantics, describe the same "state of affairs".

The second important approach to the study of linguistic meaning is the so-called *language-internal approach*, which is situated at the lower left corner of the semiotic triangle. According to this approach, linguistic meaning resides in the relations between linguistic expressions within a language (Taylor 2002:186, 190). These relations can be described from a *paradigmatic* perspective (relations between different expressions, such as synonymy, heteronymy, antonymy, hyponymy, etc.) or from a *syntagmatic* perspective (relations between items co-occurring within an expression, such as collocational preferences, semantic clash, pleonasm, etc.). It should be obvious that this approach has its roots in Saussurean structural linguistics, according to which linguistic signs have no autonomous meaning but are only made meaningful by their relation to other signs in a given sign system. Again, cognitive linguistics recognizes the relevance of these language-internal relations for a comprehensive characterization of meaning but, as with the language-world approach, it claims that linguistic meaning cannot be reduced to these relations alone. According to Taylor (ibid.:192), when meaning is equated with relations between linguistic expressions, "the semantic structure of a language becomes a vast calculus of language-internal relations, which makes no contact at all with the way speakers conceptualize the world". In other words, the language-internal approach cannot explain how speakers of a language "gain a toe-hold into the conceptual system" (ibid.). For example, the hypernym-hyponym relation between *engine* and *combustion engine* or the antonymic relation between *hot* and *cold* are certainly important in the semantic characterization of these linguistic units but they do not give an indication of the actual conceptual content of these expressions.[2]

[2] Structural linguistics has informed various linguistically oriented approaches to translation (e.g. Schreiber 1993, Albrecht 2005) that show a very high internal coherence and possess an equally high explanatory power with regard to numerous linguistic aspects of translation. However, with the cognitive turn in translation studies and the subsequent development of cognitive theories of translation (see Halverson 2010a, 2010b), it may be time to shift the focus from such structuralist approaches and to assess the potential that cognitive linguistic theories hold for the field of translation.

Finally, the *conceptualist approach*, which is situated at the top corner of the semiotic triangle, claims that the meaning of linguistic expressions can be equated with conceptualizations in the minds of language users (ibid.:187). According to Langacker (1987:97), the rationale for such a conceptualist approach to meaning is that "[m]eaning is a mental phenomenon that must eventually be described with reference to cognitive processing". The conceptualist approach is obviously the approach underlying the cognitive linguistic framework to be illustrated in this chapter. As mentioned above, CL acknowledges the merits of both the language-world and the language-internal approach but it claims that the relations which, in these two approaches, are *equated* with linguistic meaning are at most *symptomatic* of this meaning but cannot be taken to characterize it exhaustively (Taylor 2002:190, 192). Also, instead of treating meanings as "objects" (an approach which Sinha (1999:223) calls "reificatory semantics"), cognitive linguistics stresses the dynamic character of meaning construction as a "complex process that takes place at the conceptual level" (Evans/Green 2006:368). In the following sections, I will illustrate in more detail the consequences that the conceptualist approach has for cognitive linguistic and ultimately for corresponding translational accounts of meaning.

4.2 Basic tenets of cognitive linguistics

Having positioned cognitive linguistics with regard to other major approaches to linguistic meaning, we will now focus on some general characteristics of the CL framework. The discussion starts with the symbolic and usage-based character of grammar, both of which are important pillars of Langackerian Cognitive Grammar. Following this, two fundamental commitments shared by the different theories within the CL framework will be discussed before the conceptualist approach is taken up again in the discussion of dictionary vs. encyclopaedic views of linguistic meaning.

4.2.1 Symbolic and usage-based character of grammar

At the most basic level, cognitive linguistics claims that language provides a means for encoding and externalizing thoughts by using symbols or rather symbolic assemblies (Evans/Green 2006:6). These symbolic assemblies are the fundamental units of grammar and consist of forms (spoken, written or signed) and the meanings conventionally paired with these forms. This form-meaning pairing is not unlike the linguistic sign as envisaged by Saussure in his structuralist account of language (ibid.:476). The structure of symbolic

assemblies in cognitive linguistics can be illustrated by the following figure based on Langacker (1987:77)[3]:

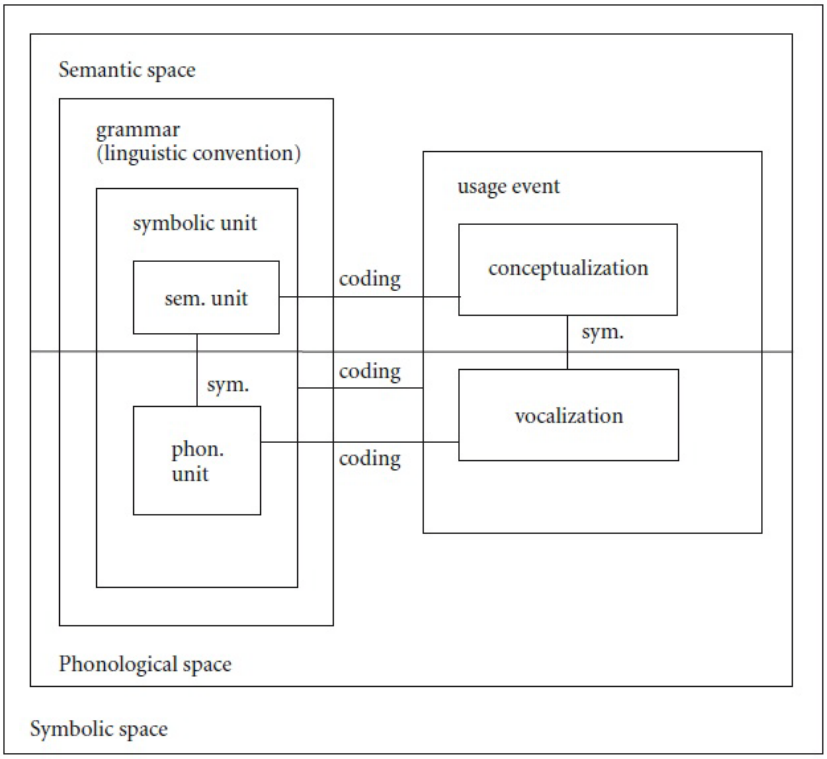

Figure 2: The structure of symbolic assemblies in cognitive linguistics

According to this figure, symbolic assemblies are bipolar entities, consisting of a phonological pole (form), a semantic pole (meaning) and the association (pairing) between the two poles (Langacker 1987:76). Here, semantic space is understood as "the multifaceted field of conceptual potential within which thought and conceptualization unfold".[4] A semantic structure (called "semantic unit" in the above figure) is then understood as a specific location or configuration in the semantic space. The symbolic space is obtained by coordinating the phonological and the semantic space, where a symbolic structure (symbolic unit) is a specific configuration in symbolic space. A symbolic structure/unit/assembly therefore consists of a semantic structure/unit at one pole, a phonological structure/unit at the other pole and a correspondence between these two units.

[3] The figure in its reduced form as depicted above was taken from Halverson (2003:202).

[4] The association of semantic space with conceptual potential follows from the conceptualist approach presented above, according to which (semantic) meaning is conceptual in nature.

An important distinction with regard to the above figure is that between *symbolization* ("sym.") and *coding*. *Symbolization* refers to the relationship between a phonological and a symbolic structure (the relationship underlying a form-meaning pair). The *coding* relationship, on the other hand, holds between a symbolic unit, as conventionalized in the grammar of a language, and a specific realization of this unit in a usage event (Halverson 2003:201). A *usage event* is the cognitive linguistic equivalent to an *utterance* and is defined as "a symbolic expression assembled by a speaker in a particular set of circumstances for a particular purpose" (Langacker 1987:66). In a usage-event, a vocalization in turn symbolizes a *conceptualization*, which is the actual form that meaning assumes in CL (see above) and which is understood by Langacker (2008:30) as encompassing

> […] any facet of mental experience. It is understood as subsuming (1) both novel and established conceptions; (1) [sic!] not just "intellectual" notions, but sensory, motor, and emotive experience as well; (3) apprehension of the physical, linguistic, social, and cultural context; and (4) conceptions that develop and unfold through processing time […].

Basically then, in verbal communication, we have at our disposal a potentially open-ended inventory of linguistic units (which can be more or less well-established in a given discourse community, see the translationally relevant notion of *default construal* discussed in 4.5.3 and 5.2.2) consisting of symbolic form-meaning assemblies. We can then choose units from this inventory for encoding or externalizing our thoughts in specific usage events. Of course, the notion of *encoding* does not mean that language can in any way encode our thoughts in all their complexity (as suggested, for example, by Reddy's (1979) conduit metaphor of communication). For, as Evans/Green (2006:7) point out, while human conceptualizations seem to be pretty much unlimited in scope, "language represents a limited and indeed limiting system for the expression of thought". What language instead does is to provide "partial and impoverished prompts upon which highly complex cognitive processes work giving rise to rich and detailed conceptualisation" (ibid.:368).[5]

Evans/Green (2006:479) point out that the distinction between a "grammar" box (containing the knowledge about conventionalized linguistic units) and a "usage" box (referring to actual usage events or utterances) in Langacker's model above does not entail

[5] This idea of language providing impoverished prompts will be taken up again in the discussion of dictionary vs. encyclopaedic approaches to linguistic meaning in 4.2.3. It will also serve to theoretically enrich the notion of linguistic underdeterminacy from a cognitive linguistic perspective (see 4.6).

a competence-performance distinction as in Chomskyan generative grammar. In fact, CL strictly rejects this clear-cut distinction between knowledge of language (competence) and language use (performance) and instead claims that linguistic knowledge derives from regular patterns of language use and that knowledge of language equals knowledge of how language is used (ibid.:108). Put more precisely, the usage-based thesis claims that "the mental grammar of the speaker (his or her knowledge of language) is formed by the abstraction of symbolic units from situated instances of language use" (ibid.:478). From a translational perspective, it appears that a linguistic theory which stresses the importance of language use and does not treat it as a second-rate phenomenon subservient to pure linguistic competence is better equipped to make statements about translational phenomena, which – if we define translation as a specific form of human action – are *per definitionem* instances of language use. By endorsing the usage-based character of grammar, cognitive linguistics assigns central importance to language use and aims to derive linguistic principles from authentic linguistic behaviour. Since this authentic linguistic behaviour is also one of the prime concerns of translation studies, cognitive linguistics seems to be in a good position to bridge the fundamental gap existing between many mainstream linguistic theories and translation studies.[6]

4.2.2 Generalisation commitment and cognitive commitment

Two key commitments on which the whole cognitive linguistic enterprise is based are the so-called *generalisation commitment* and the *cognitive commitment* (see Evans/Green 2006:27 ff.). According to the generalisation commitment, there exist various common structuring principles that apply to different aspects of language and it is the task of cognitive linguists to uncover these principles. This commitment entails a rejection of the modular view of language as entertained by formal approaches to language such as Chomskyan generative grammar. Proponents of these approaches argue that areas such as semantics, syntax and phonology are governed by different kinds of structuring principles and accordingly treat them as distinct "modules" or "subsystems" of language. Cognitive linguistics acknowledges that an isolated treatment of areas such as semantics, syntax and phonology may be useful for practical purposes but, in line with the generalisation commitment, it is denied that these areas are governed by significantly different structuring

[6] This point is also made by Faber/Ureña Gómez-Moreno (2012:75) in their cognitive linguistic account of specialized translation.

principles (see Croft/Cruse 2004:225 ff.). I will briefly illustrate two consequences of the generalisation commitment that set CL apart from other linguistic approaches. The first consequence is related to the symbolic character of grammar described above and involves treating grammar itself as a meaningful symbolic system, which exhibits important commonalities with the system of lexical meaning and therefore "cannot be meaningfully separated from it" (Evans/Green 2006:48). Therefore, syntactic patterns for word combination as well as morphological patterns for word formation are treated as symbolic units, each associating a phonological with a semantic structure (Taylor 2002:22).[7] In the context of the present study, the symbolic character of grammar as endorsed by CL will allow for a unified cognitive linguistic account of both the lexical and structural aspects of explicitation and implicitation as illustrated later in chapter 7. The second consequence of the generalisation commitment to be illustrated here is that cognitive linguistics draws no sharp distinction between semantic and pragmatic meaning. This consequence follows from the conceptualist approach to meaning and will be further discussed in section 4.2.3 below.

The cognitive commitment is closely related to the generalisation commitment and stipulates that the common structuring principles to be identified in language should reflect insights into human cognition gained in other disciplines, in particular in other cognitive sciences such as psychology, artificial intelligence and neuroscience (Evans/Green 2006:40-41). By postulating a link between linguistic structuring principles and general principles of human cognition (for example attention, perspective or gestalt perception), CL again rejects a modular view of language according to which there exists a distinct language module in the human mind which is functionally separated from general human cognition. In line with the cognitive commitment, cognitive linguists try to give an account of linguistic phenomena that is plausible from a cognitive point of view. This commitment forms the basis of the important cognitive linguistic notion of *linguistic construal*, which will be illustrated in section 4.5.1.

[7] In order to accommodate these grammatical features, cognitive linguistics extends the range of symbolic units in order to encompass not only richly specified lexical units such as *tree* but also much more abstract or schematic entities such as word classes (e.g. [NOUN]) or patterns for the assembly of noun phrases (e.g. [DETERMINER NOUN]) (Taylor 2002:26).

4.2.3 Dictionary vs. encyclopaedic view of linguistic meaning

The distinction underlying the dictionary-encyclopaedia divide in linguistics is that between a one-level approach vs. a two-level approach to the description of linguistic meaning (Cruse [3]2011:213).[8] Proponents of a two-level or dictionary approach believe that a meaningful distinction can be made between linguistic or dictionary knowledge and extra-linguistic or encyclopaedic knowledge. The rationale for such a distinction is often sought in the fields of phonetics and phonology. While humans can handle an almost infinite variety of speech sounds, only a subpart of these sounds are used to convey meanings or enter into systematic relations in a given language. Applied to the realm of linguistic meaning, proponents of a two-level approach claim that there is a virtually infinite variety of "raw meanings", of which only a subpart are truly linguistic in nature. According to the two-level approach, dictionary or linguistic meaning is fairly well-delimited, falls within the discipline of semantics and is stored in the mental lexicon of the language users. On the other hand, the vast amount of encyclopaedic or world knowledge which speakers of a language community possess and bring to bear in interpreting instances of language is the concern of the discipline of pragmatics and is governed by principles of language use. It is not a property of linguistic units but rather of concepts, which are treated as strictly extra-linguistic. The distinction drawn by the dictionary approach between semantic/dictionary/linguistic meaning and pragmatic/encyclopaedic/ extra-linguistic meaning is reminiscent of the objectivist division between Aristotelian *essentialia* and *accidentialia* (see 3.1.1) with the essential/definitional properties of an entity constituting its dictionary/semantic meaning and the contingent properties constituting encyclopaedic information or pragmatic meaning (Marmaridou 2000:45).

It should already be obvious from the distinction between linguistic meaning on the one hand and encyclopaedic meaning as a property of concepts on the other that cognitive linguistics is at odds with two-level or dictionary approaches to meaning. In fact, both the generalisation commitment and the conceptualist approach entail that cognitive linguistics – or, more specifically, the subfield of cognitive semantics – adopts a one-level or encyclopaedic approach to word meaning. The most important criticism levelled by CL against the dictionary view is that drawing a distinction between the "core" meaning and

[8] Ziem (2008:117) makes a similar distinction between "modular" and "holistic" approaches to linguistic meaning.

the “non-core” meaning of a linguistic unit is inherently arbitrary and will probably never reach any intersubjective consensus (see Evans/Green 2006:211). To illustrate the problems that invariably arise when we attempt to make such a distinction, consider an example by Wierzbicka, one of the most prominent supporters of the dictionary approach to linguistic meaning. Wierzbicka (1985:40 ff.) discusses the meaning of the word *tiger* and claims that the information that a tiger usually has stripes is part of its dictionary meaning, whereas the information that a tiger is a cat is rather expert knowledge pertaining to the domain of zoology. This information should therefore be excluded from the word’s dictionary meaning and be assigned to the encyclopaedic level instead. We could now object that the immediate hypernym of a linguistic unit should certainly be part of the dictionary meaning of a linguistic unit. After all, the canonical Aristotelian definition starts from exactly this *genus proximum* before moving on to the *differentiae specificae*. For example, it would be strange to conclude that the information that a car is a kind of vehicle should be excluded from the dictionary meaning of *car*. Thus, even for trivial examples like tigers and cars, there seems to be considerable room for debate when we try to make any dictionary-encyclopaedia distinction. This lead Haiman (1980:331) to conclude that “the distinction between dictionaries and encyclopaedias is not only one that is practically impossible to make, but one that is fundamentally misconceived”.

In contrast, the encyclopaedic or one-level view of linguistic meaning claims that words do not have a clearly delimited essential or dictionary meaning but rather serve as ‘points of access’ to or ‘prompts’ for the rich conceptual structures which provide the main input for meaning construction (Evans/Green 2006:214). According to this view, speakers of a language do not have an autonomous mental lexicon in which purely linguistic knowledge is stored. Rather, there is only encyclopaedic knowledge, and the artificial construct of *dictionary knowledge* can, at best, be claimed to be an (idealized) subpart of this encyclopaedic knowledge (ibid.:216).

An objection that is often raised against an encyclopaedic view of meaning is that the potentially vast amount of information associated with a given word would form a disorganized chaos (Evans/Green 2006:216), making any sensible and well-structured statements about word meaning impossible. It is also claimed that an encyclopaedic approach overlooks the fact that some information is more relevant to the meaning of a word than others. For example, the size and shape of cats is certainly more essential to the meaning of *cat* than their cultural association with witchcraft and Halloween (Langacker

1987:159). CL counters this criticism by claiming that encyclopaedic meaning is structured in terms of the centrality that various information associated with a word exhibits with regard to the meaning of this word (ibid.). This centrality continuum reaches from the most central information, which can hardly be dissociated from the meaning of a certain word regardless of its context of use, to highly peripheral information that barely stands any chance of featuring in any description of the word's meaning. However, no point of this continuum can be chosen in a non-arbitrary way as a boundary between linguistic and extra-linguistic meaning.[9]

To take a translational perspective again, it seems that any clear-cut distinction between dictionary and encyclopaedic meaning as proposed by the dictionary account may be rather irrelevant for our purposes. After all, translation always operates on instances of real language use, where it is only the fully specified contextual (hence pragmatic or encyclopaedic) meaning that will ultimately be of importance. Depending on the specific context, even highly peripheral information about a lexical unit may be relevant in translation and hence nothing seems to be gained by insisting that such information pertains not to linguistic but to encyclopaedic knowledge. On the contrary, by rejecting this distinction, cognitive linguistics is forced (quite willingly) to account for such encyclopaedic and/or peripheral knowledge and has developed semantic accounts that have much more to say about this wider pool of encyclopaedic knowledge and the contextual saliency or centrality of different aspects of this knowledge in actual usage events, whereas dictionary approaches gladly hand over this responsibility to the field of pragmatics. Two such encyclopaedic cognitive semantic theories which are highly relevant to the present thesis will be presented in sections 4.5.3.1 and 4.5.3.2 below.

4.2.4 Schemas and instances

The terms *schema* and *instance* are two crucial notions in cognitive linguistics and are highly relevant to the theoretical conceptualization and empirical investigation of explicitation and implicitation. The two concepts basically describe a vertical relation holding between linguistic units (Taylor 2002:123). A schema is defined as "an 'abstract'

[9] According to Langacker (1987), the centrality or saliency of certain aspects of encyclopaedic knowledge to the linguistic meaning of a word correlates with the extent to which this knowledge is conventional, generic, intrinsic and characteristic. For a detailed discussion of these various types of knowledge, see Langacker (ibid.:159 ff.) and Evans/Green (2006:216 ff.)

or ‘course-grained’[sic!] representation *vis-à-vis* its more fully specified instances” (ibid.:591). A schema is instantiated or elaborated in more detail and in contrasting ways by its instances or, if viewed from the other direction, a schema can be said to abstract what is common to the instances (ibid.:124). According to Langacker (1987:132), a schema is abstract relative to its various elaborations because it provides less information and is compatible with a broader range of options. In line with the generalisation commitment, schema-instance relations in CL apply equally to semantic, phonological, and symbolic units (Taylor 2002:123). At the level of semantic units, a schema-instance relation would, for example, hold between the schema [TOOL] and its instances [HAMMER], [SAW], etc., yielding a well-known lexical hierarchy of hypernyms and hyponyms. However, cognitive linguistics does not use the terms *hypernym* and *hyponym* in this context because they are restricted to semantic relations. As mentioned above, a schema-instance relation can also hold between phonological and symbolic units and the concepts are also applicable to aspects of non-linguistic cognition, for example, visual perception (ibid.:124, 127). Of course, schema-instance relations are not absolute but relative, i.e., the instance [HAMMER] above is schematic for instances further down the hierarchy, such as [BALL-PEEN HAMMER], [CROSS-PEEN HAMMER], etc. The schema-instance relation also holds for verbal concepts, for example the verbal schema [DO] and its instances [REPAIR], [ASSEMBLE], [DISASSEMBLE], etc.

A further point that is important in this context is whether a given linguistic unit is richly specified or rather schematic in content. This distinction can be made for both the phonological and/or semantic poles of a symbolic unit and it can yield the following four combinations (ibid.:324 ff.):

(i) A unit is richly specified at both the phonological and the semantic poles (phonologically contentful + semantically contentful)

(ii) A unit is richly specified phonologically and semantically schematic (phonologically contentful + semantically schematic)

(iii) A unit is richly specified semantically and phonologically schematic (phonologically schematic + semantically contentful)

(iv) A unit is both phonologically and semantically schematic (phonologically schematic + semantically schematic)

These distinctions are represented in the following figure. I will restrict the discussion to configurations (i) and (ii) since these are the only ones with immediate relevance to the present thesis.[10]

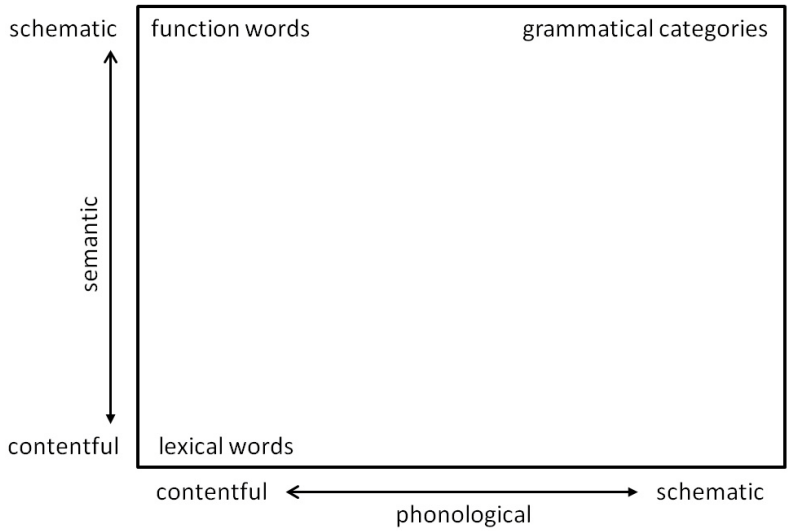

Figure 3: Contentfulness vs. schematicity of phonological and semantic structures[11]

According to this figure, units which are both phonologically and semantically richly specified would be lexical words, such as *motor*, *car*, *repair*, *assemble*, etc. However, as was shown above, contentfulness and schematicity are no absolute values but rather matters of degree (ibid.:324). For example, *sports car* would be semantically more specified than *car*, whereas *vehicle* would be semantically less specified or more semantically schematic. The same configuration would hold for phrasal or clausal expressions, whether these are established formulaic expressions or *ad hoc* constructed novel expressions. On the other hand, phonologically contentful and semantically schematic would be the majority of function words, such as the preposition *of* or the definite determiner *the*. The preposition *of* has a semantically very schematic meaning, in that it *profiles* (see 4.5.3.2 below) an inherent relation between two entities, where the major semantic input to this relation is provided by the two related entities. In the same vein, the definite determiner *the* is semantically highly schematic. It profiles a definite entity, the conceptual content of which is supplied by the noun combining with the determiner (ibid.:324-325).

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[10] For a full discussion of the contentfulness or schematicity of the semantic and phonological poles of symbolic units see Taylor (2002:324 ff.).

[11] The figure was taken from Taylor (2002:327).

The notions of *schema* and *instance* and the above described distinctions between *contentfulness* and *schematicity* will feature prominently in the cognitive linguistic discussion and investigation of explicitation and implicitation. While schema-instance relations describe the prototypical operating principle of explicitation/implicitation at the lexical level (for example, when a schematic source text unit is instantiated by a more specific target text unit), the notions of *contentfulness* and *schematicity* will serve to delineate explicitation and implicitation from an adjacent concept pair (more on this in 6.5.2).

4.3 A critical assessment of the cognitive linguistic approach to meaning

The conceptualist approach to linguistic meaning adopted by the CL framework is of course not uncontroversial and – as the language-world approach and the language-internal approach presented at the beginning of this chapter – is subject to various criticisms. Two major points of criticism need to be addressed here since the feasibility of a cognitive account of verbal communication and hence of a cognitive account of (scientific and technical) translation hinges on the ability of cognitive linguistics to convincingly counter these criticisms.[12] Both criticisms (and especially the second one) touch upon a fundamental issue in translation and human communication in general, namely that of the stability of meaning (see the discussions in 2.4.2, 3.1.2 and 5.4.2). Since the possibility of stable meaning is one of the central tenets of scientific and technical translation, cognitive linguistics' defence against these criticisms becomes all the more important in the context of the present thesis.

The first major criticism often raised against the conceptualist approach is that we do not have access to the content of other people's minds and cannot make any intersubjective, let alone theoretically sound, statements about it.[13] If, as cognitive linguistics claims, linguistic meaning is conceptual in nature and if concepts are mental entities which are located in people's minds, it follows that a linguistic analysis that would satisfy any intersubjective or scientific criteria is not possible (Taylor 2002:62; Busse 2012:789). This anti-mentalist stance is taken, for example, by the later Ludwig Wittgenstein (^{3}1978), who

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[12] For a more comprehensive discussion of the various objections raised by standard linguistic theory against a conceptualist approach to meaning see Taylor (2002:61 ff.). For a spirited defence of cognitive semantics against "its cultured despisers" see also Busse (2012:788 ff.).

[13] Sinha (1999:225) links this criticism to Hume's philosophical Problem of Other Minds.

famously claimed that the meaning of a word is not a concept in the mind of a language user but rather the rules for the use of the word[14] (Taylor 2002:63; Busse 2012:791). The advantage of equating the meaning of a word with the rules for its use seems obvious. The use of a word is publicly observable and hence open to objective or intersubjective investigation, the inherently subjective mental representation that a word evokes is not. Taylor (2002:64) objects that although words have a correct (and publicly observable) use, this does not render a conceptualist approach to meaning unnecessary since we still need to answer the question of what the criteria for judging the correct usage of a word are and how speakers of a language come to acquire these criteria (ibid.). More specifically, cognitive linguistics claims that while the use of a word is a publicly observable phenomenon, the rules of its use are normally no more public than the much-criticized concepts. For cognitive linguistics, it follows that these rules of use are also located in people's minds, i.e., when evaluating the use of a word as a publicly observable phenomenon, we make use of knowledge that is normally not publicly observable but is rather entertained at the mental level. As Taylor (ibid.:64) puts it, "[t]o eliminate concepts in the head [from the characterization of linguistic meaning] does not remove the need to describe the mental structures that condition the use of a word".

The second criticism, which is more immediately relevant to the epistemological commitments of the present thesis, is related to the anti-mentalist critique just outlined and raises the difficult question of how cognitive linguistics explains the perceived stability of human communication (Taylor 2002:65 ff.). This communication is taken to be based on signs or linguistic units, the meanings of which are, according to cognitive linguistics, conceptual in nature. However, since concepts are not available for public investigation (see the first criticism above), we cannot be sure that different speakers associate the same concepts with the same forms or, in other words, that they share the same linguistic code. Firstly, cognitive linguistics rejects the idea that human communication requires a fixed code that is stored in identical form in the minds of all language users. In this context, Taylor (ibid.:65-66) points out that, for example, adults and young children, native speakers of a language and foreign learners will certainly not share an identical sign system but are still able to communicate with each other. According to Langacker (1987:376), the

[14] Quine (1987:130) basically takes the same position as Wittgenstein when he claims that "there is no more to the meaning of an expression than the overt use that we make of the expression" (see also Taylor 2002:63).

differences in the sign systems of different speakers "[do] not preclude effective communication since this requires little more than substantial overlap from one speaker to the next".[15] Also, from the generally accepted idea of linguistic underdeterminacy and the commitment made by CL to an encyclopaedic approach to meaning, it follows that a linguistic code is only one factor (albeit a very important one) in successful communication. Secondly, while we cannot know for certain what goes on in another person's mind, cognitive linguistics claims that we have a *theory of mind* (Gordon 1999:838) based on which we can assume that other people's mental experience is similar to our own (Taylor 2002:67) and which gives us the ability to attribute certain beliefs, intentions, knowledge, etc. to them.

The theory of mind is a vast field that cannot be properly traced here in detail. Still, considering its relevance to the stability of communication and meaning in the cognitive linguistic framework (and ultimately in accounts of translation based on this framework), I will give a brief sketch of the two major (sub-)theories. In the literature on the theory of mind, two major approaches are contrasted with each other: The *theory theory* of mind basically states that humans have a naive psychological theory (or a "folk" psychological theory) based on which they assign mental states to others (Goldman 2006:4). On the other hand, the *simulation theory* of mind denies that humans possess such a veritable theory that guides the assignment of mental states. Alternatively, simulation theory holds that humans represent the mental states of others by mentally simulating these states, i.e. by generating comparable mental states in themselves or by "putting oneself in the other's place" (Gordon 1999:766).[16] For the purpose of this thesis, we can remain agnostic as to the different fine-grained arguments in favour of or against the two (sub-)theories and appeal to the idea of theory of mind in general as an important device for the stabilization of human communication. As Langacker (2008:500) puts it in the context of cognitive linguistics:

> An essential aspect of cognition is our awareness of other people and our recognition that they, too, are cognitive agents. We are quite adept at reading their intentions, as well as imagining the nature of their mental experience. Thus cognition, far from being isulated[sic!] from the world and the other people in it, is our primary means of engaging them.

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[15] A similar point from a translational perspective is made by Albrecht (2005:272).

[16] Baron-Cohen (e.g. 1995) also refers to the ability associated with the theory of mind as *mindreading*.

The theory of mind therefore seems to constitute an important theoretical tool for invalidating the general anti-mentalist criticism raised against cognitive linguistics. For, if both the production and the reception of utterances are guided by a theory of mind[17], there seems to be a powerful coordination device at work that provides substantial stability at the conceptual level, possibly enough stability to make it open for intersubjective debate and to serve as the basis for a sound theory of the stability of linguistic meaning. Of course, the conceptual content we associate with a word may vary from one person to the next. This is licensed by the cognitive linguistic claim that words provide points of access for a vast pool of encyclopaedic knowledge, which may or may not be relevant in specific usage events. However, when we communicate on the basis of our concepts in the public domain, a theory-of-mind driven adjustment process takes place which ensures that we coordinate the conceptual knowledge that we intend to evoke using our utterances with the conceptual knowledge that we can reasonably assume our interlocutors to have.[18]

The concept of theory of mind is also implicit in the different communicative configurations in scientific and technical discourse discussed in 2.7.1.2, where the expert initiator of the communication will make specific assumptions about the mental states of his/her intended (expert, semi-expert or layperson) audience and will select both the content to be communicated and its form according to these assumptions (see 4.5.2 and 5.1.1). It may also inform explicitation or implicitation decisions made by a translator who will have to make informed assumptions about the mental states of the intended target text audience (see 5.1.2 and the discussion of results in chapter 8).

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[17] This means that we usually tailor our verbalization of an utterance to the mental state we attribute to our interlocutors, so that they can optimally work out the conceptualization we have in mind; in turn, these interlocutors interpret this verbalization by taking into consideration the mental state they attribute to us (by trying to work out the conceptualization that they think we had in mind).

[18] Wierzbicka (1985:115) illustrates this fact with an easily comprehensible example: A bicycle mechanic will know much more about bicycles than a layperson, because s/he has acquired expert knowledge about bicycles and therefore certainly entertains a much richer concept of bicycles (i.e., s/he possesses much more encyclopaedic information about bicycles). If this expert talks to a layperson, s/he will use the term *bicycle* not based on his/her specialist concept but on the concept that s/he attributes to the layperson interlocutor. This is basically the communicative principle underlying expert-to-layperson communication discussed in 2.7.1.2.

4.4 Cognitive linguistics and linguistic relativism

A further important aspect with regard to the present thesis is the notion of linguistic relativism and the cognitive linguistic view concerning this issue. This question is first and foremost of interest to the issue of invariance of meaning in scientific and technical translation (see 2.4.3) since it is concerned with how much conceptual identity or congruency there can be in STT when structurally different languages intrude in a significant way in human concept formation (see 2.4.3 and 5.5). It is also relevant to the more specific concepts of explicitation and implicitation to be investigated in this thesis since these concepts refer to meanings which are absent in the source text and present in the target text and vice versa. If those meanings were tightly bound to the respective language system, they would be incommensurable and the whole enterprise of investigating explicitation and implicitation would be doomed to fail right from the start.

According to linguistic relativism, the concepts that are symbolized in a given language are not founded in any universal aspects of human cognition but are rather products of the language system itself (Taylor 2002:55). The most current and also the most forceful expression of this view is the Sapir-Whorf hypothesis, named after the two American linguists Edward Sapir and Benjamin Lee Whorf. The hypothesis consists of two parts: *linguistic determinism* and *linguistic relativity* (Evans/Green 2006:96).[19] According to linguistic determinism, non-linguistic thought is determined by language. Following from this, the idea of linguistic relativity claims that because language exercises a determining influence on thought, speakers of different languages will also think differently. The basic claim of the Sapir-Whorf hypothesis is summarized in the following quote from Whorf (1956:213):

> We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impressions which has to be organised by our minds – and this means largely by the linguistic systems in our minds.

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[19] Scarpa (2002:34) claims that linguistic determinism represents the strong version of the Sapir-Whorf hypothesis, whereas linguistic relativity represents the weak version. This interpretation is inadmissible. Determinism and relativity are two components of the Sapir-Whorf hypothesis (where relativity follows from determinism), and it is the hypothesis as a whole (together with its components determinism and relativity) that is postulated in a strong and in a weak version.

The idea of dissecting nature along certain lines is reminiscent of Plato's metaphor of conceptual systems carving nature at its joints (see 3.1.1). Recall that in objectivist metaphysics, the possible joints to carve at (or the lines along which to dissect nature) are already given by the objectively prestructured world, and human cognition and language only have to reflect this preexisting structure. Whorf rejects such a prestructured world, which "stares every observer in the face", claiming instead that we are presented with an inherently unstructured "kaleidoscopic flux of impressions".[20] According to Whorf, then, the joints or dissecting lines of nature are not out there in the world but rather imposed upon nature by the structure of human linguistic systems (which is closer to a subjectivist metaphysics and epistemology). The Sapir-Whorf hypothesis basically comes in two versions, a weak and a strong one. The strong version holds that language entirely determines non-linguistic thought and, as a consequence, speakers of a language only have access to those cognitive categories that are reflected by the linguistic categories of their language. It follows that speakers of different languages (especially languages with markedly different grammatical systems and lexicons) will have a fundamentally different understanding of the world and thus possess little to no shared ground to draw on in communication. The weak version, on the other hand, claims that the structure of different languages may influence – instead of determine – certain cognitive processes of the speakers of these languages because the structure of a language determines the way that information is "packaged" (Evans/Green 2006:96).

The strong version of linguistic relativism is generally held to be untenable today, specifically for two reasons. First, there is empirical evidence, especially from research on basic colour terms, which undermines the claim that thought is entirely determined by language.[21] The second reason is the simple fact that we can learn a foreign language to a

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[20] This view was also held by Saussure, who claimed that thought is an inherently unstructured and shapeless mass which can only form concepts through the intervention of linguistic systems (see Taylor 2002:53-54). It is also present in lexical field theory, according to which it is the lexical fields themselves which provide cognitive structure to an otherwise unstructured and amorphous human experience of the world (Linke et al. [5]2004:174).

[21] For example, there are experiments in which test subjects whose native language has only lexicalized two basic colour terms exhibited a high cognitive performance with regard to non-lexicalized focal colours (Evans/Green 2006:97, reporting on research by Heider 1972 and Rosch 1975, 1978). This high cognitive performance with regard to non-lexicalized focal colours is generally interpreted as evidence against strong

reasonably high degree (Hatim/Mason 1990:29-30) and the acquisition of competence in such a language is not restricted to its lexical and grammatical features but also extends to the foreign perspectives encoded in the language. In other words, we seem to be able to perceive, to trace and to reflect on the structural asymmetries of languages and to compare these differences on a metalinguistic level. If strong determinism was correct, we would be prisoners of our own linguistic categories and would have to remain completely agnostic as to cognitive capabilities reflected in other languages.

On the other hand, there seems to exist a rather wide consensus on the plausibility of the weak version of linguistic relativism (e.g. Jumpelt 1961:31; Linke et al. [5]2004:380; Arntz et al. [6]2009:39) and there is also empirical evidence supporting this view.[22] Accordingly, Evans/Green (2006:99) assume that instead of a full linguistic determination of non-linguistic thought, "different 'choices' of language for representing concepts can indeed affect non-linguistic thought such as reasoning and problem-solving."

In line with this view, cognitive linguistics subscribes to a weak version of the Sapir-Whorf hypothesis and linguistic relativism, according to which language is seen as a shaper – instead of a determiner – of thought which facilitates the human conceptualizing processes (Evans/Green 2006:98). According to cognitive linguistics, humans, in virtue of their shared embodiment, possess a universal "conceptualizing capacity" which takes "preconceptual structures of experiences [e.g. imagistic and basic-level structure] as input and use[s] them to motivate concepts that accord with those preconceptual structures" (Lakoff 1987:303). This universal conceptualizing capacity can then give rise to different conceptual systems which may be equally good at representing certain phenomena. Lakoff (ibid.:310) illustrates this conceptualizing capacity and the different conceptual systems it can motivate with the concept FRONT, which has its roots in shape of the human body. When you are looking at a bush, the front of the bush will be the side facing you, whereas in the African Hausa language, the front would be the side facing away from you, i.e. the side facing the same direction you are facing. Both conceptual choices would be licensed by human experience and are therefore equally valid. Given our universal conceptualizing capacity, we can comprehend both conceptual systems and compare them with regard to

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relativity since if language would indeed entirely determine thought, the test subjects' cognitive performance would presumably have been tied to the two lexicalized colour concepts.

[22] See especially the influential experiment by Gentner/Gentner (1982) and the discussion and interpretation of this experiment from a cognitive linguistic perspective (Evans/Green 2006:98-99).

their commonalities and differences.[23] However, while we can *understand* conceptualizations encoded in languages different from our own, this is not to say that we can render these conceptualizations and the perspectives they entail in any straightforward way in our own language, which may not provide the necessary grammatical or lexical means to do so. The consequences of this insight and of the general cognitive linguistic view on linguistic relativity for scientific and technical translation and for the feasibility of investigations of explicitation and implicitation in translation will be discussed in more detail in the next chapter.

4.5 Theoretical components of the CL framework relevant to the present study

After the macroscopic survey of the field of cognitive linguistics, which was necessary to sketch the general linguistic foundation of the present thesis, we will now focus on specific theoretical components of the cognitive linguistic framework that are immediately applicable and relevant to a cognitive linguistic account of scientific and technical translation and explicitation and implicitation. The notion of *linguistic construal* is particularly relevant to modelling linguistic aspects of scientific and technical translation (explicitation and implicitation being among them) from a cognitively plausible perspective. The concept of *common ground* is concerned with modelling the specialized knowledge of specific discourse communities and *cognitive semantics* provides a toolset for modelling knowledge organization in communication (and hence also in translation). The three components will now be illustrated in detail.

4.5.1 Linguistic construal

In cognitive linguistics, linguistic meaning is seen as involving two components, a particular *conceptual content* and a specific way of *construing* this content; here *construal* refers to "our manifest ability to conceive and portray the same situation in alternate ways" (Langacker 2008:43). The notion of construal is an important element of the CL framework and serves to differentiate it from truth-conditional semantics and the underlying objectivist paradigm. We have seen in the discussion of the language-world approach to linguistic meaning in 4.1 that truth-conditional semantics judges sentences

[23] This universal conceptualizing capacity would therefore ensure the principled commensurability of different languages, which is often questioned by approaches to translation standing in the wider subjectivist tradition (see Siever 2010:66).

such as *Someone stole her diamonds from the Princess* and *The Princess was robbed of her diamonds* to be equal in meaning since they describe the same "state of affairs". In this context, Sinha (1999:226) rightly criticizes that truth-conditional semantics works with "uninterpreted" states of affairs, thus leaving the issue of conceptualization out of the picture. However, from the embodied realist grounding of cognitive linguistics follows the inescapable perspectivation of all human conceptualizations of certain states of affairs (in the absence of any God's Eye perspective available to us). This perspectivation is captured by the notion of *linguistic construal*.

Langacker (2008:55) compares the conceptual content to a scene[24] and the construal of this content to a particular way of viewing this scene. He gives the example of a glass of water in which the water occupies about half of the volume of the glass (ibid.:43-44). According to Langacker, this content (i.e. a glass half-filled with water) can be evoked in a rather neutral way at the conceptual level (which follows from the relative independence of language and thought in accordance with weak relativity). If, however, this conceptual content is to be linguistically encoded, a certain construal is necessarily imposed. For example, *the glass with water in it* would highlight the container of the water, whereas *the water in the glass* would highlight the liquid inside the container.[25] Langacker (ibid.) stresses in this context that there is no clear-cut distinction between conceptual content and the construal of this content but that these two aspects are intrinsically related; for example, the more specific construal *the glass with water in it* may evoke more content than the more abstract construal *the container with liquid in it* (in the second example, contextual input would be required to arrive at the more specific construal). As already mentioned, cognitive linguists reject the view of language as an autonomous cognitive faculty but instead claim that it is based on the same cognitive abilities that humans demonstrate outside the realm of language. In line with the cognitive commitment, the linguistic construal processes proposed in cognitive linguistics are therefore derived from

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[24] The notion of *scene* is used in a pretheoretical sense here and is not to be confused with the scene concept in the early work of Fillmore (see the discussion in 4.5.3.1).

[25] A cross-linguistic example of the different construal of basically the same conceptual content is given by Dirven/Verspoor (1998:15), who discuss the example *horse-shoe*, *fer à cheval* and *Hufeisen*. While the English and French construals highlight the relationship between the whole animal and the protecting device, German focuses on the relevant body part of the animal. Also, French and German highlight the material of the device, whereas the English *shoe* "takes an anthropocentric view of the scene" (ibid.).

general cognitive processes established, for example, by cognitive psychology (Halverson 2007:113; Langacker 2008:45), thus ensuring the cognitive plausibility of this account.

In the following paragraphs, I will present two influential models of linguistic construal operations developed in cognitive linguistics. The model proposed by Langacker (2008) builds on the original account of linguistic construal developed by the same author (Langacker 1987)[26] and provides a straightforward and intuitively appealing classification of different construal operations. Croft and Cruse (2004) review Langacker's original model, Talmy's (2000) model of imaging systems as well as Johnson's (1987) account of image schemas and develop a holistic model that tries to integrate these various previous approaches. Both of these models are far to extensive to be surveyed here in detail; therefore, their description will remain at a rather general level. The two models will be revisited in 6.5.1, where I will isolate specific construal operations in the two models that can be used to model the phenomena of explicitation and implicitation from a cognitive linguistic perspective.

4.5.1.1 Langacker's model of linguistic construal operations

Using the metaphor of visual perception, Langacker (2008:55 ff.) compares the construal of a particular conceptual content to the viewing of a scene (see above) and divides this process into four major steps: "In viewing a scene, what we actually see depends on how closely we examine it, what we choose to look at, which elements we pay most attention to, and where we view it from" (ibid.:55). Accordingly, he distinguishes between the following four major construal operations:

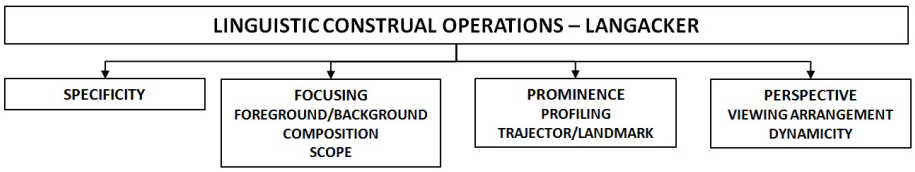

Figure 4: Langacker's model of linguistic construal operations

In this model, *specificity* refers to "the level of precision and detail at which a situation is characterised" (ibid.:55). This construal operation is of immediate relevance to the present

[26] In his original account, Langacker used the possibly misleading and – in his own words – "somewhat idiosyncratic" term *imagery* to describe the phenomenon that a given situation can be mentally and linguistically construed in different ways (1987:110). He later acknowledged this unfortunate choice of terminology and changed it to the more transparent term *construal* (2008:43).

thesis and will be taken up again in 6.5.1 and in the discussion of the results of the empirical investigation of explicitation and implicitation in chapter 8. The construal operation of *focusing* involves "the selection of conceptual content for linguistic presentation, as well as its arrangement into […] foreground vs. background" (ibid.:57, boldface removed). This linguistic foreground-background arrangement identified by Langacker exhibits a direct connection with the general cognitive principle of figure-ground segregation established by Gestalt psychology[27] (Tabakowska 1993:47; Evans/Green 2006:65). It is therefore a good illustration of cognitive linguistics' commitment to cognitive plausibility in explaining linguistic phenomena. The construal operation of *prominence* is concerned with the relative saliency of various aspects of a structure foregrounded in the process of focusing (ibid.:66), and *perspective* describes the vantage point from which a given scene is viewed (ibid.:73). This last construal operation is associated with the general aspect of perspectivation inherent in the philosophy of embodied realism.

4.5.1.2 Croft and Cruse's model of linguistic construal operations

Croft and Cruse (2004:46 ff.) also group their linguistic construal operations under four main headings; however, since the authors adopt a more encompassing approach, their model contains a finer sub-classification than the one proposed by Langacker:

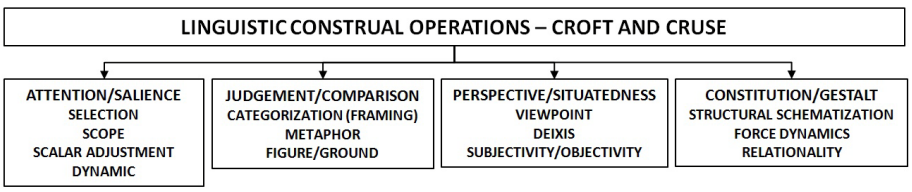

Figure 5: Croft and Cruse's model of linguistic construal operations

In this model, *attention/salience* refers to a gradable process which is comparable to Chafe's (1994:26-30) concept of *focus of consciousness* (Croft/Cruse 2004:46). The construal operations under this heading have considerable overlaps with Langacker's notions of *specificity*, *focusing* and *prominence*. *Judgement/comparison* is based on the

[27] Gestalt psychology is a psychological movement emerging at the end of the 19th century which is interested in "the principles that allow unconscious perceptual mechanisms to construct wholes or gestalts out of incomplete perceptual input" Evans (2007:90). For an overview of the different principles established by Gestalt psychology (for example, the principle of figure-ground segregation, the principle of proximity or the principle of continuity) see Evans/Green (2006:65 ff.).

Kantian concept of *Urteilskraft* (ibid.:54) and roughly covers the human ability to categorize, i.e. to grasp what is common to different experiences and to group them together in one conceptual category. The construal operations involved here do not have a straightforward counterpart in Langacker's model (except for figure-ground segregation, which is a recurring theme in his model). The general idea of *Judgement/comparison* will be briefly taken up again in the discussion of invariance of meaning in scientific and technical translation in chapter 5.5. *Perspective/situatedness* goes back to Heidegger's notion of *Being-in-the-world* (Heidegger [15]1979) and accounts for the fact that, as humans, we are never objective observers dissociated from a situation, but instead we are always participants in a situation and have to construe it from a certain perspective (Croft/Cruse 2004:58-59).[28] This concept is in line with the general discussion of the inescapable perspectivation involved in linguistic construal and therefore has strong overlaps with Langacker's construal operation of *perspective*. It also provides a link between linguistic construal and the notion of *common ground* to be discussed in the next section. Finally, the concept of *constitution/gestalt* refers to "the conceptualization of the very structure of the entities in a scene" (ibid.:63) and is linked to Gestalt psychology and phenomenology. This concept also lacks a straightforward counterpart in Langacker's classification.

4.5.2 Common ground

The category *perspective/situatedness* in Croft/Cruse's model of linguistic construal operations contains the subcategory *deixis*, in which the authors introduce the notion of *epistemic perspective*. This perspective situates the speaker and the hearer in a given communicative context with reference to "the shared knowledge, belief and attitudes of the interlocutors" (ibid.:60). Croft/Cruse link this notion of epistemic perspective to the concept of *common ground*, which is widely used in CL to model the shared knowledge underlying communication within a given discourse community (e.g. Taylor 2002:346; Langacker 2008:466). Common ground can thus be directly linked to the classification of scientific and technical texts proposed in 2.7 since it provides a way of making statements about the different communicative configurations and the respective knowledge requirements in scientific and technical discourse from a cognitive linguistic perspective.

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[28] This is also consonant with the embodied realist rejection of a God's eye perspective on the world (see 3.2.4).

The common ground concept was originally introduced in theoretical discourse by Stalnaker (2002:151, see also Clark 1996:93) but the major theoretical contribution to the concept is generally attributed to Clark (1996). Clark (ibid.:93) defines the common ground between two people as "the sum of their mutual, common or joint knowledge, beliefs and suppositions". He further distinguishes between three representations of common ground, which are *CG-shared*, *CG-reflexive* and *CG iterated* (ibid.:94-95) and argues for CG-shared as the psychologically most plausible and most fundamental concept to be theoretically elaborated further.[29] The concept of CG-shared assumes a shared basis between two or more interlocutors "for the piece of common ground that some proposition *p* holds" (ibid.:94). The concept of CG-shared is formally represented as follows (ibid.):

p [a certain piece of knowledge or information] is common ground for members of community C [e.g. a speaker and a hearer] if and only if:

1. every member of C has information that basis *b* holds;

2. *b* indicates to every member of C that every member of C has information that *b* holds;

3. *b* indicates to members of C that *p*.

This very abstract description of common ground becomes clearer if it is applied to a real-life example. Suppose that *p* refers to the location of the piston in a petrol engine, and the community C includes two engineers who discuss sulphur deposits on pistons. In order for the two engineers to assume that the location of the piston is common ground between them, they will look for a certain shared basis *b* that will justify this assumption. This search for a shared basis for an assumed piece of common ground is what Clark (ibid.:96) calls the "principle of justification":

In practice, people take a proposition to be common ground in a community only when they believe they have a proper shared basis for the proposition in that community.

In general, there are various potential shared bases for a piece of common ground, and these will normally differ in how strongly they justify the relevant piece of common ground. This in turn is what Clark (ibid.:98) calls "quality of evidence", which can be used

[29] The notion of CG-iterated actually represents a prior representation of common ground that had to be discarded because of its cognitive implausibility (Sperber/Wilson ^{2}1995:16 ff.; Clark 1996:96). The representation would look like this: A knows that B knows X. B knows that A knows that B knows X. A knows that B knows that A knows that B knows X, and so on *ad infinitum*.

to "rank" potential shared bases according to their strength of justification. A high-quality piece of evidence may be the physical co-presence of the two engineers working on a disassembled engine in which the piston location is clearly visible. The formal representation of CG-shared[30] may thus look like this:

1. every member of C [both engineers] has the information that *b* [physical co-presence in the vicinity of a disassembled engine, piston location clearly visible] holds;

2. *b* [physical co-presence] indicates to every member of C [both engineers] that every member of C has information that *b* holds;

3. *b* indicates to members of C that p [location of the piston in a petrol engine].

Therefore, by making reference to a shared basis and ranking this basis according to its quality of evidence, we can assume, in communication, that a given piece of information known to us will also be known to our interlocutor(s) and is thus common ground between us. Linking the common ground concept to the idea of *theory of mind* illustrated in 4.3, we could say that by virtue of such high-quality shared bases, we can attribute very specific mental states to our interlocutor(s), for example the mental state of knowing a piece of information that is known to us as well.[31]

After this formal elaboration of his common ground concept, Clark goes on to distinguish two types of common ground, namely *communal common ground* and *personal common ground* (ibid.:100 ff.). What is important to the present discussion is primarily the notion of communal common ground. This type of common ground is closely linked to the notion of *cultural communities*, which are "set[s] of people with a shared expertise that other communities lack" (ibid.:102). According to Clark (ibid.), it is constitutive of such a community that there is a "shared system of beliefs, practices, nomenclature, conventions, values, skills, and knowledge" about a certain set of phenomena. Examples of the bases of shared expertise that binds a cultural community together are nationality, residence, education, occupation, employment, etc. (ibid.:103). Applied to the above example of the

[30] Note how the cognitively implausibly process of iterated knowledge attribution (CG-iterated) is avoided in CG-shared by making reference to an external shared basis that can be ranked according to its quality of evidence for the existence of a given piece of common ground.

[31] Clark himself (1996:111) seems to establish an implicit connection between his common ground concept and the theory of mind when he claims that "we [...] have an intuitive feeling about what others know, which we might call *feeling of others knowing* [...]".

two engineers, the fact that both of them had a similar university education or that they are employed by the same company and deal with petrol engines on a regular basis (and are therefore members of a common cultural community) could serve as further bases for the assumption that the piston location is a piece of common ground between them (which would probably need to be invoked if they were not physically co-present[32] in the vicinity of the piston).

The common ground concept can thus be used to model the shared knowledge of a specific discourse community and, therefore, provides a link between the conceptual and the social dimensions of knowledge. Furthermore, as mentioned at the beginning of this section, it is not difficult to establish a connection between Clark's notions of communal common ground, cultural community and shared expertise and the three-dimensional classification of scientific and technical texts proposed in 2.7. Both the different communicative configurations and the different degrees of technicality of scientific and technical texts proposed in this classification basically reflect different configurations of communal common ground between the authors and readers of such texts. In the present thesis, the common ground concept will have a two-fold application. Firstly, as described above, it will be used to model the shared knowledge underlying texts with different degrees of technicality. Secondly, it will be understood as the intersection of individual knowledge contexts (for example, the knowledge contexts of authors and readers of scientific and technical texts) and, as such, will serve as one dimension of context responsible for the relative saliency or centrality of encyclopaedic information in a given stretch of discourse (see 5.3). The actual organization of the knowledge underlying the discourse of specific discourse communities in the form of common ground between the discourse participants is modelled within cognitive semantics, to which we turn next.

4.5.3 Cognitive semantics

Cognitive semantics is a very important component of the cognitive linguistic framework because it provides the basis for a symbolic account of grammar (see 4.2.1). In line with the encyclopaedic approach to linguistic meaning adopted by CL, it is concerned with the organization of knowledge configurations underlying overtly encoded textual structures in

[32] Physical co-presence is actually subsumed under personal common ground by Clark (1996:112). However, for written communication, e.g. in the form of scientific and technical translation, it is the communal common ground that is of primary importance.

actual discourse and may thus provide tools for modelling the implicit aspect of communication that is necessarily invoked in any study of explicitation and implicitation.[33] Similar to the superordinate field of cognitive linguistics, cognitive semantics is not a unified theory but rather a cover term for various more specific approaches to semantics which share a number of common principles or assumptions. Evans/Green (2006:157 ff.) identify four of these guiding principles or central assumptions, two of which can be readily linked to the discussion so far.

The first principle holds that conceptual structure, which, according to the conceptualist approach, is the structure manifested in linguistic meaning, is embodied. This idea follows directly from the discussion of embodied cognition in 3.2.3 and does not need to be further discussed here. The second assumption is that semantic structure is conceptual structure (again, this follows from the conceptualist approach to meaning). Semantic structure is understood as the meanings which are conventionally associated with words or other linguistic units and can be equated with linguistic or lexical concepts. However, semantic structure is not identical with conceptual structure. Instead, cognitive linguistics claims that lexical concepts are just a subset of all possible concepts that humans can entertain.[34] If a non-linguistic concept becomes in any way important enough that it has to be communicated on a regular basis, this concept will usually become lexicalized as a new component of semantic structure (see Cruse [3]2011:174). However, the semantic structure of a given language encodes a certain conventionalized and possibly language-specific perspective of conceptual structure in the form of so-called "default construals" (Croft/Cruse 2004:72). It is also important to note that semantic structure, in a cognitive linguistic account, does not only relate to open-class units such as nouns, verbs and adjectives but also to closed-class units, such as bound morphemes or larger patterns such as the structure of active or passive sentences. This principle can both be related to the symbolic character of grammar discussed in 4.2.1 and to the discussion of the relative semantic contentfulness or schematicity of symbolic units in 4.2.4. The third assumption

[33] According to León Araúz et al. (2012:174), cognitive semantics is concerned with the two main fields of *meaning construction* and *knowledge representation*, which are both related to the conceptualist and the encyclopaedic approach to meaning. The focus of the current discussion will be on the cognitive semantic means of knowledge representation.

[34] Note how this contrasts with strong linguistic determinism, according to which semantic structure would indeed be identical to conceptual structure.

holds that meaning representation is encyclopaedic in nature and follows directly from the corresponding approach to meaning adopted by cognitive linguistics and from the rejection of dictionary accounts of meaning. The two cognitive semantic theories presented in the following sections have developed specific tools for modelling these encyclopaedic knowledge structures that are accessed in actual discourse. The fourth and last guiding principle shared by the different cognitive semantic approaches is the view that meaning construction is conceptualization, with *conceptualization* being understood here as "a dynamic process whereby linguistic units serve as prompts for an array of conceptual operations and the recruitment of background knowledge" (Evans/Green 2006:162). The idea of meaning construction as conceptualization has already been discussed in connection with the conceptualist approach to linguistic meaning in section 4.1.

In the following sections, I will provide an overview of Fillmore's frame semantics and Langacker's theory of domains, these being the two most influential cognitive semantic theories in the CL framework. The focus of this thesis will be on the theory of domains since this theory seems to provide a more fine-grained, flexible and dynamic toolset for modelling knowledge organization in discourse. Also, this theory seems to be better suited to model the explicitness-implicitness divide which will necessarily be evoked in studies on explicitation and implicitation (see 6.4.1). I decided to include frame semantics in the present discussion for the following reasons: a) it is the better-known theory outside the immediate field of cognitive linguistics; b) an earlier version of frame semantics is widely applied in translation studies, whereas the theory of domains is virtually absent from our discipline (but see Tabakowska 1993); c) despite the higher granularity and dynamicity of the theory of domains, both theories are highly complementary on a general level and are often used interchangeably in cognitive linguistics.

4.5.3.1 Frame semantics

Fillmore's *frame semantics* is the earliest semantic theory which systematically followed an encyclopaedic approach to linguistic meaning. Although Fillmore developed his theory outside the main paradigm of cognitive linguistics centred on Langacker's Cognitive Grammar[35], it has still been highly influential in the overall CL framework. Also,

[35] For example, Fillmore is not concerned in any way with the embodiment of conceptual structure, which is one of the guiding principles of mainstream cognitive linguistics identified above and which links cognitive linguistics with embodied realism.

Fillmore's work is not unknown in translation studies (e.g. Kußmaul [2]2010); however, it has only been incorporated in a very cursory and incomplete way. With his encyclopaedic, frame-semantic approach, Fillmore established a *semantics of understanding*, or *U-semantics*, that stood in direct opposition to *truth-conditional semantics*, or *T-semantics* (Croft/Cruse 2004:8; Albrecht 2005:225). This semantics of understanding was intended to go beyond the impoverished and theory-driven account of linguistic meaning postulated by T-semantics and, instead, aimed to provide a semantic model that could explain "the full, rich understanding that a speaker intends to convey in a text and that a hearer constructs for that text" (Croft/Cruse 2004:8). To this end, the semantics of understanding incorporated various phenomena which were traditionally excluded from semantic theories and instead assigned to the realm of pragmatics (Albrecht 2005:225, see also the discussion in 4.2.3).

In the current cognitive linguistic literature, a semantic frame is generally defined as a knowledge structure which is required in order to understand a particular word or a related set of words (Evans 2007:192). In the early work of Fillmore, however, the frame concept did not exhibit any significant cognitive dimension but was rather tied to specific linguistic features (hence the early designation *syntactic frames*).[36] This narrow notion of *frame* was then expanded in the form of *case frames*, which were used to model the semantic valence of verbs. The transition phase between a narrow linguistic conception of frames and the much more encompassing definition given at the beginning of this section was characterized by Fillmore's *scenes and frames semantics*, which is the only part of his *oevre* that has found its way into translation studies.[37] In this framework, frames still retain their linguistic status, but they are now related to *scenes*, which include

> [...] not only visual scenes but also familiar kinds of interpersonal transactions, standard scenarios defined by the culture, institutional structures, enactive experiences, body image, and, in general, any kind of coherent segment of human beliefs, actions, experiences or imaginings. (Fillmore 1975:124)

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[36] For an overview of the development of the *frame* concept in frame semantics see Fillmore ([2]2006).

[37] Indeed, it is striking that *scenes and frames semantics*, which was only a short intermezzo in the theoretical work of Fillmore (see Busse 2012:25), has found such a widespread application in translation studies (e.g. Vannerem/Snell-Hornby [2]1994; Kußmaul [2]2010), while the current state of his work (i.e. frame semantics) has been largely ignored. Still, many introductions to the field of translation studies mention only scenes and frames semantics when illustrating the *cognitive turn* in the discipline (e.g. Albrecht 2005:225; Prunč 2007:186; Stolze [6]2011:170).

Therefore, with scenes and frames semantics, the encyclopaedic knowledge which is necessary for the full understanding of linguistic structures is explicitly introduced in Fillmore's theory but it is not yet assigned to the (still linguistically tied) frame concept but rather to the notion of *scene* (see also Busse 2012:57). Later, Fillmore gave up the distinction between linguistic frames and cognitive scenes (Busse 2012:94) and finally raised the frame concept from linguistic to cognitive status. A frame in its current form is then understood as

> [...] any system of concepts related in such a way that to understand any one of them you have to understand the whole structure in which it fits [...]. (Fillmore 1982:111)

The most popular example used to illustrate this cognitive notion of frame is that of a *commercial transaction/event frame*, which is linked to a set of semantically related verbs, such as *buy*, *sell*, *pay*, *spend*, *cost*, as well as related nominal concepts, such as BUYER, SELLER, GOODS, etc. (Evans/Green 2006:225 ff.). With reference to Fillmore's definition of *frame* above, if we want to have a full understanding of the meaning of any of the elements above, we need the full background knowledge of the *commercial transaction frame*.[38]

4.5.3.2 Theory of domains

As already mentioned above, the theory of domains shows several parallels to Fillmore's frame semantics and complements this theory in various ways. Langacker developed his theory of domains as a semantic basis for his Cognitive Grammar (Evans/Green 2006:206). A domain is defined as "any knowledge configuration which provides the context for the conceptualization of a semantic unit" (Taylor 2002:196) or simply as "[a] context for the characterization of a semantic unit" (Langacker 1987:147). The function of a domain is thus to provide background information which serves as the basis for understanding and using lexical concepts (Evans/Green 2006:230). In contrast to Fillmore's frame semantics, which focuses primarily on establishing relations between a set of lexical concepts (for example in the *commercial transaction frame*), Langacker's theory of domains is more concerned with modelling the internal structure of single lexical concepts. For example, the expression *glass* used in its ordinary sense as a container for drinking may evoke domains such as SHAPE [cylindrical, closed at one end], MATERIAL [usually the substance glass],

[38] This prototypical example of Fillmore's frame concept shows that Fillmore focused his work on what Busse (2012:551) calls "predicative frames", which are centred on an action or an event.

SIZE [can normally be held in one hand], $FUNCTION_1$ [container for drinking], $FUNCTION_2$ [role in the process of drinking], etc. (Langacker 2008:47).[39] If we assign all this information associated with the meaning of *glass* to different domains (as is common practice in cognitive linguistic accounts working with Langacker's domain concept), it becomes clear that a lexical concept is not normally characterized with respect to a single domain but rather to a whole set of domains (Taylor 2002:439). This set of domains that is accessed in a communicative situation and which provides the context for the full understanding of a lexical concept is called its *conceptual* or *domain matrix* (Taylor 2002:439; Langacker 2008:47).

The profile-base organization

An important structuring principle of meaning in the theory of domains is the so-called profile-base organization. According to Evans and Green (2006:166-167), the profile of a linguistic unit is that part of its semantic structure upon which the linguistic unit focuses attention. The base, on the other hand, is the essential part of the conceptual or domain matrix that is necessary for understanding the profiled entity (ibid.:237). In the words of Langacker (1987:183):

> Perceived intuitively, the profile […] 'stands out in bas-relief' against the base. The semantic value of an expression resides in neither the base nor the profile alone, but in their combination; it derives from the designation of a specific entity identified and characterized by its position within a larger configuration.

The profile, standing out "in bas-relief" against its base, would thus be that part of the semantic structure that is explicitly mentioned, whereas the base is the implicit content that needs to be accessed for a full understanding of the profile. Take, for example, the German expression *Kohlekraftwerk*, which profiles or designates a specific kind of power plant (*Kraftwerk*) and a specific kind of energy carrier (*Kohle*, coal) and which provides a point of access to a potentially open-ended inventory of knowledge relating to POWER PLANTS or ENERGY CARRIERS in general, COAL, the FUNCTIONING PRINCIPLE OF POWER PLANTS, SOCIETAL ASPECTS, ENVIRONMENTAL CONCERNS and so on. These different knowledge configurations or domains constitute the expression's

[39] It is important to note in this context that the set of domains evoked by a given linguistic unit is potentially open-ended, i.e. there is no principled way of telling where the meaning of an expression ends in a given context (see Langacker 2008:42). This follows from the encyclopaedic approach, which rejects a clear-cut distinction between (strictly delimited) semantic and (potentially open-ended) pragmatic meaning.

domain matrix. The knowledge which is necessary or essential for a full understanding of the lexical concept KOHLEKRAFTWERK (i.e. its base) would be reducible to a sub-part of this domain matrix (on the problems involved with the notion of *base* in the context of nominal concepts, see the discussion below). The term *Kohlekraftwerk* profiles a specific configuration in the expression's domain matrix. On the other hand, the profile of the English equivalent *coal-fired power plant* would be more explicit than the profile of the German expression since it does not only profile a specific kind of power plant and an energy carrier but also the process by which this power plant operates (i.e. a *firing* process). This information, which is part of the base/domain matrix of the German expression, constitutes an explicit part of the profile of the English expression (more on this in 6.4.1.2). The relation between profile, base, domain and domain matrix is illustrated quite clearly in the following figure taken from Taylor (2002:197).

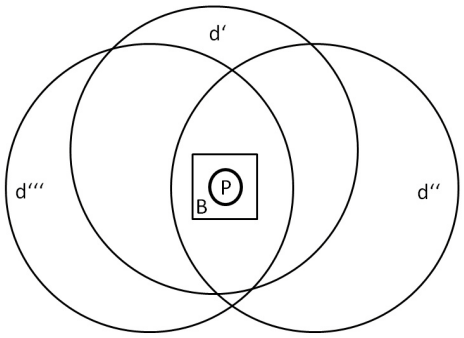

Figure 6: The distinction between profile, base, domain and domain matrix

This figure is to be understood as follows: A given expression profiles an entity P (the profile). This profiling takes place against the base B (containing the domain information essential for understanding the profiled entity). The profile-base relation is conceptualized with respect to (usually overlapping) knowledge configurations which constitute the domains (here, d', d'' and d'''). The set of domains that serves as the overall knowledge configuration for the profile-base relation is called the domain matrix.

Taylor (2002:194) points out that the notion of *profile* is not only applicable to noun phrases; it is in fact one of the axioms of Langacker's Cognitive Grammar that *all* linguistic expressions profile an entity of some kind. While noun phrases have nominal profiles, other verb classes, such as verbs, prepositions, conjunctions, adjectives and adverbs, have relational profiles, with verbs profiling a temporal relation and the latter four word classes profiling atemporal relations (ibid.:221). Relational profiles contain a so-called *trajector* (tr) and a *landmark* (lm), with the trajector being "the more prominent

entity within the conceptualization of a relation […], whereas the landmark entity has secondary focus" (ibid.:206). For example, the preposition *above* in *the picture above the sofa* profiles a vertical relation between two entities (the picture being the tr and the sofa the lm), with tr and lm being schematically present in the preposition's profile. With regard to the above example, *the picture* and *the sofa* would then instantiate the preposition's schematic tr and lm (see the discussion on schemas and instances in 4.2.4). The different kinds of profiles and their trajector and landmark will not be discussed in detail here (for a concise overview see Taylor 2002:221) but the notions will be taken up again and elaborated further in the discussion of cohesive and preposition-based explicitation and implicitation shifts in chapter 8.

An important point remains to be made here. While it is intuitively plausible that relational concepts such as prepositions cannot be fully understood without their base (in the form of trajector and landmark), it has to be stressed that isolating the base of nominal concepts (i.e. the "essential" part of their domain matrix) is far from straightforward (this has also been acknowledged by Taylor 2002:195). For highly structured concepts such as HYPOTENUSE and RIGHT-ANGLED TRIANGLE, which are frequently used in CL to illustrate the profile-base distinction (see Evans/Green 2006:237) and which stand in a meronymic/holonymic relation to each other, it may reasonably be claimed that the profiled meronym (HYPOTENUSE) cannot be understood without knowledge about its holonym (TRIANGLE), which would therefore constitute its base. Trying to identify the essential knowledge required to understand highly abstract and less well-structured concepts such as CULTURE, we would possibly run into the same problems as dictionary theories of meaning, which try to isolate the essential properties of a word from its contingent properties.[40] For the purpose of the present thesis, I will therefore remain agnostic as to what constitutes the base of nominal expressions as compared to their domain matrices.[41] For our purposes, it will be sufficient to assume that a given nominal expression profiles a specific configuration in its domain matrix.

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[40] It is perhaps telling that in the cognitive linguistics literature the term *base* is mainly illustrated using highly structured conceptual configurations such as triangles (Evans/Green 2006:237), circles (Langacker 1987:184) and kinship networks (Evans/Green 2006:239).

[41] As with the distinction between linguistic and extralinguistic knowledge in dictionary approaches to meaning, the distinction between the "essential" base of a linguistic unit and its possibly open-ended domain matrix may not be relevant from a translation-oriented point of view since translators are always concerned

Structuring and distribution of information in domains and domain matrices

A general problem with the structuring and distribution of information in domains and domain matrices is that the notion of domain is defined in such general terms that it can be applied in very different ways. For example, there is no uniform way of determining whether a given body of information is to be subsumed under one domain or to be distributed over several domains (for a similar criticism in the context of frame-based terminology see Faber Benítez 2009:122). Langacker (2008:44) points out in this context that "[w]e should not expect to arrive at any exhaustive list of the domains in a matrix or any unique way to divide an expression's content among them—how many domains we recognize, and which ones, depends on our purpose and to some extent is arbitrary." This lack of a universally applicable formalism that could resolve these problems is possibly the price that an encyclopaedic account of meaning, which is *per definitionem* more encompassing and hence more ambitious that dictionary approaches to meaning, has to pay.[42] However, a formalism that could be useful with regard to the theory of domains is Pustejovsky's (1991) *qualia* structure, which structures semantic representations of an entity according to its relation to its substance or constituent parts (constitutive role), its perceptual identification (formal role), its purpose or function (telic role) and its genesis (agentive role). These roles are derived from Aristotle's *four causes* and therefore roughly correspond to the *causa materialis*, the *causa formalis*, the *causa finalis* and the *causa efficiens* (see Störig [4]2003:204). For each role, Pustejovsky (1991:426-427) lists several values that the role may assume for a given linguistic expression. The four roles of the *qualia* structure together with their possible values can be represented as follows:

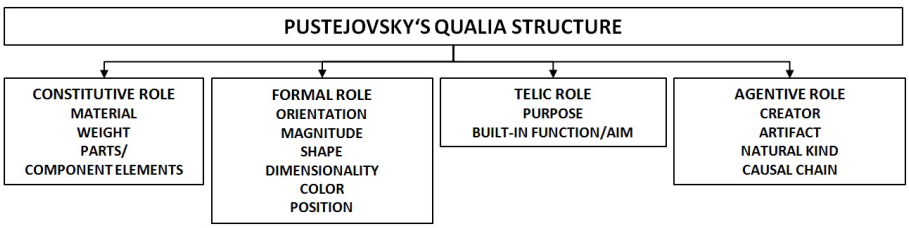

Figure 7: Detailed overview of Pustejovsky's *qualia* structure

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with the full extent of encyclopaedic knowledge that is relevant to the use of a linguistic unit in a given usage event (see the discussion in 4.2.3).

[42] Cruse (1986:20) points out in this context that "it is surely better for a model of meaning [...] to err on the side of generosity of scope, rather than on the side of austerity."

As Taylor (2002:457) rightly points out, this classification seems primarily suitable for man-made artefacts (for example, what would be the substance or the purpose of abstract concepts such as TIME or CULTURE?). However, the *qualia* structure may well have a useful application in scientific and technical translation. Since science and technology are inherently teleological endeavours that involve, to a large extent, the fabrication or application of man-made artefacts or the human investigation and manipulation of natural forces, the *qualia* structure could probably be used as a kind of "core formalism" for structuring and distributing domain information in scientific and technical translation.[43] We would just have to accept that not all the roles in this structure will assume a value on every occasion (time does not have any purpose, nor does culture) and that the characterization of a given linguistic unit may require further, probably less clearly delimited, domains which are not captured by the four roles and their values in the *qualia* structure. In the discussion of the results of the empirical investigation of explicitation and implicitation in chapter 8, I will at various points make use of this core formalism provided by the *qualia* structure to make statements about implicit information in the domain matrices of linguistic units.

4.5.3.3 Frames and domains: a combined approach

In the literature on cognitive semantics, the terms *frame* and *domain* are often used more or less interchangeably (e.g. Croft/Cruse 2004:16-17; Evans/Green 2006:206-207). However, equating the notions of *frame* and *domain* may not be as unproblematic as it appears. Besides being embedded in different theoretical frameworks (which, however, share the commitment to a conceptualist and encyclopaedic approach to meaning), both concepts seem to be concerned with slightly different phenomena. Fillmore's frame semantics has a somewhat verbal bias, as evidenced by the prototypical *commercial event frame* which is often used to illustrate his theory (however, the various definitions of *frame* are broad enough as to be applicable to nominal concepts as well[44]). Also, and perhaps more importantly, frame semantics is not particularly concerned with the inner structure of concepts (Busse 2012:551). A frame is prototypically understood as a system of concepts and thus provides a more "extrinsic" perspective by highlighting other frame elements that

[43] For an application of Pustejovsky's *qualia* structure in specialized language semantics as "a systematic way of representing conceptual dimensions" see León Araúz et al. (2012:148).

[44] For example, the frame model developed by Barsalou (1992a, 1992b) is exclusively concerned with nominal concepts (see also Busse 2012:551).

are evoked when a given element of the frame is indexed in a text (see Fillmore's definition in 4.6.3.1). Langacker's theory of domains, on the other hand, provides a more "intrinsic" perspective, by focusing on the various domains which characterize a single concept (see the examples of *glass* and *Kohlekraftwerk* above). However, it does not capture the external relations of nominal concepts to other concepts as readily as frame semantics does.[45] Also, it is generally agreed within the theory of domains that lexical concepts are usually complex in the sense that the encyclopaedic knowledge required for their full understanding is not structured in only one but rather in several domains, which constitute the expression's domain matrix. Consider the example *glass*, for which we posited the domains SHAPE, MATERIAL, SIZE, $\text{FUNCTION}_{1,2}$ and possibly many more. In frame semantics, the corresponding information would probably be subsumed under the frame indexed by the term *glass*, whereas in the theory of domains the information is distributed over various domains. Therefore, it seems that, besides the other differences identified above, a frame has a broader extension than a domain. In light of the discussion so far, it seems then that a frame is closer to a domain matrix than to a single domain[46], keeping in mind that a frame provides a more extrinsic perspective (i.e. going from the concept in question to related concepts) while a domain matrix provides a more intrinsic perspective (by zooming in on the internal structure of a single concept).

For the purpose of the present thesis, I would like to propose a combination of the two approaches to highlight their shared epistemic aims (albeit from slightly different perspectives) and to do justice to the joint consideration of frames and domains in multiple works on cognitive linguistics. In this thesis, the terms *frame* and *domain matrix* will be used interchangeably to refer to the body of encyclopaedic knowledge that is associated with a given linguistic unit. Understood this way, a frame/domain matrix may, depending on the nature of the linguistic unit or concept in question, consist of one or more domains that represent the internal structure of the concept (with the *qualia* structure as a core formalism for organizing these domains), and/or may provide a more extrinsic perspective

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[45] However, if we use Pustejovsky's *qualia* structure as core formalism for structuring domain information in scientific and technical translation, there are various values in this structure which imply such extrinsic relations to other concepts, for example, the values *parts/component elements*, *purpose*, *built-in function/aim*, *creator* and *causal chain*.

[46] This is in line with Taylor's (^{3}2003:90) understanding of the concepts. For Taylor, the term *frame* is "a useful theoretical term, denoting the knowledge network linking the multiple domains associated with a given linguistic form."

by highlighting the relations of this concept to other concepts which feature in its understanding. However, as pointed out in 4.5.3, the thesis will draw more heavily on the theory of domains since, with the notions of *profile/base/domain matrix*, it has more to say about the important explicitness-implicitness divide and is better suited to describe the dynamic foregrounding and backgrounding of different domains or aspects of meaning in specific usage events (see 5.3.4). The explanatory power of frames/domain matrices for modelling knowledge organization and representation in scientific and technical discourse/translation will be illustrated in the empirical analysis in chapter 8.

4.6 Cognitive linguistics and linguistic underdeterminacy

This chapter concludes with the recurrent theme of linguistic underdeterminacy, this time viewed from a cognitive linguistic perspective. In this context, I would like to repeat the quote from Faber Benítez (2009:108) which was already cited in 2.8. Faber Benítez works in the field of frame-based terminology, which is a terminological approach with a specific cognitive linguistic bias. Her description of linguistic underdeterminacy in scientific and technical translation is therefore in line with the cognitive linguistic perspective taken in this chapter:

> The information in scientific and technical texts is encoded in terms or specialized knowledge units, which can be regarded as access points to more complex knowledge structures. As such, they only mark the tip of the iceberg. Beneath the waters stretch the tentacles of a many-splendored conceptual domain, which represents the implicit knowledge underlying the information in the text.

The idea of specialized knowledge units providing access points, or prompts, to more complex knowledge structures should sound familiar from the discussion of the encyclopaedic approach to linguistic meaning in 4.2.3. From this perspective, linguistic surface structures, representing the visible tip of the iceberg, provide such "partial and impoverished prompts upon which highly complex cognitive processes work giving rise to rich and detailed conceptualisation" (Evans/Green 2006:368).[47] The complex knowledge structures which are accessed by these linguistic structures in the process of conceptualization (or meaning construction) – and which represent the larger part of the iceberg hidden under water – are organized in the form of "a many-splendored conceptual domain" or, with specific reference to the cognitive semantic discussion in the previous

[47] In the theory of domains, these "partial and impoverished prompts" would take the form of the *profile*, which "stands out in bas-relief" (Langacker 1987:183) against a much broader base/domain matrix.

sections, in the form of frames and domain matrices. Which part of this knowledge will actually be relevant and thus needs to be accessed in the understanding of specific texts is subject to various contextual factors and will be elaborated in more detail in the next chapter. Frames and domains therefore describe, from a theoretical point of view, the locus of the knowledge assigned to the larger part of the iceberg under water.

The different common ground configurations in expert-to-expert, expert-to-semi-expert and expert-to-layperson communication are also functionally related to the underdeterminacy of a given text (see the discussion of linguistic underdeterminacy and STT in 2.8). Basically, the broader the common ground between the discourse participants is, the less information has to be explicitly verbalized in the text. The actual linguistic makeup of a text, which contributes directly to a higher or lower degree of linguistic underdeterminacy, can also be captured in the cognitive linguistic framework, namely in the form of *linguistic construal* (see Faber/San Martín Pizarro 2012:200). Of special relevance in this context is Langacker's construal operation of *specificity/schematicity* (2008:55), which describes the level of detail at which a given situation is linguistically encoded. The link to linguistic underdeterminacy should be quite obvious. The more schematic a certain construal, the more linguistically underdetermined it is, requiring potentially extensive contextual input to arrive at a more fine-grained conceptualization. To take up the example from chapter 1 again, the construal *the CO_2 generated from a primary fossil fuel* is schematic or underdetermined with regard to the actual production of the CO_2 (possibly because this information is deemed to be common ground between the discourse participants). If this construal is intended to communicate the more fine-grained conceptualization *the CO_2 generated from* ***the combustion of*** *a primary fossil fuel*, it has to be contextually enriched with this information (which can be claimed to be part of the frame/domain matrix of *CO_2*) in the process of conceptualization. On the other hand, the more specific a construal, the more linguistic underdeterminacy recedes to the background since more specific construals encode, at the textual surface, much of the information that would otherwise stay schematic or hidden under water.[48] The specificity/schematicity

[48] Tabakowska (1993:37) points out in this context that "conceptual limits of specificity cannot be matched by the level of specificity of linguistic expression", meaning that humans can always conceptualize a given scene at a much finer granularity than can be achieved by linguistic expressions. This fundamental gap between conceptual structure and semantic structure as a subset of conceptual structure (see 4.5.3) can be seen as the basic prerequisite of linguistic underdeterminacy.

dimension of linguistic construal will be revisited in the cognitive linguistic discussion of explicitation and implicitation in chapter 6.

4.7 Chapter summary

This chapter provided a detailed overview of the framework of cognitive linguistics. It was illustrated that CL subscribes to a conceptualist and hence encyclopaedic approach to linguistic meaning, which led cognitive semanticists to develop fine-grained toolsets for modelling the organization of potentially open-ended knowledge configurations evoked by linguistic expressions in discourse. These toolsets should prove useful both for the knowledge-intense field of scientific and technical translation in general and for the discussion and investigation of more microscopic concepts such as explicitation and implicitation. Also, cognitive linguistics highlights the usage-based character of grammar hence assigning prime importance to instances of language use (such as translation) and thereby bridging the sometimes considerable gap between linguistic theories and translation studies. The theory of mind as a coordinating device between participants in verbal communication serves to ensure both the overall stability of a conceptualist approach to meaning and, more specifically, the potential stability of textual meaning, which is of crucial importance to both STT and to explicitation and implicitation. In much the same context, cognitive linguistics subscribes to a weak version of linguistic relativism, conceding that language may act as a shaper of thought but at the same time postulating a universal human conceptualizing capacity that allows us to understand and to compare conceptual systems encoded in different languages. Again, this is important for both the (interlingual) stability of meaning and for the feasibility of investigations into explicitation and implicitation. It was also shown that cognitive linguistics provides specific theoretical components with direct relevance to scientific and technical translation and explicitation and implicitation. Among these are the toolsets covered by the term *linguistic construal*, which can be used to model linguistic aspects of STT (such as explicitation and implicitation) from a cognitively plausible perspective, the concept of *common ground*, which captures the shared knowledge of specific discourse communities, and the field of *cognitive semantics* (and here in particular frame semantics and the theory of domains). As stated at the beginning of this section, cognitive semantics provides tools for modelling the organization of (implicit) knowledge in translation and in communication in general.

The next chapter will attempt to apply the cognitive linguistic framework illustrated in the present chapter to relevant aspects of scientific and technical translation.

5 Scientific and technical translation from a cognitive linguistic perspective

This chapter intends to illustrate the specific potential that cognitive linguistics holds for the field of scientific and technical translation. To structure this discussion, a model of the scientific and technical translation process will be introduced below and both the various elements and the process represented by this model will be elaborated from a cognitive linguistic perspective. Following this macroscopic approach, we will focus on specifically relevant aspects of this model, for example, epistemological aspects of STT and – more pertinent to actual translation – the notions of text and context in STT, again seen from a cognitive linguistic perspective. At several points in this discussion (particularly in the context of epistemological aspects of STT in 5.2), I will not only draw on the cognitive linguistic framework introduced in the previous chapter but also on the embodied realist basis of this framework sketched in chapter 3. This discussion of STT from a cognitive linguistic perspective will again also take up several issues raised in the general context of scientific and technical translation in chapter 2, for example, the ideas of stable frames of reference, narrow scopes of interpretation and the ensuing stability of meaning and invariance of meaning in STT. In chapter 2, the epistemological and linguistic tools required for a sound theoretical discussion of these aspects had still been missing. However, now that the philosophical and linguistic foundations of the thesis have been laid, we will attempt to tackle the complexities involved in these notions. A second and subordinate aim of this chapter – besides exploring the interface between scientific and technical translation and cognitive linguistics – is to lay the foundation for the subsequent discussion and analysis of explicitation and implicitation as potential indicators of text-context interaction in STT. Especially the discussions of context and invariance of meaning in STT will include considerations that will be taken up again in the following chapters concerned with the theoretical and methodological aspects of explicitation and implicitation.

5.1 A model of the scientific and technical translation process

Scientific and technical translation is, like any other form of bi- or monolingual communication, a highly complex process that can be approached from various different perspectives and at different levels of granularity. Modelling such a process inevitably entails a reduction of this complexity but at the same time it allows us to highlight specific

aspects of STT that are deemed relevant from a specific epistemic perspective. The model that I will propose to describe the phenomenon of scientific and technical translation is specifically concerned with the immediate textual work of the translator, who interprets[1] a scientific/technical source text and, on the basis of this interpretation, creates a target text. The model of the translation process developed by Revzin/Rozencvejg (1964:57), which covers the whole process from the sender of the source text to the translator and the receiver of the target text, captures most of the important variables and will serve as the basis of our own model of the scientific and technical translation process. Revzin/Rozencvejg's model was translated from Russian into German by Schubert (2007:226) and introduced as a model of the general LSP translation process in the context of LSP research by Roelcke ([3]2010:153-154).[2] It has therefore already been applied in a context not unlike the context of the present study. Roelcke uses this model to describe the wider LSP translation process, whereas it will be used here as the basis for a more granular model of the more specific scientific and technical translation process.

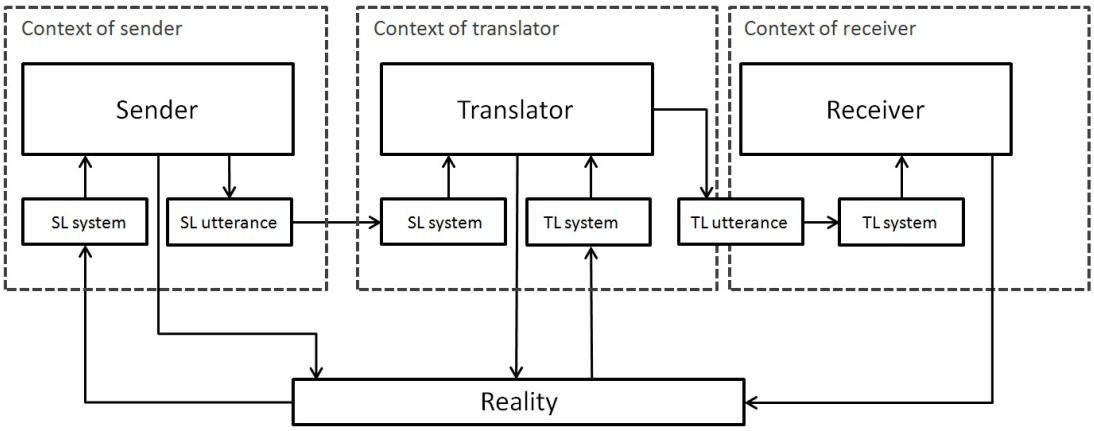

Figure 1: Model of the scientific and technical translation process

According to Roelcke ([3]2010:153-154), the model can be interpreted as follows: The author (sender) writes a source text (SL utterance) based on the SL system and engaging

[1] In this chapter and in the remainder of this thesis, the terms *interpretation*, *understanding* and *conceptualization* will be used in roughly the same way. Interpretation theory actually distinguishes between *understanding* as a social or communicative process and *interpretation* as the process by which a specific meaning is attributed to a specific sign (Siever 2010:299). *Conceptualization*, on the other hand, shifts the perspective from the text to be interpreted or understood to the dynamic cognitive processes that take place in the mind of the recipient during text interpretation/understanding (see Langacker's (2008:30) definition of *conceptualization* in 4.2.1).

[2] I translated the model into English based on the German version presented by Schubert and Roelcke.

with the (domain-related) reality (*fachliche Wirklichkeit*, ibid.). The translator interprets this text (SL utterance) based on his/her knowledge of the SL system and against the domain-related reality described in the source text. Starting from this interpretation of the SL utterance and equipped with the means of the TL system, the translator then composes a target text (TL utterance) which is then interpreted by the receiver based on his/her knowledge of the TL system and with respect to the domain-related reality to which the target text refers.

Although this model traces the immediate communication path from the sender of the source text to the translator and the receiver of the target text quite exhaustively and takes into account most of the variables relevant to this study, I would like to propose several changes and additions in order to tailor the model to the specific theoretical commitments and epistemic aims of this thesis.

Firstly, the sender does not produce the source text in a vacuum but takes into account the expectations and the previous knowledge of the ST receiver, who is not considered in the above model. In the same vein, the translator, when interpreting the source text, will not only take into account the domain-related reality but will also try to reconstruct the context of production (context of sender) and the possible context of the source text's reception (context of ST receiver). Likewise, in writing the target text, the translator will anticipate the context (expectations, previous knowledge, etc.) of the intended TL receiver, and this, in turn, will influence the form and content of the target text.

Secondly, the notions of *sender* and *receiver* in the original model are reminiscent of a code model of communication (see Sperber/Wilson ^{2}1995:2). This does not sit well with the cognitive linguistic claim that meaning is not reified in a code but rather emerges in a dynamic process of conceptualization. Consequently, these terms will be substituted by the – at least in this context – less theory-laden terms *author* and *reader*.[3]

Finally, the unidirectional arrows running from agents to reality in the model do not do proper justice to the dialectical interaction between the world and human beings[4] and the

[3] Revzin/Rozencvejg, Schubert and Roelcke obviously do not commit to the – perhaps overly simplistic – code model of human communication since they do not posit a passive process of coding and decoding in the model but rather a process of *interpretation*, thereby stressing the active contribution of the discourse participants in communication.

[4] This is also criticized by Schubert (2007:228).

role of conceptualization in our access to reality as posited by the embodied realist basis of this thesis. To reflect this in the revised model, these unidirectional arrows have been replaced by bidirectional ones passing through an intermediary stage of conceptualization (more on this in 5.2.1).

I would therefore like to propose the following extended and revised version of Revzin/Rozencvejg's model:

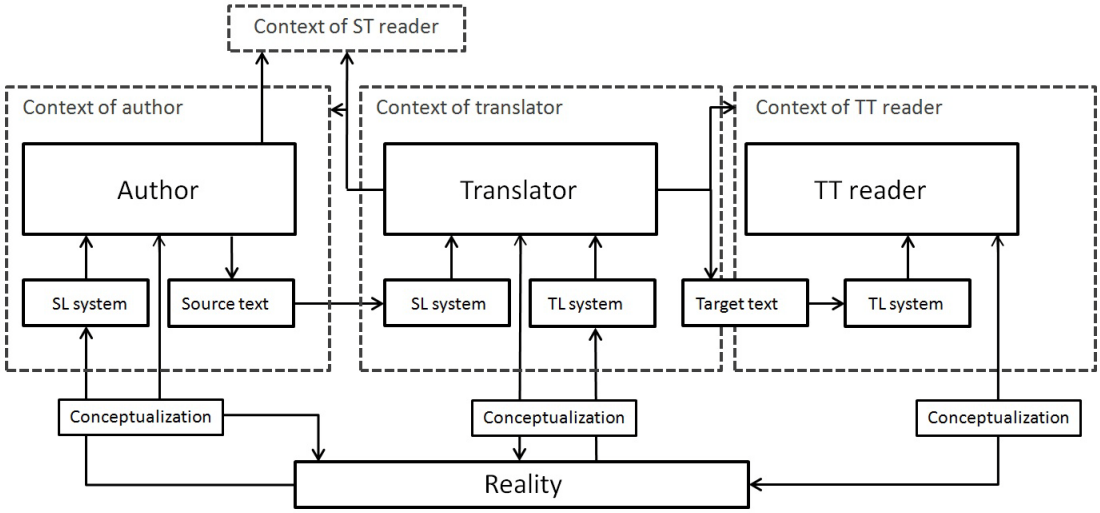

Figure 2: Extended and revised model of the scientific and technical translation process

In the following sections, the relevant elements and relations depicted in this model will be discussed from a cognitive linguistic perspective.

5.1.1 Author and source text

In the model of the scientific and technical translation process, the author engages with the domain-related reality by means of conceptualization and writes – on the basis of the SL system – a source text that is intended to communicate this conceptualization. In writing the source text, the author imposes a certain linguistic construal on the conceptual content to be communicated (see 4.5.1) and s/he will, in a theory-of-mind driven process, anticipate the context of the ST reader and, here especially, the knowledge context (for a detailed discussion of the various dimensions of context see section 5.3 below). As established in 2.7.1.2, the author of a scientific/technical text will be an expert in the topic of the text since it is only persons with such an expert status that can initiate specialized

communication (Vargas 2005:306, referring to Cabré 1999:153-154). The author[5] produces a scientific/technical text with a certain communicative intention in mind which, according to Nord ([4]2009:53), can roughly be equated with the communicative function of the text (see the discussion in 2.7.1.1). The communicative function of the text (in science and technology prototypically the informative function, subclassified into the juridical-normative, progress-oriented actualizing, didactic-instructive or compilation function) entails a certain communicative configuration (expert-to-expert, expert-to-semi-expert or expert-to-layperson communication). This in turn will be reflected in a specific common ground configuration between author and reader (see 5.3.3 below). The author will establish this common ground based on his/her theory of mind about the subject-matter knowledge of the ST recipient by looking for shared bases and ranking them according to their quality of evidence (such as educational background, professional occupation, etc., see 4.5.2). The communicative function of the text and the common ground between author and reader will correlate with the degree of technicality of the text. This degree of technicality will, in turn, be reflected in the construal of the text (see above) which, in the context of specialized communication, can be understood as "the way a text sender formulates his/her message for one group of recipients or another" (Faber/San Martín Pizarro 2012:203). Text construal in scientific and technical communication may vary, for example, along the specificity-schematicity dimension (see 4.5.1.1), resulting in source texts exhibiting a low (as in expert-to-layperson communication) to high degree of linguistic underdeterminacy (as in expert-to-expert communication) and therefore a low to high context dependence.[6]

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[5] The singular use of the terms *author*, *translator* and *reader* in the following discussion is made for the sake of convenience. In reality, texts are often written by teams of authors, they undergo various revision or editing processes and will normally not be addressed at individuals but at groups of people. Also, more than one translator may be involved in the translation and the target text may undergo proofreading or editing processes. For the purposes of a model, this simplification is certainly justified but it becomes problematic in comparable ST-TT analyses when certain motives are ascribed to *the author* or *the translator* without having detailed information on the actual circumstances of text production. I will show in 7.1.4 how this problem can be overcome by the "corpus-in-context" design adopted in this thesis.

[6] Discussing texts from the domain of oncology, Faber/San Martín Pizarro (2012:201) observe, for example, that expert-to-expert discourse "uses very specialized anatomical terms without any sort of explicative context […]", whereas expert-to-layperson discourse in this domain even defines terms pertaining to the basic level.

5.1.2 Translator, source text and target text

The translator interprets the scientific/technical source text based on his/her knowledge of the SL system, with respect to the conceptualized domain-related reality described in the text and with respect to the domain-related reality conceptualized independently of the ST (for example by consulting reference material or experts on the subject matter described in the text). In interpreting the source text, s/he will also take into account the original context of the author and the context of the originally intended reader. Starting from this interpretation of the source text and equipped with the linguistic means of the TL system, the translator composes a target text anticipating, again in a theory of mind-driven process, the (knowledge) context of the TT reader, which will again influence the actual construal of the text.[7] It was claimed in 2.6 that the prototypical case in scientific and technical translation will be functional invariance, meaning that the communicative function of the target text will generally equal that of the source text. This will probably be the case both at the superordinate level (i.e. it may rarely be the case that the informative function will shift to the appellative or expressive one) and at the subordinate level (e.g. progress-oriented actualizing texts will generally not assume a compilatory function in the target culture). As a consequence, the degree of technicality of the TT will normally be comparable to that of the ST. This will probably also be the case for the construal of the TT along the specificity-schematicity dimension, provided that genre conventions and register requirements do not differ significantly in this regard between source and target culture.

Of course, the translator's intermediary position between ST author and TT reader entails another highly complex dimension that goes beyond considerations of functional (in)variance and the anticipation of the TT audience's knowledge context. The translator is faced with a source text representing the linguistic construal of a given conceptualization, where both the construal and the conceptualization were established in the source cultural context (the construal based on the linguistic means provided by the source language and

[7] In this context, see also Faber/Ureña Gómez-Moreno (2012:82): "The source language text has been written for a group of receivers with a certain level of expertise, and the translator must be able to recognize whom the text is being addressed to, and mentally create a potential reader profile which matches receiver groups in the source and target language."

the conceptualization based on the conceptual systems established by the source culture[8]). In prototypical STT, the translator's task will now be to render this ST construal and the intended conceptualization as precisely as possible based on the conceptual system of the target culture and using the linguistic means provided by the target language, at the same time preserving the ease and economy of expression required by the TL register[9] (see 5.2.2 and 5.5 below). For this task to be successful, let alone feasible, several prerequisites have to be fulfilled. Firstly, the construal of the source text has to allow for a very narrow scope of interpretation in arriving at the conceptualization that the ST author intended to communicate. Only if this scope of interpretation is sufficiently narrow can we posit an intersubjective stability of meaning, where this stable meaning is recovered and recreated in the target text by the translator (see 2.4.2). Stability of meaning is a central tenet of STT and at the same time a *conditio sine qua non* for the existence and investigation of explicitation and implicitation. However, this stability has consistently been challenged on epistemological grounds by the subjectivist philosophy discussed in chapter 3. Secondly, the conceptual systems in source and target cultures must be sufficiently congruent and source and target languages must offer suitable means of linguistic construal in order to allow for a TT construal that licenses the basically same conceptualization as the ST (this would equal invariance of meaning, see 2.4.3) while fulfilling the register requirements of the target culture.

5.1.3 TT reader and target text

The target text reader will interpret the target text based on his/her knowledge of the TL system, with respect to the domain-related reality described in the target and with respect to the domain-related reality conceptualized independently of the text. In prototypical

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[8] Regarding the difference between *concepts* and *conceptualization*, Langacker (2008:46) points out that *concept* suggest a static or fixed notion whereas *conceptualization* suggests dynamicity. I will follow this distinction and view a concept as a rather stable or static "codification of experience" (Cruse [3]2011:53) and a conceptualization as the inherently dynamic process of meaning construction (see 4.1 and 4.2.1) based on such rather stable concepts. Concepts in science and technology are usually lexicalized in the form of a specific terminology, which in turn is often standardized in order to fix these concepts for a specific intra- or interlingual discourse community.

[9] I understand the term *register* as a diaphasic (situation-bound) (Albrecht 2005:248) or use-related (Hatim/Mason 1990:46) language variety. *Register* therefore refers to a choice of linguistic means that is appropriate in a given communicative situation. The concept will be employed at several points in chapter 8 as an explanatory tool in the discussion of explicitation and implicitation.

scientific and technical translation, the knowledge of the TT reader with regard to the topic of the text will generally be comparable to that of the original ST reader, provided that the domains in question are not structured in highly incongruent ways in source and target culture and that there is no significant difference in the degree of industrialization/ technologization between source and target culture.[10] The prototypical functional invariance between ST and TT means that the TT reader will generally read the translation as if it were an original text produced in the target language, i.e. the translation will normally be a *covert translation* (House 2002) or an *instrumental translation* (Nord 1997). In prototypical STT involving some form of invariance of meaning, it is assumed that the TT reader will be able to form – based on the target text construed by the translator – the "same" conceptualization that the ST author intended to communicate with his/her source text construal. The various issues involved in this process have already been highlighted in the previous section.

5.2 Some epistemological aspects of scientific and technical translation

This section will be concerned both with the epistemological underpinnings of the interaction between the agents in the model and the domain-related reality underlying scientific and technical discourse as well as with the role of source and target language systems in this interaction. The focus of subsection 5.2.1 will be on the relation between reality, its conceptualization and the corresponding conceptual systems, taking into account the discussion of embodied (scientific) realism in chapter 3. Subsection 5.2.2 will then elaborate on the relation between conceptualization and language and will draw on the cognitive linguistic view of linguistic relativism illustrated in 4.4 and the cognitive linguistic notion of linguistic construal (4.5.1). While the discussion of these complex issues will necessarily be highly reductionist, I will attempt to provide a coherent picture from the perspective of embodied realism and cognitive linguistics.

5.2.1 Domain-related reality, conceptualization and conceptual systems

Firstly, on a basic epistemological note, it follows from the discussion of embodied realism in chapter 3 that humans do not have any uninterpreted direct access to reality from an

[10] An often discussed example in this context is the translation of German operating instructions for a washing machine to be used in Indonesia (Kußmaul 1995:75, see also Göpferich 1998a:325; Reinart 2009:273). However, both Koller (2002:49) and Reinart (2009:273) point out that this is a rather marginal example that may not adequately represent the professional everyday reality of translators.

objectivist God's Eye perspective. Hence, the reduction of human epistemology to the search for "one fully correct way in which reality can be correctly divided up into objects, properties, and relations" (Lakoff 1987:265) will not be reflected in the present account of scientific and technical translation. Instead, it was argued that this access to reality is a function of the human coupling with the world via our embodiment. This dialectical relationship between humans and the world is reflected in the STT model above by the bidirectional arrows running between the various agents and the notion of reality. Furthermore, it was argued that our epistemic access to reality is always perspectivized in the form of a specific *conceptualization* of reality.[11] Therefore, in the model above the arrows do not run directly between the agents and reality but pass through an intermediary stage of conceptualization. While this emphasis on an indirect access to reality via conceptualization may entail a certain variation in the way reality is conceptualized by different people, this scope of variation was argued to be crucially limited by human embodiment.

In science and technology, the conceptual systems in which our conceptualization of the domain-related reality is codified can be claimed to be tightly structured, hence providing a stable frame of reference for scientific and technical discourse to operate upon. Since conceptualization usually takes place based on pre-existing conceptual systems, this stable frame of reference (in the form of tightly structured conceptual systems) will probably limit, to a significant extent, the admissible scope of variation in the conceptualization of the domain-related reality. Other parts of reality, for example our everyday reality, may be structured on the basis of less rigid conceptual systems and correspondingly less stable frames of reference and may hence allow for a greater scope of variation in their conceptualization. It was argued in the discussion of embodied realism and science in 3.3 that the stability of the conceptual systems in science and technology results, among other things, from the nature of the phenomena found in the domain-related reality[12], the rigour associated with the scientific method and our technologically extended basic-level abilities for perceiving, observing and manipulating such phenomena. This last point entails that the

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[11] In cognitive linguistics, this insight is reflected, for example, in the categories of *perspective* and *perspective/situatedness* in the models of linguistic construal operations developed by Langacker and Croft/Cruse (see 4.5.1.1 and 4.5.1.2).

[12] This means that we experience these phenomena at the sensory level and not at the introspective or subjective level (see 3.2.3).

general conceptual stability which is characteristic of the human basic level is imported into the conceptual systems of science and technology.

Since basic-level perception is claimed to be a universal feature of human cognition as a result of our shared embodiment, this embodied account of science can be taken to be one factor contributing not only to the perceived stability of scientific knowledge but also to its relative universality, resulting in a high congruence of the respective conceptual systems in different cultures (Brekke 2004:620). Furthermore, several authors (e.g. Reinart 2009:43-44, 277; Siever 2010:213) have pointed out that scientists in various fields form rather homogeneous diacultures – which are bound by their shared expertise or common ground with regard to their common research field – across national and linguistic borders. These *scientific communities*, their joint scientific efforts and the expert knowledge acquired through these efforts may therefore be less amenable to particular influences from their respective national cultures than other cultural communities. The link between the common ground of specialized discourse communities and the relative congruence or commensurability of SL and TL conceptual systems is also highlighted by Scarpa (2002:136), who claims that there is

> [...] a tendency for the conceptual systems of the SL and the TL to get closer to commensurability as the [scientific or technical] text is being aimed at an increasingly specialized readership (where communication is best ensured by a large shared amount of specialized knowledge).

The characterization of these scientific communities as international diacultures bound together by a very broad specialized common ground can thus be taken to be another factor contributing to the stability and relative universality of scientific knowledge.[13]

However, despite the assumed universality and stability of human basic-level capacities as imported into science and technology and further universalist influences due to the work of scientific communities as international diacultures, there is of course still room for – and evidence of – intercultural conceptual variation. The reason is that basic-level experience and cognition, although providing a straightforward philosophical link between human epistemology and the formation of stable scientific and technical conceptual systems, are

[13] This universalist tendency will be reinforced by the international efforts aimed at the harmonization of conceptual systems and terms in science and technology (see, for example, standard ISO 860).

of course not the only factors influencing the formation of such systems.[14] Indeed, if this was the case, all the efforts of terminology geared to the international harmonization of conceptual systems would, in fact, be redundant. However, as standard ISO 860 "Terminology work – Harmonization of Concepts and Terms" points out, "[c]oncepts and terms develop differently in individual languages and language communities, depending on social, economic, cultural and linguistic factors" (see also Arntz et al. [6]2009:180).[15] It therefore seems that concept formation in science and technology takes place based on epistemological basic-level stability and is to some extent shielded from influences by a particular national culture as illustrated above. However, beyond this stable basis the process will be subject to a certain degree of socially, economically, culturally and linguistically induced variation.

An often cited example of such conceptual variation in science and technology is the trivial case of the German *Schraube*, which has no 1:1 equivalent at the same level of abstraction in English, where we find a lexicalized distinction between *bolts* (which are fastened with a nut) and *screws* (which have a pointed thread and are screwed directly into a given material) (see, for example, Göpferich 1998a:23). In this case, the English conceptual system exhibits a "generalization gap" (Schreiber 1993:38) compared to the German system. Of course, German can reflect this conceptual difference expressed in the lexicalized distinction between bolts (*Schrauben mit Muttern*) and screws (*Schrauben ohne Muttern*) but not with the same ease and economy of expression as English. Apart from such rather straightforward examples of cross-linguistic terminological inclusion (i.e. the German hypernym/schema *Schraube* includes or can be instantiated by the two English hyponyms/instances *bolt* and *screw*), there are also more difficult cases in which source and target language conceptual systems are structured asymmetrically, as illustrated for example by Schmitt ([2]1994:259-260) in his discussion of German *Löten* vs. *Schweißen* and English *soldering* vs. *welding*. Also, Franck (1980) illustrates various cases of incongruence between the scientific and technical conceptual systems of English and German. In such cases, there is usually a partial overlapping between the different SL and

[14] As Lakoff (1987:310) puts it, "experience does not *determine* conceptual systems, but only *motivates* them."

[15] An interesting research field that cannot be explored within the bounds of this thesis is *socioterminology* (Gaudin 2003), which investigates social and ethical parameters of terminological (and hence conceptual) variation (see also Faber Benítez 2009:113).

TL concepts but no conceptual identity. This issue of conceptual variation will be further discussed in the context of invariance of meaning in scientific and technical translation in 5.5.

5.2.2 Conceptualization and language

Regarding the influence of language in human conceptualization of reality, the fact that there are independent arrows running directly between each of the three agents and the conceptualized domain-related reality in the model above (parallel to the arrows running through the respective language systems, which represent the construal of a given conceptual content) is intended to demonstrate a relative autonomy of thought vs. language. This is in line with weak linguistic relativity as endorsed by cognitive linguistics (see the discussion in 4.4). According to weak relativity, language merely *shapes* thought, thus facilitating human conceptualizing processes. From the perspective of strong linguistic relativism, according to which inherently shapeless human thought or a kaleidoscopic flux of impressions is structured and organized solely by language, these arrows would be inadmissible and we would have to content ourselves with the arrows running through the respective language systems in the model. The assumed relative independence of thought vs. language is also reflected in the cognitive linguistic notion of *construal*, which describes the linguistic forming or shaping of a given conceptual content from a specific perspective (see 4.5.1). In this account, the grammar and lexicon of a language are seen as "storehouses of conventional imagery" (Langacker 1987:47) or "default construals" (Croft/Cruse 2004:72). While these default construals and the perspectives encoded by them may guide our conceptualizations in a particular way when we encounter them in a text, it is claimed that we are not bound by these construals and can shift our perspective rather freely. According to Langacker (1991:12), "[t]he conventional imagery invoked for linguistic expression is a fleeting thing that neither defines nor constrains the contents of our thoughts". Taking an example from science and technology, Arntz (^{2}1994:297-298) discusses the French utterance *[La particularité de ces transistors] est que la conduction s'y fait verticalement* and its German translation *[Die Transistoren zeichnen sich] dadurch aus, daß die leitende Zone […] bei ihnen senkrecht […] verläuft* and points out that both texts construe a different perspective.[16] Whereas the French *conduction* focuses on the process itself, the German *leitende Zone* focuses on the locus of

[16] Although Arntz does not use this cognitive linguistic terminology.

this process. Cognitive linguistics would probably claim that both utterances structure basically the same conceptual content but differ in the construal and perspectivation of this content (see 5.5 below). Also, these different construals do not prohibit us from shifting our perspective to the locus of the process when encountering the French *conduction* or from conceptualizing the process of conduction when faced with the German *leitende Zone*. Language, in this account, mediates our access to the domain-related reality but it does not tie our conceptualizations of this reality to the perspectives encoded in the respective construals. With reference to the model of the STT process, the SL and TL systems and conventions would then provide the *default construals* (representing the lexicalized default conceptualizations) of certain phenomena (such as French *la conduction* vs. German *die leitende Zone* in the example above) as manifested in scientific and technical texts, whereas the arrows between the agents and conceptualized reality point to the fact that we can dissociate ourselves from these linguistically induced default construals and entertain alternative conceptualizations.

However, the fact that we can shift between different perspectives at the level of conceptualizations does not entail that we can encode or construe every possible conceptualization with the required ease or economy of expression in any given language (Schreiber 1993:45, see also the discussion of *screw/bolt* vs. *Schraube mit Mutter*/*Schraube ohne Mutter* in the previous section). As already pointed out, the grammatical and lexical resources of a given language offer a vast repertoire of default construals. The same holds for different registers, phrasemes or collocations within a language, which prescribe to some extent those modes of expression/construals which are acceptable in a given discourse. Given the abundant evidence of cross-linguistic variation in grammatical/lexical resources and general linguistic conventions, it seems only logical that certain default construals of a source language cannot be carried over in a straightforward way to the target language. As Langacker (1991:12) puts it, "[b]ecause languages differ in their grammatical structure, they differ in the imagery [construals] that speakers employ when conforming to linguistic convention". If, for example, we want to recreate the exact perspective encoded in the French construal *la conduction s'y fait verticalement* into German, we would have to opt for a construal such as *da die Leitung senkrecht erfolgt*. However, this way of construing the situation probably clashes with the prevailing German register requirements in this context, which is possibly why the translator opted for an alternative construal in the first place (see Arntz ^{2}1994:297-298). Let us briefly look at another example, this time from the scientific/technical corpus to be

analyzed in this thesis. In this corpus, we find the German ST clause *Erkundungsbohrungen sind Schwachstellen, bei deren mangelhafter Versiegelung ein Gasaufstieg möglich ist*, which contains the deverbal German noun compound *Gasaufstieg*. Since English does not seem to provide any readily available 1:1 equivalent in the form of a lexicalized default construal such as *gas rise/ascent* (and a corresponding *ad hoc* construal may not be licensed by the English technical register), the translator had to shift the perspective on the corresponding conceptual content and to construe it verbally as *gas may ascend through them* in the TT. So, even when the conceptual content is basically the same in ST and TT, both in practical translation and in contrastive translation analyses, we have to be aware of possible variations in construals and hence shifts of perspective on this conceptual content. This issue will also be further discussed section 5.5.

5.3 The notion of context in scientific and technical translation

We now turn from these rather high-level epistemological reflections on STT to more earthly and more practically relevant aspects of this field of translation. Going back to the model of the STT process above, another highly important element of STT that needs to be discussed in this chapter is the notion of *context* (not least because explicitation and implicitation are understood as indicators of text-*context* interaction in STT). While the concept is frequently evoked as a theoretical tool in translation studies, its vastness inevitably entails a considerable degree of fuzziness since, adopting a broad definition, *context* can be understood as "the whole world relative to the speech event" (v. Hahn 1998:383, referring to Pinkal 1985:36, my translation). Furthermore, as Aschenberg (1999:7) notes, any definition of context and the function we ascribe to it is inevitably linked to the theoretical framework applied and the research aims pursued. In order to get a general grasp of the difficult concept of context, I would first like to make an initial distinction between what Clark/Carlson (1981) call *intrinsic context* and *incidental context*. The intrinsic context is "that part of the context that, a priori, has the potential of being necessary on some occasion for carrying out the process in question", while the incidental context is understood as "what remains, the parts of the context that never need to be consulted" (ibid.:319).[17] Adopting this distinction, we would no longer be faced with a

[17] The intrinsic context is similar to van Dijk's (1977:217) view on context as a "theoretical and cognitive abstraction from the actual physical-biological situation so that a number of features of the situation, which are not relevant for the understanding of an utterance, are excluded" (quoted from Marmaridou 2000:29).

notion of context potentially representing the whole world relative to a speech event but only with that part of the world which is also *relevant to it*, i.e. its intrinsic context. However, what we define as intrinsic and incidental context of a given phenomenon will, as Aschenberg rightly claims, be influenced by the theoretical framework applied and also by our epistemic aims. For example, a macroscopic sociological study of the agents and power factors involved in the scientific and technical translation process will probably evoke a much broader notion of intrinsic context than a more microscopic study focusing on explicitation and implicitation as indicators of text-context interaction in STT. In such a text-focused study, much of what would be considered as intrinsic context in a sociological study would probably be considered as incidental context. This should not be seen as a sign of ignorance on the part of studies working with narrower conceptualizations of context. Often, it is simply a question of how many variables can realistically be incorporated and controlled in a given theoretical and methodological framework. The choice of context thus seems to correlate with the epistemic granularity of the respective investigation.

I would like to link the present discussion of context to the overall perspective of linguistic underdeterminacy as a recurring theme of the thesis. From this perspective, the textual surface structures only mark the impoverished "tip of the iceberg" (see the discussion in 2.8 and 4.6). In order to arrive at the much richer conceptualization that the author intends to communicate, the reader must infer various information which implicitly underlies this text. From this perspective, the (intrinsic) context would provide that information which is not explicitly verbalized in the text but which can or has to be inferred based on this text in order to arrive at a coherent interpretation or conceptualization. This perspective primarily regards context as a provider of non-linguistically encoded information or as the locus of implicit information and thus represents a deliberately narrow notion of context that is specifically tailored to the epistemic aims of this thesis. Faber/San Martín Pizarro (2012:194-195, referring to Evans 2008) – who provide a cognitive linguistic account of specialized translation much in line with the present thesis – claim that a notion of context understood in this way must at least incorporate the following four elements:

(1) the physical venue and temporal setting of the utterance

(2) the communicative intention of the speaker as recognized by the hearer

(3) the other words that make up the utterance itself

(4) the background knowledge shared by the speaker and hearer

If we subsume the first and second point of this list under the notion of *situation* (including both the spatio-temporal setting of the discourse and the discourse participants and their intentions), we would obtain the classic triad of (1) situational context, (2) discourse context, and (3) knowledge context. This triad covers what is often regarded as the three elementary context types, which are necessary for the emergence of textual meaning (see Aschenberg 1999:9; Saeed [3]2009:199) and it also provides the three contextual dimensions considered relevant for the present thesis. These three dimensions will now be discussed in detail.

5.3.1 Situational context

The situational context, as applied in translation studies, is often informed by the systemic functional linguistic approach with its tripartite distinction between *field*, *tenor*, and *mode* (see Baker 2006:324).[18] It is thus somewhat more extensive than points (1) and (2) in Faber/San Martín Pizarro's list above, which I subsumed under the situational context. The *field* refers to "what is happening, the nature of the social action that is taking place" (Halliday/Hasan 1985:12). Vargas (2005:305, referring to Eggins 1994:73) points out that the field "varies along a dimension of technicality", ranging from common/everyday to technical/specialized discourse. STT is obviously concerned with scientific and technical discourse. Here, a further subdivision of the degree of technicality of this discourse was presented in the form of Arntz' scale presented in chapter 2. *Tenor* refers to the relationship between the discourse participants and can be readily linked to the triad of expert-to-expert, expert-to-semi-expert and expert-to-layperson communication as discussed in chapter 2.7.1.2. (see also Krein-Kühle 2003:68; Vargas 2005:306). For the purpose of this thesis, the tenor relationship is further understood to include the communicative intention of the author as recognized by the audience; this corresponds to point (2) of Faber/San Martín Pizarro's list above. Finally, *mode* refers to the medium of communication, where a distinction is generally made between written, written to be read, written to be spoken, spoken and spoken to be written (Vargas 2005:307). Scientific and technical translation will of course be primarily concerned with texts that are written to be read, which follows from the prototypical spatiotemporal setting of the corresponding discourse. While the communication to be achieved by means of scientific/technical texts

[18] For an application of these three dimensions of situational context (in the form of the Hallidayan register model) in STT see Krein-Kühle (2003:68).

is usually almost synchronous[19], this communication is generally "dilated" (see Becher 2010a:18), meaning that author and reader are normally not physically co-present, for if they were, they would not have to resort to written discourse.

5.3.2 Discourse context

The discourse context is also known as *co-text* (Catford 1965) in translation studies and refers to the textual environment of a given linguistic unit. The relative specificity or schematicity of the co-text, i.e. its linguistic construal along the specificity or schematicity dimension is a function of the communicative configuration underlying the text (which results from the *tenor* element of the situational context) and accordingly a function of the shared knowledge of the discourse participants or the common ground between them (which will be captured in the notion of *knowledge context*). This is in line with Faber/San Martín Pizarro (2012:201), who claim that "[i]n specialized language, construal [of a text] often reflects the knowledge shared by the participants in the act of communication". The co-text is certainly one of the most important sources for understanding impoverished linguistic units in a text. However, since the co-text itself is made up of such impoverished units, which have to be interpreted based on the specialized knowledge of the discourse participants, the informativity of the co-text is functionally related to the informativity of the knowledge context of the discourse participants.

5.3.3 Knowledge context

The knowledge context, as mentioned above, refers to the discourse participants' (specialized) knowledge, which they can bring to bear in text interpretation. Referring to the common ground concept introduced in 4.5.2, we could say that common ground represents the intersection of the knowledge contexts of author and reader relative to the topic of the text. Common ground, as the intersection of these knowledge contexts, could be graphically represented as follows:

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[19] This means that there is usually only a short period of time between the production of a scientific/technical source text, its translation and the reception of the target text. This is, for example, due to market pressures leading to ever shorter development and marketing cycles for technical products or the rapid growth of scientific and technical knowledge, which requires the rapid publication of new scientific findings before they become outdated.

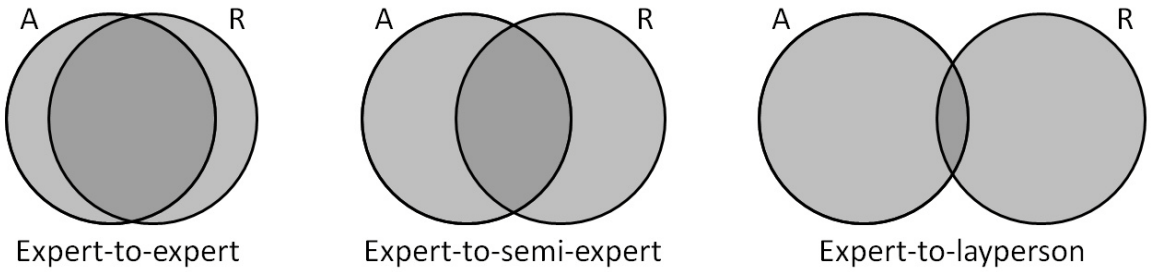

Figure 3: Common ground in expert-to-expert, expert-to-semi-expert and expert-to-layperson communication

Depending on the *tenor* element of the situational context, we will arrive at different common ground configurations. Expert-to-expert communication, for example, will be characterized by a high degree of shared knowledge between author and reader (represented by the large intersection of the two corresponding circles above). This shared knowledge can remain largely implicit in this form of communication and may thus entail a high linguistic underdeterminacy of the whole text. Moving to expert-to-semi-expert and expert-to-layperson communication, the common ground between the discourse participants becomes smaller and smaller (represented by the smaller intersections of the circles in the above figure), usually entailing a decreasing degree of linguistic underdeterminacy since, to secure understanding, more and more contextual information has to be explicitly verbalized in the text. The more linguistically underdetermined a scientific/technical text is, the more relevant the common ground/knowledge context becomes as the locus of information which has to be accessed in order to arrive at a coherent conceptualization based on impoverished textual surface structures. It follows from this discussion that the knowledge context is of paramount importance in STT, especially when translating texts classified as expert-to-expert or expert-to-semi-expert communication. The importance of this contextual dimension is also stressed by Krein-Kühle (2003:7), who claims that "[i]n STT, in particular, the context refers predominantly to the domain(s) underlying the text and reflected in it."

5.3.4 Contextual "shaping" of frames/domain matrices in usage events

According to Langacker (2008:42), the contextual dimensions outlined above form a *conceptual substrate* based on which communication takes place by means of impoverished linguistic expressions. In cognitive semantics, the encyclopaedic information pertaining to this conceptual substrate would then be organized in the form of frames/domain matrices, which are the locus of encyclopaedic meaning as laid out in 4.5.3. Of course, the information found in a given frame/domain matrix and the relative

saliency[20] of this information is not static but highly dynamic and subject to various contextual pressures acting on a given usage event. These contextual pressures exerted on frames/domain matrices in usage events "shape" these frames by determining which information will be included in them and how salient a given piece of information will be. By virtue of this contextual shaping, we move from encyclopaedic meaning, referring to the potentially open-ended pool of knowledge associated with a linguistic unit, to *contextual* or *situated meaning* (Evans/Green 2006:220) arising in specific usage events.

To illustrate the shaping of a frame/domain matrix by taking the three contextual dimensions into account, we will revisit the two engineers from section 4.5.2 who, for the purpose of illustrating the common ground concept, were working on a petrol engine. In the same context, engineer 1 now says to engineer 2: *Would you please remove the spark plugs*? Firstly, from the *tenor* element of the situational context, it is clear that we are dealing with expert-to-expert discourse between two engineers who share a correspondingly large common ground. This means, for example, that engineer 2 can locate the referent of the *spark plugs* in the spatial setting of the discourse without further explicit instructions because s/he will entertain a very rich concept of *spark plugs* due to his/her corresponding expert knowledge. With reference to Pustejovsky's *qualia* structure proposed as a core formalism for structuring information in frames/domain matrices in STT (see 4.5.3.2), we could say that for engineer 2, the frame/domain matrix indexed by *spark plugs* contains rich knowledge about the domains MATERIAL, WEIGHT (constitutive role), SHAPE, POSITION (formal role), PURPOSE (telic role) and possibly CREATOR (agentive role). The discourse context will then probably foreground, or make salient, the domains SHAPE and POSITION whilst backgrounding domains such as MATERIAL and CREATOR. The domains SHAPE and POSITION will now have to supply the exact information on the removal procedure, which remains schematic in the utterance of engineer 1 (the spark plug has a threaded shaft → it is screwed into the cylinder head and protrudes into the combustion chamber → therefore, to remove it, it has

[20] In line with Langacker (2008:57), I understand the term saliency as the "likelihood of activation" of a certain domain/piece of information in a given usage event. For example, in the sentence *The photograph is torn*, the domain MATERIAL in the domain matrix of the lexical unit *photograph* will probably be salient since it is likely to be activated upon encountering this sentence. The sentence *This is not a very good photograph of you*, however, would background this domain and make salient a domain such as REPRESENTATION instead (see Taylor 2002:442-443).

to be unscrewed). Engineer 1 will, based on his/her theory of mind[21], assume that engineer 2 is aware of this information, i.e. that it is common ground between them. S/he will further assume that engineer 2 can form a conceptualization of the required granularity based on the impoverished construal uttered by engineer 1. If engineer 1 assumed that this information is not available to engineer 2, s/he would have to project more context into the utterance by opting for a more specific construal such as *Could you please unscrew the spark plugs from the cylinder heads of the petrol engine?* This example illustrates how frames/domain matrices as the locus of encyclopaedic meaning are shaped in actual discourse to yield contextual/situated meaning. These considerations will be taken up again in the cognitive linguistic discussion of explicitation and implicitation in 6.5.2 and they will feature extensively in the discussion of results in chapter 8.

5.3.5 Current discourse space: cognitive representation of the three context types

As a final step in the discussion of context in STT, I would like to introduce the cognitive linguistic notion of *current discourse space (CDS)*, which basically describes the cognitive representation of the three previously discussed contextual dimensions from the perspective of the discourse participants. Langacker (2008:59), who introduced the current discourse space as a theoretical tool in cognitive linguistics, describes this concept as follows:

> As discourse unfolds, at each step the current expression is constructed and interpreted against the background of those that have gone before. The prior discourse is a major determinant (along with context, background knowledge, etc.) of what I call the **current discourse space** (CDS). The CDS is a mental space comprising everything presumed to be shared by the speaker and hearer as the basis for a discourse at a given moment.

Two of our three contextual dimensions are clearly discernible in this quote. The prior discourse, which dynamically updates the current discourse space, can be equated with the discourse context, whereas the background knowledge referred to by Langacker would correspond to the knowledge context. Elsewhere in his book, Langacker (ibid.:42) speaks of the "apprehension of the physical, social, and cultural context", thus making his notion of context broadly compatible with the situational context as understood above. Langacker (ibid.:281) stresses the dynamic character of the CDS by claiming that

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[21] More precisely, by ranking available shared bases according to their quality of evidence in order to make assumptions about the common ground between him/her and engineer 2 (see 4.5.2).

[t]he CDS is stable in many respects […], but as discourse proceeds, it is continually updated as each successive utterance is processed. At any point, the CDS provides the basis for interpreting the next utterance encountered, which modifies both its content and what is focused within it.

So, while the situational context, at least in written communication, remains reasonably stable, both discourse and knowledge context are dynamically updated in this mode of discourse. Langacker further distinguishes between three *discourse frames*[22], which are those portions of the CDS that "are specifically invoked and brought to bear in the interpretation of any particular utterance" (ibid.). The *previous discourse frame* is the frame "invoked for interpreting the current expression" (ibid.), the *current discourse frame* is "obtained by updating the previous frame in accordance with the meaning of this expression" (ibid.:282), and the *anticipated discourse frame* refers to that information which is expected to follow the current expression and which may also influence its interpretation (ibid.). The scope of these discourse frames seems to be rather flexible and not clearly delimited since Langacker (ibid.) claims that "[what counts as a discourse frame is relative to a particular structural phenomenon or level of organization and cannot necessarily be determined with any precision."

With the notion of *mental space* (see quote from Langacker (2008:59) above), Langacker refers to a specific theory within the CL framework developed by Fauconnier (1994, 1997).[23] Evans/Green (2006:369) define mental spaces as "regions of conceptual space" which are constructed online and "result in unique and temporary 'packets' of conceptual structure, constructed for purposes specific to the ongoing discourse". I will not elaborate in detail on mental space theory since it is primarily concerned with linguistic theory-internal issues and notoriously difficult to apply to matters of translation. Suffice it to say that mental spaces and hence the CDS (or its specific discourse frames) can be understood as dynamic conceptual configurations that provide the locus for meaning construction, for example in the form as discussed in 4.1 and 4.2.1. The input to these conceptual

[22] These discourse frames are not to be confused with the frames as understood in frame semantics. While in frame semantics, frames refer to specific knowledge configurations tied to certain linguistic expressions, discourse frames are less dependent on specific linguistic clues and more encompassing than Fillmorean frames, "comprising everything presumed to be shared by the speaker and the hearer" (see Langacker's quote above).

[23] Mental space theory is a specific semantic theory primarily concerned with meaning construction, as opposed to frame semantics and the theory of domains, which are specifically concerned with knowledge organization and representation (see 4.5.3).

configurations would be the information provided by the three contextual dimensions discussed above. The current discourse space can also be understood as the locus of the contextual shaping of frames/domain matrices and the ranking of information according to their relative saliency as illustrated in 5.3.4. The information made salient by this process of contextual shaping would then feed into the actual conceptualizations entertained by the discourse participants. The notion of CDS will be taken up again in the cognitive linguistic discussion of explicitation and implicitation in 6.5.2 and it will feature prominently in the discussion of results in chapter 8.

5.4 The notion of text in scientific and technical translation

The last important element in the model to be discussed here is the notion of *text*. The concept of text, as the concept of context, is notoriously difficult to define, possibly because of its widespread, intuitive use in everyday language and the multiple theoretic perspectives from which it can be investigated. This has led some scholars (e.g. Adamzik 2004:31) to conclude that a generally accepted holistic definition of text is impossible and that researchers should instead focus on the different textual dimensions that can form the basis for theoretical investigation. For the purpose of this study and following the cognitive-functional perspective adopted by Rickheit/Strohner (1993:21), a text is understood as a verbal unit that is required to perform a verbal action. This very broad definition of text has two main advantages: it can easily be integrated into the model of the STT process proposed above and it allows various textual dimensions to be foregrounded according to specific epistemic aims.

5.4.1 The meaning dimension of text

The dimension of text that I want to focus on in the present discussion is that of text as a "carrier of meaning" (see, for example, Adamzik 2004:11) since this dimension ties in directly with the assumed narrow scope of interpretation and the ensuing stability of meaning in scientific and technical discourse (see 2.4.2 and 5.1.2). This section will scrutinize in more detail the possibility of intersubjectively stable textual meaning, which is both a central tenet of scientific and technical discourse/translation as well as a *conditio sine qua non* for the phenomena of explicitation and implicitation.

In line with the general principle of linguistic underdeterminacy and the specific cognitive linguistic claim that textual surface structures provide only impoverished prompts for rich conceptualization processes, we certainly cannot take the understanding or interpretation of

texts to be a passive process in which the meaning "contained" in the text is just decoded by the recipient. Such a concept of text would require a "reificatory" view on semantics (Sinha 1999, see 4.1) and a "container" or "conduit" view on human communication (Reddy 1979, see 4.2.1). Rather, cognitive linguistics stresses the dynamic character of text understanding/interpretation as an active process of meaning construction in which the text in its material form is just one – although a very important – input, containing prompts or access points to more detailed knowledge structures that are subject to the three contextual dimensions (and their cognitive representation in the CDS) discussed above. In order to highlight the qualitative distinctions entailed by this notion of text, Siever (2010:282-283)[24] distinguishes between the following five "texts":

$text_1$: the text intended by the author (mental construct/conceptualization)

$text_2$: the text produced by the ST author (text in its material form[25]/impoverished linguistic construal of the conceptualization of $text_1$)

$text_3$: the text interpreted by the translator (mental construct/conceptualization based on $text_2$)

$text_4$: the text produced by the translator (text in its material form/impoverished linguistic construal of the conceptualization of $text_2$)

$text_5$: the text interpreted by the TT recipient (mental construct/conceptualization based on $text_4$)

This classification provides a comprehensive overview of the different "intermediary stages" between the initial conceptualization or *intentio auctoris* and the text as interpreted by the translator and then by the target language recipient. If it is agreed that the understanding/interpretation of a text (i.e. the mental conceptualization of $text_3$ and $text_5$) takes place in the mind of the recipient and is thus primarily a *subjective* process, the question inevitably arises as to what extent the initial conceptualization of the author and the $text_2$ representing the linguistic construal of this conceptualization can indeed determine the conceptualization of $text_3$.[26] Put in a slightly different way, the question is

[24] For similar, albeit less granular, distinctions between various concepts of text see Nussbaumer (1991:136) and Jahr (1996:54-55).

[25] The text in its material form is comparable to Vermeer's (2002:134) notion of *texteme*; see also Siever (2010:215-216).

[26] Of course, this question also applies to the relation between $text_4$ and $text_5$ and their relation to the initial conceptualization of the author. Since this question also has to consider the potential symmetry or asymmetry

whether there can be any form of identity or approximation between the initial conceptualization of the author and the text as understood by the recipient and, if not, how many different interpretations of one and the same $text_2$ are admissible. This question directly relates to the admissible scope of interpretation of scientific and technical texts. While this scope is generally deemed to be quite narrow (see 2.4.2), there are also – in the wider debate about the stability or dynamicity of textual meaning –proponents of a dynamic concept of text who seem to generalize this dynamicity/subjectivity to all kinds of text, regardless of the form of discourse to which they belong.

Firstly, from a static perspective of textual meaning, there exists a fixed and objectively given text-internal meaning and therefore only one correct interpretation of a text. Proponents of this view can, for example, be found in hermeneutics (e.g. Paepcke [2]1994, see also Siever 2010:120) or in the structuralist tradition of German equivalence-based translation theory (Schreiber 1993:42).[27] From a cognitive point of view, it could be said that these approaches stress the importance of the bottom-up processes involved in text understanding, i.e. that understanding is primarily governed by the text in its material form.

A dynamic concept of text on the other hand is advocated, for example, by reception theory (Plett 1979), interpretive philosophy (Abel 1993), the Peircean tradition of interpretive semiotics as applied in translation studies (Siever 2010) and functional theories of situated translation (Risku 1998, 2004). Advocates of this dynamic concept of text stress the constructional and thus subjective character of text understanding and principally allow for as many different textual interpretations as there are acts of text reception. While static accounts of text show some affinity to the wider objectivist paradigm laid out in 3.1.1, the dynamic concept of text can be seen in the wider tradition of subjectivism/ postmodernism.[28] Again, seen from a cognitive point of view, these approaches focus on the importance of the top-down processes involved in text understanding, and since

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of the conceptual systems in source and target language cultures, it will be left aside for now and will instead be discussed in section 5.5 on the invariance of meaning in STT.

[27] However, both traditions concede that this text-internal meaning may be too complex to be fully recoverable (Schreiber 1993:42, quoting Albrecht 1990:71) or may only be approximated by means of the hermeneutic circle (Siever 2010:120).

[28] Recall Pym's (2010:95) axiomatic claim that "[w]hatever we say will be only one of many possible variations on what we think we mean, and what others make of our words will be only one of many possible interpretations".

previous knowledge, expectations, interests and other relevant factors differ from recipient to recipient, text interpretation is seen as a highly subjective process.

5.4.2 Stability vs. instability of textual meaning

In line with the cognitive linguistic basis of this thesis, the constructional and hence principally subjective character of meaning, in the form of conceptualizations in the minds of language users, can hardly be doubted and would then require us to adopt a dynamic concept of text as discussed above. The important question in this context is whether shifting the locus of meaning from the text to the mind of text users really entails the radical consequence that meaning construction is completely idiosyncratic or whether – at least for specific forms of discourse – it may be more fruitful to focus on the stable and intersubjective factors involved in communication. Within the poststructuralist paradigm currently dominating translation studies, the question is clearly answered in favour of the first alternative. However, the apparently widespread agreement on the indeterminacy of meaning[29] and the resulting idiosyncrasy of text understanding entails several problems that are hardly verbalized by the proponents of this approach. For example, if subjectivity and indeterminacy are indeed pervasive features of human communication, how is it possible that this communication is successful most of the time (e.g. Albrecht 2005:272)? How is it possible that we reach intersubjective consensus in text understanding? Or, as Siever (2010:286) pointedly asks, if Shakespeare's *Hamlet* has been interpreted in many different ways over time and in different cultures, why has it never been interpreted as an instruction to build an atomic bomb? The example may appear highly exaggerated but it actually touches the heart of the problem of how much objectivity/intersubjectivity and how much subjectivity is actually involved or admissible in text understanding. Siever (2010:284 ff.), who works in the framework of interpretive semiotics, further elaborates on this question by contrasting the positions of Umberto Eco and Jacques Derrida on this issue. While Eco (1992) believes that a text may have infinitively many interpretations but at the same time cannot be interpreted in any way the recipient wishes[30] (Siever (2010:285) speaks of an infinite but limited semiosis in this case), Derrida (1994) basically holds the

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[29] There is an important difference between the *underdeterminacy of meaning* referred to in this study and the *indeterminacy of meaning*, which is central to the poststructuralist paradigm in translation studies. While linguistic underdeterminacy implies that – given enough extra-linguistic input – a stable interpretation of a text can be obtained, the indeterminacy thesis denies that such stable interpretations are at all possible.

[30] The same opinion is held by Albrecht (2005:272).

opinion that a text allows whatever interpretation the recipient comes up with (an infinite and unlimited semiosis, Siever 2010:285). It should have become clear from the philosophical grounding of this thesis that Derrida's Deconstructionist position is not considered a viable option to be further pursued here since, from an embodied realist perspective, our conceptual systems are not free-floating but tied to the world as a function of human embodiment. Instead, it is highly interesting to take a closer look at Eco's position and the notion of "infinite but limited semiosis", which Siever (2010:285) illustrates with a very good example: The set of numbers between 0 and 1 is infinite since there are infinitively many fractions of the type 1/2, 1/3, 1/4, etc. This infinite number of fractions corresponds to the infinite number of possible interpretations of a text. However, these interpretations are limited by the numbers 0 and 1. The number 2.5, for example, does not belong to the set of numbers between 0 and 1 and would thus signify an inadmissible interpretation.

Siever's example provides a very good basis for a discussion of the relative stability or instability of text understanding since it is now established that there are interpretations which are outside the range of interpretations licensed by a particular text (e.g. the interpretation 2.5 in the example above). However, this insight is not very interesting in itself since it corresponds both to general intuitions about text understanding and to a general theoretical consensus on this question, apart from radical positions like Deconstruction. What is more interesting, both from a theoretical and a practical point of view, is the range of admissible interpretations which, in the example above, is delimited by the interval between 0 and 1. For the purpose of this study, I would like to argue that the interval delimiting the range of admissible interpretations can be conceptualized as an *interpretation corridor*[31] of variable width which, for a specific text, is a function of various interrelated factors. From this perspective, a wide interpretation corridor would allow infinitively many interpretations of more or less considerable qualitative difference (for example the interpretations 1, 4, and 7 in the interpretation corridor between 1 and 10), while a narrow corridor would still allow infinitively many interpretations but the qualitative differences of these interpretations become more and more granular or irrelevant the narrower the corridor becomes (for example the interpretations 1/4, 1/2 and 3/4 in the interpretation corridor between 0 and 1). This concept of a variable interpretation corridor thus incorporates the dynamic aspect of infinitively many possible interpretations

[31] Which is reminiscent of Snell-Hornby's *scope of interpretation* discussed in 2.4.2.

of one and the same text while at the same time linking it in a meaningful way to more static or stable factors which delimit the range of possible interpretations and which also have a bearing on the qualitative differences between these admissible interpretations.

The most important factor influencing the width of such an interpretation corridor will certainly be the frame of reference of the text[32], by which we bring back into the picture the perceived high stability of scientific and technical discourse. Consider the following sentence from the scientific/technical corpus of this thesis:

Das […] MEA/Wassergemisch wird *unter erheblicher Wärmezufuhr regeneriert und rezirkuliert.*

The linguistic surface structure of this sentence principally licenses two qualitatively very different interpretations: (1) both recirculation and regeneration occur under considerable input of heat; (2) only the regeneration occurs under considerable input of heat. The frame of reference of the text (i.e. a scientifically conceptualized state of affairs holding in the standard world) will then cancel the interpretation that conflicts with this state of affairs in the standard world since it lies outside the interval delimiting the interpretation corridor, say 1 and 2 in this case. In other words, the relations holding in the standard world will govern the relations within the text (see Jahr (1996:56) and the discussion in 2.4.2). Of course, within the interval of 1 and 2, there is still an infinite number of ways of forming a conceptualization based on the above construal. For example, upon encountering the above construal, I may conceptualize the pipes through which the water mixture flows as being grey, while another cognizer may conceptualize the pipes as being rust-coloured. However, with regard to the information to be conveyed by the above construal, these are arguably very granular differences that are unlikely to have any qualitative influence on understanding. If, on the other hand, we are faced with a poem reflecting the stream of consciousness of its author, the frame of reference will not be the standard world but the

[32] Adamzik (2004:64) proposes a model of different worlds serving as frames of reference for a particular text: (1) The *standard world* is the world as experienced by humans and in which humans function based on learned/acquired schemata; (2) the *world of games/fantasy* refers to imaginary worlds evoked in literature and the manipulation of these worlds; (3) the *world of science* includes the development of (preliminary) scientific models of the standard world with the aim of rational explanation of certain phenomena in this world; (4) the *world of subjective construction of meaning* includes the interpretation of the standard world according to subjective coherence schemata; and (5) the *world of the supernatural* includes beliefs and actions based on concepts which are not unanimously accepted in the standard world.

world of games/fantasy or, in other words, the highly idiosyncratic subjective experience of the author. In the absence of a sufficiently stable frame of reference, this text would probably exhibit a very wide interpretation corridor licensing interpretations of considerable qualitative difference.[33]

The primary function of the text also probably delimits the width of the interpretation corridor. In informative texts, as the prototypical form of text in scientific and technical discourse, we will assume, based on our theory of mind, that the author had a specific communicative intention in mind and have to consider this in our interpretation of the corresponding text. The theory of mind, which was discussed as a theoretical construct ensuring the feasibility of a conceptualist approach to meaning in 4.3, may therefore also serve to delimit the interpretation corridor of informative texts by coordinating text understanding between authors and readers of such texts. Expressive texts, on the other hand, may specifically avoid such clear communicative intentions which are characteristic of informative texts and instead appeal to the creativity of the text recipient.

Finally, the context in its three dimensions illustrated above will certainly also influence the admissible range of qualitatively different interpretations. If, for example, the utterance concerning the water mixture above is made by an engineer working in a specific treatment plant with rust-red pipes, my conceptualization of grey pipes would conflict with the real world and would thus be inadmissible due to the situational context. If the discourse context was more specific and mentioned that the mixture flows through such rust-coloured pipes, my interpretation would not conflict directly with the real world but with the textual information provided and would again be ruled out. Finally, the knowledge context will also serve to cancel inadmissible interpretations. While the utterance *Please remove the spark plugs* could principally be interpreted as a request to grab a pair of pliers and rip the spark plugs out of the cylinder heads by brute force, the common ground between the discourse participants (as the intersection of their knowledge contexts) will certainly ensure that this interpretation will lie outside the interval of admissible interpretations.

Summing up, I proposed the frame of reference, the primary text function and the context in its three dimensions as important factors defining an *interpretation corridor* which limits the range of admissible text interpretations in significant ways. This construct allows

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[33] The discussion above is in line with Jahr's (1996:58) distinction between the interpretation of LSP texts and literary texts. A similar distinction in the context of text interpretation can be found in Nord (1997:85).

us to accept the principally constructional and subjective character of text understanding while at the same time considering several stable factors that ensure the high stability of text interpretation in scientific and technical discourse. This also corresponds to the narrow scope of interpretation and the high stability of meaning posited for this form of discourse (see 2.4.2). The possibility of intersubjectively stable textual meaning as a central tenet of scientific and technical discourse/translation and as a *conditio sine qua non* for the phenomena of explicitation and implicitation should thus be sufficiently secured from a theoretical perspective. What remains to be addressed in this chapter is the notion of invariance of meaning in STT, to which we turn now.

5.5 A cognitive linguistic view on invariance of meaning in scientific and technical translation

In the previous section, I have argued for the high stability of textual meaning in scientific and technical translation/discourse. However, having made a case for the stability of meaning in *monolingual* scientific and technical discourse does not automatically entail that this meaning can be held *invariant* in translation to another linguistic and conceptual system. While the discussion on the stability of meaning was primarily concerned with the relations holding between texts which are based on the same conceptual system and construed using the means of the same linguistic system[34], the present discussion on the invariance of meaning will be concerned with the relation between texts which are based on different conceptual systems and construed using the linguistic means of different linguistic systems[35]. The problem has already been hinted at in the discussions in 2.4.3 and 2.6, and it will now be taken up again with the philosophical and linguistic basis of the present thesis in mind. Before doing so, however, I would again like to point out that meaning will not always be the highest ranking invariant in STT since various sociocultural factors may require corresponding shifts if the translation is to serve the same function as the source text (see 2.6). Therefore, the discussion of invariance of meaning in STT in the following sections will only be relevant to those instances where a translator

[34] With reference to Siever's five text types discussed in 5.4.1, this would be the relation between $text_2$ (text produced by the ST author) and $text_3$ (text interpreted by the translator) and the relation between $text_4$ (text produced by the translator) and $text_5$ (text interpreted by the TL recipient).

[35] This would be the relation between $text_{1/2}$ (text intended and produced by the author) and $text_{4/5}$ (text produced by the translator and interpreted by the TL recipient) and ultimately the relation between $text_1$ (conceptualization of ST author) and $text_5$ (conceptualization of TT recipient).

obviously tried to achieve such invariance of meaning. Shifts of meaning in STT are certainly a very interesting field of research but they will not be considered in the present thesis, which is more specifically concerned with the phenomena of explicitation and implicitation. These two concepts are actually based on the idea that there is invariance or a high similarity of meaning in translation, with the differences pertaining to the degree of explicitness or implicitness with which this meaning is encoded in ST and TT (see the definitions of explicitation and implicitation in 6.6).[36] However, the focus on invariance of meaning in STT is certainly justified since it can be deemed to be the primary invariant to be achieved in this form of translation, as discussed in the context of the distinctive features of STT in 2.4.3.

Both Lakoff (1987:312) and Scarpa (2002:136) claim that for meaning to be held "invariant" in translation, close correspondences between the respective conceptual systems are required. I would like to make the following reservation with regard to this statement. From the common human conceptualizing capacity as a result of our shared embodiment, it follows that we can even understand conceptual systems which may be radically different from our own. Following Jakobson (1959:234) and Schreiber (1993:45), I would therefore like to make the optimistic claim that we can also recreate the meaning associated with these conceptual systems in our own language but, and this is crucially important, not with the ease or economy of expression that may be required by the function of a given translation. For example, as discussed in 5.2.1 and 5.2.2, English has lexicalized a very economic distinction between *bolts* and *screws* (in the form of two single root morphemes). German can recreate this distinction but it has to resort to more lengthy and hence less economic prepositional word groups to do so (*Schrauben mit Muttern*/*Schrauben ohne Muttern*). The effort required to recreate the meaning of the English terms in German is still relatively low since the two conceptual systems are still sufficiently congruent. However, the more incongruent the source and target conceptual systems are, the more effort may be required to recreate the meaning of an ST expression

[36] See, for example, Becher's (2011:81) discussion of a close correspondence of meaning between ST and TT as a prerequisite for any meaningful study of explicitation and implicitation in translation. Note also Chesterman's (1998:30) claim that "when looking at meaning relations as manifested through translation, we have tended to omit data that seem to be "too freely" translated – i.e. which differ too much from the original form, as well as its meaning […]".

in the TT.[37] It was argued in section 5.2.1 above that conceptual systems in science and technology will probably not be radically different but rather tend to exhibit a high degree of cross-cultural and cross-linguistic congruence. However, I also pointed out the possibility and evidence of asymmetries between such conceptual systems in SL and TL (as evidenced, for instance, by the trivial example of *screws/bolts* vs. *Schrauben* above). Furthermore, even in cases where SL and TL conceptual systems are highly congruent, the TL may not provide any readily available lexicalized or conventionally accepted means (in the form of default construals) to recreate the specific perspectives encoded in the source language (see the discussion of the term *Gasaufstieg* and its translation in 5.2.2).

With these provisos in mind, we will now investigate the notion of invariance of meaning in translation, starting from a common point of criticism levelled against this concept, especially from the postmodernist strand in translation studies. In his discussion of the epistemological problems of equivalence-based approaches to translation, Siever (2010:66 ff.) rightly asks about the locus of the *tertium comparationis*[38] which is intended to serve as the invariant in translation. He points out that equivalence-based approaches often refer to "the reality" as the ultimate and objective criterion for deciding whether or not meaning is kept invariant in translation (see Kade 1964:94). The philosophical premise of these approaches is illustrated in the following, slightly modified, figure from Wilss (1977:49-50).

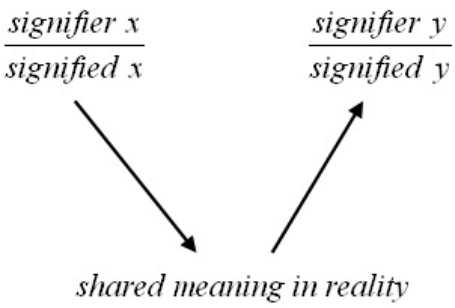

Figure 4: Shared meaning in reality acting as *tertium comparationis*

[37] See, for example, Geertz (1973:134-135, quoted in Croft/Cruse 2004:21), who requires half a page to explain the meaning of the Javanese term *rasa* in English.

[38] The notion of *tertium comparationis* is inextricably linked with the notion of invariance and hence associated with the same epistemological problems. Since the *tertium comparationis* is primarily of methodological importance to this study (see Bakker et al. [2]2009:269), its discussion will be postponed until chapter 7. The discussion can then be based on the epistemological reflections on the invariance concept in the current chapter.

In this figure, the signifier-signified relation in source language x refers to a meaning in reality which is shared with target language y. Given this shared meaning in reality, it is possible to recreate or keep invariant the meaning encoded in the source text by the signifier-signified relation in the target language. The objectivist undertow of such approaches, which are reminiscent of the uninterpreted states of affairs of formal semantics, should be obvious, making them somewhat incompatible with the philosophical and linguistic commitments of the present thesis. As Siever (2010:66-67) claims, since Kant, it is no longer possible to simply refer to the "thing in itself" as the ultimate decision-making criterion in translation (see also Salevsky 2002:164). In the same vein, embodied realism claims that our access to reality is not direct and uninterpreted but rather mediated by conceptualization, and although there are constraints placed on this conceptualization by human embodiment, a certain amount of variation is expected and documented in real life (see 5.2.1). This variation may occur within a single language (Lakoff 1987:317) and perhaps even more so between languages since different languages have lexicalized different default construals of certain aspects of reality (e.g. *bolts/screws* vs. *Schrauben*). Therefore, it is somewhat problematic to assume, *a priori*, a shared meaning in uninterpreted reality and to posit this as a rock-solid *tertium comparationis* guaranteeing invariance of meaning in translation. If we discard the notion of reality understood as an Archimedean point of reference for establishing invariance of meaning in translation and approach the problem from the philosophical and cognitive linguistic perspective of this thesis, we will obtain a revised figure that may look like this (Wilss 1977:49-50, again, the figure was slightly modified):

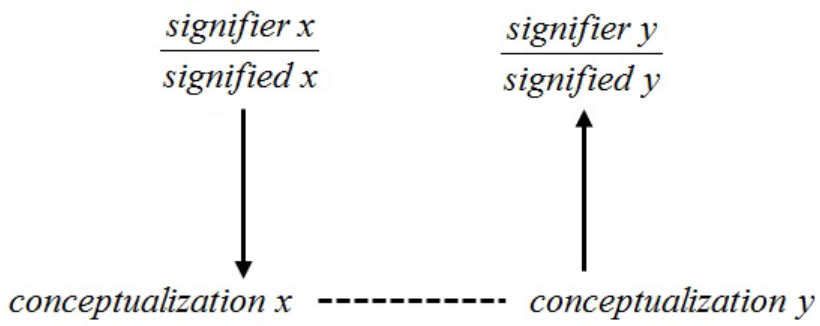

Figure 5: Two principally independent conceptualizations of reality

In this figure, a shared meaning in reality has been omitted and we are faced with two potentially different conceptualizations, the invariance of which has to be sought

somewhere else other than in objective reality. It is on this second figure that the present discussion of invariance of meaning will be based.

Invariance has previously been defined as pertaining to "those elements which remain unchanged in the process of translation" (Bakker et al. [2]2009:269). It thus describes a relation of *sameness* or *similarity* between a certain ST dimension and a corresponding TT dimension, in our case the dimension of (denotational) meaning. In this context, Halverson (1997:209) points out that there are two crucial aspects associated with the notion of sameness or similarity[39] in translation – its nature and its degree. We will first address the problem of the nature of sameness/similarity in translation. It seems that, in the absence of any objectively given and accordingly perceived reality that "vouchsafes" for invariance of meaning in translation, establishing sameness or similarity between ST and TT becomes the task of a human observer and thus a primarily (inter)subjective instead of a purely objective process. As Chesterman (1996:159) puts it, "[t]wo entities "are" similar if they are *judged to be similar* – judged by someone". From this perspective, the potential invariance between the two conceptualizations in the figure above becomes the interpretive result of a comparison between the two conceptualizations. We must therefore take into account that when postulating invariance of meaning between ST and TT, we make judgements that are – at least to some extent – subjective in that the similarity/sameness that leads us to postulate invariance is perceived by a human cognizer and not determined by an objectively given reality. This leads to the second aspect identified by Halverson above, namely the degree of similarity/sameness perceived between two entities – in this case the meaning of ST and TT (see also Chesterman 1996:160). Halverson (1997:209) points out that we are talking about scalar concepts here, meaning that two entities being compared with regard to a given quality can possess these qualities in varying degrees (ibid.:210). In the context of translation this would mean that two entities, in this case ST and TT, can be compared with regard to a given quality, for example invariance of meaning, and this perceived invariance of meaning can be present to different degrees.[40]

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[39] The focus of the discussion changes from invariance to sameness/similarity here since the following reflections are based on the corresponding accounts of Chesterman (1996, on similarity) and Halverson (1997, on sameness). After surveying their arguments, the invariance concept will be brought back into focus.

[40] See Schreiber's notion of *degree of equivalence* discussed in chapter 2.6, which is a function of the degree of invariance achieved in translation.

It follows that the process of comparison involved in establishing invariance or sameness/similarity of meaning in translation is an inherently cognitive operation (see Chesterman 1996:159) which, in line with the cognitive linguistic basis of this thesis, can be linked to one of the dimensions of linguistic construal in Croft/Cruse's model discussed in 4.5.1.2. In their category *judgement/comparison*, the authors attempt to "link the fundamental philosophical concept of [Kantian] judgement to the cognitive psychological process of comparison" (Croft/Cruse 2004:54). The authors do not elaborate in detail on this cognitive psychological process but instead refer to Langacker (1987:101 ff.), who gives a more detailed account of comparison in the CL framework. Langacker (ibid.:102) isolates three functional components of the act of comparison, which he summarizes in the formula S > T. *S* stands for the standard of comparison and *T* for the target, with an asymmetrical relation holding between *S* and *T*. The standard of comparison "serves as a baseline event or point of reference, relative to which the target is evaluated" (ibid.). The third component of the comparison process, denoted by the symbol >, is a scanning operation reflecting the directionality of the comparison from S to T, "with the value of T depending on its degree of "departure" from S" (ibid.). Langacker points out two further cognitive operations involved in the comparison process, these being *selection* and *abstraction* (ibid.:104).[41] *Selection* pertains to the fact that the comparison of two entities usually does not treat them as "unanalyzed wholes" (ibid.) but normally refers to a specific aspect, quality or dimension of these entities. *Abstraction*, on the other hand, describes the process whereby, in a comparison, we can abstract away from or omit from consideration certain differences between the entities being compared in order to focus on the perceived similarities (ibid.:104, 132). Langacker's cognitive linguistic account of comparison seems to be readily applicable to the present discussion of invariance of meaning in translation.

I would now like to go back to the example from the scientific/technical corpus discussed in 5.2.2 in order to discuss the cognitive process of comparison just outlined:

[41] *Selection* and *abstraction* were two linguistic construal operations in the original model developed by Langacker (1987), in which the notion of construal was still called *imagery*. In Langacker's current model presented in 4.5.1.1, *selection* was replaced by the construal operation of *focusing*, and *abstraction* seems to have no direct counterpart (however, processes of abstraction feature in the construal operation of *specificity/schematicity*).

[...] Erkundungsbohrungen sind Schwachstellen, bei deren mangelhafter Versiegelung ein Gasaufstieg möglich ist.

(...) exploratory boreholes are weak points since if they are not properly sealed gas may ascend through them.

In a process of scanning, we can compare the German construal *möglicher Gasaufstieg* (the standard of comparison S) with its English translation *gas may ascend* (the target T). If we *select* the meaning of the two construals (i.e. the conceptualizations triggered by these construals in combination with contextual factors) as the dimension with regard to which the comparison is to be conducted, we would probably ascribe a high degree of similarity to the two construals and the resulting conceptualizations (since we would perceive the basically same conceptual content construed). We would also have to *abstract* away from very little and irrelevant differences (namely that the German source text opts for a nominal construal of the rising gas whereas the English target text construes this conceptual content as a verbal process). In other words, we would probably ascribe a high degree of invariance of meaning to the translation. If the English construal read, for example, *gas may escape*, we would have to abstract away from a more significant difference, namely that the German construal profiles the rising of the gas (probably inside a container), whereas the English target text states the possibility of the gas escaping from this container. This would probably result in a lower degree of perceived similarity or invariance of meaning. Depending on contextual factors, we may come to the conclusion that we are dealing with an instance of variance of meaning here.[42] Finally, if the English construal read *gas will escape*, we would judge the meaning of the two construals to be no longer similar since it is hardly possible to abstract away from the difference in epistemic modality between ST and TT. In other words, the comparison process involving this last English construal will yield a considerable conceptual distance from the original German construal that will not allow us to establish any meaningful similarity or sameness between the two construals.

One point remains to be made in this context. It has been indicated in 4.5.1 that cognitive linguistics claims that linguistic meaning has two components, a conceptual content and the construal of this content. If construal is part of meaning and if we accept that the

[42] This judgement will be influenced by the question of whether the information about the possibility of the gas actually escaping can reasonably be claimed to be inferable from the context of the source text construal and can thus still be integrated in the conceptualization based on this construal.

original SL and TL elements above (*möglicher Gasaufstieg → gas may ascend*) differ slightly in construal (albeit of the basically same conceptual content), we would have to strictly say that the translator did not succeed in keeping the meaning (here, the construal component of meaning) invariant. However, such a radical conclusion would be quite exaggerated. Just as we often cannot recreate each and every conceptual nuance of the ST or the conceptualization licensed by this ST in the TT (at least not with the required ease and economy of expression), we also often cannot fully recreate in the target text the source text construal of basically the same conceptual content (see the discussion of default construals in 5.2.2).[43] However, in both cases, we would probably still speak of invariance of meaning if the perceived differences and the effort required to abstract from these differences are small enough. Probably similar considerations led Schreiber (1993:57), whose equivalence concept was illustrated in 2.6, to concede that the invariance requirement can often only be fulfilled in an *approximate* manner in translation. To account for the possible variation that such an approximation entails, Schreiber (ibid.) applies McFarlane's (1953:84) concept of *tolerance*, which shows some striking similarities to the discussion so far:

> We probably need in any blue-print theory of translation some concept similar to the engineer's 'tolerance', some term to describe that state of affairs where there are similarities that are fundamental and differences that are irrelevant, some limits of imprecision within which there is a satisfactory functioning.

It is precisely these fundamental similarities and irrelevant differences perceivable in ST-TT comparisons that justify the idea of invariance of meaning in translation.[44] A corresponding investigation of explicitation and implicitation would then be feasible if we perceive the possible differences between ST and TT to be within the tolerance range described above. If we come to the conclusion that basically the same conceptual content is construed in ST and TT, with only the construal of this content varying, this would certainly fall within this tolerance range. If we also perceive differences in the conceptual content construed, our judgement of whether or not these differences are still within the

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[43] Indeed, it is one aspect of high-quality translation that the translator often specifically has to avoid recreating the SL default construals in the TT if the translation should not read like *translationese*.

[44] Arntz (2001:25) rightly points out in this context that, unlike mathematics for example, linguistics and translation studies do not have an exact measure for similarity or invariance (which is only natural given the primarily hermeneutic character of the two disciplines). It seems therefore indispensable to allow for a certain tolerance range when making any similarity/sameness or invariance judgements in translation.

tolerance range will be both a function of the contextual factors influencing the conceptualization based on this construal and a function of the cognitive effort required to abstract from these differences. Since we have no objective algorithm for determining this tolerance range and whether any perceived differences fall within or outside this range, it is all the more important to make transparent our corresponding reasoning when discussing the results of our contrastive investigations. An invariance concept understood this way, which cannot conveniently be anchored in an objectively given and prestructured reality, becomes a fuzzier and more subjective but theoretically sounder and cognitively more plausible notion. To reiterate Lakoff's (1987:265) words from the closing section of chapter 3, "that is the best we can do" – and it should be good enough to make the notion of invariance both feasible in theoretical accounts of scientific and technical translation and at the same time applicable in contrastive analyses of explicitation and implicitation in translation.

5.6 Chapter summary

This chapter explored various aspects of scientific and technical translation from a cognitive linguistic perspective. Based on a model of the STT process, the different agents in the model and their immediate textual actions were discussed on a cognitive linguistic basis. Then, taking a more macroscopic perspective, several epistemological aspects of STT were elaborated. It was argued that the nature of the domain-related reality, the technological extension of human basic-level abilities, the rigour associated with the scientific method and the international character of scientific communities result in a high stability and universality of conceptual systems in science and technology but that beyond this stable basis, a certain degree of socially, economically, culturally and linguistically induced variation will occur. Language was argued to facilitate but not to determine the conceptualization of domain-related reality and it was illustrated that different languages provide different default construals for encoding such conceptualizations. The focus was then narrowed down again to the discussion of situational context, discourse context and knowledge context as the three contextual dimensions of primary importance in STT. Reintroducing cognitive semantics into the picture, it was illustrated how frames/domain matrices will be shaped by contextual pressures acting on specific usage events. The discussion of context concluded with the illustration of Langacker's concept of *current discourse space* as a means of cognitive representation of the three context types. Then, the notion of text in STT was discussed and it was shown that we can adopt a dynamic and

constructional account of textual meaning in line with the tenets of cognitive linguistics and still ensure the possibility of intersubjectively stable textual meaning. Finally, the difficult notion of invariance of meaning in STT and the epistemological issues involved in this notion were discussed. It was argued that we do not need to anchor invariance of meaning in an objectively given and prestructured reality but that judgements on (in)variance of meaning will be the result of a comparison process by human cognizers. It was also shown that this process of comparison can be coherently modelled within the cognitive linguistic framework.

The next chapter will narrow down the perspective to the specific phenomena of explicitation and implicitation as potential indicators of text-context interaction in translation.

6 Explicitation and implicitation

This chapter narrows down the perspective to the two specific translational phenomena of explicitation and implicitation as potential indicators of the interaction between text and context in scientific and technical translation. The discussion of the two concepts will start from a translation studies oriented perspective, illustrating the theoretical status of explicitation and implicitation and critically evaluating several conceptual issues, primarily pertaining to the distinction between the two phenomena and various adjacent concepts. In the second part of the chapter, I will then give a cognitive linguistic account of explicitation and implicitation that addresses these issues and that aims to integrate the two concepts into the overall theoretical framework of the thesis.

6.1 Explicitation and implicitation as areas of enquiry in translation studies

The concepts of explicitation and implicitation were first introduced into the discourse about translation by Vinay/Darbelnet (^{2}1977) in their comparative stylistics of English and French (Shuttleworth/Cowie ^{2}1999:55; Klaudy ^{2}2009:104), and their definitions will serve as a starting point for the following discussion. Vinay/Darbelnet define explicitation as a "stylistic translation technique which consists of making explicit in the target language what remains implicit in the source language because it is apparent from either the context or the situation" (1995:342, translation by Sager/Hamel[1]). In the same vein, implicitation is defined as a "stylistic translation technique which consists of making what is explicit in the source language implicit in the target language, relying on the context or the situation for conveying the meaning" (ibid.:344[2]). Leaving aside the fact that explicitation and implicitation are reduced to mere "stylistic" techniques in these definitions, both phenomena seem intuitively appealing and straightforward, showing huge potential for empirical analysis. And indeed, especially the notion of explicitation has recently informed much research in translation studies, without however scrutinizing the underlying definition(s) of the concept as closely as perhaps would have been desirable or even necessary (Kamenická 2007:45). For if we take a closer look at Vinay and Darbelnet's definitions above, things become more complicated. Most striking perhaps is the partial

[1] The original definition reads as follows: "Procédé qui consiste à introduire dans LA [langue d'arrivée] des précisions qui restent implicites dans LD [langue de départ], mais qui se dégagent du contexte ou de la situation." (Vinay/Darbelnet ^{2}1977:9, square brackets added)

2 "Procédé qui consiste à laisser au contexte ou à la situation le soin de préciser certains détails explicites dans LD." (Vinay/Darbelnet ^{2}1977:10)

circularity of their definitions, where the root morphemes *explicit* and *implicit* occur both in the *definiendum* and in the *definiens*.[3] Claiming, for example, that implicitation means making something implicit immediately begs the question as to what exactly is meant by some piece of information being "implicit" in the source/target language? Is it sufficient for the information to be just overtly absent from the text or does it have to be inferable in some way?[4] The same question could, of course, be asked about the relation between explicitation and the notion of *explicitness*. It therefore seems that Vinay and Darbelnet's definitions as well as similar definitions of explicitation and implicitation may well serve as a starting point for the discussion of these concepts but that a detailed elaboration of these definitions and especially their *differentiae specificae* is required before they can be confidently applied in empirical analyses.

6.1.1 Theoretical and empirical imbalance between explicitation and implicitation

From the outset, any joint study of explicitation and implicitation is faced with a major complication, namely the huge imbalance between these two concepts in terms of theoretical reflection and empirical analysis. This imbalance can, for example, be illustrated by a quick search in Translation Studies Abstracts Online (accessed on 29/07/2013), which yields more than 120 results for explicitation but merely 15 entries for implicitation. Illustrating specifically the asymmetry in terms of theoretical reflection, Krein-Kühle (2009:236) points out that important works of reference in translation studies (especially Baker/Saldanha ^{2}2009) contain a proper entry for explicitation but not for implicitation. This is not to say that implicitation does not feature at all in the analyses and discussions of explicitation, but it is often treated as a mere annexe, not having a truly independent conceptual status and only being evoked when a counterpart is needed in the theoretical discussion of explicitation.[5] One important reason for this theoretical and empirical imbalance is certainly Blum-Kulka's (1986) hugely influential Explicitation Hypothesis claiming the inherence of explicitation in the translation process regardless of

[3] This circularity is also present in other canonical definitions. See, for example, Klaudy's (^{2}2009:104) widely accepted definition of explicitation being "the technique of making explicit in the target text information that is implicit in the source text".

[4] Becher (2011:17) raises similar questions with regard to Vinay and Darbelnet's definition of explicitation.

[5] In a recent article, Murtisari (2013:333) even proposes to substitute the term "implicitation" by the term "de-explicitation" [sic!]. To be fair, this proposed change of designation is induced by the relevance-theoretic framework that Murtisari is working with but it still serves to illustrate the clear subservience of the implicitation concept to its "bigger brother" explicitation.

other factors involved (see 6.1.2 below). Another reason may be the impetus explicitation research received with the advent of corpus-based translation studies in the 1990s (see, for example, Baker 1993). Implicitation has only recently received greater consideration in the discipline, for example in the form of Klaudy's (2001) Asymmetry Hypothesis and in subsequent joint studies of the two concepts (e.g. Becher 2011). However, studies focusing solely on the investigation of implicitation as an independent concept are, with few notable exceptions (Salama-Carr 2001, 2003), still virtually absent from the discipline. Since much of the theoretical work has until now gone into the concept of explicitation, I will also start from this vantage point by first tracing the theoretical development and the major lines of argument in explicitation research and then extending the discussion to the implicitation concept.

6.1.2 Explicitation and translational universality

As mentioned in the previous section, ever since the postulation of Blum-Kulka's Explicitation Hypothesis in 1986 and the rise of corpus-based translation studies in the early 1990s, explicitation has been regarded as an inherent, universal feature of the translation process; translational universals are understood as "linguistic features which typically occur in translated texts and are thought to be the almost inevitable by-products of the process of mediating between two languages" (Laviosa 2002:43). The claim of the translational universality of explicitation has spurred a considerable amount of research, especially within the context of corpus-based translation studies, with a multitude of studies trying to find evidence for or against the Explicitation Hypothesis (see the overview in 6.1.3 below). This thesis does not intent to contribute another body of empirical evidence to this highly complex universalist debate since it is concerned with different epistemic aims. Therefore, I will only very briefly illustrate my own view of this topic. Firstly, the term *universal* in translation certainly cannot be understood in the strict sense with which it is used in linguistics, where universals refer to "those properties that are necessarily common to all human languages" (Comrie 2003:195, quoted from Becher 2010a:23). Such a strong use of the term would mean that explicitation is a feature necessarily present in all translations ever done, which is obviously quite absurd. Translation cannot be studied the same way the grammar of a language can[6] since it is a much more unstable phenomenon and exhibits a much greater variation that the relatively

[6] Although the strong linguistically oriented early German Leipzig School envisaged such a "translation grammar" that could systematically capture the rules of translational action (see Prunč 2007:50).

stable grammatical structures of a language (see also Becher 2010a:23). Therefore, the notion of universals is generally toned down in translation studies, with corresponding studies intending to uncover "not the existence of all-or-none-phenomena, but tendencies, trends, regularities" (Laviosa 2002:78). However, as Becher (2011:75-76) rightly argues, treating translational universals as universal tendencies still begs the question of which criteria have to be fulfilled to consider explicitation as a universal tendency of translation. For example, which percentage of studies must yield evidence for the universality of explicitation? How do we treat evidence against such universality? And, how much evidence against it is admissible before we may have to reconsider the claim of a universal tendency? Since the current evidence on the universality of explicitation is highly inconclusive (Krein-Kühle 2009:224, see also the detailed discussion of various studies on explicitation in Becher 2011:28 ff.) and since there is no coordinated, large-scale research programme on the horizon that could shed proper light on the issue, even the idea of a universal tendency of explicitation is too strong in my opinion. Also, a negative by-product of the search for universals in translation studies may be that explicitation has often been reduced to its alleged universality alone, while other interesting dimensions of this concept (for example, its function as a potential indicator of text-context interaction or the translational motivation for performing explicitation shifts) have receded into the background. Also, the universalist perspective may suppress other interesting research questions, for example, whether the frequency and distribution of explicitation possibly correlates with the language direction or with the degree of technicality of the texts investigated (see 7.1.1.3 and 7.1.1.4). And moreover, these questions can certainly also be asked for the implicitation concept. In light of these problems, I propose to dissociate the explicitation concept from its potential universality, to bring implicitation into the picture as a concept of equal standing and to open the way for new perspectives on both phenomena. This will be attempted in the present chapter.

6.1.3 Major strands in research on explicitation

In the wake of the Explicitation Hypothesis, translation scholars have accumulated a considerable body of work on explicitation.[7] Since the present thesis takes a different epistemic perspective on the explicitation concept and therefore aims to dissociate it from the (perhaps not very fruitful) discussion of translational universality, I will not discuss the

[7] For a quite extensive, albeit already somewhat dated list of studies on explicitation see Englund Dimitrova (2005:35).

various studies, their methodologies, findings and potential merits and shortcomings in detail.[8] Instead, I will try to give a structured overview of the work done so far and to highlight the major theoretical frameworks underlying the various studies. Also, I will pick out some representative studies of the various approaches and very briefly situate them with regard to the present thesis.

The following overview and discussion is based on Baumgarten et al. (2008:180-185). The authors identify two major strands of explicitation research which are primarily rooted in translation studies and a third strand which is more prevalent in interpreting studies. Of course, these different strands do not represent clearly delimited or even mutually exclusive approaches to explicitation research; they rather represent different perspectives on the phenomenon and, to some extent, often overlap with other approaches.

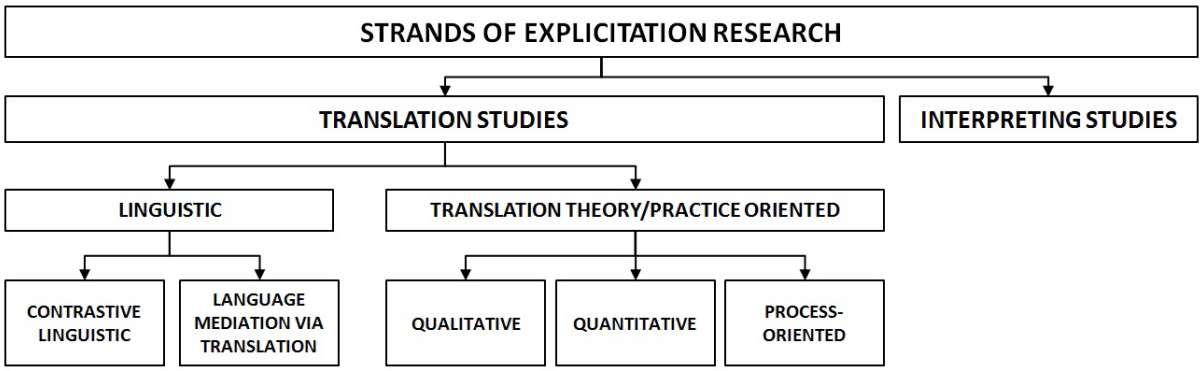

Figure 1: Strands of explicitation research in translation and interpreting studies

In translation studies, the authors distinguish between a linguistically-oriented strand and a translation-theory and translation-practice oriented strand. The linguistic strand is further subdivided into an essentially contrastive linguistic approach and an approach that focuses on language mediation via translation. The former approach, adopted by scholars such as Doherty (2002) and Fabricius-Hansen (1996, 1999), focuses on structural differences between SL and TL which lead to explicitation in translation. The findings of these studies can be related to Klaudy's ([2]2009:106) notion of "obligatory explicitation", which "is dictated by differences in the syntactic and semantic structure of languages". Naturally, the contrastive linguistic approach does not focus on the pragmatic/communicative dimension of language and disregards potential explicitations that may be triggered by pragmatic considerations (e.g. Klaudy's ([2]2009:106-107) notions of "optional explicitation" and

[8] This has already been done quite extensively by Becher (2010a, 2010b, 2011), who takes a particularly firm stand against the alleged universality of the explicitation concept.

"pragmatic explicitation"). This is not intended as a criticism of the contrastive linguistic approach which, by definition, takes an intentionally reductionist view on its object of study.[9] Also, it does not mean that the findings of this approach will be disregarded in the present study since a holistic investigation of explicitation (and implicitation) needs to take all the relevant variables into account, structural differences between source and target languages certainly being among them. The latter approach in the linguistic strand of explicitation research is represented by House (e.g. 2002, 2004, 2006), Steiner (2005) and Hansen-Schirra et al. (2007), with the latter authors focusing on "a systematic description of the text type/register "translation" and its relation to comparable texts in the source language and target language communities" (Baumgarten et al. 2008:180). House, filling the gap left by the contrastive linguistic approach, looks at explicitation from a communicative/discursive perspective and tries to link explicitations observed in English-German translations to differences between English and German discourse norms (see Becher 2011:55). In comparing these discourse norms, she identifies, for example, "[a] shift from a conventionally strong emphasis on informational explicitness in German texts to Anglophone inference-inducing implicitness and propositional opaqueness" (House 2002:200). Steiner (2005) and Hansen-Schirra et al. (2007), working within the framework of Systemic Functional Grammar, assign the notion of explicitness to the three Hallidayan linguistic meta-functions and apply an annotation scheme for the study of explicitation to the CroCo corpus, which is a large-scale bilingual translation corpus (Hansen-Schirra et al. 2007:248-249). Since the analysis is based on the automatic querying of this large-scale annotated corpus, the authors focus on the formal realization of explicitation phenomena (Steiner 2005:9) and their notion of source-text implicitness is tied to linguistic triggering elements in the source text (ibid.:17).

In the translation-theory and translation-practice oriented strand, Baumgarten et al. (2008:182) identify three research foci, namely qualitative, quantitative and process-oriented studies. Qualitative studies focus on translation product analyses and the possible motivation behind the identified explicitations (e.g. Weissbrod 1992; Øverås 1998). Explanatory variables often invoked in qualitative studies of explicitation are for example translation norms (Weissbrod 1992; Øverås 1998) or the style of the translator (Saldanha

[9] Doherty, a major proponent of the contrastive linguistic approach, specifically points out its "highly restrictive" nature since this approach uses "the microscope as an instrument for questions of discourse analysis and translation". She also highlights its "direct opposition to the multi-functional perspective of text linguistics and the culture-dominated approach of modern translation studies" (Doherty 2002:xi).

2008; Kamenickà 2008). The explicitation research undertaken by House (see above), linking instances of explicitation to prevailing discourse norms of source and target-language communities, would also fit into the qualitative approach in the translation-theory and practice oriented strand. In contrast to qualitative studies on explicitation, quantitative studies usually focus on a set of pre-defined explicitation phenomena and establish statistical analyses of these phenomena in large-scale corpora. The corpus design used in quantitative research is often of the comparable type (Laviosa 2002:34 ff.), investigating the relationship between translations and texts originally written in the target language instead of the relationship between translations and their source texts. The probably best known and most influential study in this approach to explicitation research is Olohan/Baker (2000). In this study, the authors analyze the use of the optional complementizer *that* in combination with the reporting verbs *say* and *tell* using a comparable corpus design.[10] Both qualitative and quantitative explicitation research is often theoretically positioned with regard to the Explicitation Hypothesis, either trying to confirm it (e.g. Øverås 1998; Olohan/Baker 2000; Pápai 2004; Konšalová 2007) or to falsify it (Baumgarten et al. 2008; Becher 2010a, 2010b, 2011). The best known process-oriented analysis of explicitation is possibly Englund Dimitrova's (2005) study, which correlates the phenomenon with different degrees of translator expertise (professional translators, translation students and language students at university level). Englund Dimitrova's study uses think-aloud protocols and computer logging to capture relevant process data. Her study focuses on the explicitation of various logical links within and between sentences and therefore investigates a predefined subset of possible explicitation phenomena.

In the third strand of explicitation research, which features more prominently in interpreting studies, explicitation is primarily seen as a strategy that is needed "to circumvent linguistic and socio-cultural differences" (Pöchhacker 2004:135) and "to overcome the pragmatic underdetermination of what is said" (Baumgarten et al. 2008:183). While linguistic and socio-cultural differences also feature prominently in the translation-theory and the translation-practice oriented strand – mostly in the discussion of the possible motivation of explicitation – the pragmatic and cognitive underdeterminacy of linguistic structures has mostly been neglected in translational explicitation research. This

[10] Whether both the feature under investigation and the setup of this study can yield true instances of explicitation will be critically discussed in the course of this chapter.

is one of the gaps that the cognitive linguistic account of explicitation and implicitation presented in the second half of this chapter aims to fill.

6.2 Examining the explicitation concept

After this broad overview of the different strands of explicitation research, the various complex dimensions of this concept will now be investigated in detail. I will start with a general discussion of the conceptual status of explicitation before investigating in some detail two fundamentally different versions of explicitation that have come to coexist in translation studies but which portray two radically different approaches to explicitation. After identifying the version of explicitation relevant to the present study, a distinction will be made between explicitation and two adjacent concepts which represent closely related, yet distinct phenomena.

6.2.1 Conceptual issues

The broad array of approaches to explicitation research presented above can be seen as proof of the huge popularity of this concept in translation studies and it gives the impression that researchers are dealing with a well-defined and delimited concept, the theoretical arguments circling mainly around its possible motivation and the question of whether or not it is a translation-inherent phenomenon. But in fact, the opposite may be true. Although explicitation is a widely applied and researched concept, it still lacks a universally accepted definition (Kamenická 2007:45), leading Englund Dimitrova (2005:40) to observe that

> […] at the present time in studies of translation, a host of phenomena with certain aspects in common are grouped together under the term "explicitation", which tends to be used as a kind of umbrella term to label certain phenomena of differences between the ST and the TT which seem to be permissible in translation.

This parallel existence of various notions of explicitation and the general lack of awareness of the conceptual problems involved in explicitation research can possibly be attributed to the following main reasons. As was discussed at the beginning of this chapter, the original definition given by Vinay/Darbelnet is intuitively appealing and seems to invite straightforward empirical testing. However, the definition suffers from an indeterminacy in the *definiens* pertaining to the central concept of ST *implicitness* of the information to be explicitated in the TT (see also Becher 2011:17). As Blum-Kulka (1986:19) restricted her notion of explicitation to cohesive shifts, which are easily identifiable at the textual surface, she was not obliged to address the shortcomings of Vinay and Darbelnet's

definition (Kamenická 2007:46). Studies in the tradition of her Explicitation Hypothesis have then widened this reductionist approach and extended the notion of explicitation to features beyond cohesive markers (Pym 2005:32), often still without committing to a more detailed definition of the concept that would resolve or at least address the issues mentioned above (Kamenická 2007:46). This is somewhat problematic since in its wider (and arguably more interesting) conception, explicitation is not only a feature that is objectively analyzable by establishing the presence or absence of cohesive markers in the target text but which can also manifest itself within fuzzier boundaries, e.g. in the form of a higher specificity of target-language expressions or the verbalization of new "meaningful elements" (Klaudy/Károly 2005:15) in the target text without an obvious triggering element in the source text.

This is of course a very unsatisfactory state of affairs since it means that, despite the extensive research into explicitation in translation studies, the comparability of results and the discourse between different researchers can be severely impeded since we may not be talking about the same phenomenon at all. A *desideratum* for explicitation research would thus be a precise *a priori* elaboration of the theoretical status of the concept and its possible manifestations. These reflections will, after all, govern which kinds of shifts[11] will be considered in the empirical analysis and they will also make the analysis open to intersubjective debate.

6.2.2 S-explicitation vs. T-explicitation

Perhaps the most obvious evidence of the definitional vagueness of explicitation is the fact that, within the framework of corpus-based translation studies, two different strands of explicitation research have emerged which portray two quite different "versions" of this phenomenon. What is even more striking in this context is that, with some notable exceptions (e.g. Heltai 2005:47-48), this dualism has hardly been explicitly verbalized in the literature and the coexistence of the two versions seems to go largely unnoticed. On the one hand, we find canonical definitions in encyclopaedias or dictionaries of translation studies, e.g. Klaudy's (^{2}2009:104) widely accepted definition of explicitation being "the technique of making explicit in the target text information that is implicit in the source text". On the other hand, we find, for example, the following definition by Puurtinen (2004:165-166):

[11] For a discussion of explicitation and implicitation as translation shifts, see 7.2.1.1.

One of the hypothesised universals of translation is explicitation, which can refer either to making implicit source text (ST) information explicit in a translation, or to a higher degree of explicitness in translated texts than in non-translated texts in the same target language (TL).

The main difference between the two definitions is fairly obvious. While in the definition given by Klaudy, explicitation is conceptualized with regard to the translational relation between a source text and a target text, this relation disappears as a necessary criterion in Puurtinen's definition. In this case, taking the target text as the sole anchor point, explicitation can either be established relative to the source text (which would be the "traditional" notion of explicitation) or relative to another text originally written in the target language, with no translational relation holding between the two texts. With reference to Chesterman's (2004:39) notions of *S-universals* and *T-universals*[12], I propose the two designations *S-explicitation* and *T-explicitation* in order to draw a distinction between the two different versions of explicitation. *S-explicitation* thus refers to the "traditional" notion of explicitation holding between source and target texts, whereas *T-explicitation* designates the "new" notion of explicitation that is established between target texts and non-translated texts in the same language.[13]

In Krüger (forthcoming), I give a detailed account of the history of the explicitation concept starting from its origins in the Stylistique Comparée and identify the circumstances and motivations that led to the division into S-explicitation and T-explicitation in the first place. I will summarize the arguments laid down in this forthcoming article in very concise form here. Until the 1990s, the original concept of S-explicitation was the sole and uncontested version of explicitation and, through the Explicitation Hypothesis, had been firmly anchored in translation studies. The actual division of the concept into S-explicitation and T-explicitation occurred in a seminal article by Baker (1993) in which she highlights the theoretical possibilities of large corpora in translation research (ibid.:234) and thereby lays the groundwork for corpus-based translation studies and for the large-

[12] "Some hypotheses claim to capture universal differences between translations and their source texts, i.e. characteristics of the way in which translators process the source text; I call these S-*universals* (S for source). Others make claims about universal differences between translations and comparable non-translated texts, i.e. characteristics of the way translators use the target language: I call these T-*universals* (T for target)" (Chesterman 2004:39).

[13] While Heltai (2005:48) claims that "[e]xplicitation can be regarded as either an S- or a T-universal, or both", it must be pointed out that in Chesterman's typology of S-Universals and T-Universals, explicitation is clearly treated as an S-Universal (Chesterman 2004:40).

scale study of the previously mentioned universals of translation (6.1.2). In the course of the article, Baker proposes various possible universals of translation that would warrant large-scale corpus research, the first being a "marked rise in the level of explicitness compared to specific source texts *and to original texts in general*" (ibid., italics added). Baker's article is – to the best of my knowledge – the first to use the term "explicitation" in relation to both specific source texts and to original target language texts in general. Baker thereby openly proposes a shift of focus away from the ST-TT relation of explicitation, which until then had been a definitional criterion of explicitation. Given the huge influence that this article and further papers by Baker on the same topic (e.g. 1995, 1996, 1999) had in establishing the field of corpus-based translation studies, this second version of explicitation quickly spread in the field and was investigated in various empirical corpus studies. Perhaps the most prominent of these studies is Olohan and Baker's (2000) quantitative investigation of T-explicitation using a comparable corpus design (see 6.1.3 above). In their study, the authors investigate the use of the optional complementizer *that* in connection with the reporting verbs *say* and *tell* and come to the conclusion that the *that*-connective features far more prominently in translated texts whereas the *zero*-connective (i.e. the non-verbalization of the optional complementizer) is more frequent in original texts. These results are interpreted as possible evidence for subconscious processes of explicitation in translation and can be seen as supportive of Blum-Kulka's Explicitation Hypothesis. This study firmly anchored T-explicitation as an empirically fruitful concept to be applied in corpus-based translation studies.

However, despite the huge popularity of T-explicitation in corpus-based translation studies, there are several problems involved in this new version of explicitation. In Krüger (forthcoming), I show that, if we investigate one and the same translation with regard to its source text (this would be an investigation of S-explicitation) and with regard to another text originally written in the target language (T-explicitation), we may obtain contradictory results regarding whether the translator performed explicitations or implicitations. Since S-explicitation is the original, well established and widely accepted concept, I claim that this casts doubt on the status of T-explicitation as a true form of explicitation. Furthermore, I argue that T-explicitation cannot be investigated in a translation process study since the original target-language texts used to establish this phenomenon in the first place fall completely outside the actual translation process, which "only" comprises a translator interpreting a source text and producing a target text. In process studies of T-explicitation, we would end up retrospectively attributing explicitation decisions to the translator which

s/he never made in the first place since one of the comparison standards (the original target-language texts) falls completely outside the translator's cognitive reality and translational action. This is highly problematic since the translator is the agent who is performing the alleged explicitations to be subsequently analyzed. Finally, I argue that Baker's (1993) original motivation for introducing T-explicitation – which behaves in a fundamentally different way than the original concept of S-explicitation – as a second version of explicitation is not made clear. It seems that the attempted dissociation of explicitation from the source text and its reorientation toward the wider target language environment may have been an ideological by-product of the more general shift away from the normative and source-text oriented equivalence paradigm of the 1980s that was propagated by Descriptive Translation Studies and subsequently by corpus-based translation studies.

In light of the reasons illustrated above, I conclude that the notion of T-explicitation should be abandoned. To do justice to the fundamental differences between this concept and the original concept of S-explicitation and to make the discourse about explicitation more transparent, I propose the designation *comparative explicitness*[14] to set it clearly apart from explicitation in its true form. With this proposal, I am neither questioning the validity nor the epistemic value of such comparative explicitness investigations in translation studies. On the contrary, these studies can yield and have in fact yielded important insights into typical patterns or features of translated texts, whether or not we want to classify these as translational universals. My aim is rather to eliminate some of the persistent definitional vagueness surrounding the concept of explicitation in order to make the discourse about explicitation more transparent and to allow the comparison of findings by making sure that different researchers are indeed talking about the same concept.

6.2.3 Distinction between explicitation and adjacent concepts

Even if the question of S-explicitation vs. T-explicitation is answered in favour of the former concept and therefore the focus is laid on explicitation in its original form, the problem of definitional vagueness still persists. This is mainly due to the fact that explicitation is situated between two adjacent concepts with fuzzy boundaries.

[14] This concept could also be called *comparable explicitness* so as to point directly to the corpus design that is used to investigate this type of explicitness.

Unfortunately, research in the tradition of S-explicitation has not always drawn a distinction between these concepts.

6.2.3.1 Explicitation vs. expansion

The non-distinction between explicitation and *expansion* – arguably the less controversial of the two adjacent concepts – is particularly evident in the Hungarian tradition of explicitation research established by Klaudy (e.g. 2001). In their typology of explicitation, Klaudy and Károly (2005:15) speak of explicitation "when the meaning of a SL unit is distributed over several units in the ST", the standard transfer operation in this case being "lexical division". How this notion of "explicitation" would be applied in practice becomes clear from the following quote by Pápai (2004:159):

> If we consider the structural differences between the two languages involved (the agglutinative Hungarian uses fewer words to express the same meaning than the analytical English, e.g. I love you -> Szeretlek), translations from English into Hungarian would be expected to result in implicitation (making things more general, omitting linguistic or extralinguistic information of the ST) rather than in explicitation.

Although the focus is on implicitation in this quote, the example can easily be turned around to show the view on explicitation underlying Pápai's study. Translating the Hungarian *Szeretlek* with the English *I love you* would be considered an instance of explicitation in the Hungarian research tradition. Applying this line of reasoning to another example involving the French *futur simple* (since my knowledge of Hungarian is very limited), the translation of the French *je mangerai* by the English *I will eat* would – according to Pápai's line of reasoning – constitute an instance of explicitation. If, however, we follow the broad majority of definitions of explicitation in the field that require some kind of information to be verbalized in the target text that is missing in the source text, we are unlikely to find any in the examples just discussed. Neither is there any additional semantic information in the translation nor any additional syntactic information that would cancel alternative semantic interpretations of the utterance. Instead, what the examples show is merely an addition of words in the target text. In the second example, this is due to the fact that the future tense category is expressed by means of suffixation in French, whereas it is marked by the auxiliary verb *will* in the English translation.[15]

[15] For a similar criticism of Pápai's study see Becher (2011:43).

I would therefore suggest that examples like these should not be treated as instances of explicitation but rather as instances of *expansion*.[16] The term was introduced by Wotjak (1985:32, see Schreiber 1993:221[17]) and is defined by Delisle et al. (1999:138) as "[a]n increase in the amount of <text> that is used in the <target language> to express the same semantic content as compared to the parallel segment in the <source text>". Whether or not expansion is to be expected in translations between a given language combination is fairly easy to predict since, at the structural level, it is a function of the position of source and target language in a morphological language typology (see Bauer 2003). Based on such a typology, analytic languages like English will tend to distribute the same amount of information over more words than synthetic languages, which in turn tend to exhibit a higher number of morphemes per word. This fits with Pápai's comment above that Hungarian is an agglutinative language, *agglutinative* being a further sub-classification of synthetic languages.

Although the different character of the two concepts explicitation and expansion is quite obvious and intuitively plausible and although it is likely that analyses will yield many clear-cut cases that can clearly be attributed to one of the two categories, we should also expect borderline cases that do not lend themselves easily to strict categorization. One example of such borderline cases would perhaps be the optional complementizer *that*, which Olohan and Baker (2000) investigated in their study discussed earlier in this chapter. Inserting this complementizer in a translation without there being a counterpart in the source text may indeed entail an addition of information in the TT but the semantic contribution of this information will be so low that it can hardly be claimed to be a clear-cut case of explicitation but rather shows strong characteristics of expansion. Because of

[16] In Vinay and Darbelnet's Stylistique Comparée, the equivalent to expansion would be *amplification*, which is a "translation technique whereby a target language unit requires more words than the source language to express the same idea." (Vinay/Darbelnet 1995:339). A special form of amplification would be *supplementation*, which is a "translation technique of adding lexical items in the target language which are required by its structure and which are absent in the source language" (ibid.:350). To make matters even more complex, there is a further concept related to amplification, namely *dilution*. Dilution refers to "[t]he translation technique of spreading one meaning over several lexical items" (ibid.:341-342).

[17] Schreiber (1993:221) claims that instances of expansion are generally accompanied by a higher degree of explicitness, which cuts across the distinction proposed here. In this thesis, expansion is viewed as a simple increase in morphemes without any semantic contribution to the utterance, whereas explicitation entails such a semantic contribution, one possible manifestation of this being a higher morpheme count (on the notion of *morpheme count* in explicitation research, see Heltai 2005).

cases like these, it may be useful to treat explicitation and expansion not as concepts standing in binary opposition to each other but rather as endpoints of a continuum. We could then say that the more semantically relevant the information introduced by a certain shift is, the more we move to the explicitation point of the continuum and vice versa. The insertion of optional complementizers like *that* would then be located towards the expansion endpoint of the continuum.

6.2.3.2 Explicitation vs. addition

The distinction between explicitation and *addition* is concerned with the extent to which new information introduced in the target text can reasonably be claimed to be implicit in the source text (see Kamenická 2007:50). The definitional criterion of source text implicitness is present in most of the intertextual definitions of explicitation; however, the complexity associated with this notion is hardly problematized in the studies based on these definitions and the issue is treated rather intuitively in the empirical analyses. Becher (2011:18) seems to be aware of the problems involved since, elaborating on his definition of implicitness,[18] he explicitly avoids stipulating "*from where* the addressee might infer the non-verbalized information". However, later in his analysis (ibid.:227, my emphasis) Becher distinguishes between inferable and genuinely new information, claiming that

> [t]he addition of inferable information and the addition of new information should not be treated on a par, since it seems likely that the two kinds of changes are governed by different factors. *Studies of explicitation need to take care to exclude additions of new information from analysis* […].

While Becher correctly identifies the central problem here (which he avoided earlier in his definition of implicitness), it could be argued that the distinction between inferable and new information is not theoretically helpful since any information is in some way inferable; the question is only on what basis the inferences take place. Therefore, it seems more reasonable to make a distinction between information inferable based on the source text (which broadly corresponds to the notion of source-text implicitness) and information inferable based on other inputs. The phenomenon described in the latter case is mostly labelled as *addition* in the literature. Schreiber (1993:229, my translation) comments on the distinction between explicitation and addition as follows:

[18] "**Implicitness** is the verbalization of information that the addressee might be able to infer if it were not verbalized" (Becher 2011:18).

Explicitation means that the […] information 'added' to the TL text must be implicitly contained in the SL text, i.e. it must be inferable from the SL text or be regarded as common knowledge of the SL text recipients; otherwise this is referred to as an *addition*.

An example of potential addition can be found in Delisle et al. (1999:115):

Beim Bierumsatz handelt es sich zu 85% um 'Ale'. * About 85% of the beer sold in supermarkets is ale.

Here, the question is whether the inserted information can be reasonably claimed to be implicit in the source text or not (which, of course, cannot be established on the basis of this isolated text string alone). It should be obvious that drawing this borderline between explicitation and addition presents a much more complex challenge than the distinction between explicitation and expansion since, in this case, the researcher is forced to make statements about "content [that] is paradoxically held to be at once hidden and obviously available to all" (Pym 2005:34). Due to the complexity of this task and the lack of any clear-cut and objective criteria for judging which information is implicit in a text and which is not, a detailed theoretical elaboration of the concepts of explicitness and implicitness is required (see 6.4.1). For the same reason, it does again not seem feasible to view explicitation and addition as standing in a binary opposition. Rather, the two concepts should also be viewed as two end-points of a continuum, with clear-cut cases situated on each side and a fuzzy "transition zone" in the middle. The higher the probability, then, that the relevant information is implicit in the source text (i.e. inferable based on this text), the further to the explicitation point of the proposed continuum we move and vice versa.

6.2.3.3 The expansion-explicitation-addition continuum

The explicitation concept is thus positioned between the two adjacent concepts of expansion and addition and the distinction between explicitation and the other two concepts is expected to be not always clear-cut but often a matter of degree. The resulting expansion-explicitation-addition continuum can be graphically presented as follows:

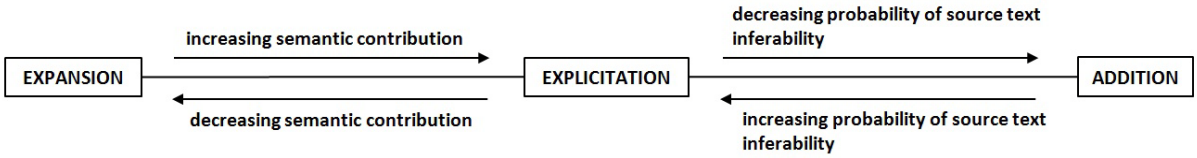

Figure 2: The expansion-explicitation-addition continuum

This continuum should capture the intuitive relation and distinction between expansion, explicitation and addition quite adequately but in order to make theoretically well-founded

statements about the position of empirically established phenomena on this continuum, further theoretical work is required. In the cognitive linguistic discussion of explicitation and implicitation in 6.5.2, I will propose a theoretically better-founded model of this continuum.

6.3 Examining the implicitation concept

The survey of implicitation will be much shorter than that of explicitation since, as mentioned previously, most of the theoretical effort to date has gone into the concept of explicitation. Going back to Vinay and Darbelnet's original definition of implicitation being a "stylistic translation technique which consists of making what is explicit in the source language implicit in the target language, relying on the context or the situation for conveying the meaning" (Vinay/Darbelnet 1995:344, translation by Sager/Hamel), it becomes obvious that, once explicitation has been properly conceptualized, a corresponding account of implicitation will be rather straightforward since most if not all of the necessary theoretical tools will already be in place. However, this is only evidence of the close theoretical interconnection of the two concepts; it does not explain the theoretical imbalance between them. Besides the dominance of Blum-Kulka's (1986) Explicitation Hypothesis, another possible reason for this imbalance may be that, at first glance, explicitation involves more cognitive effort and is thus seen as more interesting than implicitation. After all, explicitation involves a "zero information" in the source text that has to be contextually inferred in order to be verbalized in the target text. Implicitation seems to be a rather uneventful process in comparison since it only involves the omission of information in the target text, apparently without entailing much cognitive effort. There may be some truth to the hypothesis that, from the point of view of the translator, explicitation is cognitively more demanding than implicitation. However, as Schreiber (1993:39) rightly argues, implicitation also involves a considerable degree of complexity since the translator, anticipating the context of reception (again, by virtue of his/her theory of mind), must evaluate whether the implicitated information is required and/or inferable by the target audience. So with implicitation, then, the translational inference process involved in explicitation is shifted from the translator to the target audience. This means that, downstream from the translation process (i.e. during the reception of the target text), the implicitations performed by the translator will (probably) again trigger (mental) explicitation processes that show the same potential complexity as those performed by the translator. From this point of view, it seems that implicitation deserves the same attention

as its counterpart explicitation. However, after the introduction of the concept by Vinay/Darbelnet, there follows a long period of theoretical neglect.[19] In Blum-Kulka's seminal paper on the Explicitation Hypothesis, the concept of implicitation is also notably absent, and the subsequent rise of corpus-based translation studies and the growing popularity of the explicitation concept have done nothing to change this situation. It was only with Klaudy's (e.g. 2001) Asymmetry Hypothesis that implicitation received wider theoretical attention in the field. According to this hypothesis

> [...] explicitations in the L1→L2 direction are not always counterbalanced by implicitations in the L2→L1 direction because translators – if they have a choice – prefer to use operations involving explicitation, and often fail to perform optional implicitation (Klaudy/Károly 2005:14).

This hypothesis also favours the status of explicitation as a translational universal but at least implicitation is incorporated here as a concept of principally equal value. However, within the framework of the Asymmetry Hypothesis, Klaudy neither proposes a new conceptualization of implicitation, nor does she address the complexity inherent in the phenomenon. In the following sections, I will try to highlight this complexity by following the same route as with the explicitation concept. Since, to my knowledge, a notion of *T-implicitation* is completely absent from the literature, we can skip a corresponding discussion and focus directly on the distinction between implicitation and two adjacent concepts.

6.3.1 Distinction between implicitation and adjacent concepts

Given the close theoretical connection between explicitation and implicitation, it is to be expected that implicitation is also situated between two adjacent concepts. Again, we should not expect a clear distinction at each side but rather the same fuzzy boundaries we found with the explicitation concept. Since the basic ideas underlying the adjacent concepts and the continua were already elaborated within the context of explicitation, the following discussion with regard to implicitation will be more concise.

[19] For example, contrary to Klaudy (2009:104), who claims that Nida, in his "techniques of adjustment" (1964:226 ff.), further elaborated the concepts of both explicitation and implicitation, his category of "subtractions" contains no sub-technique that would constitute a counterpart to the sub-technique of "amplification from implicit to explicit status". Nida (ibid.:233) only mentions in passing the possibility of changing "some features from explicit to implicit status", and, therefore, his theoretical contribution is much more to explicitation than it is to implicitation.

6.3.1.1 Implicitation vs. reduction

The distinction between implicitation and *reduction*[20] mirrors the distinction between explicitation and expansion. The relevant question in this case would be whether a certain translation operation entails a substantive semantic loss in the target text (implicitation, provided the relevant semantic content is inferable based on the target text) or whether this operation has a predominantly formal character without a significant semantic loss in the target text (reduction). Schreiber (1993:221, my translation) defines reduction as a "decrease in the number of words in translation". A probably more adequate definition that also captures the semantic dimension of this translation technique is given by Delisle et al. (1999:130), who define the concept as

> [a] decrease in the amount of text used in the <target language> to express the same semantic content as compared to the parallel segment in the <source text>.

In this case, Delisle et al. do not speak of *reduction* but of *contraction* but the difference is purely designational in nature. As an example of reduction, Schreiber (1993:221) gives the translation of the English hendiadys *just and equitable treatment* by the German *gerechte Behandlung*. If it is agreed that *just* and *equitable* are full synonyms and show full conceptual equivalence with the German *gerecht*, this would be a clear case of reduction. However, as with the distinction between explicitation and expansion, we should expect various borderline cases that cannot be assigned to one of the two categories in a straightforward way. Going back to the optional complementizer *that*, it could be argued that leaving out the equivalent of this complementizer in the target language indeed omits information from the target text but that the semantic loss involved is so low that it can hardly be claimed to be a central case of implicitation. So again, it seems necessary to conceptualize implicitation and reduction as endpoints of a continuum. In this case, the less semantically relevant the loss introduced by a certain shift is, the more we move to the reduction point of the continuum and vice versa. The omission of the equivalent of the

[20] In the Stylistique Comparée, the counterpart of reduction would be *economy*, which is "the relative smaller quantity of expression forms required in one language for conveying the same content which is expressed by more words in another language" (Vinay/Darbelnet 1995:342). *Reduction*, in the Stylistiqe Comparée, would be a special type of economy, designating "the translation technique which selects the essential elements of the message and expresses them in a concentrated manner" (ibid.:348). To make matters even more complex, there is a further phenomenon related to economy, namely *concentration*. Concentration is "[t]he translation technique of replacing the meaning expressed by several words by a smaller number or even by one alone" (ibid.:341).

complementizer *that* in the target text would thus be located towards the reduction endpoint of the continuum.

6.3.1.2 Implicitation vs. omission

The distinction between implicitation and *omission* is comparable to that between explicitation and addition. It is concerned with the question of whether the information left out in the target text can be reasonably said to be inferable based on this text (implicitation) or not (omission) (see Kamenická 2007:50). Schreiber (1993:229, my translation) comments on the distinction between implicitation and omission as follows:

> *Implicitation* means that the information 'left out' of the TL text must be inferable from the TL text or must be regarded as common knowledge of the TL text recipients; otherwise this is referred to as an *omission* […].

Again, an example of potential omission can be found in Delisle et al. (1995:165):

> *Durch Doppelklicken auf dem Textfeld wird eine untergeordnete Hierarchieebene ein- oder ausgeblendet.*
> * A subordinate level can be displayed or hidden in the text field.

Here, the question is whether the information left out in the target text (*by double-clicking*) can be reasonably said to be inferable from the target text or not. If we reach the conclusion that it is indeed inferable, we would classify it as an instance of implicitation, otherwise as omission. Again, it should be obvious that a binary opposition of implicitation and omission seems impracticable. Therefore, it also seems necessary to position them as the two endpoints of a continuum. The higher the probability, then, that the relevant information is inferable from the target text, the further we move to the implicitation point of the continuum and vice versa.

6.3.1.3 The reduction-implicitation-omission continuum

Implicitation, like explicitation, is thus positioned between two adjacent concepts, in this case between reduction and omission. Again, the distinction between implicitation and the other two concepts may not be a clear-cut but rather a gradual one. The resulting reduction-implicitation-omission continuum can be graphically presented as follows:

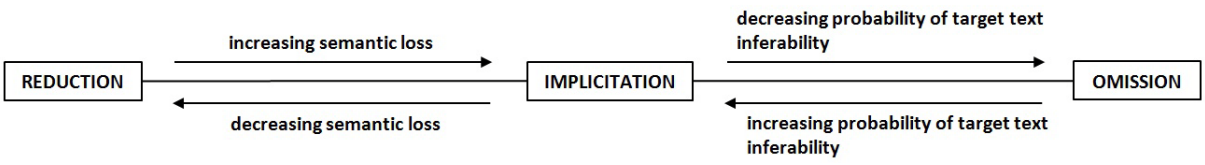

Figure 3: The reduction-implicitation-omission continuum

Again, this continuum should capture the intuitive relation and distinction between the different concepts quite adequately but the process of positioning empirically established phenomena on the continuum will need to be modelled in sounder theoretical terms. This will be done in section 6.5.2 below.

6.4 Explicitation and implicitation vs. explicitness and implicitness

We have seen that, when making a distinction between explicitation/implicitation and addition/omission, we are faced with the difficult question of what it means for a piece of information to be explicit or implicit in a text. Establishing explicit information seems rather straightforward since this information is overtly encoded and hence "objectively" given in the text. Talking about implicit information, however, is less straightforward since this information is deemed, at the same time, to be "hidden and obviously available to all" (Pym 2005:34, see 6.2.3.2 above). Partially circular definitions of explicitation and implicitation, which incorporated the notions of explicitness and implicitness in their *definiendum*, ignore the problems involved if they are not complemented by a suitable theory for modelling especially the implicit information that is said to be part of a text. Below, I will give an overview of the theoretical treatment of explicitness and implicitness in Anglo-American pragmatics and cognitive linguistics. However, before doing so, I consider it necessary to draw a clear distinction between explicitation/implicitation on the one hand and explicitness/implicitness on the other.[21] The reason is that the close interrelation of the two concept pairs has sometimes lead to confusing accounts that hinder a transparent discourse on explicitation and implicitation in translation studies. This is evidenced, for example, by misleading statements such as "Explicitness as a universal feature of translation" (Schmied/Schäffler 1997), which is the headline of an article in which the authors actually investigate instances of explicitation and implicitation in translation.

In his discussion of explicitation, Steiner (2005:8) states that explicitation "is a process, or a relationship, which assumes that some meaning "is made explicit" in moving from one text or discourse to some other one". This definition is in line with the intertextual view of (S-)explicitation adopted in this study. Explicitation and implicitation are thus seen as translational phenomena which establish a relation between two texts or discourses, in this

[21] This distinction was already implicitly underlying the distinction between "true" explicitation or S-explicitation and comparative/comparable explicitness.

case source texts and target texts. Explicitness and implicitness, on the other hand, are first and foremost "monotextual" or "monodiscoursive" phenomena (although, as will be seen below, there is an element of comparison to them) and can be viewed from a microscopic and a macroscopic perspective. From the microscopic perspective, the terms refer to the linguistic encoding of information and describe, for a given text or utterance, the relationship between information that is overtly linguistically encoded (explicit) and information that has to be inferred (i.e. that is implicit) in order to arrive at a full interpretation (Baumgarten et al. 2008:177-178). This perspective thus focuses on "the lexical and grammatical material on the surface of the linguistic structure" (ibid.:179). It then seems obvious that explicitness and implicitness are inherent features of all linguistic structures and utterances since no structure or utterance can ever be fully explicit or implicit but always involves a complex interaction between these two components of meaning. The macroscopic perspective views explicitness and implicitness as "a property of texts and discourses" (ibid.:179) and highlights the functional or pragmatic dimension of the two concepts. From this perspective, texts or discourses exhibiting a high degree of explicitness project the context (i.e. the implicit component of communication) as fully as possible into the text and thus allow an isolated understanding outside of their context of production (v. Hahn 1998:383). From this second perspective, the relative and relational character of the two concepts becomes clear. For, if a text is said to be explicit, "there has to be the systemic possibility of an implicit (or less explicit) variant" (Baumgarten et al. 2008:179) that could serve as a standard of comparison. From the previous discussion it should become clear why statements such as "Explicitness as a universal feature of translation" are quite misleading. From the first perspective, they are merely a truism since explicitness and implicitness are, in any case, inherent features of language and communication. From the second perspective, they miss a standard of comparison, i.e. are we dealing with high or low explicitness, and compared to what standard of comparison is this high or low explicitness to be established?

It can thus be summarized that while explicitation and implicitation refer to a specific intertextual relation between source text and target text, explicitness and implicitness refer to general features of language and discourse that can be present to different degrees. If, at a certain level, a given source text exhibits a lower explicitness/higher implicitness than the corresponding target text, this would be treated as potential evidence of explicitation and vice versa

The perspective on explicitness and implicitness having immediate relevance to an adequate understanding of explicitation and implicitation is the microscopic one proposed by Baumgarten et al., referring to the relationship between overtly encoded and contextually inferable information. The macroscopic perspective on the two concepts is somewhat peripheral to their understanding but it is highly important to the discussion of the empirical findings, where possible explanations for different instances of explicitation and implicitation will be elaborated.

6.4.1 Theoretical accounts of explicitness and implicitness

The next sections will review the Anglo-American pragmatic account and the cognitive linguistic account with regard to their stance on explicitness and implicitness. In this context, I will briefly survey their different tools for modelling the microscopic notion of explicitness and implicitness, i.e. the relationship between linguistically encoded and textually inferable information. Anglo-American pragmatics, adopting a two-level or dictionary approach to meaning (see 4.2.3), obviously cuts across the cognitive linguistic orientation of the present thesis. Nevertheless, I find it important to review its stance on explicitness and implicitness since Anglo-American pragmatics represents the dominant view on the topic in mainstream linguistics. Also, by reviewing a two-level perspective on explicitness and implicitness, the distinctive features of the cognitive linguistic approach adopted in the present thesis may be fleshed out more clearly.

6.4.1.1 Explicitness and implicitness in Anglo-American pragmatics

Most of the theoretical debates on explicit and implicit communication are held within the Anglo-American school of pragmatics[22], which developed from the "ordinary language" philosophy of Austin, Strawson, the later Wittgenstein and Grice (Carston 2002:3).[23] Ordinary language philosophers were, among other things, concerned with the contextual variability of natural language expressions and were investigating how – given this contextual variability – human verbal communication was possible. It was within ordinary

[22] For a distinction between the Anglo-American and the European Continental school of pragmatics see Huang (2007:4).

[23] Ordinary language philosophy emerged as a reaction to the formalist endeavours of "ideal language" philosophers like Frege and Russel, who were primarily concerned with logical properties of language and tried to overcome the perceived imperfections of natural languages (Carston 2002:48). Ideal language philosophers were investigating the context-free truth conditions of linguistic expressions that could then be assigned a definite truth-value (see the objectivist account of meaning discussed in 3.1.1).

language philosophy and Anglo-American pragmatics that the linguistic underdeterminacy thesis – which is strongly linked to explicit and implicit communication and the concepts of explicitness and implicitness – has been most thoroughly theorized. Carston (2002:19) states this underdeterminacy thesis (as seen from the perspective of Anglo-American pragmatics) as follows:

(a) Linguistic meaning underdetermines what is meant.
(b) What is said underdetermines what is meant.
(c) Linguistic meaning underdetermines what is said.

According to this thesis, there are three levels of meaning[24] to be distinguished, i.e. linguistic meaning (the context-free meaning of the words on the page), *what is said* (the fully propositional/truth-conditional or explicit meaning conveyed by a speaker) and *what is meant* (the implicitly conveyed and pragmatically inferable meaning of the speaker). Linguistic meaning and *what is said* were originally treated as roughly equal concepts, being the concern of semantics and ideal language philosophy, whereas ordinary language philosophy and pragmatics were concerned with what the speaker means in an actual utterance context (Carston 2002:3). It was particularly the work of Grice which eventually reconciled these two approaches to linguistic meaning. Grice's theory of implicature is specifically concerned with the question of how, in communication, people understand more (the pragmatic notion of *what is meant*) than what is literally said (semantics) (Baker 1992:223). In order to account for the pragmatic dimension of speaker meaning, Grice developed a co-operative principle which he then subdivided into nine maxims of conversation classified along the four Kantian categories of quality, quantity, relation and manner (Grice 1989:26). Once *what is said* – which corresponds to the truth-conditional content of an utterance or the proposition expressed – has been determined, this serves as the basis for a rational calculation of speaker meaning by applying the co-operative principle and the maxims of conversation (Marmaridou 2000:11). Verbal communication is thus seen as a two-step process in which, firstly, the literal or truth-conditional meaning

[24] In the two-level or dictionary approach to meaning illustrated in 4.2.3, the levels of linguistic meaning and *what is said* are merged into one level. It is one crucial claim of contemporary Anglo-American pragmatics that *what is said* does not follow directly from the linguistic meaning (in which case, the two could be equated), but requires pragmatic input (see Huang 2007:216). Whatever the case, the various distinctions of different levels of meaning are a good illustration of the differences between Anglo-American pragmatics and the encyclopaedic approach to meaning adopted by cognitive linguistics.

of an utterance is determined and then implicit meanings (implicatures) are calculated to arrive at the speaker-intended meaning.

Current debates in the Neo-Gricean and Post-Gricean tradition of Anglo-American pragmatics are concerned with the "division of labour" between semantics and pragmatics and the "pragmatic intrusion into the classical Gricean notion of what is said" (Huang 2007:216). Grice allowed only a small gap between linguistic meaning and the truth-conditional *what is said*, namely the need for reference assignment and the resolution of linguistic ambiguities (Carston 2002:21). For example, in the sentence *She is a beautiful dancer* (example taken from Taylor 2002:450), the pronoun *she* must be assigned a referent and it must be established whether the adjective *beautiful* modifies the referent as a person or the process of dancing. Once the referent has been assigned and the ambiguity resolved, the sentence is fully propositional and possible implicatures can be calculated (one such implicature may be that the speaker wants to convey that she is not a beautiful dancer at all). Newer pragmatic approaches like relevance theory (Blakemore 1992; Sperber/Wilson ^{2}1995; Carston 2002) – in which the Gricean conversational maxims have been reduced to one overruling principle, namely the principle of relevance – point out that, besides the processes of disambiguation and reference assignment (which Grice treated as semantic processes but which post-Gricean theories treat as pragmatic), further pragmatic processes like saturation, free enrichment or ad hoc concept construction may be necessary to arrive at a fully propositional content.[25] In the example above, the adjective *beautiful* may, for example, have to be pragmatically strengthened (extremely good looking) or weakened (above average looking) in a process of *ad hoc* concept construction. The relevance-theoretic notion of explicature in turn is criticized by scholars like Bach (2010:131-132), who claims that part of the content that is covered by an explicature is implicit rather than explicit content and should thus rather be called an *impliciture*. Again, considering the example above, in the relevance-theoretic account, the intended interpretation of the ambiguous structure *beautiful dancer* is explicitly communicated, i.e. it is part of the explicature (although it has to be pragmatically inferred), whereas Bach would probably argue that it is implicitly communicated (part of an impliciture) since the intended interpretation is not linguistically encoded.

[25] What relevance theory calls *explicature* instead of *what is said* (Huang 2007:188 ff.).

The whole debate is highly complex and fine-grained and cannot be traced here in full.[26] With reference to the two concepts of interest to the present discussion, i.e. explicitness and implicitness, it can be summarized as follows. Starting from some underdetermined form of linguistic meaning, several processes are necessary to arrive at a proposition with a definite truth-value (*what is said* or explicature). There is disagreement on how much pragmatic intrusion is necessary to arrive at this propositional content but this content is generally what is deemed to be explicitly communicated (e.g. Sperber/Wilson [2]1995:182).[27] This explicitly communicated content then serves as the basis for the rational calculation of implicit meanings (implicatures) by applying universal cognitive principles like Grice's co-operative principle or the principle of relevance.

Of special interest to the present study is the fact that the propositional content explicitly communicated (e.g. the relevance-theoretic explicature) is not directly linked to a fixed degree of explicitness. According to Carston (2002:117), the following utterances may convey the same explicature but vary in their degree of explicitness:

a. Mary Jones put the book by Chomsky on the table in the down stairs sitting-room.
b. Mary put the book on the table.
c. She put it there.
d. On the table.

So, one and the same explicature (corresponding to the content explicitly communicated) can be communicated with different degrees of explicitness, where "degrees of explicitness" in relevance-theoretic terms corresponds to the relative contribution of decoding and pragmatic inference in the development of an explicature (Sperber/Wilson [2]1995:182; Wilson/Sperber 2012:13). The same would hold for the communication of implicatures (implicitly conveyed content). These phenomena are captured by Yus' (1999:492 f.) notions of *e-continuum* and *i-continuum*, which postulate that both explicit and implicit communication are situated between an explicit and an implicit pole, i.e. both types of communication can be realized with different degrees of explicitness and implicitness. The notion of explicitly/implicitly communicated content adopted by Anglo-American pragmatics seems to cut across the notion as understood by the present thesis, whereas the idea of different degrees of explicitness is quite consistent with it. The objection to be made is quite adequately captured by the above example by Carston and the

[26] For a concise overview of the different fault lines in Anglo-American pragmatics see Huang (2007:241).

[27] With the exception of Bach (2010:131-132), see the discussion above.

two continua proposed by Yus. It seems difficult to accept that a given content can be communicated *explicitly* but with different degrees of *explicitness* (in this context, Bach (2010:131) proposes to substitute the notion of *explicit content* with the notion of *directly conveyed content*). Rather, moving to the implicit point of Yus' *e-continuum* and downwards in Carston's example above, it seems that more and more content is conveyed implicitly instead of the same content only with different degrees of explicitness.

6.4.1.2 Explicitness and implicitness in cognitive linguistics

Underlying the different frameworks of explicit/implicit communication in Anglo-American pragmatics is the distinction between different levels of meaning as laid out in Carston's version of the underdeterminacy thesis. The intermediate level of *what is said* as the first propositional or truth-conditional content to be established (followed by possible implicatures) betrays the formal-semantic basis of these approaches and their grounding in the objectivist paradigm of language and meaning (Marmaridou 2000:45-46, see also 3.1.1). In this account, the meaning of *what is said*/explicature is closely linked to the dictionary meanings of individual words (mind, however, the pragmatic intrusion into what is said as established by current pragmatic theories) and, being truth-conditional/ propositional, *what is said* exhibits some form of correspondence to some state of affairs in the world. It is against this background that the distinction between explicit communication and implicit communication, as understood by Anglo-American pragmatics, has to be seen. Since actual speaker meanings are both generally much richer than those that can be accounted for by narrow dictionary meanings and also go beyond the simple correspondence to some uninterpreted state of affairs in the world, a division of labour is established between (formal) semantics, which yields part of the input to the meaning of what is said, and pragmatics, which introduces all of the encyclopaedic information that is necessary to arrive at the actual speaker meaning.

It should be clear from the discussions in chapters 3 and 4 that both the philosophical underpinnings and the account of linguistic meaning adopted in cognitive linguistics are different from that of formal semantics and Anglo-American pragmatics. These differences will not be revisited here in detail. What is important to the present discussion is that cognitive linguistics rejects the dichotomy of dictionary/linguistic vs. encyclopaedic/non-linguistic meaning and adopts a fully encyclopaedic account of meaning in which lexical items serve as points of access to this encyclopaedic knowledge (see 4.2.3). In this account, "[t]here is no principled distinction between semantics and pragmatics" (Evans/Green

2006:215) and, consequently, no principled distinction between the various levels of meaning identified within Anglo-American pragmatics. In the absence of this distinction, there has been considerably less specific theorizing on explicit and implicit communication in the cognitive linguistic framework. According to Fauconnier (1990:391), who introduced the notion of *invisible meanings* into cognitive linguistics, the distinction between the Gricean enterprise with its explicit-implicit distinction and cognitive linguistics can be phrased as follows:

> [...] it is in the very nature of linguistic form to considerably underspecify meaning construction; the search for 'invisible' meaning is on from the start: context and prior discourse configurations must be invoked directly before any meaning at all, literal or derived, can emerge.

This view seems more resonant with the view on explicitness and implicitness held in the present study. From this perspective, the linguistic surface structures actually verbalized (or *profiled*, see 4.5.3.2) in a text would constitute the explicit part of the content to be conveyed, and those contextually licensed aspects of the encyclopaedic information to which these structures provide access[28] would constitute the implicit content. Langacker (2008:54) discusses an example quite similar to the one used by Carston (see 6.4.1.1) to highlight the difference between explicit and implicit meanings as perceived in cognitive linguistics:

(a) I want you to put the canned tomatoes on the top shelf of the pantry.
(b) Put the tomatoes on the top shelf of the pantry.
(c) Put them on the top shelf.
(d) Tomatoes, top shelf.
(e) On the top shelf.
(f) On top.

According to Langacker (ibid.), all of the above utterances may be used to convey the same essential content, but they differ in construal because different proportions of this content are explicitly profiled/coded and contextually inferred (so far, this is in line with Carston's reasoning). Langacker (ibid.) further claims that underlying all communication is a *conceptual substrate* (see 5.3.4) that largely remains implicit in communication and serves as the basis for contextual inferencing processes. Importantly, and contrary to Anglo-American pragmatics, he does not claim that all of the above utterances convey the

[28] The locus of this contextually inferable encyclopaedic information would be the discourse participants' *current discourse space* as discussed in 5.3.5.

same *explicit* content (i.e. the same explicature with varying degrees of explicitness) but rather the same content to be conveyed by the speaker[29] with different degrees of overt/explicit linguistic profiling/encoding and implicit contextual inferencing. This means that, in recognizing that some (essential or directly conveyed) content can be conveyed with varying degrees of explicitness, we should also acknowledge that this content is then conveyed with varying degrees of *implicitness*. This is the view on explicitness and implicitness (in their microscopic version) that will be followed in the present thesis. From this perspective, the linguistic surface structures actually verbalized or profiled in a text would constitute the explicit part of the content to be conveyed and the contextually inferable aspects of the encyclopaedic information to which these structures provide access would constitute the implicit part.

However, it must be pointed out that abandoning or disregarding the Anglo-American pragmatic account of explicit and implicit meaning also has several drawbacks. One of the advantages of this account is undoubtedly its very fine-grained theoretical toolset for developing underdetermined linguistic structures into actual speaker meanings[30], which could readily be applied in empirical studies on explicitation and implicitation for classification purposes. However, since in particular the processes of saturation, free enrichment and *ad hoc* concept construction require the theoretically problematic notion of *what is said* as a starting point, they will not be used in this thesis. Cognitive linguistics, on the other hand, appears to possess more adequate tools for modelling the shared knowledge that serves as part of the conceptual substrate or implicit basis of communication (for example, the common ground concept) and for capturing the conceptual organization and representation of this implicit knowledge (for example, frame semantics or the theory of domains). With regard to these issues, Anglo-American pragmatics mainly refers to the somewhat imprecise and no further differentiated notion of "cognitive environment" (Sperber/Wilson ^{2}1995:39).

6.5 Explicitation and implicitation from a cognitive linguistic perspective

In the following sections, explicitation and implicitation will be situated within the cognitive linguistic framework, and it will be demonstrated how the various problems identified with regard to previous accounts of the two concepts can be captured and

[29] In Bach's (2010:131) terms this would be the *directly conveyed content*.

[30] This toolset would include the processes of disambiguation, reference assignment, saturation, free enrichment and *ad hoc* concept construction; see 6.4.1.1 above.

possibly solved within this framework. The line of thought to be followed here was partially influenced by two articles which establish a tentative link between explicitation/ implicitation and cognitive linguistics.

The first article, written by Halverson (2007), reviews the central cognitive linguistic notion of *linguistic construal* and situates various translation shifts and alleged translational universals (explicitation being among them) within the model of linguistic construal operations developed by Croft/Cruse (see 4.5.1.2). This approach is particularly useful for situating explicitation and implicitation within the overall CL framework. The second article was published by Kamenická (2007), who applies frame semantics in order to model the implicit information underlying overt textual structures. Kamenická's approach is more microscopic than Halverson's since it is specifically concerned with the investigation of actual textual occurrences of explicitation and implicitation.

Both Halverson's and Kamenická's approaches are, in my opinion, very promising and show considerable explanatory potential with regard to explicitation and implicitation research. However, both approaches are rather tentative in nature and do not give an exhaustive account of explicitation and implicitation in cognitive linguistic terms. In the following sections, I will attempt to develop such an exhaustive account. I start by situating explicitation and implicitation in the wider context of linguistic construal operations, thus establishing a link between explicitation and implicitation and general human cognitive abilities as reflected in language and language use. The focus will then be shifted to cognitive semantics and its specific means of modelling implicit knowledge structures. In this context, it will be illustrated how important aspects of explicitation and implicitation can be accounted for within cognitive semantics.

6.5.1 Explicitation and implicitation as cross-linguistic construal operations

The notion of linguistic construal in cognitive linguistics was already elaborated in 4.5.1. We will now revisit the two models of linguistic construal operations developed by Langacker and Croft/Cruse specifically from the perspective of explicitation and implicitation.

6.5.1.1 Explicitation and implicitation in Langacker's model of linguistic construal operations

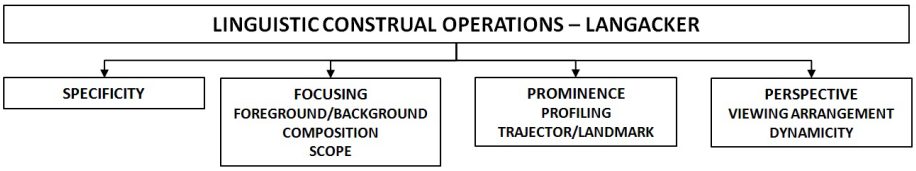

Figure 4: Langacker's model of linguistic construal operations

In Langacker's model, the construal operation of *specificity*[31], i.e. the level of detail with which we examine or construe a scene, is of special interest to the present discussion. While describing the temperature, for example, we could say that it is *hot*, *in the 90s*, *about 95 degrees* or *exactly 95.2 degrees* (ibid.:55) and would thus describe a given situation with progressively greater specificity.[32] The counterpart of specificity would be *schematicity*, i.e. going from more specific to less specific construals would entail a progressively greater schematicity. Langacker (ibid.:56) further points out that construal processes along the specificity/schematicity dimension can apply both to lexical items – which corresponds to the different levels in a taxonomy – or to novel expressions such as complete sentences. At the level of lexical items, for example, the expression *tool* would be schematic for its instances *hammer* and *saw*, whereas *hammer*, in turn, could be further instantiated or elaborated by *ball-peen hammer*, *cross-peen hammer*, etc. (see 4.2.4). At the level of novel expressions, on the other hand, the construal *Something happened* (ibid.) would be maximally schematic and could be instantiated by the more specific construal *A person perceived a rodent*. This construal is again schematic with regard to the person and the rodent (and, in fact, with regard to many other aspects as well) and could in turn be instantiated by *A girl saw a porcupine*, or *An alert little girl wearing glasses caught a brief glimpse of a ferocious porcupine with sharp quills*, and so on. The notions of specificity and schematicity thus describe the "precision of specification along one or more parameters, hence [...] the degree of restriction imposed on possible values along these parameters" (Langacker 1987:132).

[31] Alternative terms proposed by Langacker (2008:55) are *granularity* and *resolution*.

[32] It should be obvious from this example that while Langacker's construal operations have a certain visual bias (as evidenced by his notion of a scene (see 4.5.1.1) that can be viewed from different perspectives), they also encompass construals of a more abstract nature (in the example above, it is hard to find an immediate visual correspondence to the different construals of temperature, unless we use the analogy of a thermometer).

Specificity and schematicity are closely related to the view on explicitness and implicitness adopted in the present thesis. From the microscopic perspective, specificity and explicitness would refer to that part of a given conceptual content that is overtly linguistically encoded, while schematicity and implicitness refer to that part of the content which underlies the overtly encoded part as a conceptual substrate and which needs to be contextually inferred to arrive at the full content to be communicated. From the macroscopic perspective, we could say that the more specific the construal of a certain situation is, the more contextual information is projected into the text (see v. Hahn 1998:383). On the other hand, the more schematic a construal is, the more it has to be fleshed out with contextually inferable details. The notions of explicitness and implicitness thus betray a textual or linguistic perspective, while specificity and schematicity basically "construe" the same phenomena from a cognitive point of view. Within this framework, explicitation would occur when basically the same conceptualization is construed more schematically in the source text or more specifically in the target text. In contrast, implicitation occurs when this conceptualization is construed more specifically in the source text or more schematically in the target text. Explicitation and implicitation thus arise from a difference between the construal of a given source text and the construal of the corresponding target text and can therefore be characterized as cross-linguistic construal operations.

6.5.1.2 Explicitation and implicitation in Croft and Cruse's model of linguistic construal operations

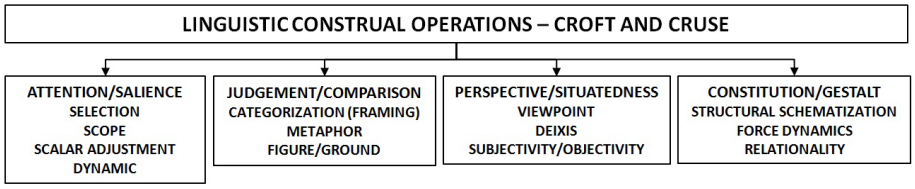

Figure 5: Croft and Cruse's model of linguistic construal operations

In Croft and Cruse's model, the concept relevant to the present discussion is the notion of *scalar adjustment*, a subcategory of the construal operation *attention/salience* (see also Halverson 2007:114). In line with the higher overall granularity of their model, the authors propose a further sub-classification of scalar adjustment into *quantitative* scalar adjustment and *qualitative* scalar adjustment.

A quantitative scalar adjustment refers to "the construal of an object by adjusting the granularity of the scalar dimensions" (Croft/Cruse 2004:52). The authors give the example *She ran across the field* vs. *She ran through the field* and argue that the second sentence construes the scene in a more fine-grained way since, in this sentence, the field is construed as a three-dimensional surface (by evoking the thickness of the field), whereas it is construed as a two-dimensional surface in the first sentence. A quantitative scalar adjustment would also be possible along the temporal dimension. Whereas the simple present in *Conor lives in New York City* construes the time frame in New York as permanent or long-term, the present progressive in *Connor is living in New York City* construes the time frame as short-term or temporary and thus evokes a finer-grained scale (ibid.:41, 52).

A qualitative scalar adjustment, on the other hand, involves "viewing something by means of a more encompassing category" (Croft/Cruse 2004:52-53). With reference to Langacker's (1987) original model of linguistic construal, the authors also call this construal operation *schematization*. For example, the difference between *polygon* and *triangle* would be a qualitative scalar adjustment since the latter specifies the exact number of sides of the shape whereas the former is indeterminate in this respect. Thus, the difference between quantitative and qualitative scalar adjustment is that, in the first case, the construal leaves out or adds a measurable scale or dimension whereas in the second case, the construal leaves out or adds certain properties (Croft/Cruse 2004:52-53).

6.5.1.3 Comparing the two models with regard to their applicability to explicitation and implicitation

Comparing Croft and Cruse's notions of quantitative/qualitative scalar adjustment to Langacker's notions of specificity/schematicity, the following points may be noted. Firstly, while Croft and Cruse provide a finer sub-classification than Langacker, their choice of terminology is more schematic. Whilst with *specific* and *schematic* there is one term for each direction on the granularity continuum, *scalar adjustment* leaves the directionality indeterminate and has to be further qualified (e.g. *downward/upward* scalar adjustment). Secondly, it seems that scalar adjustment primarily operates on entities that are already specified in a scene (e.g. the motion across/through a field or the concept of a polygon or a triangle), whereas specificity/schematicity, especially in the context of novel expressions, can more readily accommodate the introduction of new entities that were lacking in a more coarse-grained construal of the scene. For example, moving from the more schematic

construal *Something happened* to the more specific construal *A girl saw a porcupine*, a new agent and a new patient are introduced, which, depending on the context, can be claimed to be implicit/schematic in the previous construal. However, this seems difficult to capture using the notion of scalar adjustment, unless we treat the whole event as a category and qualify the more specific construal as a qualitative scalar adjustment of this event category. Finally, it seems that, contrary to qualitative scalar adjustment, quantitative scalar adjustment is not directly related to explicitation and implicitation.[33] Going back to the example *She ran across/through the field*, it is difficult to see how the introduction of the third spatial dimension in the construal *through the field* could be classified as more explicit that the construal *across the field* (i.e., in what sense could this spatial dimension be claimed to be implicit in the first construal?). Also, the temporary or short-term character of the stay in *Connor is living in New York City* cannot be claimed to be implicit in the construal *Connor lives in New York City*. Rather, the interpretation "temporary" or "short-term" is ruled out by the present tense in this example.

Summing up, it appears that quantitative scalar adjustment is not directly relevant to explicitation and implicitation while qualitative scalar adjustment primarily operates on elements already specified in a scene and is difficult to apply to the introduction of new elements in the case of novel expressions. In the light of these issues, it seems that Croft and Cruse's concept of scalar adjustment is less straightforwardly applicable to explicitation and implicitation than Langacker's more flexible and more encompassing notions of specificity and schematicity.[34] What seems to be clear, however, is that the translational phenomena of explicitation and implicitation correlate with general features of human cognition as reflected in language and language use since they are more or less well covered by the two influential models of linguistic construal operations presented above.

[33] Halverson (2007:116) seems to categorize her example *when **material support** is not enough → når **pengene** ikke strekker til* (*when the **money** is not enough*) as an instance of quantitative scalar adjustment (ibid.:114). However, this would rather be an instance of qualitative scalar adjustment, i.e. *money* would be an instantiation of the more schematic category *material support*.

[34] The cognitive linguistic discussion of the findings of the corpus analysis in chapter 8 will therefore be based on Langacker's model.

6.5.2 A cognitive linguistic distinction between explicitation/implicitation and their adjacent concepts

This section attempts a more theoretically robust distinction between expansion, explicitation and addition on the one hand and between reduction, implicitation and omission on the other. The distinction between explicitation/implicitation and expansion/reduction will draw on the general cognitive linguistic discussion of the *schema* concept (see 4.2.4), whereas the distinction between explicitation/implicitation and addition/omission will be informed by the notion of *current discourse space* (5.3.5) and the cognitive semantic toolset for modelling the implicit knowledge structures underlying overt textual structures in a given usage event (4.5.3). A theoretically enriched expansion-explicitation-addition continuum could look like this:

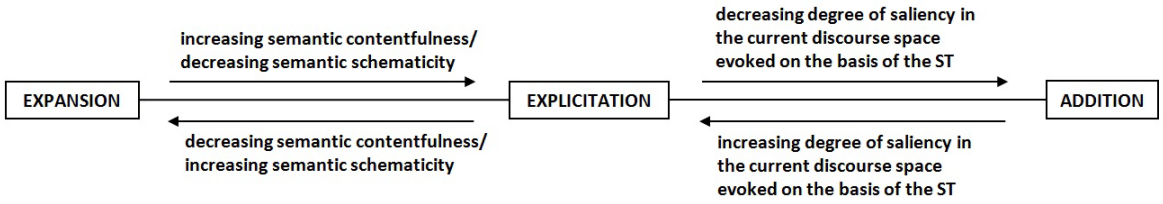

Figure 6: The expansion-explicitation-addition continuum from a cognitive linguistic perspective

Parallel to this continuum, the reduction-implicitation-omission continuum as seen from a cognitive linguistic perspective can be represented as follows:

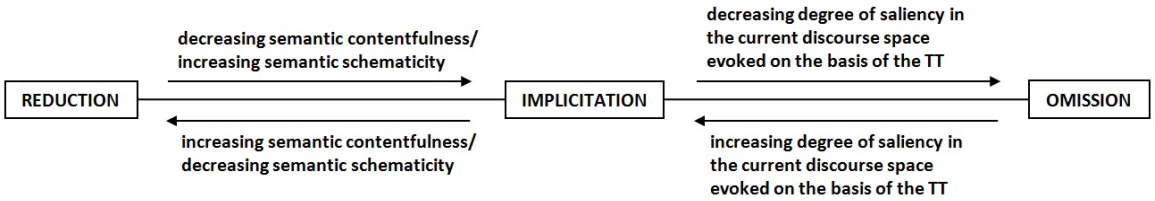

Figure 7: The reduction-implicitation-omission continuum from a cognitive linguistic perspective

The distinction between explicitation/implicitation and expansion/reduction can be linked in a straightforward way to the discussion of schemas and the relative semantic contentfulness or schematicity of linguistic units. For example, with reference to Olohan/Baker's study of the complementizer *that* we could say that the function word *that* is semantically quite schematic so that its introduction or deletion in the target text would be situated toward the expansion or the reduction endpoint of the corresponding continuum. The idea of schematicity would also hold for shifts operating on the syntagmatic plane. For example, the compound *fuel sulphur* leaves the semantic relation

between its constituents quite schematic whereas the prepositional word group *Schwefelgehalt im Kraftstoff* makes the semantic relation much more specific, thus bringing about a considerable increase in semantic contentfulness. This shift would therefore be located toward the explicitation endpoint of the corresponding continuum.

The distinction between explicitation/implicitation and addition/omission is inspired by Kamenická's (2007) application of frame semantics to explicitation and implicitation research. Kamenická (ibid.:54) asserts that the question of whether a certain piece of information can be claimed to be implicit in a text is a function of the relative saliency of this information in a given frame (or domain matrix) indexed by a particular word or construction. The information found in a given frame/domain matrix and the relative saliency of this information is of course not static but highly dynamic and subject to various factors pertaining to the context of the corresponding utterance or usage event (see 5.3.4). If, for example, we encounter the source text construal *the CO_2 generated from a primary fossil fuel* and the corresponding target text construal *das bei der Verbrennung eines fossilen Primärenergieträgers entstandene CO_2* (see chapter 1) and wonder whether the TT verbalization of the information *bei der Verbrennung* (*during the combustion*) is an instance of explicitation or addition, we must consider the saliency of this information in the frame/domain matrix of the term CO_2 in the source text by taking the context of this text into consideration. The domain matrix could look like this:

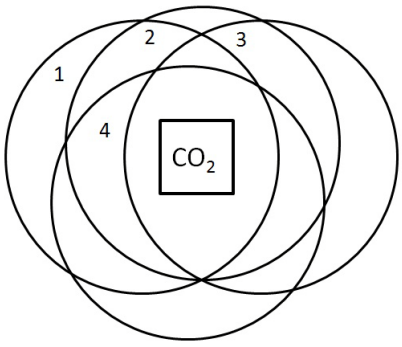

Figure 8: Possible domain matrix of the term CO_2

The domains in this matrix could be SHAPE/FORM (constitutive role of the *qualia* structure), CHEMICAL COMPOSITION (constitutive role), PRODUCTION (agentive role) and SOCIETAL RELEVANCE.[35] If we know from the situational context that the

[35] This list of domains only serves informational purposes. Recall that the number of domains associated with a given lexical unit is potentially open-ended (see 4.5.3.2).

text is an instance of expert-to-semi-expert communication we can, for example, make assumptions about the knowledge contexts or the common ground of the discourse participants. We could then assume that the exact circumstances of the production of CO_2 (i.e. detailed knowledge about the domain PRODUCTION) will be common ground between the discourse participants and that the discourse context (the participle construction *generated from a primary fuel*) will probably foreground this domain in the matrix of CO_2 while backgrounding others such as SOCIETAL RELEVANCE. We would thus have a theoretically-backed justification for classifying this shift as an instance of explicitation and not as an instance of addition. It should be obvious that we may often have to refer to all three contextual dimensions discussed in 5.3 to make informed judgements about the distinction between explicitation/implicitation and addition/omission. Of course, this does not provide us with an objective algorithm for determining how to classify certain shifts. However, the theoretical basis provided, together with a transparent reasoning by the respective researcher, should make this inherently difficult distinction open to a sound intersubjective debate.

In the two continua above, I do not refer to the saliency of a given piece of information in a frame/domain matrix but rather employ the broader notion of *current discourse space*, which was discussed in 5.3.5. There are three reasons for this. Firstly, the CDS can be understood as the cognitive representation of the three context types which were invoked above to discuss the distinction between explicitation/implicitation and addition/omission. As such, it should feature prominently in the theoretical distinction of the two concept pairs. Secondly, it was pointed out that the CDS can also be understood as the locus of the contextual shaping of frames/domain matrices and the ranking of information according to their relative saliency. Thus, I do not move away from Kamenická's initial insight but merely situate it at the level where the saliency of a given piece of information is actually determined, i.e. at the level of the CDS as a specific mental space providing the locus of meaning construction. Finally, and perhaps most importantly, there are instances of explicitation and implicitation that cannot be neatly tied to a particular frame/domain matrix indexed by a given expression. Consider the following example:

EN: About 3-4 $MtCO_2$ that would otherwise be released to the atmosphere is captured and stored annually in geological formations.
DE: **Dabei** werden jährlich insgesamt etwa 3-4 Mt CO_2 zur Vermeidung von Emissionen in die Atmosphäre abgeschieden und in geologischen Formationen gespeichert.

In this example, the pronominal adverb *dabei* was introduced in the target text, establishing an explicit anaphoric reference to the previous discourse frame. However, the information explicitated in this example cannot be claimed to be salient in a particular frame/domain matrix associated with a specific linguistic expression. Rather, it seems to be salient in the CDS in the form of a more general situation described in the previous discourse frame and a coherent link between this situation and the information presented in the current discourse frame. Therefore, it seems that if our distinction between explicitation/ implicitation and addition/omission is to be applicable to all relevant phenomena, we should model it not with reference to individual frames/domain matrices but by resorting to the broader notion of CDS.

6.6 Defining explicitation and implicitation in cognitive linguistic terms

Now that all the theoretical tools are in place, I will attempt to provide a coherent definition of both explicitation and implicitation from a cognitive linguistic perspective:

Explicitation is a translation technique which consists in a more specific target text construal of basically the same conceptualization as licensed by the source text. The information explicitly verbalized in the more specific TT construal is not verbalized but deemed to be implicit in the ST in the form of a reasonably high saliency of this information in the current discourse space which is evoked based on the ST, as determined by taking the relevant contextual dimensions into account.

Implicitation is a translation technique which consists in a more schematic target text construal of basically the same conceptualization as licensed by the source text. The information explicitly verbalized in the more specific ST construal is not verbalized but deemed to be implicit in the TT in the form of a reasonably high saliency in the current discourse space which is evoked based on the TT, as determined by taking the relevant contextual dimensions into account.

These definitions avoid the partial circularity found in various prominent definitions of explicitation and implicitation in translation studies and integrate the two concepts firmly in the cognitive linguistic framework by linking them to the notion of linguistic construal, the notion of current discourse space and (indirectly) to the cognitive semantic tools of frames and domain matrices. The idea of basically construing the same conceptualization with different degrees of specificity/schematicity assumes both a high stability of meaning and the potential to keep this meaning invariant in translation. The principled stability of meaning in STT, based on a dynamic account of meaning, has been established in 5.4.2. Also, the epistemological issues and cognitive processes involved in judging two conceptualizations to be the same, similar or invariant have been addressed in the

discussion of the invariance of meaning in STT in 5.5.[36] The feasibility of investigations into explicitation and implicitation in STT should therefore have been properly secured.

6.7 Explicitation and implicitation and linguistic underdeterminacy

I will conclude this chapter by briefly considering explicitation and implicitation in the context of the notion of linguistic underdeterminacy as a recurring theme of the present thesis. The link, as I see it, is the following: The principle of linguistic underdeterminacy is the very reason that textual surface structures offer impoverished prompts or access points for encyclopaedic knowledge structures which are then contextually shaped in the process of meaning construction or conceptualization (see 4.6 and 5.3.4). This text-context interaction in meaning construction is, in turn, that which explicitation and implicitation are claimed to be indicative of. Explicitation can thus be claimed to be a process of text-context interaction which reduces linguistic underdeterminacy by projecting information which was originally provided by the context into the target text. The resulting TT construal will therefore be more specific and less linguistically underdetermined than the ST construal and requires less contextual input in the process of meaning construction. Implicitation, on the other hand, is a process of text-context interaction that contributes to linguistic underdeterminacy since it moves previously textually available information into the context, to be inferred by the reader. The resulting TT construal is more schematic and more linguistically underdetermined than the ST construal and requires more contextual input during the process of meaning construction. It was claimed in 2.8 and 4.6 that linguistic underdeterminacy may correlate with the degree of technicality of a text, where expert-to-expert discourse generally exhibits a higher degree of underdeterminacy than expert-to-semi-expert and expert-to-layperson discourse. This begs the question of whether the frequency and distribution of explicitation and implicitation may also correlate with this parameter since highly underdetermined texts should offer more opportunities for explicitating information. Also, if a text is addressed to an expert audience, the translator may be more confident in implicitating information than if it were geared towards a layperson audience. The degree of technicality is one important design dimension of the scientific/technical corpus to be analyzed for instances of explicitation and implicitation (see 7.1.1.4). The corpus design will thus allow us to answer this interesting research question in the quantitative discussion of results in chapter 8.

[36] How this invariance of meaning as a prerequisite for the investigation of explicitation and implicitation can be translated into the methodologically required *tertium comparationis* will be discussed in the next chapter.

6.8 Chapter summary

This chapter provided an overview of the two phenomena of explicitation and implicitation as potential indicators of text-context interaction in translation and thus narrowed the perspective of this thesis to specific linguistic phenomena deemed to be relevant in scientific and technical translation. After highlighting the theoretical and empirical imbalance between explicitation and implicitation and discussing the assumed universality of explicitation and major strands of research on explicitation, the explicitation concept was scrutinized in detail. After arguing for the notion of explicitation in its original version (S-explicitation), the concept was shown to be positioned between the two adjacent concepts of expansion and addition, having a fuzzy borderline on both sides that translated into the expansion-explicitation-addition continuum. The focus was then shifted to the implicitation concept, which was shown to stand in a similar intermediary position on the reduction-implicitation-omission continuum. Since the complexity of explicitation and implicitation cannot properly be captured without a detailed theoretical investigation of the closely related concepts of explicitness and implicitness, the two latter concepts were scrutinized in detail from the perspectives of Anglo-American pragmatics and cognitive linguistics. It was argued that cognitive linguistics provides a more plausible account of the two phenomena and a finer-grained theoretical toolset for modelling them. Explicitation and implicitation were then reconceptualized from a cognitive linguistic perspective, viewing them as cross-linguistic construal operations that can be situated in both Langacker's and Croft/Cruse's model of linguistic construal. The expansion-explicitation-addition continuum and the reduction-implicitation-omission continuum were then theoretically enriched from a cognitive linguistic perspective and it was shown that the complexity of the two continua can be coherently captured by the proposed framework. The proposed cognitive linguistic definitions of explicitation and implicitation avoid the circularity and imprecision of other canonical definitions of the two concepts and can be readily integrated into the wider theoretical framework of the present thesis. The chapter concluded with the discussion of explicitation and implicitation as processes of text-context interaction that contribute to or reduce linguistic underdeterminacy.

The following chapter will illustrate both the design of the corpus to be investigated for instances of explicitation and implicitation as well as the methodology of this investigation.

7 Corpus design and methodology

The present chapter discusses the design of the scientific/technical corpus to be investigated for instances of explicitation and implicitation and illustrates the methodology of the corpus analysis. Both corpus design and methodology are based on the theoretical considerations discussed in the previous chapters.

7.1 Corpus design

The design of the scientific/technical corpus is based on the design criteria developed by Krein-Kühle (2003, 2011, 2013) in the context of the Cologne Specialized Translation Corpus (see 7.1.2 below) to ensure the high quality of the translations to be included in the corpus. In line with Krein-Kühle (2005:29), I understand the corpus to be analyzed in this thesis as "a reflection of actual professional translation practice". The corpus was enriched with diverse information pertaining to this professional practice of translators, resulting in a "corpus in context" (Krein-Kühle 2011:391). In the following sections, the primary design considerations that guided the selection of the corpus texts will be illustrated. As will be seen, most of these considerations follow directly from the theoretical reflections in the previous chapters. After laying out these considerations, the actual structure of the corpus, the relevant statistical corpus data and various textual data in relation to the professional dimension of the corpus will be illustrated. The corpus discussion will conclude with an elaboration of the epistemic value of the corpus in context.

7.1.1 Primary design considerations

The theoretical reflections in the previous chapters and the overall epistemic aims of the present thesis are reflected in the following six primary considerations that guided the design of the corpus to be investigated.

7.1.1.1 Translation corpus

The most fundamental consideration in the design stage was to build a translation or parallel corpus[1], which allows the comparison of specific ST-TT features, in this case

[1] The designation *parallel corpus* is widely established in corpus-based translation studies but it has sometimes been criticized for its possible terminological confusion (e.g. Johansson 1998; Krein-Kühle 2003). As Krein-Kühle (2003:45) points out, the adjective *parallel* is traditionally used in the term *parallel texts*, which refers to original target language texts having a subject matter and communicative function

explicitation and implicitation. This choice situates the corpus somewhere on the periphery of corpus-based translation studies, which has come to be dominated by comparable corpora investigating features of translations with respect to original texts written in the target language (see the influential study by Olohan/Baker 2000 discussed in 6.2.2). As these research designs focus primarily on formal properties of translated texts *vis-à-vis* original texts in the target language (Laviosa 2002:63), they exclude an important factor of the translation process – i.e. the source text(s) – and thus do not allow for a holistic discussion of the investigated phenomena (see also Becher 2011:14). A translation corpus design, on the other hand, recognizes the "'double-binding' relationship" (House 1997:29) of translation, i.e. the retrospective relation of a translation to its source text and its prospective relation to the target-culture readers. Also, the decision to design a translation corpus follows directly from my understanding of explicitation and implicitation as describing intertextual relations holding between source texts and their translations.[2]

7.1.1.2 Domain-controlled corpus

The second relevant design consideration was to select the corpus texts according to the domain to which they belong. In line with the overall focus of this thesis, which is primarily concerned with scientific and technical translation, all corpus texts belong to the domain of science and technology. This translates into a tightly domain-controlled corpus or, in the words of Laviosa (2002:35), a "terminological" corpus, although terminology is of course only one dimension of scientific and technical discourse. The domains covered in the corpus are carbon dioxide capture and storage (CCS) and piston technology. The two domains coincide with two different degrees of technicality, which reflect another dimension of the corpus design (see 7.1.1.4 below).

7.1.1.3 Bidirectional corpus

The third important design consideration was the directionality of the corpus. I decided to build a bidirectional corpus containing translations from English into German and vice versa. This bidirectional design permits the investigation of whether the general frequency and distribution of explicitation and implicitation correlate with the respective translation

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comparable to that of a specific text to be translated (Göpferich 1998b:184). In the remainder of this thesis, the more transparent designation *translation corpus* will therefore be used (see also Krüger 2012:507).

[2] See the discussion of S-explicitation vs. T-explicitation in 6.2.2.

direction investigated.[3] It also allows the comparison of the explicitation/implicitation patterns established for one translation direction with regard to potential symmetries or asymmetries with the patterns established for the other translation direction. The bidirectional corpus design should thus provide both a more holistic and a more differentiated picture of explicitation and implicitation than monodirectional corpora focusing on only one translation direction.

7.1.1.4 Subcorpora with different degrees of technicality

The fourth consideration in corpus design was to include texts with different degrees of technicality. This is intended to show whether the frequency and distribution of explicitation and implicitation may also possibly correlate with this parameter (see the discussion in 6.7). With reference to the three-dimensional classification proposed in 2.7, the corpus texts can be classified as expert-to-expert and expert-to-semi-expert discourse. The procedure used for this classification will be illustrated in 7.1.3.2 below. Expert-to-layperson discourse is not represented in the corpus because I would claim that it is primarily expert-to-expert and expert-to-semi-expert discourse that exhibit the prototypical knowledge gap or "conceptual distance" (see 2.4.1) between the intended discourse participants and the translator which makes linguistic underdeterminacy and text-context interaction (and explicitation/implicitation as two of its linguistically analyzable indicators) a pressing concern in actual translation. Also, the broad common ground underlying expert-to-expert and expert-to-semi-expert discourse as a conceptual substrate and the relatively high schematicity of the texts pertaining to these forms of discourse may result in a highly multifaceted text-context interaction in the translation of such texts.

7.1.1.5 Functional invariance between STs and TTs

Closely related to this consideration is the fifth design consideration, which requires the functional invariance of the translations in the corpus.[4] This follows from the discussion of STT as a prototypical concept in 2.6, where it was claimed that the central members in the

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[3] If this is the case, this could be taken as evidence against the universality of explicitation as discussed in 6.1.2 since, from a universalist perspective, explicitation would be an inherent feature of the translation process and would thus behave in a language-independent way.

[4] Halverson (1998:504-505) rightly points out that if our concept of translation principally allows for functional variance, the variance or invariance of translation can be incorporated as one parameter of the corpus design.

prototype category of STT are characterized by functional invariance. This invariance entails, for example, that the communicative configuration underlying the ST discourse is held constant in translation. The assumption is that, even when we claim the background knowledge and the expectations of ST and TT readers to be relatively constant (see 5.1.3), there will still be many relevant instances of explicitation and implicitation in the corresponding translations – however, these instances may, to a large extent, be attributable to systemic or register-induced differences between source and target texts but not relatable to any significant knowledge asymmetries between the intended ST and TT readers. Such knowledge asymmetries would become much more significant in the translation of SL expert-to-expert or expert-to-semi-expert discourse for a TL layperson audience. However, I consider such functionally variant translations to be a peripheral phenomenon in STT understood as a prototype concept.[5] Hence, they are excluded from the corpus.

7.1.1.6 High-quality corpus

The sixth and last primary design consideration pertains to the quality of the corpus texts. Claims about translation quality are inherently difficult, probably because of the lack of objective or universally agreed criteria for measuring such quality. Consequently, Stewart (2000:213) notes that in corpus-based translation research "qualitative judgements are conspicuous by their absence".[6] However, this is not unproblematic since, as Krein-Kühle (2011:392) points out, the quality of the texts to be included in the corpus "will inevitably influence the results of the analyses". To counter the subjective influences which are necessarily involved in any judgements on translation quality, I adopted a triangulated approach consisting of an (inter)subjective and an objective element. The (inter)subjective element is my own judgement of the quality of the corpus texts based on my professional experience as a scientific and technical translator and on my experience as a teacher of STT. As Lederer (2003:43) points out, approaching translation quality this way, we can, *ex*

[5] This claim is somewhat difficult to substantiate in empirical terms since, to my knowledge, there exists no large-scale study on the actual contents of translation briefs in professional translation. I therefore draw on anecdotal evidence when I say that in my five years as in-house translator in the field of science and technology, I can remember only one translation assignment where the source text was geared toward an expert audience and the target text had to be rendered for a layperson audience. Other professional translators may of course have had different experiences.

[6] See also Krein-Kühle (2003:47).

negativo, set a minimum standard requiring that the translations are free of any significant linguistic or content-related errors.[7] My proofreading of the corpus texts showed that the texts do not only fulfil these minimum standards but exhibit a very high overall quality as regards the choice and consistency of register, the transmission of information and the general fulfilment of their intended function. This (inter)subjective judgement is backed by several objective criteria relating to the translation context (see 7.1.3.3). For example, the texts were translated in an environment which promotes high-quality translation, they were translated by qualified native speakers of the target language and there was a proofreading stage for every translation. This combination of (inter)subjective and objective factors should provide a sound basis for the claim that the texts of the scientific/technical corpus do indeed exhibit a very high quality.

7.1.2 Corpus data

Based on these design considerations, I compiled a bilingual, bidirectional translation corpus containing German and English scientific/technical source texts and their translations into English and German respectively. Below, I will briefly elaborate on the superordinate corpus of which my own corpus forms a part and I will illustrate the internal structure of the corpus. Then, the relevant statistical corpus data will be discussed.

7.1.2.1 Corpus structure: superordinate corpus and subcorpora

The scientific/technical corpus to be analyzed in this thesis forms part of the Cologne Specialized Translation Corpus (CSTC), which is a "high-quality specialized translation corpus […] being compiled at the Cologne University of Applied Sciences with the aim of establishing corpus-based translation studies" (Krein-Kühle 2013:8). The CSTC contains three major subcorpora: the scientific and technical subcorpus, the economic subcorpus and the legal subcorpus.[8] My corpus forms part of the scientific and technical subcorpus of the CSTC, which contains articles in learned journals, conference articles, research reports, operating instructions, technical specifications, manuals, etc. (ibid.:9).[9] The scientific/

[7] Further criteria that can be used to ensure a minimum quality standard for corpus texts can be found in Maia (2003:45).

[8] This tripartite corpus structure reflects the three major domains taught in the MA in Specialized Translation programme offered at the Institute of Translation and Multilingual Communication at Cologne University of Applied Sciences.

[9] For a detailed overview of the CSTC and its various subcorpora see Krein-Kühle (2013:8-11).

technical corpus to be analyzed in this thesis is also composed of two subcorpora: the CCS subcorpus containing research reports on carbon dioxide capture and storage and the Automotive subcorpus containing a technical paper and a specialist article, both concerned with piston technology. As already mentioned in the discussion of the domain-controlled corpus in 7.1.1.2, the CCS subcorpus was classified as expert-to-semi-expert discourse and the Automotive subcorpus as expert-to-expert discourse.

7.1.2.2 Statistical corpus data

The scientific/technical corpus				
Subcorpus/ discourse participants	**CCS subcorpus** Expert-to-semi-expert		**Automotive subcorpus** Expert-to-expert	
Translation direction/ subject matter	**EN-DE** IPCC Special Report on Carbon Dioxide Capture and Storage – Technical Summary	**DE-EN** Research and Development Concept for Zero-Emission Fossil-Fuelled Power Plants	**EN-DE** The Effect of Piston Temperature and Fuel Sulfur on Diesel Engine Piston Deposits	**DE-EN** Nitriding of Piston Ring Surfaces for Wear Reduction
Text type	Progress-oriented actualizing	Progress-oriented actualizing	Progress-oriented actualizing	Progress-oriented actualizing
Genre	Research report (technical summary)	Research report	Article in learned journal	Technical paper
Words ST	6,972	5,565	6,619	5,656
Words TT	6,350	6,856	7,074	7,046
Subtotal	*13,322*	*12,421*	*13,666*	*12,702*
Total CCS		**25,743**		
Total Automotive				**26,368**
Total EN-DE		*26,988*		
Total DE-EN		*25,123*		
Final total	**52,111**			

Table 1: Statistical overview of the scientific/technical corpus

As can be seen, the four ST-TT pairs in the corpus are roughly equal in size, with the EN-DE pairs being slightly larger in both cases. Both text pairs in the Automotive subcorpus are full texts, whereas the text pairs of the CCS subcorpus are thematic excerpts of two larger research reports. In both cases, the size of the thematic excerpts (which deal with the scientific/technical dimension of carbon dioxide capture and storage) roughly correspond to the size of the full texts in the Automotive subcorpus.

The relatively small size of the scientific/technical corpus is indicative of the primarily qualitative character of the present thesis. Since explicitation and implicitation can exhibit multiple linguistic manifestations (see 7.2.2.1 and 7.2.2.2 below), most of which do not lend themselves easily to a fully automated analysis, I opted for a small-scale corpus design which allows for a detailed qualitative analysis of possible explicitation and implicitation phenomena. This primarily exploratory approach shows parallels to Sinclair's (2001:xi) *early human intervention* (EHI) method in which most of the corpus analysis is done manually, with computerized tools playing only a supportive role. Despite the primarily qualitative character of the analysis, a corpus size of 52,000 words is deemed "extensive enough to provide a sound basis from which to propose statistically underpinned generalizations" (Krein-Kühle 2003:78). However, the generalization capacity of the corpus should not be overstated. Although I will present statistical figures of the analysis and discuss their potential significance, I take the qualitative discussion of the results in translational and cognitive linguistic terms to be the main contribution of the empirical part of this thesis.[10]

7.1.3 Text data

The following sections will discuss in more detail various relevant aspects of the corpus texts. With reference to table 1 above, the discussion will always progress from the leftmost to the rightmost ST-TT pair.

7.1.3.1 General information, text type and genre

The first ST-TT pair in the corpus (CCS EN-DE) is the technical summary of a special report published by the Intergovernmental Panel on Climate Change (IPCC). The report and the technical summary discuss Carbon Dioxide Capture and Storage (CCS) as a viable

[10] See also Becher (2011:78-79), who basically sets the same priorities in his qualitative analysis of explicitation and implicitation.

option for reducing anthropogenic CO_2 emissions into the atmosphere. The technical summary was not included in the corpus in full. Excluded were those parts which are uniquely concerned with the economic and societal dimensions of CCS. The focus is thus on the scientific and technical dimension of CCS. The English source versions of both the full report and the technical summary were published on the internet.[11] The translation was not published.

The second ST-TT pair in the corpus (CCS DE-EN) is the final report on a research and development concept for zero-emission fossil-fuelled power plants. The report was published by COORETEC, an initiative by the German Federal Ministry of Economics and Technology (BMWi), which is concerned with **CO_2 re**duction **tec**hnologies for fossil-fuelled power plants. The COORETEC report covers a more diverse range of topics than the IPCC report and is also much longer. The text included in the corpus is an excerpt of the full report which is specifically concerned with CO_2 capture and storage (again from a scientific/technical perspective). Both ST and TT were published on the internet.[12]

The third ST-TT pair in the corpus (Automotive EN-DE) is an article in a learned journal published by the Society of Automotive Engineers (SAE) and is concerned with the effects of piston temperature and fuel sulphur on diesel engine piston deposits. In contrast to the first two text pairs, these texts were included in the corpus in full. The ST was published as print version and is not available on the internet. The translation was done primarily for information purposes and was not published.

The fourth and last ST-TT pair in the corpus (Automotive DE-EN) is a technical paper published by Goetze AG (now Federal-Mogul Burscheid GmbH). The paper is concerned with nitriding piston ring surfaces for wear reduction and thus shares with the first text pair of the Automotive subcorpus the overall domain of piston technology. ST and TT were

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[11] Full report CCS EN-DE (ST): [http://www.ipcc.ch/pdf/special-reports/srccs/srccs_wholereport.pdf] [last accessed on 12/08/2013]

Technical summary CCS EN-DE (ST): [http://www.ipcc.ch/pdf/special-reports/srccs/srccs_technical summary.pdf] [last accessed on 12/08/2013]

[12] ST CCS DE-EN: [http://www.cooretec.de/index.php/index.php?path=publikationen&file=35] [last accessed on 12/08/2013]

TT CCS DE-EN: [http://www.cooretec.de/index.php/index.php?path=publikationen&file=52] [last accessed on 12/08/2013]

also included in the corpus in full. Both ST and TT were published as print versions and are not available on the internet.

From a text-typological perspective, all texts can be classified as informative and more precisely as progress-oriented actualizing texts (see Göpferich's primary text function in the classification proposed in 2.7.2). The genres (research reports, technical papers, articles in learned journals) can be classified as "hybrid[s] of science and technology" (Byrne 2012:63), thus illustrating the symbiotic relationship between the two fields as discussed in 2.1.

7.1.3.2 Degree of technicality

The texts CCS EN-DE and CCS DE-EN were classified as expert-to-semi-expert discourse and the texts Automotive EN-DE and Automotive DE-EN as expert-to-expert discourse. I started from the general impression that the Automotive texts exhibited a higher informational density and were generally more difficult to understand than the CCS texts. To give this impression a more solid theoretical and empirical footing, I resorted to Arntz' (2001:195-196) criteria for determining the vertical complexity of a text as one parameter of the textual degree of technicality (see 2.7.1.3) and analyzed two random 1000 word samples from each subcorpus with regard to the frequency and complexity of technical terms in these samples. The analysis of the CCS sample yielded 110 technical terms with an average term complexity of 1.85 elements per term. The analysis of the Automotive sample, on the other hand, yielded 195 technical terms with an average term complexity of 2.17 elements per term. These results may be interpreted as empirical confirmation of the general impression that the Automotive subcorpus exhibits a higher degree of technicality than the CCS subcorpus. Note, however, that this result does not fit with the assignment of genres in Arntz' ranking scale for the degree of technicality of scientific/technical texts in 2.7.1.3. According to this scale, research reports would exhibit a degree of technicality of X of IX, whereas I would classify the CCS reports in my corpus as VI of IX, with a tendency towards degree VII. On the other hand, articles in learned journals would exhibit a degree of technicality of VII on Arntz' scale, whereas I would rank the DE-EN article in the Automotive subcorpus at X and therefore of the same technicality as the SAE Technical Paper.

7.1.3.3 Translation context

The CCS EN-DE text was translated into German by a German native speaker within the scope of a diploma dissertation at the Institute of Translation and Multilingual

Communication at Cologne University of Applied Sciences. The dissertation was supervised by a professor who is an expert on the subject matter and was awarded the grade "very good". The translation was proofread by the supervisor and by two translators with several years of professional experience in STT. This text is the only text in the corpus that was not translated by a professional translator but by a trainee translator. However, this potential lack of experience should be balanced by the generous timeframe available for the translation[13] (ensuring a very high translation quality) and by the fact that the translation was proofread independently by three translation experts.[14]

The CCS DE-EN text was translated by an in-house translator (English native speaker) of the translation department of Forschungszentrum Jülich, a leading German research centre. The translation was then proofread by another in-house translator of the translation department. During the translation, the translator was able to consult with the ST authors and a number of subject-matter experts based at the research centre. After the translation was completed, there was a revision stage in which the original translator and the proofreader were involved.

The Automotive EN-DE text was translated by an in-house translator (German native speaker) at the translation department of Goetze AG. The translator had access to a subject-matter expert who was also the initiator of the translation. The translation was proofread by the head of the translation department and there was no revision stage.

Finally, the Automotive DE-EN text was translated by another in-house translator (English native speaker) at the translation department of Goetze AG. The translator had access to both the ST author and a subject-matter expert from Goetze. The translation was again proofread by the head of the translation department and there was also no revision stage.

As mentioned in 7.1.1.6, various aspects of the context in which the translations were produced are taken as objective support for the claim that the corpus to be analyzed is indeed a high-quality translation corpus. Specific factors that can be said to contribute to

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[13] The full text to translate had about 9,000 words, and the diploma dissertation had to be completed within three months. Regardless of the fact that the student also had to work on various theoretical aspects of STT in her dissertation, this is obviously a translation deadline that a professional translator would consider extremely generous.

[14] My own proofreading of the translation also did not show any significant differences in quality as compared to the other translations in the corpus.

this assumed high quality are, for example, the proofreading stage involved in every translation or the fact that the student translator of the CCS EN-DE text was allowed a very generous deadline for the translation, was supervised by a professor with expertise in the specific subject matter and was awarded the highest possible mark for her dissertation. The fact that the professional translators of the texts CCS DE-EN, Automotive EN-DE and Automotive DE-EN had recourse to subject-matter experts during translation can also be taken to contribute to the quality of the translations.

7.1.4 Epistemic value of "corpora in context"

The availability of such detailed information on the context in which the corpus texts were translated results in what Krein-Kühle (2011:391) has quite fittingly called a "corpus in context". The general idea behind this notion is that the translation analyst, by having recourse to such contextual information, is positioned "closer" to the actual translation process and – in discussing certain features exhibited by the corresponding translations – can make more informed statements on the possible motivations that may have guided the translator's actions. This is a principled advantage of carefully designed small corpora over large corpora in the range of hundreds of thousands or millions of words, where it is often unfeasible to enrich the corpus texts with the kind of information available for the present corpus. A corpus in context may help counter Toury's (1995:183) allegation that, in empirical ST-TT analyses, the translator is often merely a "hypothetical construct". In this context, Toury (ibid.) claims that "[a]s long as it is only pairs of target vs. source texts that are available for study, there is no way of knowing how many different persons were actually involved in the establishment of a translation, playing how many different roles". It is particularly the merit of corpora in context that they do not only consist of "pairs of target vs. source texts" but also comprise – potentially very detailed – information on the actual context in which the translation was produced (see Krein-Kühle 2011). With regard to the present corpus, we cannot completely disentangle the translator as a hypothetical construct into which all potential agents involved in the translation process have been collapsed (Toury 1995:183), but we can reduce this construct to a small, limited and definite set of agents. We know, for example, that each of the corpus texts was only translated by one translator and not by a team of translators. And while it is not evident from the end-product whether the translator or the proofreader was responsible for a given translation solution, we can deduce from the professional translation competence of the proofreaders that the final version of the TT was produced with translational concerns in

mind – as opposed to editorial or revisional concerns, which may result in textual interventions that fall outside of the scope of prototypical translational action.[15] Also, when discussing potential motivations for certain explicitation and implicitation shifts, we can be somewhat more confident in our reasoning and go beyond the implicit causality that Chesterman (2000:19) attributes to a comparative ST-TT investigation. According to Chesterman (ibid.), the implicit causality of a comparative analysis is reducible to the formula "[i]f X (in the source text), then Y will follow (in the target text)". This formula is somewhat oversimplified since it is purely text-internal and does not reflect the various other parameters on which a corpus-in-context-based study can draw in discussing potential translational motivations. For example, if we want to attribute a certain shift to register considerations or potential target-reader expectations, we can be reasonably confident that the translators, in virtue of their professional experience and/or university education, were actually aware of these aspects. Of course, pinpointing the exact motivation for certain translational actions would require a process-based study, which can elicit a plethora of additional data that necessarily remain hidden in a product-focused investigation. Still, a corpus-in-context design should allow us to invoke, with a reasonable degree of confidence, more factors of potential influence and more detailed factors than corpus studies comprising (potentially large sets of) completely anonymous and decontextualized texts.[16]

At this point, I would like to stress again that I take the qualitative discussion of the results in translational and cognitive linguistic terms to be the main contribution of the empirical part of this thesis and that I do not aim to give a comprehensive and systematic account of translational motivations for certain explicitation and implicitation shifts.[17] However, the

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[15] As illustrated above, the translation of the CCS-DE-EN text was subject to a revision stage which, however, involved the translator and the proofreader. This should again ensure that the translational perspective is still reflected in the end-product.

[16] The issue of causality is largely ignored in Becher's (2011) corpus-based study of explicitation and implicitation in translation. Becher's study "was carried out on a random subset of the business corpus of the project *Covert Translation* […]" (ibid.:79). Given this random sampling, the general corpus-based setup of the study and the absence of any detailed discussion of translational contexts in the methodology of Becher's thesis, his aim to "find out *when* and *why* translators explicitate or implicitate" (ibid.:75) may have been somewhat overambitious.

[17] This is also reflected by the fact that this thesis does not work with a *retrospective* or *cause-oriented* classification of explicitation and implicitation shifts (see, for example, Klaudy's (^{2}2009:106-107) typology

usage-based character of cognitive linguistics entails that I cannot (and in fact, I do not want to) remain completely agnostic toward this dimension since language use is always a purpose-driven activity. Therefore, in the qualitative discussion of the results from the translational perspective, I will reason quite extensively on issues of causality or translational motivation, knowing that the overall comparative setup of the study does not allow for absolutely secure statements on these issues, but also knowing that the corpus-in-context design of the study gives a reasonable justification for these speculations.

7.2 Methodology

After the discussion of the design of the translation corpus to be analyzed in this thesis, the focus will now be shifted to the methodology of the translation analysis. First, the *tertium comparationis* of the translation comparison will be discussed. Then, I will elaborate on Klaudy/Károly's (2005) linguistic classification of explicitation and implicitation shifts and propose a revised classification which is broadly based on Klaudy/Károly's model but which avoids some of its problems and also reflects the cognitive linguistic perspective adopted in this thesis. The chapter concludes with an illustration of the actual procedure followed in analyzing the translation corpus and in classifying the identified shifts.

7.2.1 *Tertium comparationis* of the translation comparison

In his book on contrastive functional analysis, Chesterman (1998:29) points out that "no comparison can be made between any two entities without a frame of reference provided by a third term of some kind […]". Chesterman is talking about the *tertium comparationis* as a prerequisite for any sound translation comparison (see also Krein-Kühle 2003:60). However, although the need for such a *tertium* seems to be widely acknowledged in the literature, the concept is virtually absent from most if not all comparative analyses of explicitation and implicitation in translation (but see Krein-Kühle 2009). This may be due to the fact that the notion of *tertium comparationis* is far from unproblematic and considered to be "[p]erhaps the biggest bone of contention in the comparison of an ST and a TT" (Munday [3]2012:76). The epistemological problems involved are basically the same as those for the closely related concept of invariance (see 5.5), and the corresponding

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of obligatory, optional, pragmatic and translation-inherent explicitation). Instead, the classification proposed here is both more *prospective* and more formally oriented in that it focuses on the linguistic realization of explicitation and implicitation shifts in the target text (see 7.2.2.1 and 7.2.2.2 below). The functional dimension of these shifts will then be elaborated in the discussion of results in the next chapter.

discussion will be taken up briefly below. Before this, two crucial points need to be illustrated.

Firstly, Chesterman (1998:29) points out that "different kinds of analysis require different kinds of third term [i.e. *tertium comparationis*]".[18] Thus, when we want to compare inherently multidimensional phenomena such as source texts and their translations, we have to choose a certain dimension to compare and hence a certain *tertium comparationis*.[19] In the present thesis, the *tertium comparationis* will obviously pertain to the meaning dimension of ST and TT.

Secondly, I would like to point out an important distinction made by Bakker et al. ([2]2009:269), who discuss an *a priori* and an *a posteriori* conception of the invariant/*tertium comparationis* in translation studies. From an *a priori* perspective, "the invariant is postulated as a necessary condition to be met before the transfer operation can qualify as translation; here, the invariant coincides with the *tertium comparationis* of the translation" (ibid.). This idea is reminiscent both of the normative equivalence paradigm which dominated translation studies until the mid-1980s and of the ongoing efforts, also in modern equivalence-based approaches, to delineate translation from non-translation by positing definitional equivalence (and hence invariance) requirements to be met in translation. From an *a posteriori* perspective, on the other hand, "the invariant is meant for use as a descriptive, purely heuristic construct", where "the *tertium comparationis* is a device in the methodology of the description" (ibid.). It should be obvious from the general prototypical perspective on translation adopted by the present study that invariance (of meaning, in this case) is understood here not as a definitional prerequisite of translation but rather as a prototypical aim of STT that can be achieved to varying degrees (see 2.6 and 5.5). Also, invariance of meaning is considered here as a heuristic – albeit necessary – construct to be invoked in the investigation of explicitation and implicitation. Since this thesis basically subscribes to an *a posteriori* conception of invariance, it is not in the theoretical context of this thesis but in the present methodology section that the notion of *tertium comparationis* is discussed as a prerequisite for a sound translation comparison.

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[18] See Arntz (2001:26-27), who discusses various potential *tertia comparationis* on which comparative analyses can be based.

[19] See the discussion of Albrecht's and Schreiber's multidimensional equivalence model in 2.6 and the discussion of Langacker's cognitive process of comparison in 5.5.

Having made these two important points, I would now like to address the epistemological problems associated with the *tertium comparationis*. With reference to the cognitive linguistic discussion of the invariance of meaning in STT in 5.5, the *tertium* is not understood as something "out there" in the objective world but rather as an interpretive construct resulting from the comparison of two entities (in the present case the meaning dimension of ST and TT). When, in the cognitive process of comparison illustrated in 5.5, we perceive invariance of meaning between a specific ST and TT construal (or, more precisely, between the conceptualizations triggered by these construals in combination with contextual factors), this meaning will be taken as the *tertium comparationis* for our analysis. From this *tertium*, we can then gauge variation in the degree of explicitness/specificity or implicitness/schematicity with which this meaning is construed in ST and TT. As such, the present approach is not unlike van Leuven-Zwart's (1989, 1990) well-known model of translation comparison. However, van Leuven-Zwart's notion of *architranseme* as a common denominator between ST and TT (see Hermans 1999:59) shows strong parallels to the structural linguistic notion of *archiseme*, implying that the locus of the *tertium comparationis* is somehow in the texts themselves (see the discussion of the language-internal approach to linguistic meaning in 4.1), requiring no human conceptualizing efforts. The present thesis, on the other hand, aims to give an interpretive account of the *tertium comparationis* from a cognitive linguistic perspective. In line with the discussion in 5.5, the perceived invariant meaning that is posited as a *tertium* in the comparison can vary within a certain tolerance range as posited by McFarlane (1953) and Schreiber (1993). Note that this conception of the *tertium* actually precludes its existence "out there" in the world prior to the actual process of translation. It is only after a translation process resulting in "divergent similarity" (Chesterman 1996:161) in the form of an ST and a TT that we can perceive a "convergent similarity" (ibid.) between the two texts that we can then posit as the *tertium comparationis*.

The principally subjective character of this process has already been pointed out in 5.5. However, there are various stabilizing factors involved that should set the whole procedure on a more intersubjective basis. Firstly, the conceptualizations licensed by particular ST and TT construals are tightly constrained in STT, as illustrated in the discussion of stability vs. instability of textual meaning in 5.4.2. Secondly, the process of comparison performed by the translation analyst is of course not wholly subjective or idiosyncratic since s/he will

strive for intersubjective consensus on the analysis results among his/her peers.[20] Finally, in presenting and discussing the results in the data analysis stage of the investigation, the analyst makes this process of comparison public, inviting the readers to agree or disagree with the decisions made.[21] In light of these factors, I think that we can justifiably reject Herman's (1999:57) claim that the interpretive character of establishing invariance and *tertia comparationis* in translation "is bound to render the invariant of the comparison pretty unstable."[22] To make one last reference to Lakoff's words from the closing section of chapter 3, a human and therefore interpretive and (inter)subjective conception of the invariant and the *tertium comparationis* is the best we can do – and it should be good enough to serve as a robust methodological tool for a corpus-based investigation of explicitation and implicitation in translation.

7.2.1.1 Explicitation and implicitation as translation shifts

This thesis has at various points referred to explicitation and implicitation as translational *shifts* that can be investigated in a comparative ST-TT analysis. This may not be quite unproblematic since the term *shift* carries with it a considerable amount of theoretical baggage in translation studies. The concept is closely linked with the strongly linguistically oriented translation theory developed by Catford (1965), who drafted a list of probabilistically established, context-free *translation rules* the application of which would lead to empirically observable *translation shifts* (ibid.:31, see also Stolze ^{6}2011:57). The concept of shifts so understood seems firmly anchored in the normative and restrictive equivalence paradigm which dominated translation studies until the mid-1980s. Also well-known in the context of shifts is Toury's (1995:84) dictum that investigations of shifts tend to focus on "all that a translation *could have had* in common with its source but *does not*." It should have become clear from the overall perspective of this study that the notion of shifts is to be understood neither in Catford's nor in Toury's sense here. As Toury himself (2004:21-22; capitalization removed) points out, "translation involves shifts", or, in other words, shifts are a constitutive feature of translation. For the purpose of this study, shifts

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[20] In a similar context, Krein-Kühle (2003:64) speaks of the "requisite – though by no means arbitrary – evaluativeness" of the translation analyst.

[21] For a similar line of argument see Becher (2011:78).

[22] In a similar context, Halverson (2007:119) points out that "old arguments regarding the status of the *tertium comparationis* arise the moment we posit a mental entity as the basis for shift analysis. These must be dealt with carefully." I hope that the previous discussion has complied with this demand.

are therefore considered as a neutral term for a perceived difference between a source text and its translation that "should not be regarded as an end in itself" (Toury 1995:85) but rather as part of a discovery procedure (ibid.). More specifically, explicitation and implicitation shifts are treated as indicators of text-context interaction in translation. As such, they are not an "end in themselves" but rather serve as triggers for a holistic discussion of this text-context interaction in translational and cognitive linguistic terms.

7.2.2 Classification of explicitation and implicitation shifts

In the following sections, a linguistic classification of potential explicitation and implicitation shifts will be developed that will serve as a yardstick in the analysis and in the discussion of the results. I will start from the linguistic classification of explicitation and implicitation shifts developed by Klaudy/Károly (2005:15), discuss some merits and potential shortcomings of this classification and then propose a revised classification from a cognitive linguistic perspective.

7.2.2.1. Linguistic classification proposed by Klaudy/Károly

According to Klaudy/Károly (2005:15), explicitation shifts in translation can be linguistically realized in the following ways:

lexical addition: new meaningful elements are introduced in the TT

lexical specification: an ST unit with a more general meaning is replaced by a TT unit with a more specific meaning

lexical division: the meaning of an ST unit is distributed over several units in the TT

grammatical addition: not further specified

grammatical specification: an ST sentence is divided into two or more TT sentences

grammatical elevation (raising): ST phrases are "raised" to clause level in the TT

The classification of implicitation shifts mirrors that of explicitation shifts. According to Klaudy/Károly (ibid.), implicitation shifts can be realized as follows:

lexical omission: meaningful elements of the ST are dropped in the TT

lexical generalization: an ST unit with a more specific meaning is replaced by a TT unit with a more general meaning

lexical contraction: the meaning of several ST units is combined in one TT unit

grammatical omission: not further specified

grammatical generalization: two or more ST sentences are conjoined into one TT sentence

grammatical lowering (downgrading): ST clauses are reduced to phrases in the TT

Since they capture prototypical instances of explicitation and implicitation, the notions of *lexical addition/omission* in the above classification should be uncontroversial, as long as the relevant meaningful elements can be reasonably said to be contextually inferable or, in cognitive linguistic terms, to be sufficiently salient in the current discourse space (or the respective frames/domain matrices indexed in the source or target text). However, the designations lexical *addition* and *omission* are a somewhat unfortunate choice in the context of the present thesis since, in the present theoretical framework, *addition* and *omission* refer to concepts which have to be distinguished from explicitation and implicitation (see 6.2.3.2 and 6.3.1.2). In the classification adopted in this thesis, the designations of the corresponding procedures have therefore been changed to lexical *insertion* and lexical *deletion*.

The notions of *lexical specification/generalization* are straightforward as well since they also capture prototypical instances of explicitation and implicitation. However, with a view to the cognitive linguistic basis of the present thesis, the designation lexical *generalization* was changed to lexical *schematization*. Lexical specification and lexical schematization would thus be prime examples of Langacker's construal operation of *specificity/ schematicity* (see 4.5.1.1 and 6.5.1.1).

The notions of *lexical division/contraction* are, however, problematic since they basically describe the notions of *expansion* and *reduction* discussed in 6.2.3.1 and 6.3.1.1 respectively. Since the present thesis claims that the concepts of expansion/reduction are qualitatively different and therefore have to be differentiated from explicitation/ implicitation, these two procedures will not feature in the revised classification below.

Grammatical addition/omission is not further specified in Klaudy/Károly's classification but since, at some point in their paper, the authors discuss the addition and omission of determiners in translation, we can deduce that grammatical addition/omission refers to the addition or omission of function words as opposed to content words. Since function words also form part of the lexicon of a language, these two operations are subsumed under the operations of lexical insertion/deletion.

Grammatical specification/generalization again seem to describe prototypical instances of explicitation/implicitation, although it is not quite clear why this should primarily be manifested in the splitting or conjoining of sentences. For example, the English composite structure *French silk underwear*[23] is grammatically or structurally ambiguous because it is not clear whether the adjective *French* modifies the noun *silk* or the noun compound *silk underwear*. If we resolve this scope ambiguity in translation, this would be an instance of grammatical specification in Klaudy/Károly's terms, which, however, has nothing to do with the splitting of sentences. The important point, as I see it, is whether any relations holding between component structures of a composite structure[24] (be it at the sentence, clause, phrase or compound levels) on the syntagmatic plane are made more explicit or more implicit in the TT. Therefore, and again with regard to the cognitive linguistic bias of the present thesis, the designations were changed to *relational specification* and *relational schematization* in the revised classification.

The notions of *grammatical elevation/lowering* are again somewhat problematic in the context of explicitation and implicitation since raising a phrase to clause level or reducing a clause to phrase level may entail a semantically very schematic shift that would probably have to be classified as expansion/reduction and not as explicitation/implicitation. If, for example, we raise the prepositional phrase in *Pass me the newspaper on the table* to clause level as in *Pass me the newspaper which is on the table*, it may be argued that the ensuing shift is semantically highly schematic and therefore has to be classified as an instance of expansion. However, this need not be the case. If we raise the prepositional phrase in the construal *Pass me the cup of coffee and the newspaper on the table* to clause level, we are forced to render the relations holding between the component structures of this composite structure (here, the relations between the prepositional phrase and its one or two possible heads) more explicit, i.e. *Pass me the cup of coffee and the newspaper which is/are on the table*. Since the two interpretations licensed by the first construal are qualitatively different, cancelling one of these interpretations would qualify as a semantically contentful shift that would be classified as explicitation. However, since such a shift operates again at the level of composite structures on the syntagmatic plane (as do grammatical specification/generalization shifts in Klaudy/Károly's typology), grammatical elevation/

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[23] This example is taken from Cruse (1986:66).

[24] The cognitive linguistic notions of *component structure* and *composite structure* will be explained in the next section.

lowering is treated as a potential instance of relational specification/schematization in the revised classification and not as an independent class of explicitation/implicitation shifts.

7.2.2.2 Revised cognitive linguistic classification

Based on the above discussion, I would like to propose the following classification of explicitation/implicitation shifts to be applied in the corpus analysis:

Lexical insertion/deletion

In cognitive linguistic terms, *lexical insertion/deletion* prototypically operate at the level of novel expressions (see the discussion of the construal *Something happened → A girl saw a porcupine*, etc. in 6.5.1.1). Lexical insertion introduces new and autonomous elements into a scene, i.e. the TT construal features new elements which were missing in the ST construal. Lexical deletion, on the other hand, removes autonomous elements from a scene, i.e. elements which were present in the ST construal are removed from the TT construal. As a consequence, the TT construal will be more specific/schematic than the ST construal.[25] However, the two requirements discussed in 6.5.2 must be met. Firstly, elements introduced into the TT must be inferable from the ST, (i.e. they must be sufficiently salient in the current discourse space evoked based on the ST) and elements deleted from the TT must be inferable from the TT (they must be sufficiently salient in the current discourse space evoked based on the TT). Otherwise, we would be dealing with addition and omission respectively. Secondly, the shifts associated with lexical insertion/deletion must be sufficiently semantically contentful; otherwise we would be dealing with expansion or reduction.

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[25] It may be asked why this category is treated independently of the category of lexical specification/ schematization below since it is also concerned with the relative specificity/schematicity of ST and TT. The reason is as follows: Linking explicitation and implicitation to Langacker's construal operations of specificity and schematicity (see 6.5.1.1) entails that all explicitation and implicitation shifts ultimately adjust the specificity/schematicity of the TT construal. However, this very general commitment to explicitation/ implicitation equalling shifts in specificity/schematicity should not prevent us from finding meaningful distinctions in how these shifts can be realized, such as the introduction/deletion of autonomous elements vs. the specification/schematization of elements already present. So, keeping in mind that all explicitation/implicitation shifts principally adjust the level of specificity/schematicity of the TT construal, a distinction is made between shifts that introduce/delete autonomous elements at the level of novel expressions in the TT construal and shifts that adjust the specificity/schematicity of elements already present in the ST construal (see also the discussion of lexical specification/schematization below).

Lexical specification/schematization

In contrast to lexical insertion/deletion, *lexical specification/schematization* operate on entities that are already given in a scene, i.e. lexical units which are already present in the ST construal are specified or schematized in the TT construal. Lexical specification/ schematization can basically be described in terms of hypernym-hyponym or schema-instance hierarchies as discussed in 4.2.4. In LSP research and translation studies, these concepts are also referred to as *concretization/abstraction* (Roelcke [3]2010:28) or as *concretization/generalization* (Schreiber 1993:228). These construal operations will primarily operate on nominal and verbal concepts since it is primarily these concepts that feature in such hierarchies.[26] However, as will be shown in the analysis, lexical specification/schematization can also occur at the level of pronouns, determiners and even prepositions. This will be discussed in more detail in 8.3. The distinction between lexical insertion/deletion and lexical specification/schematization may seem straightforward at first glance but it gets somewhat complicated when applied in the empirical analysis. The issues involved in this distinction will be discussed in 8.1 and 8.2.

Relational specification/schematization

As discussed above, the category of *relational specification/schematization* will cover semantically relevant shifts occurring on the syntagmatic plane, "where two or more [component] structures [...] combine to form a composite structure of greater size" (Langacker 1987:75, boldface removed). The cognitive linguistic notion of *composite structure* requires a brief explanation here since it is important for the understanding of the notions of relational specification and schematization. In CL, a composite structure consists of two or more integrated component structures (ibid.:277) and can exhibit various levels of complexity. For example, the free morpheme *plug* (component structure A) can combine with the bound plural morpheme *-s* (component structure B) to form the composite structure *plugs* (see Langacker 1987:75; Dirven/Verspoor 1998:52-53). The composite structure *plugs*, in turn, can feature as a component structure of a more complex composite structure, such as the compound *spark plugs*. The compound/composite structure *spark plugs* can again feature as a component structure in a more complex composite structure such as the complex noun phrase *the spark plugs screwed into the*

[26] However, hypernym-hyponym or schema-instance relations may also hold at the level of adjectives and adverbs, e.g. *red → maroon*, *once in a while → annually* (Croft/Cruse 2004:142, see also Becher 2011:166).

cylinder heads and so on. Relational specification will occur when the TT construes the relations between the component structures of a given composite structure in a more specific way than the ST. In turn, relational schematization will occur when such relations are construed more specifically in the ST and more schematically in the TT.

Borderline cases

I also decided to include a category of *borderline cases* in my classification. This category comprises those shifts which are not situated closely enough to the explicitation or implicitation endpoints of the expansion-explicitation-addition and the reduction-implicitation-omission continuum so as to categorize them clearly as instances of explicitation or implicitation. In order to illustrate the sometimes fuzzy transition zone between expansion/reduction, explicitation/implicitation and addition/omission, some of these shifts will be discussed separately. This brief discussion will also show how this fuzzy transition zone can be modelled using the cognitive linguistic toolset laid out in this thesis. Since these borderline cases are somewhat peripheral to the actual aims of the analysis, their discussion will be set apart from the actual discussion of explicitation and implicitation shifts.

7.2.3 Identification and classification procedure

To conclude this chapter, I will briefly elaborate on the various steps involved in preparing, analyzing and annotating the various corpus texts. The texts were either available in PDF format or in Word format. The PDF texts were then converted to Word format using the *export* function of Adobe Acrobat Professional©. The Word versions of source and target texts were then manually aligned with SDL Trados WinAlign© to create electronic translation units consisting of ST and TT segments. The alignment files were then exported into the Trados exchange format TXT. Below is an example of what such a manually aligned translation unit looks like:

<TrU>

<Quality>100

<CrU>ALIGN!

<CrD>11122010, 21:22

<Seg L=EN-US>The activation energy for this process was determined to be 5 kcal/mole.

<Seg L=DE-DE>Die Aktivierungsenergie für diesen Prozeß wurde auf 5 kcal/Mol festgelegt.

</TrU>

<TrU>

The meta-information in brackets was then removed using the *search and replace* function in Microsoft Word© to yield an intercalated text in which a source text unit is immediately followed by the corresponding target text unit (see Laviosa 2002:78-79). This intercalated text looks like this:

Crankcase oil oxidation appeared to correlate with piston temperature.
Die Oxidation des Motorenöls steht offensichtlich in unmittelbarem Zusammenhang mit der Kolbentemperatur.

The activation energy for this process was determined to be 5 kcal/mole.
Die Aktivierungsenergie für diesen Prozeß wurde auf 5 kcal/Mol festgelegt.

The rate of crankcase oil oxidation doubled for each 67°C increase in piston top groove temperature.
Bei jedem Anstieg der Temperatur in der ersten Kolbennut von 67°C verdoppelte sich die Oxidationsrate des Motorenöls.

This was done to facilitate the microscopic comparative analysis of ST and TT units since this way we have both ST and TT units in our immediate visual field and can compare them directly without having to switch between documents or papers.[27] To avoid losing sight of the bigger picture, the analysis of this intercalated text was accompanied by an analysis of the corresponding texts in their original format. This allowed a more macroscopic perspective on the translation units and on the identified shifts in their wider discourse context. Using the *comment* function in Microsoft Word©, the shifts were then annotated in the electronic version of the intercalated text with the following labels, which correspond to the classification proposed above:

[27] The intercalated text used for the analysis actually resembles the segmented presentation of ST and TT units in translation memory systems such as SDL Trados 2007©.

Explicitation	Implicitation
ex_lex_ins	im_lex_del
ex_lex_spec	im_lex_schema
ex_rel_spec	im_rel_schema

Table 2: Labels used for annotating explicitation and implicitation shifts in the corpus texts

For example, an explicitation shift realized by means of lexical specification was annotated with the label *ex_lex_spec* and an implicitation shift realized by means of relational schematization was annotated with *im_rel_schema*.[28] In a second analysis step, these labels were further specified to yield a more fine-grained subclassification which will serve to structure the discussion of the various shifts in the next chapter. For example, for lexical insertion shifts, the class of the linguistic unit inserted into or omitted from the text was determined, yielding labels such as *ex_lex_ins_noun* or *ex_lex_ins_prep*. These labels were then used to navigate directly to a specific (sub)category of explicitation or implicitation shifts in order to group the corresponding shifts and to establish the corresponding statistical data.

7.3 Chapter summary

This chapter illustrated the design of the corpus to be investigated for instances of explicitation and implicitation and discussed the methodology of this investigation. Primary design considerations included, for example, the high quality of the corpus texts, the bidirectionality of the corpus and different degrees of technicality of the subcorpora. Especially the latter two design parameters will allow a more fine-grained quantitative perspective on the frequency and distribution of explicitation and implicitation shifts that goes beyond rather undifferentiated assumptions of (explicitational) universality. After illustrating various corpus and text data, the epistemic value of the "corpus in context" to be investigated in this thesis was discussed. In this context, it was pointed out that, equipped with the information available for the present corpus, the translation analyst is positioned "closer" to the actual translation process and can make more informed assumptions about translational motivations when discussing the results of the product-based analysis. The discussion of the methodology illustrated the *tertium comparationis* to

[28] This annotation scheme is based on the scheme developed by Becher (2011:83).

be used for the translation comparison and linked this notion to the epistemological and cognitive linguistic reflections on the closely related invariance concept in chapter 5. A cognitive linguistic classification of explicitation and implicitation shifts based on Klaudy/Károly's classification was then developed. This classification serves to structure the discussion of results in the next chapter and at the same time integrates some relevant cognitive linguistic tools discussed in the previous chapters. The chapter concluded with a brief illustration of the practical identification and classification procedure applied in the corpus analysis.

The next chapter will provide a detailed discussion of the results of the corpus analysis in translational and cognitive linguistic terms.

8 Data Analysis

This chapter provides a detailed discussion of the results of the corpus analysis. The first part will be concerned with the overall quantitative dimension of the analysis, providing statistical figures for the different subcorpora and discussing the frequency and distribution of the identified explicitation and implicitation shifts in relation to the translation direction and the degree of technicality of these subcorpora. This quantitative discussion will be followed by a detailed qualitative discussion of explicitation and implicitation shifts from a general translational and cognitive linguistic perspective. This will bring together the various theoretical components of the thesis. At the end of the qualitative discussion of the individual shift categories, the quantitative perspective will be taken up again and the linguistic distribution of the shifts within the respective category will be discussed. This discussion will be linked to the qualitative considerations introduced previously and may provide interesting insights that could not be captured in the rather coarse-grained overview of the overall quantitative dimension in the first part of the chapter. The chapter concludes with the discussion of several borderline cases that serves to illustrate the fuzzy transition zone between explicitation/implicitation and the adjacent concepts of expansion/reduction and addition/omission.

8.1 Quantitative dimension of the analysis

Shift types	**Subcorpora**				**TOTAL**
	CCS EN-DE	**CCS DE-EN**	**Automotive EN-DE**	**Automotive DE-EN**	
Explicitation: lexical insertion	28	21	54	15	**118**
Explicitation: lexical specification	148	43	223	114	**528**
Explicitation: relational specification	46	6	123	0	**175**
Total explicitation	*222*	*70*	*400*	*129*	***821***
Implicitation: lexical deletion	29	24	11	11	**75**
Implicitation: lexical schematization	82	68	143	100	**393**
Implicitation: relational schematization	0	21	0	12	**33**
Total implicitation	*111*	*113*	*154*	*123*	***501***
TOTAL	**333**	**183**	**554**	**252**	**1322**

Table 1: Statistical overview of explicitation/implicitation shifts in the four subcorpora

Starting from a very general perspective, we can say that explicitation and implicitation are indeed well-suited concepts for illustrating the interaction between text and context in

scientific and technical translation since a total of 1,322 shifts could be identified in the analysis. Based on a corpus size of 52,111 words (see 7.1.2.2), this translates into an average of about 2.5 explicitation/implicitation shifts per 100 words. Total explicitation shifts outweigh total implicitation shifts (821 vs. 501), which may, at first glance, be taken as evidence of the higher relevance of explicitation compared to implicitation in translation and as justification for the attempts to prove the translational universality of explicitation – at the expense of implicitation. However, the 501 implicitation shifts identified in the analysis are clear evidence of the fact that this concept is also a quantitatively important factor in STT and therefore warrants empirical investigation and theoretical reflection in its own right, or at least a joint consideration together with the explicitation concept. Therefore, instead of trying to interpret the total figures as evidence of the Explicitation Hypothesis (6.1.2), the results seem to be better reflected by the Asymmetry Hypothesis (6.3), which considers both explicitation and implicitation and which claims a quantitative asymmetry in favour of explicitation (as evidenced by the present analysis). The Asymmetry Hypothesis, however, makes a distinction between obligatory and optional explicitation/implicitation and is only concerned with optional shifts (see Klaudy/Károly 2005:14). Such a principled distinction between obligatory and optional explicitation/ implicitation shifts is not quantitatively reflected in the present thesis.[1] This is because the line between optional and obligatory shifts may not be as clear-cut as it seems at first glance (see Salama-Carr 2001:218) and because – if we view explicitation and implicitation primarily as potential indicators of text-context interaction in translation – there is no reason why (clear-cut) obligatory shifts should be any less interesting than (clear-cut) non-obligatory shifts. Therefore, I will refrain from making any assumptions about the translational universality of explicitation or about the asymmetry between optional explicitation and optional implicitation at this point. Instead, it is expected that in narrowing down the perspective in the next sections, we may find more interesting quantitative patterns beyond the scope of the two rather coarse-grained hypotheses.

Three further observations can be made with regard to the table above. Firstly, the category of lexical specification/schematization is the quantitatively most significant category in the classification, accounting for 528 explicitation and 393 implicitation shifts. This may partly be due to the fact that this category captures the most clear-cut and prototypical realization of explicitation and implicitation shifts, i.e. the translation of meaningful ST

[1] See, however, the discussions in 8.3.2 and 8.4.

elements with a higher schematicity by meaningful TT elements possessing a higher specificity and vice versa. A second reason may be the occasionally difficult distinction between lexical insertion/deletion and lexical specification/schematization shifts and the classification procedure followed in this thesis. This had the consequence that various shifts that could, in principle, have been classified as lexical insertion/deletion shifts were actually classified as lexical specification/schematization shifts. This issue will be elaborated in detail in 8.2 below. The second observation pertains to the very uneven distribution of relational specification/schematization shifts, where no relational specification shifts occurred in the subcorpus Automotive DE-EN and no relational schematization shifts occurred in the subcorpora CCS EN-DE and Automotive EN-DE. This uneven distribution points to a strong correlation of these shifts with the translation direction investigated; this will be considered in the next section. The last observation is the very high occurrence of explicitation shifts in subcorpus Automotive EN-DE (400 shifts), which is almost double the figure for the subcorpus with the second highest number of explicitation shifts (CCS EN-DE with 222 shifts). This points to some idiosyncratic features of this subcorpus being responsible for this high figure since both the subcorpus with the same degree of technicality (Automotive DE-EN, 129 shifts) and the subcorpus with the same translation direction (CCS EN-DE, 222 shifts) behave very differently. We will look for signs of this "anomaly" in the discussion of the linguistic distribution of explicitation/implicitation shifts in 8.2.2, 8.3.2 and 8.4.2.

8.1.1 Frequency and distribution of shifts in relation to the translation direction

Shift types	**Translation direction**	
	EN-DE	**DE-EN**
Explicitation: lexical insertion	82	36
Explicitation: lexical specification	371	157
Explicitation: relational specification	169	6
Total explicitation	**622**	**199**
Implicitation: lexical deletion	40	35
Implicitation: lexical schematization	225	168
Implicitation: relational schematization	0	33
Total implicitation	**265**	**236**

Table 2: Frequency and distribution of explicitation/implicitation shifts in relation to the translation direction

If we arrange the results of the analysis according to the translation direction, we can observe the following trends. Firstly, explicitation is much more prevalent in the

translation direction EN-DE (622 shifts) than in the translation direction DE-EN (199 shifts). This difference is quite striking and points to systemic or communicative differences between English and German that may exhibit a strong influence on the frequency and distribution of explicitation shifts performed by translators. The difference is most striking in the category of relational specification (169 vs. 6 shifts), indicating that English-German translators perform much more specification shifts at the syntagmatic level than German-English translators. However, there are also more than twice as many explicitation shifts in the translation direction EN-DE than in the DE-EN direction for the categories of lexical insertion and lexical specification. For implicitation shifts, the distribution between the translation directions is much more balanced, with 265 implicitation shifts in the translation direction EN-DE vs. 236 shifts in the direction DE-EN. However, within this more balanced distribution, we again find a striking difference, namely the total absence of relational schematization shifts in the translation direction EN-DE compared to 33 instances in the opposite direction. This observation reflects, to some extent, the observation made for relational specification. In the present case, English-German translators performed no relational schematization shifts at the syntagmatic level, whereas German-English translators performed at least some of these shifts. This striking imbalance in the category of relational specification/schematization and the fact that these shifts operate at the syntagmatic level may lead us to conclude that we are uniquely concerned with obligatory shifts here and that these shifts are solely induced by grammatical differences between English and German. However, I would like to refrain from such general judgements until we take a closer look at the linguistic distribution of relational specification/schematization shifts (8.4.2) following their qualitative discussion.

Again taking a more macroscopic perspective on the table above, we can perceive a very strong correlation of explicitation shifts with the translation direction and a rather weak correlation of implicitation shifts with the translation direction. In this context, we need to take into account the fact that subcorpus Automotive EN-DE, which in 8.1 was observed to exhibit an "abnormally" high number of explicitation shifts, is contained in the explicitation figures for the translation direction EN-DE, leading to the "inflation" of this figure compared to the figure for the opposite translation direction. As was argued above, the reason for the high number of explicitation shifts in subcorpus Automotive EN-DE may be due to idiosyncratic features of the corpus texts. This is somewhat problematic in the context of the qualitative small-scale corpus design opted for in this thesis since, in the present analysis, such idiosyncratic features are directly reflected in the statistical figures,

whereas in large-scale quantitative analyses they would be smoothed out – at least to some extent.

8.1.2 Frequency and distribution of shifts in relation to the degree of technicality

Shift types	Degree of technicality	
	Expert-to-expert	**Expert-to-semi-expert**
Explicitation: lexical insertion	69	49
Explicitation: lexical specification	337	191
Explicitation: relational specification	123	52
Total explicitation	**529**	**292**
Implicitation: lexical deletion	22	53
Implicitation: lexical schematization	243	150
Implicitation: relational schematization	12	21
Total implicitation	**277**	**224**

Table 3: Frequency and distribution of explicitation/implicitation shifts in relation to the degree of technicality

Looking at the frequency and distribution of explicitation/implicitation shifts in relation to the degree of technicality of the corpus texts, we can make the following observation: For both explicitation and implicitation, more shifts were identified in the expert-to-expert subcorpora than in the expert-to-semi-expert subcorpora. Again, the difference is more pronounced in the category of explicitation (529 vs. 292) than in the category of implicitation (277 vs. 223). This may also be attributed to the very high number of explicitation shifts in subcorpus Automotive EN-DE, which is contained in the expert-to-expert figure for explicitation shifts.

In general, the higher frequency of both explicitation and implicitation shifts in the expert-to-expert subcorpora may have the following reasons: It was argued in 2.8, 4.6 and 6.7 that the linguistic underdeterminacy or schematicity of a text may correlate with its degree of technicality, with expert-to-expert discourse probably exhibiting a very high degree of underdeterminacy or schematicity due to the broad common ground of the expert discourse participants. This broad common ground allows the non-verbalization of a host of information that can be assumed to be known by the discourse participants and it also allows a high linguistic condensation of the information actually verbalized, for example by using multi-element compounds, various means of syntactic compression (for example English reduced relative clauses) or ellipses. Therefore, when translating expert-to-expert

discourse, translators will probably be confronted with a higher number of highly condensed/schematic/implicit structures than in expert-to-semi expert or expert-to-layperson discourse. As a consequence, translators of expert-to-expert discourse may also have more opportunities to perform explicitation shifts in the translation, whatever the actual reasons for these shifts may be. At the same time, assuming that the TT audience will also have expert status (which can be deduced from the functional invariance of the translations, see 5.1.3 and 7.1.1.5), translators can also be more confident in performing implicitation shifts without this causing any risk of misunderstanding on the part of the TT audience. Summing up, it seems that expert-to-expert discourse offers translators more possibilities to perform both explicitation and implicitation shifts than expert-to-semi expert or expert-to-layperson discourse. In the light of this fact, it only seems reasonable that they will also make use of (at least some of) these possibilities, as indicated by the figures above.

We now turn from the quantitative discussion of the identified explicitation and implicitation shifts to their detailed qualitative analysis in cognitive linguistic and translational terms. As mentioned at the beginning of this chapter, the quantitative perspective will be taken up again at the end of each category and it will be linked to the qualitative considerations discussed previously.

8.2 Lexical insertion and deletion

It was already implied in 7.2.2.2 and 8.1 that the category of lexical insertion/deletion is less straightforward than it may appear at first glance. The analysis showed that it is sometimes difficult to decide whether a certain shift should be classified as lexical insertion/deletion or as lexical specification/schematization since the specification/ schematization of a linguistic unit may itself take place in the form of the insertion/deletion of linguistic elements. Take the following corpus example:

Erdgasgefeuertes GuD-Kraftwerk mit Rauchgasdekarbonisierung

GCC power plant with flue gas decarbonization

In the TT construal, the past participle *erdgasgefeuert* was deleted, which could principally be classified as a lexical deletion shift. However, the overall shift operates on a linguistic unit which was already present in the ST construal (the GCC power plant), meaning that it could also be classified as lexical schematization (by deleting the past participle, the power plant is construed in a more schematic way in the TT). Klaudy/Károly (2005) – who

introduced the principled distinction between insertion/deletion and specification/ schematization shifts and on whose classification the present classification is based – only discuss very straightforward examples and therefore do not have to elaborate the potentially problematic distinction between what they call lexical addition/omission and lexical specification/generalization. Becher (2011:111), whose classification bears some resemblance to Klaudy/Károly's classification and the present classification, treats, for example, the shift *collaboration → collaboration with manufacturers* as an instance of addition (*insertion* in my terms) since the prepositional phrase *with manufacturers* was added in the translation.[2] However, in his category of *substitution* (which basically covers Klaudy/Károly's category of lexical specification/generalization and my category of lexical specification/schematization), Becher (ibid.:115) claims that explicitation occurs when a more general term is substituted by a more specific term and gives the following formula: "A term x is more specific (= less general) than another term if (and only if) the meaning of x includes the meaning of y, but not vice versa". This formula basically describes the hypernym-hyponym or schema-instance relation that was identified as a prototypical feature of lexical specification/schematization shifts in 7.2.2.2. However, if we look at both my own and Becher's example above, there seems to be such a straightforward hypernym-hyponym relation holding in both of them, i.e. *power plant* is hypernymic for *natural gas-fuelled power plant* the same way as *collaboration* can be seen as hypernymic for *collaboration with manufacturers*.[3] So, it seems somewhat inconsistent of Becher to classify his *collaboration* shift as addition when it passes the hyperonymy-hyponymy test and would thus qualify for his category of substitutions. Also, it may have been an arbitrary or idiosyncratic choice on the part of the translator to realize the shift as a prepositional phrase and not by a compound such as *manufacturer collaboration*.[4] The shift *collaboration → manufacturer collaboration* makes its specification character even more prominent because we would perhaps intuitively attribute less semantic autonomy to a compound element than to a prepositional phrase. And indeed, such cases were classified

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[2] For the sake of simplicity, the following shifts will be discussed in monolingual terms, although we are of course concerned with cross-linguistic shifts.

[3] We can establish this hypernym-hyponym relation by using the "is a" test (see Becher 2011:115; Croft/Cruse 2004:142): A collaboration with manufacturers is a collaboration but a collaboration is not necessarily a collaboration with manufacturers.

[4] This may not be a very good example, however, consider the corpus instances *CO_2 capture* vs. *capture of CO_2*, which could both be said to be default construals of the same conceptual content.

as instances of substitution by Becher (ibid.:197). However, if we do not want to let such potentially arbitrary or idiosyncratic verbalization strategies on the part of the translator guide our classification of shifts as either lexical insertion/deletion or lexical specification/schematization shifts, our decision should be based on a rather strict criterion. For the purpose of the present thesis, I resorted to the hypernym-hyponym test proposed by Becher. Lexical insertion/deletion shifts are therefore defined, *ex negativo*, as those shifts which do *not* entail a previously non-existent hypernym-hyponym relation between specific ST and TT elements. This criterion also makes clear the autonomous character of these shifts, "autonomous" here meaning that they do not modify any existing ST or TT element in a way that yields a new hypernym-hyponym relation. According to this criterion, all the shifts discussed above would not be classified as lexical insertion/deletion but as prototypical instances of lexical specification/schematization since they all pass the hyperonymy-hyponymy test.

This distinction between lexical deletion/insertion and lexical specification/schematization should be reasonably justified since it avoids problematic situations where we would have to classify, for example, the shift *capture* → *capture of* CO_2 as insertion of a prepositional phrase but the shift *capture* → CO_2 *capture* as specification, with the semantic consequences of the two shifts being basically the same. However, as can be seen from the statistical overview of explicitation/implicitation shifts in 8.1, the classification procedure followed in this thesis entails that the category of lexical insertion/deletion shifts is somewhat "impoverished" – both quantitatively and qualitatively – since many, potentially very interesting, shifts that *could* be treated within this category are actually included in another one. However, since these shifts are not actually lost but only assigned to another category, this decision does not have any adverse effects on the qualitative discussion of the results.[5]

[5] At this point, much more could be said about the problems involved in the distinction between lexical insertion/deletion and lexical specification/schematization but this would probably lead us too far into a general linguistic discussion and away from the actual purpose of this chapter. The procedure illustrated above should be both sufficient and reasonable from a pragmatic point of view. After all, the classification proposed here mainly serves to structure the qualitative discussion of the results and is not intended as an eternal and completely water-tight classification for future explicitation/implicitation studies.

8.2.1 Qualitative discussion of lexical insertion/deletion shifts

Overview of lexical insertion and deletion shifts[6]						
	Noun[7]	**Verb**	**Adverb**	**Pronoun**	**Preposition**	**Conjunction**
Lexical insertion	67	2	24	8	17	-
Lexical deletion	23	-	32	1	18	1

Table 4: Overview of lexical insertion/deletion shifts

Table 4 gives an overview of the distribution of lexical insertion/deletion shifts over the word classes to which the inserted/deleted elements belong, with the highest number of shifts occurring in the categories of nouns, adverbs and prepositions. The qualitative discussion below is structured according to this table, starting with lexical insertion shifts and proceeding from left (nouns) to right (conjunctions).

8.2.1.1 Explicitation: lexical insertion

Nouns

(1) CCS EN-DE

Humans would be less affected by leakage from offshore storage locations than from onshore storage locations.

Leckagen aus Offshore-Speicherstätten hätten weniger Auswirkungen auf den Menschen als *Leckagen* aus Onshore-Speicherstätten.

In the first example to be discussed here, the translator inserted the noun *Leckagen* in the target text, whereas its equivalent *leakage* was used elliptically in the source text. Since the filling in of elliptical gaps is generally considered an instance of explicitation (see Schreiber 1993:186), we can say that the target text construal is slightly more explicit than the source text construal. In Halliday/Hasan's (1976:147) terms, the ST construal contains an "ellipsis within the nominal group", where the nominal head of the complex noun phrase *leakages from onshore storage locations* is omitted and the qualifying prepositional phrase assumes head status. According to cognitive linguistics, prepositions such as *from* or *aus* profile an atemporal relation between a trajector (tr) and a landmark (lm), with tr

[6] The tables list only those word classes for which actual insertion/deletion shifts were identified in the analysis.

[7] The categories noun, verb, adverb and preposition also include noun phrases, verb phrases, etc. For instance, in example (21) below, the complex noun phrase *Application of CCS* was deleted in the TT. This shift is covered by the category *noun* in the table above.

and lm being schematically present in the preposition's profile (see 4.5.3.2). In the ST construal above, the trajector (being the more prominent entity in the relation, see Taylor 2002:206) is not overtly encoded, with the corresponding ellipsis functioning as an "anaphoric search instruction" (Linke et al. [5]2004:252) for this trajector. Of course, the trajector will be readily supplied by the discourse context, which means that it will be highly salient in the current discourse space (CDS, see 5.3.5). From a translational perspective, it seems that the explicitation may have been triggered by a reversal of the grammatical subject in the TT construal, which is associated with the TT nominalization (*Auswirkungen haben*) of the verbal ST process of *being affected*. In the TT, *Leckagen* assumes the subject position at the beginning of the sentence, whereas *Menschen* assumes the object position in the middle, thus moving between the subject *Leckagen* and its possible ellipsis in the second part of the sentence. It may be assumed that this greater distance between the two potential occurrences of *Leckagen* and the fact that the informative focus in the second part of the TT construal is on *Menschen* led the translator to explicitly encode the subject again, thus raising the explicitness or specificity of the TT.

(2) CCS EN-DE

Road and rail tankers are also technically feasible options. [...] However, they are uneconomical compared to pipelines and ships, except on a very small scale, and are unlikely to be relevant to large-scale CCS.

Auch *der Transport* per Lkw und Bahn ist technisch durchführbar. Im Vergleich zum *Transport* per Pipeline oder Schiff sind diese Optionen jedoch unwirtschaftlich (außer in sehr kleinem Umfang), und ihr Einsatz in einer großtechnischen CCS-Anwendung ist daher unwahrscheinlich.

(3) CCS EN-DE

For ships, the total loss to the atmosphere is between 3 and 4% per 1000 km, counting both boil-off and the exhaust from ship engines.

Beim *Transport* per Schiff beläuft sich der gesamte CO_2-Austritt in die Atmosphäre auf 3-4 % pro 1000 km, unter Einbeziehung von Verdampfungsverlust und den Abgasen der Schiffsmotoren.

Examples (2) and (3) above will be discussed together since they illustrate the same phenomenon. In both cases, the noun *Transport* has been inserted in the TT (twice in the second example), thereby construing it more specifically than the ST. The wider discourse context in which these examples appear is concerned with feasible methods of CO_2 transport. This information has been introduced in the previous discourse frame and can thus be claimed to be salient in the CDS, the more so since the notion of *transport* is central to the meaning of road and rail tankers, pipelines and ships and will thus be highly

salient in their frames/domain matrices.[8] The ST relies on the saliency of this information in these specific frames/domain matrices or in the previous discourse frame (and hence in the CDS) and does not explicitly verbalize it again in discussing the various transport methods. The resulting construal can be said to exhibit a certain degree of what House (2002:200) calls "propositional opaqueness" as a typical feature of English in contrast to German discourse. The shift in example (2) may have been triggered by the translator's decision not to refer to the subject (road and rail tankers) as technically feasible options (*options* here referring to transport options). In the resulting TT construal, the translator specified the actual process that is technically feasible, i.e. the transport. In example (3), the German translator could, in principle, have opted for a similarly implicit or schematic construal (e.g., *Bei Schiffen beläuft sich der gesamte CO_2-Austritt*) but in German discourse there seems to be a higher communicative pressure to avoid such propositional opaqueness and to construe the situation with a higher specificity.

(4) CCS EN-DE

The increased fuel requirement results in an increase in most other environmental emissions per kWh generated relative to new state-of-the-art plants without CO_2 capture and, in the case of coal, proportionally larger amounts of solid wastes.

Der erhöhte Brennstoffbedarf hat eine Zunahme der meisten anderen umweltschädlichen Emissionen pro erzeugter kWh zur Folge (im Vergleich zu neuen, modernen Anlagen ohne CCS). Bei Kohle*kraftwerken* entstehen außerdem verhältnismäßig größere Mengen fester Abfälle.

Example (4) occurs within the context of the discussion of energy requirements of different types of power plants, for example pulverized-coal plants or natural gas combined cycle plants. In this discussion, the ST always compares the different plant types with each other. The only exception is the ST construal above, where the last parameter of comparison is an energy carrier (*coal*) instead of a plant type. The intended power plant type has already been introduced in the previous discourse frame and can therefore again be claimed to be salient in the CDS. Therefore, the ST audience may readily form the intended more specific conceptualization based on the relatively schematic construal. Again, the German translator opted to avoid the propositional opaqueness of the ST by inserting the noun *Kraftwerk* (power plant), thus construing the last parameter of comparison in a more

[8] This would be a PURPOSE specification of the telic role in Pustejovsky's *qualia* structure (see 4.5.3.2).

specific way.[9] In German, it may have been communicatively unacceptable, or at least highly marked, to say that coal generates wastes since coal is a ”passive” entity upon which an active process has to act if any waste products are to be formed. Hence, in line with the German register requirements, the translator had the choice of either verbalizing this process (the *burning* of coal generates waste) or of specifying the facility in which this process takes place (*coal-fired power plants* generate waste) and opted for the second alternative.

(5) Automotive EN-DE

It was interesting to compare the visual observation with the temperature and gravimetric data used in our correlation.

Es war interessant, einen Vergleich zwischen den durch Sichtprüfung *festgestellten Ablagerungen* und der in unserer Korrelation eingesetzten Temperaturwerte und gravimetrischen Daten durchzuführen.

In example (5), the translator rendered the schematic ST construal *visual observation* in a more specific way by inserting the noun phrase *festgestellte Ablagerungen* in the TT. In the discourse prior to this example, it is pointed out that different degrees of deposit formation are visually apparent on pistons. The object of the visual observation is thus apparent from the previous discourse frame and hence salient in the CDS. Therefore, the author may have opted to construe only the process of discovery in the example above. The target text, on the other hand, specifically verbalizes the observed deposits again, while the visual observation is construed as the process by which these deposits have been discovered (by using the causal preposition *durch*). The reason for this explicitation shift may be as follows. According to German technical register, it seems inadmissible to construe a comparison where one parameter is a specific set of data (i.e. temperature and gravimetric data) and the other parameter is a process (the visual observation) that is actually intended to yield another set of data (the degree of deposits). In line with House (2002:200), such a degree of propositional opaqueness may generally be more admissible in English than in German discourse. The German register seems to require parameters of comparison of a similar kind (see example (4) above), i.e. the *results* of the visual observation. And indeed, a construal such as *ein Vergleich zwischen dem Ergebnis der Sichtprüfung und den Daten*

[9] This shift was classified as an instance of lexical insertion and not as lexical specification because the element already present (*coal/Kohle*) is not specified in a way that would yield a new hypernym-hyponym relation (see the discussion in 8.2). Instead, this element now specifies the newly introduced TT element (*Kraftwerk*).

would be perfectly acceptable in German. However, in remedying the propositional opaqueness of the ST construal, the translator went one step further and specified the exact results of the visual observation (the piston deposits) in the TT.

(6) Automotive EN-DE

When the difference between T1and T2 is small, we can set T1 x T2 = T² and let (T1–T2 = TΔ)

Ist die Differenz zwischen T1 und T2 gering, kann man T1 x T2 = T² setzen und *die Gleichung* (T1–T2 = TΔ) beibehalten.

(7) Automotive EN-DE

[Fig. 6 […] 1-G conditions for 20 hours.]

[Bild 6] […] 1-G-Prüfbedingungen bei *einer Testdauer* von 20 Std.]

Examples (6) and (7) again illustrate a similar phenomenon and will therefore be discussed together. In example (6), the translator inserted the noun *Gleichung* (equation) in the TT, thus providing additional information on the mathematical formula discussed in the sentence. Of course, this information will be highly salient to the ST audience since is it central to the meaning of the equal sign = that it symbolizes the equality relation between two variables in an equation. The semantic contribution of this insertion shift will therefore not be very significant, and a more schematic construal parallel to that in the ST would have been perfectly acceptable in German, which seems licensed both by the technical and mathematical German registers.

In example (7), we have a similar case in that the translator again inserted a noun (*Testdauer*), thus providing additional information on the 20 hours period mentioned in the text (meaning that we are dealing with a 20 hour long test).[10] Again, this information will be highly salient to the ST audience since it can be recovered from the figure that this caption refers to. However, a TT construal at the same level of schematicity as in the ST (*Prüfbedingungen bei/für 20 Stunden*) would again exhibit a high degree of propositional opaqueness and thus may, in this case, have conflicted with the German technical register. The German register seems to call for a nominal head for which the 1-G conditions apply and the modification of this head by a prepositional phrase (*von 20 Std.*) specifying the exact length of the test.

[10] There is actually another (similar) explicitation shift in this example, namely the specification of *conditions* by *Prüfbedingungen* (test conditions). However, this shift is excluded from the present discussion since it illustrates an instance of lexical specification.

(8) Automotive DE-EN

Zu diesem Verfahren gehört – neben Aufkohlen, Borieren, Vanadisieren usw. – das Nitrieren bzw. Nitrocarburieren, bei dem in die Randschicht von Eisenwerkstoffen Stickstoff bzw. auch in geringen Mengen Kohlenstoff eingelagert wird.

Into this category fall such processes as carburizing, boronizing, vanadizing etc., as well as nitriding and nitrocarburizing, whereby nitrogen or *nitrogen* and small quantities of carbon are absorbed into the surface layer of iron materials.

In this example, the translator explicitly verbalized the noun *nitrogen* for a second time in the TT, rendering this construal in a more explicit or specific way and avoiding a potential misunderstanding that could arise based on the more schematic ST construal. The intended conceptualization to be communicated by ST and TT is that the surface layer of iron materials absorbs a) nitrogen or b) nitrogen + small quantities of carbon (this is made explicit by the insertion of *nitrogen* in the TT). The elliptic ST construal, on the other hand, could be taken to mean that the surface layer absorbs a) nitrogen or b) small quantities of carbon. This is because, in the above example, the German adverb *auch* can either be interpreted as *in addition* (which is the intended interpretation) or as *alternatively* (which would be wrong). It is possibly this risk of misunderstanding[11] which led the translator to raise the level of explicitness of the TT, thereby potentially improving its coherence.

Verbs

(9) CCS DE-EN

Hierunter wird verstanden, dass aus dem Rauchgas eines meist konventionellen Stromerzeugungsprozesses (aber gegebenenfalls auch aus dem Abgas einer Brennstoffzelle) das enthaltene CO_2 nach der Verbrennung abgetrennt wird.

This is taken to mean that the CO_2 is removed from the flue gas *resulting* from a usually conventional electricity generation process (but, if applicable, also from the exhaust gas of a fuel cell) after combustion.

[11] For the notion of *risk avoidance* in the context of explicitation and implicitation see Becher (2011:61 ff.).

In example (9), the translator inserted the present participle *resulting* in the TT, making use of the English *ing*-construction for forming reduced relative clauses.[12] The insertion of the present participle *resulting* entails a higher level of explicitness/specificity of the TT construal since it makes the relation between the flue gas and the electricity generation process more explicit. While the ST construes this relation with a very schematic genitive construction (*Rauchgas eines [...] Stromerzeugungsprozesses*), the reduced relative clause in the TT makes explicit the causal relation between the two elements, i.e. that the flue gas is a by-product of the electricity generation process. This information would have to be inferred from the domain matrices of the two concepts by the ST audience, which, in light of their assumed semi-expert status, would certainly be unproblematic. The schematic genitive construction in the ST provides a convenient means of syntactic compression and economy of expression. Also, encoding the causal relation would have made the ST construal more cumbersome since the author would have had to use either a non-reduced relative clause (*aus dem Rauchgas, das aus einem [...] Stromerzeugungsprozess entsteht*) or another prepositional phrase (*aus dem Rauchgas aus der/infolge der Verbrennung*), which would have been stylistically marked. The English translator, on the other hand, could verbalize this information in a very straightforward and economic way by using the *ing*-construction. This explicitation could therefore be interpreted as an instance of what Becher (2011:172) calls "[e]xploiting features of the target language system". According to Becher, some explicitations may arise because translators make "an effort to make full use of the syntactic and lexical features that the target language system has to offer" (ibid.). Put another way, the translator may have opted for the explicitation shift discussed above because the English grammar provides a straightforward syntactic slot for the corresponding information. This, in turn, may result in a slight communicative pressure to actually fill this slot in discourse (see Becher 2011:157-158).

[12] See, for example, Sager et al. (1980:216-218) and Krein-Kühle (2003:140), who point out the high frequency of the present participle as a means of clause reduction in English scientific and technical discourse and STT.

Adverbs

(10) CCS EN-DE

> Geological storage of CO_2 is ongoing in three industrial-scale projects (projects in the order of 1 $MtCO_2$ yr-1 or more): […] About 3-4 $MtCO_2$ that would otherwise be released to the atmosphere is captured and stored annually in geological formations.
>
> Die geologische Speicherung wird bereits im Rahmen von drei Projekten im großtechnischen Maßstab (1 Mt CO_2/Jahr oder mehr) durchgeführt: […] *Dabei* werden jährlich insgesamt etwa 3-4 Mt CO_2 zur Vermeidung von Emissionen in die Atmosphäre abgeschieden und in geologischen Formationen gespeichert.

In the example above, the translator inserted a prepositional or pronominal adverb (Bußmann [4]2008:558) in the TT, establishing an explicit anaphoric reference to the previous discourse frame and thus improving the cohesion of the TT construal. In cognitive linguistics, pronominal adverbs or pro-forms in general are classified as semantically schematic entities (see 4.2.4), with pro-forms acting as "'substitute[s]' for a semantically more elaborated expression" (Taylor 2002:325). The pronominal adverb *dabei* is therefore schematic for its anaphoric referent, which would be the geological CO_2 storage in three large-scale industrial projects where the CO_2 capture and storage discussed in the second sentence takes place. Of course, having been introduced in the previous discourse frame, this information will again be salient in the CDS so that the ST readers can readily establish a coherent link between previous and current discourse frames. However, improving the cohesion of German target texts by inserting pronominal adverbs is in line with empirical findings by Krein-Kühle (2002), who analyzes cohesion and coherence in scientific and technical translation from English into German and, according to whom, pronominal adverbs "are a common feature of German discourse and contribute to cohesion by refocussing and condensing knowledge" (ibid.:48). A similar empirical observation in the context of business translation is made by Becher (2011:156). Becher (ibid.; referring to Rehbein 1995 and Pasch et al. 2003) points out that German has a larger inventory of what he calls "composite deictics" (such as the pronominal adverb *dabei*) than English. Becher (ibid.) concludes that this high availability of composite deictics in German "is probably both a reason for and a consequence of the German tendency to verbalize coreference relations".

(11) CCS EN-DE

No probabilistic approach to assessing capacity estimates (FS1) exists in the literature, and this would be required to quantify levels of uncertainty reliably (FS2).

Zur Beurteilung der Kapazitätsabschätzung ist in der Literatur kein wahrscheinlichkeitstheoretischer Ansatz zu finden. Dieser ist *jedoch* zur verlässlichen quantitativen Bestimmung der Unsicherheitsgrade erforderlich.

In this example, the translator inserted the conjunctional adverb *jedoch* (however) in the TT, thus making the adversative relation between the previous and the current discourse frames more explicit than the ST construal. Syntactically, such conjunctional adverbs behave like adverbs (hence the shift was classified as the addition of an adverb) but their functional role is that of a coordinating or subordinating conjunction (see Duden vol. 4 [8]2009:584). In cognitive linguistic terms, a conjunction(al adverb) also imposes a relational profile with trajector and landmark but in this case, tr and lm are relations themselves (Taylor 2002:221). In the example above, tr and lm of the conjunctional adverb would be the relation expressed by the first sentence (*no probabilistic approach exists*) and the relation expressed by the second sentence (*such an approach is required*), with the adversative relation between tr and lm being encoded in the actual adverb. The ST connects the two sentences with a simple coordinating conjunction *(and*) and is therefore cohesively less explicit than the TT since the ST audience would have to infer the adversative relation from the CDS. Regarding the potential translational motivation for this shift, Becher (2011:173) points out that, in German, connectives (such as the conjunctional adverb *jedoch*) can be placed in the syntactic slot right after the verb, a position which is not available for connectives in English.[13] Probably because this slot is readily available in German, there may be a higher communicative pressure to exploit this feature of the TL system (see example (9) above) and to actually use this slot in order to explicitly encode adversative relations such as the one discussed here. And indeed, deleting the conjunctional adverb in the above TT construal would probably be perceived as a defect in intersentential cohesion (see, for example, Königs [3]2011:72-73), which the translator avoided by raising the level of explicitness/specificity of the TT.

[13] See Becher (2011:173): "While the rigid SV syntax of English makes it difficult at times to integrate adverbials into the syntactic frame of the sentence without interfering with information structure, the German sentence is capable of absorbing a multitude of optional adverbs without problems [...]."

(12) CCS DE-EN

Der Gesamtwirkungsgrad der Schaltung liegt voraussichtlich mit ca. 45 % um 8-10 Prozentpunkte niedriger als bei der DKSF ohne CO_2-Abscheidung. Hierbei ist zu betonen, dass die Wirkungsgradangaben rudimentäre Schätzungen darstellen. Abschätzungen über die erforderlichen Mehrinvestitionen sind nicht vorhanden.

The overall efficiency of the cycle is estimated to be approx. 45 % and thus 8 – 10 percentage points lower than PPC without CO_2 capture. It must be emphasized that data on efficiencies only represent rudimentary assessments. There are no estimates *as yet* on the additional investments required.

Example (12) occurs within the discussion of promising technology routes and concepts for carbon dioxide capture and storage. In the TT construal, the translator inserted the adverb phrase *as yet*, making explicit the possibility that estimates on additional investments will be made at a later date. This possibility remains implicit/schematic in the ST construal. However, the following discourse highlights the need for future research with regard to the technology route just discussed, with this future research certainly also entailing estimates for the financial requirements involved. Therefore, we could say that the translator accessed the anticipated discourse frame (see 5.3.5) and verbalized, in the current discourse frame, a certain piece of information being reasonably salient in the anticipated discourse frame. The result may be a slightly optimized coherence in the TT. While the ST construal, at first, licenses the interpretation that these estimates will never be made, this interpretation will be considerably weakened or cancelled by the following discourse. The TT avoids this potential coherence defect by explicitly verbalizing the possibility of future estimates right from the start.

(13) Automotive EN-DE

In the WTD rating system established in 1975, the absolute piston deposits are rated visually, (an approximation to the volume of deposit involved) then multiplied by location factors as shown below:

Bei dem im Jahre 1975 erstellten WTD-Bewertungssystem werden die absoluten Kolbenablagerungen durch Sichtprüfung errechnet (*hierbei* handelt es sich um einen Näherungswert im Hinblick auf das Ablagerungsvolumen) und mit den Lagefaktoren, wie im folgenden gezeigt, multipliziert:

Example (13) is again concerned with the insertion of a pronominal adverb in the TT, which cohesively ties the bracketed information to the previous discourse. In the ST construal, on the other hand, this bracketed information remains somewhat isolated from the surrounding discourse. The insertion of the pronominal adverb *hierbei* in the German text again seems indicative of the high availability of such adverbs in German and the

relative lack of straightforward English counterparts[14] (see the discussion of example (10) above). This observation will be revisited in the discussion of lexical deletion shifts in examples (27) to (29) below.

Pronouns

(14) CCS EN-DE

Yet another type of trapping occurs when CO_2 is preferentially adsorbed onto coal or organic-rich shales replacing gases such as methane.

Eine weitere Form der Bindung entsteht durch die präferenzielle Adsorption des CO_2 an Kohle oder an Schiefer mit hohem Anteil an organischem Material und die daraus resultierende Verdrängung *anderer* Gase wie Methan.

In example (14), the translator inserted the indefinite pronoun *andere* (other) in the TT, thus making explicit the normal state of matter of CO_2 under ambient conditions (i.e. CO_2 is a gas, as is methane). The ST audience would have to resort to frame/domain knowledge about CO_2 (for example knowledge assigned to a domain such as STATE OF MATTER as part of the constitutive role of the *qualia* structure) or to the previous discourse frame in which this state of matter may have been mentioned. The information that CO_2 is a gas can be claimed to be quite central to its meaning and can thus be considered highly salient in its frame/domain matrix, especially for the intended semi-expert audience of the research report. The translator may have felt it odd to contrast CO_2 with gases since CO_2 is a specific type of gas (i.e. it is a hyponym or an instantiation of the lexical unit *gas*) and not a qualitatively different substance. Therefore, it seems that the translator may have seen the need to remedy a perceived defect of coherence in the ST, thereby raising the level of explicitness of the TT.[15]

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[14] Although, in the present example (13), a cohesive link to the previous discourse could have been established for example by using the pronoun *this*.

[15] Actually, the sentence occurs in the context of a discussion of underground storage of CO_2, where the CO_2 would be present in a liquid or supercritical state (either because of the high ambient pressures and temperatures or because the CO_2 is dissolved in underground water). It is therefore possible that the ST author intentionally contrasted CO_2 with gases here since s/he intended not to refer to it in its normal (gaseous) state of matter but in its liquid state as a result of specific ambient conditions.

(15) CCS DE-EN

Dieses erreicht man durch Verbrennung mittels Sauerstoff und Aufkonzentration des CO_2 durch Rückführung in die Verbrennung.

This can be achieved by combustion using oxygen and concentrating the CO_2 by feeding *it* back into the combustion.

In the example above, the translator inserted the pronoun *it* in the TT, making the described feed-back process more explicit by specifying its patient. The source text is highly schematic in this regard since the elliptic construction *Rückführung in die Verbrennung* does not indicate which element is to be actually fed back into the combustion process. By introducing the pronoun *it* in the TT, the translator gives the TT audience an explicit anaphoric search instruction, specifying that the intended referent is retrievable from the preceding discourse (see Becher 2011:153). The ST audience, on the other hand, does not have such a specific pointer and is thus less linguistically constrained in their search for the intended patient of the feed-back process. There may be syntactic reasons for this explicitation shift since the verbal construal of the nominal ST element (*Rückführung*) in English requires a direct object complement (**concentrating the CO_2 by feeding back into the combustion*). Also, the preposition *by* seems to call for a verb in this case (?*concentrating the CO_2 by feed-back into the combustion*), making a more schematic nominal construal parallel to that in the ST impossible or at least stylistically marked in English. This shift could therefore be interpreted as an instance of "[dealing] with specific restrictions of the target language system" (Becher 2011:170). In contrast to examples (9) and (11), where the translator could exploit a specific syntactic feature of the TL grammar, in the present example, she was constrained in her translational action by specific syntactic restrictions of the TL grammar (the preposition *by* favouring a verbal construal and the resulting verb phrase requiring a direct object complement), which required a more explicit TT construal.

(16) Automotive DE-EN

Nach dem Nitrieren wurden die Oberflächen der Ringe poliert, um die Rauhigkeitsspitzen zu beseitigen, die beim Einlauf der Paarung zu Riefen bzw. bei Abbrechen zu Abrasion führen können.

After nitriding, the ring surfaces were polished in order to remove roughness peaks which can cause scoring during running-in or abrasion if *they* break off.

Example (16) illustrates another insertion of a pronoun in the translation. The ST does not make explicit the fact that it is the roughness peaks that can cause abrasion if they break

off, whereas the TT plural pronoun *they*, again acting as a substitute for a semantically more contentful unit (see example (10) above), specifically points to these peaks. By virtue of their domain knowledge, the intended expert audience will certainly be able to form the more specific conceptualization based on the relatively schematic ST construal. The reason for this shift may again be attributable to systemic constraints. The ST author opted for a prepositional phrase with the preposition *bei* + substantivized verb (*bei Abbrechen*) as a common "sentence-reducing linguistic means" (Krein-Kühle 2003:124) in German technical discourse. The preposition *bei* is often used to construe conditions for or side effects of a specific process (see Reinhardt et al. ^{3}1992:162), as was the case in the above example. The translator rendered this causal relation using the conjunction *if*, which governs a verbal construal requiring a noun or pronoun and may thus have led to the corresponding explicitation shift.

Prepositions

(17) CCS EN-DE

> Based on a review of the literature, the increase in fuel consumption per kWh for plants capturing 90% CO_2 using best current technology ranges from 24-40% for new supercritical PC plants, 11-22% for NGCC plants, and 14-25% for coal-based IGCC systems compared to similar plants without CCS.
>
> Wie der Fachliteratur zu entnehmen ist, beträgt die Zunahme des Brennstoffverbrauchs pro kWh bei Anlagen, *in* denen unter Einsatz der derzeit besten Technologien 90 % des CO_2 abgetrennt wird, 24-40 % (moderne überkritische kohlenstaubgefeuerte Kraftwerke), 11-22 % (NGCC-Kraftwerke) bzw. 14-25 % (IGCC-Kraftwerke auf Kohlebasis) gegenüber vergleichbaren Kraftwerken ohne CCS.

In example (17), the translator inserted the preposition *in* in the TT, with this preposition imposing a relational profile with trajector (the plants) and landmark (the capture process). As a consequence, the target text construes the spatial relation between tr and lm or, more precisely, the locus of the CO_2 capture, with a higher specificity than the ST. While this information is thus construed explicitly for the TT audience, the ST audience needs to access their frame/domain knowledge on the design of power plants (in which CO_2 capture technology is employed) or on the exact functioning principle of CO_2 capture. The reason for this explicitation shift may be that the present participle *capturing*, which functions as a reduced relative clause in the TT, had to be rendered as a non-reduced relative clause in German since German grammar does not offer a syntactic solution equivalent to the English *ing*-construction (see Becher 2011:178). Without inserting a preposition, the sentence would have had to be rendered in active voice (*Anlagen, die [...] CO_2 abtrennen*), with the non-agentive noun *Anlagen* assuming the status of grammatical subject. This

process of non-agentive elements assuming subject status ("secondary subjectification", see Krein-Kühle 2003:222 ff.) is less acceptable in German than in English since "non-agentive semantic roles in German frequently resist being mapped onto subjects where this is possible in English" (Hawkins 1986:58, quoted from Krein-Kühle 2003:222). Therefore, it seems that, in order to avoid such a stylistically marked secondary subjectification, the translator inserted the preposition *in*, which allowed rendering the clause in passive voice and at the same time increased the explicitness of the TT construal.[16]

(18) CCS DE-EN

Das abgetrennte Gas (Produkt) enthält noch Restbestandteile an anderen Komponenten der Mischung.

The separated gas (product) still contains residual constituents of the other components *in* the mixture.

(19) CCS DE-EN

Penetrationen der Deckschichten durch Injektionsbohrungen oder ehemalige Produktions- und Erkundungsbohrungen sind Schwachstellen, bei deren mangelhafter Versiegelung ein Gasaufstieg möglich ist.

Penetrations of the overlying strata by injection boreholes or former production and exploratory boreholes are weak points since if they are not properly sealed gas may ascend *through them*.

Example (18) and (19) will be discussed together since they are concerned with the same phenomenon. In both instances, the translator inserted a preposition(al phrase) in the translation, specifying spatial relations that remain schematic in the ST construal. In example (18), the schematic genitive construction was replaced by a prepositional word group in which the preposition makes the spatial relation between its tr (the components) and lm (the mixture) more explicit (the tr is contained in the lm). This conceptualization can also readily be formed based on the more schematic ST construal since it is a central aspect of the meaning of *component* that it assumes a meronymic role within a larger structure, the same way that it is a central aspect of the meaning of *mixture* that it consists of various component parts (specifications in the domain PARTS/COMPONENT ELEMENTS, constitutive role of the *qualia* structure). The co-occurrence of these two lexical units in the complex ST noun phrase will reinforce the saliency of this information in the respective domain matrix. In the words of Langacker (2008:53), "[e]ach component

[16] Although the active voice may have been an acceptable translation solution here. As Krein-Kühle (2003:223) points out, German allows for different degrees of "anthropomorphization" of inanimate subjects, with the anthropomorphization of a machine or apparatus being generally more acceptable than in the case of other inanimate subjects.

[of the noun phrase] reinforces this aspect [the explicitated information] of the other's encyclopedic semantics".

In example (19), the insertion of the prepositional phrase *through them* makes explicit the route through which the gas may ascend to the surface, which remains schematic in the elliptic ST construal. While the preposition specifies the way the gas may ascend (i.e. it ascends *through* a certain element), the pronoun *them* makes explicit this element by pointing to an antecedent in the previous discourse. This shift may also have been motivated by linguistic reasons. As discussed in 5.2.2 and 5.5, it seems that the English lexicon does not provide any straightforward equivalent of the deverbal German noun compound *Gasaufstieg*, i.e. English does not have any lexicalized nominal "default construal" (Croft/Cruse 2004:72) such as *gas rise/ascent*, etc. Therefore, this conceptual content has to be construed by a verbal construction in English, with this verbal construction prompting for an adjunct, for example in the form of a prepositional phrase.[17]

(20) Automotive EN-DE

> Thus, the rate constants for "sump oil oxidation" should reflect the ring zone oxidation at each temperature barring some drastic change in types or amounts of oxidation products reaching the sump over the measured temperature range.
>
> Daher sollten die Konstanten für die Oxidationsgeschwindigkeit im Ölsumpf die Oxidationsgeschwindigkeit in der Ringzone bei jeder Temperatur wiedergeben, es sei denn, es tritt eine drastische Änderung in der Art und Menge der innerhalb eines bestimmten Temperaturbereiches *in* den Ölsumpf fließenden Oxidationsprodukte ein.

In example (20), the German translator inserted the preposition *in* in the TT, thus construing the spatial circumstances of the oxidation products reaching the oil sump in a more specific way. The ST construal is more schematic in that it only indicates that the oxidation products travel a certain distance and arrive at the oil sump, without providing any further spatial information. The German preposition *in*, on the other hand, makes this process more explicit by construing the oil sump as a container[18] and specifying the exact

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[17] *Adjuncts* can occur more freely in the sentence than *complements* (see example (15) above), which are often required for a sentence to be grammatical (see Huddleston/Pullum 2005:65). In example (19), the prepositional phrase is not grammatically required (the construal *if they are not properly sealed gas may ascend* is grammatically acceptable) but there may be a certain communicative pressure to add an adjunct after the verb so that the clause does not feel "stranded".

[18] This container construal of the oil sump is covered by Croft/Cruse's (2004:63 ff) construal operation of *structural schematization* (this concept goes back to Talmy 2000) as a subcategory of *constitution/gestalt*

direction of movement of the oxidation products, i.e. they flow *into* the oil sump. This more specific conceptualization based on the more schematic ST construal can certainly be expected from the intended expert audience of this text. That is, the precise form and/or function of an oil sump will certainly be common ground between the expert-to-expert discourse participants and will hence be highly salient in the respective frame/domain matrix and in the CDS. The reason for this shift may be the translator's decision to construe the verbal process of *reaching* in a more specific way in German[19] by using the semantically more contentful participle *fließenden*, which governs a preposition in this context. A spatially more schematic preposition such as *zu* would have been available in German; however, a construal such as *zum Ölsumpf fließenden* would have been more schematic than the ST construal since it only states that the oxidation products travel toward the oil sump and not that they actually reach it.

8.2.1.2 Implicitation: lexical deletion

Nouns

(21) CCS EN-DE

> *Application of CCS* to biomass energy sources could result in the net removal of CO_2 from the atmosphere (often referred to as 'negative emissions') by capturing and storing the atmospheric CO_2 taken up by the biomass, provided the biomass is not harvested at an unsustainable rate.
>
> Unter der Voraussetzung einer nachhaltigen Biomasseproduktion würden Biomassekraftwerke durch die Abscheidung und Speicherung des CO_2 aus der Biomasse eine Nettosenke bilden („negative Emissionen").

In example (21), the translator did not encode an equivalent of the complex noun phrase *Application of CCS* in the TT. The discourse context in which this example appears is concerned with the functioning principle and potential application of carbon dioxide capture and storage. Therefore, the information that the current discourse frame is concerned with the application of CCS can be claimed to be highly salient in the CDS and thus inferable by the intended TT audience based on the relatively schematic construal.

(see 4.5.1.2). In Croft/Cruse's terms, the insertion of the preposition *in* in example (20) above would result in the construal of "a more specific topological or geometric structure" (2004:64; boldface removed). The choice of terminology seems to be somewhat unfortunate here since it is difficult to understand how a process of *schematization* could lead to a more *specific* construal. Perhaps the construal operation should have been called *structural schematization/specification* instead.

[19] This shift will be discussed as an instance of lexical specification in example (48) below.

The reason for omitting the noun phrase in the TT may be that the CCS process was mentioned twice in the ST (application of CCS, capturing and storing the atmospheric CO_2) and that the translator wanted to avoid this redundancy in the TT, thus remedying a perceived defect of cohesion and coherence in the TT. Avoiding this redundancy is both in line with the "postulate of economy" frequently evoked in scientific and technical discourse (Fijas 1998) and with Krein-Kühle's (2003:174) observation that in STT, translators "may be fully aware of the need to eliminate ST redundancy in the TL for pragmatic reasons to contribute to cohesion and coherence".[20] Since this implicitation shift is concerned with the reduction of ST redundancy, we would probably not classify it as a central implicitation shift but would rather situate it closer to the reduction point of the reduction-implicitation-omission continuum.

(22) CCS EN-DE

In the United States, over 2,500 km of pipeline transports more than 40 Mt CO_2 per year from natural and anthropogenic sources, mainly to *sites* in Texas, where the CO_2 is used for EOR.

In den USA werden über ein mehr als 2.500 km langes Pipeline-Netz über 40 Mt CO_2/Jahr aus natürlichen und anthropogenen Quellen hauptsächlich nach Texas transportiert, wo das Gas für EOR genutzt wird.

In this example, the translator did not encode an equivalent of the noun *sites* in the TT, which results in a more schematic construal of the region of Texas as the place of destination of the CO_2 transport. Whereas the ST construes the region as consisting of different sites at each of which the CO_2 is used for EOR (Enhanced Oil Recovery), the TT construes the region as an unstructured whole, leaving implicit whether the CO_2 is transported to just one central site or to several distributed sites in Texas. A cotextual clue could be provided by the term *EOR* which, together with domain knowledge about Texas (Texas is an oil-rich region; accordingly oil drilling will certainly be practised at various sites in the region), could make the information inferable by the audience. However, it can neither be claimed to be particularly salient in the CDS nor in any particular frames/domain matrices indexed in the TT, making this shift not a central example of implicitation but rather situating it closer toward the omission endpoint of the reduction-implicitation-omission continuum. The shift may have been triggered by register

[20] The reduction of redundancy is also evoked as one explanatory parameter in Becher's qualitative investigation of explicitation and implicitation (see Becher 2011:169).

considerations on the part of the translator since a construal such as *zu Standorten in Texas transportiert* seems slightly overspecified in German.

(23) Automotive DE-EN

Zum Vergleich sind noch die Verschleißergebnisse von badnitrierten Stahlringen mit eingetragen, die nach dem sog. QPQ-Verfahren (*Fa.* Degussa) behandelt worden waren, bei dem durch Nachoxidieren eine Verbesserung der Korrosionsbeständigkeit in vielen Anwendungsfällen erzielt wird [8].

For comparison, the graph also shows the wear results for bath nitrided steel rings treated using Degussa's "QPQ" process, in which postoxidation improves the corrosion resistance in many applications [8].

In example (23), the translator did not encode an equivalent of the abbreviation *Fa*. (short for *Firma*, company) in the TT, thus implicitating the information that Degussa is a company and not, for example, the name of the inventor of the described QPQ process. This example is somewhat striking since Degussa is a German company (*Degussa* being the truncated form of **De**utsche **G**old- **u**nd **S**ilber**s**cheide**a**nstalt) and hence, the more schematic TT construal could actually have been expected to occur in the ST. Knowledge about the company Degussa will certainly be common ground between the German discourse participants, so that the author could have left out the addition *Fa.* in German. By deleting this information in the TT, the translator seems to assume that, based on his/her theory of mind about the intended English expert readership of the TT, they will also be familiar with this German company and will be able to identify it by its name alone.[21] Of course, it may reasonably be assumed that English speaking experts on piston technology may be familiar with German companies developing corresponding products or processes but the risk of misunderstanding may be slightly higher in the TT compared to the ST culture.

[21] There are no other occurrences of *Degussa* in the text where the expression would have been explained in more detail.

Adverbs

(24) CCS EN-DE

Additionally, if leakage to the atmosphere were to occur in low-lying areas with little wind, or in sumps and basements overlying these diffuse leaks, humans and animals would be harmed if a leak were to go undetected.

Bei einem Austritt von CO_2 in die Atmosphäre in tief liegenden Gebieten mit wenig Wind, in Sümpfen oder Kellern unmittelbar oberhalb der Austrittsstelle würden Menschen und Tiere geschädigt, falls die Leckage nicht entdeckt werden würde.

In the example above, the TT construal does not contain an equivalent of the conjunctional adverb *additionally*. As a result the additive relation between the previous and the current discourse frames is construed more schematically than in the ST. The wider discourse in which this example appears is concerned with the risk assessment and environmental impact of CO_2 storage in geological reservoirs. In the previous discourse frame, various environmental risks of this storage (like groundwater contamination or soil acidification) are enumerated. CO_2 leakage to the atmosphere is the last of the risks illustrated, and the ST cohesively links this risk to the previous discourse frame via the conjunctional adverb and the relational tr-lm configuration imposed by this adverb. In the German construal, this cohesive copulative relation is not overtly encoded, leaving it to the audience to establish a coherent link to the previous discourse frame. The reason for this shift may be that the translator did not find a satisfying position for an equivalent conjunctional adverb (e.g. *außerdem*) in the TT and hence opted to omit it. Placing an adverb such as *außerdem* in the sentence-first position (*Außerdem würden bei einem Austritt von CO_2 in die Atmosphäre* ...) may give rise to the misinterpretation that the harming of humans and animals is an additional consequence of atmospheric CO_2 leakage (in addition to other consequences mentioned in the previous discourse), whereas it is actually the sole consequence of this leakage that is discussed in the text. The second option would be to place the adverb after the inflected verb (... *würden außerdem Menschen und Tiere geschädigt* ...). This also may not be an optional solution since, in this case, the adverb would be preceded by various prepositional phrases (*in die Atmosphäre in tief liegenden Gebieten mit wenig Wind, in Sümpfen oder Kellern* ...) which considerably widen the distance between the adverb and the actual previous discourse to which this adverb is supposed to establish a cohesive link (meaning that the focus of the sentence would already be firmly placed on the current discourse frame before an anaphoric link with the previous discourse frame is established). However, since this link will be readily inferable from the CDS, the more schematic TT

construal opted for by the translator will probably not pose any risk of misunderstanding and it relieved the translator from deciding between two suboptimal adverb positions in the TT construal. It seems that this implicitation shift can again be linked to a specific restriction of the target language system as discussed in example (15) above.

(25) CCS DE-EN

Zunächst werden die unerwünschten Gasbestandteile (H_2S, COS, HCN, NH_3) in einer ersten Rectisol-Gaswäsche entfernt.

The undesirable gas components (H_2S, COS, HCN, NH_3) are removed in a first Rectisol gas scrubbing process.

In this example, the translator did not encode an equivalent of the temporal adverb *zunächst* in the TT, leaving implicit the information that the Rectisol gas scrubbing is only the first step in a more complex process (which consists of first Rectisol gas scrubbing → shift conversion → second Rectisol gas scrubbing).[22] For the TT audience, this information only becomes clear in the following discourse (where the different process steps are described in detail). For the ST audience, on the other hand, this piece of information from the anticipated discourse frame is made explicit in the current discourse frame. The translational reason for this implicitation shift seems to be the fact that the potential English equivalent of *zunächst* would be *first(ly)*, which would clash with the use of the same element in the second part of the sentence (?*First(ly), the components are removed in a first process*). It seems that German has more lexical resources than English for construing "firstness" in contexts such as the one above. Therefore, the implicitation again may have been triggered by restrictions of the target language system, as was already illustrated in examples (15) and (24).

(26) Automotive EN-DE

In addition, the Ni-resist insert which is used for wear protection was not necessary for this study, as test lengths were *only* 10 to 20 hours.

Darüber hinaus war der Ni-resist-Einsatz, der im allgemeinen als Verschleißschutz eingesetzt wird, nicht erforderlich, da die Versuchszeiträume zwischen 10 und 20 Std. lagen.

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[22] Of course, the construal *first Rectisol gas scrubbing* points to the fact that the process involves more than one step. However, it only makes explicit the fact that there is more than one gas scrubbing step, while the German ST construal reinforces the interpretation that there is a) a first scrubbing step which is, b), followed by one or more different steps (e.g. shift conversion) which is/are, c), in turn followed by another scrubbing step (potentially more than one).

In example (26), the translator did not encode an equivalent of the evaluative ST adverb *only* in the TT. The result is that the evaluative information on the test lengths (i.e. that 10 to 20 hours are considered to be relatively short test lengths) which is overtly encoded in the ST remains implicit in the TT. The information may still be salient in the CDS since a) it is central to the meaning of the term *Ni-resist insert* that it exhibits a high wear resistance[23] and b) the domain matrix of the noun phrase *(engine) test length* may supply the information that a test length of 10 to 20 hours is unlikely to cause any wear[24]. Given the fact that both ST and TT are instances of expert-to-expert discourse, this information may reasonably be claimed to be common ground between the discourse participants and will probably be made salient due to the discourse context. This frame/domain information, together with the causal conjunction *as/da*, makes it probable that the relevant information (i.e. a test length of 10 to 20 hours does not cause any wear→ it is therefore a relatively short test time) will be salient in the CDS. However, the translational motivation for this implicitation shift remains unclear since an evaluating adverb providing the corresponding information could have easily been incorporated in the TT (e.g. *da die Versuchszeiträume lediglich zwischen 10 und 20 Std. lagen*).

(27) Automotive DE-EN

Grundsätzlich können mit allen Verfahren ähnliche Stickstoff-Eindringtiefen erreicht werden, wenn die Verfahrensparameter Temperatur und Behandlungsdauer entsprechend *darauf* abgestimmt werden.

Fundamentally, the nitrogen penetration depths that can be achieved with all the methods are similar when the process parameters “temperature” and “treatment time” are appropriately set.

(28) Automotive DE-EN

Dabei folgt einem Volllasttest (von einer Laufzeit entsprechend 2.600 km) der Kalt-Warm-Test mit Zwischenvermessung bei ca. 11.000 km, *wobei* die Gesamtlaufzeit einer Laufstrecke von 27.000 km entspricht.

A full-load test (duration equivalent to 2,600 km) is followed by the cold-warm test with interim measurements at about 11,000 km, the total operating time corresponding to a mileage of 27,000 km.

[23] This information would be a specification in the domains MATERIAL (constitutive role) and FUNCTION (telic role) of the expression’s *qualia* structure.

[24] This may be a specification in a domain such as FUNCTIONING PRINCIPLE in the telic role of the *qualia* structure.

(29) Automotive DE-EN

Darin wurden die Kolbenringe in der 1. Nut mit der verchromten Lauffläche aus der Serienbestückung durch allseitig nitrocarburierte Ringe ersetzt, während sonst keine Änderungen im System Kolben/Kolbenring vorgenommen wurden.

The piston rings in the top groove with chromium plated running surface from the production ring pack were replaced by all-over nitrocarburized rings, with no other changes being made to the piston/piston ring assembly.

In examples (27) to (29), the translator reduced the cohesive explicitness of the TT by not encoding an equivalent of the German pronominal adverbs *darauf*, *dabei*, *wobei* and *darin*. These shifts reinforce a tendency that has been observed in the translation direction EN-DE. In examples (10) and (13), the German translator inserted a pronominal adverb in the target text, thereby raising its cohesive explicitness. In the three examples above, we observe the reversed phenomenon. In all three cases, the English translator did not opt for a TT construal that would preserve the level of cohesive explicitness established by the German pronominal adverbs in the ST. It was already pointed out that German has a much larger inventory of these adverbs than English (Becher 2011:156) and it seems that this lexical (non)-availability correlates with the corresponding discourse norms of the two languages – with German requiring a higher cohesive explicitness (for example in the form of pronominal adverbs) than English. This observation has been empirically confirmed in various studies, for example Krein-Kühle (2002), Behrens (2005), Fabricius-Hansen (2005) and Becher (2009). In view of the findings of the present analysis and the studies just outlined, it seems that the insertion or deletion of pronominal adverbs correlates, to a very high extent, with the respective translation direction investigated (see 8.2.2 and the discussion in Becher 2011:151 ff.).

Prepositions

(30) CCS EN-DE

An analysis of these high-purity sources that are within 50 km of storage formations and that have the potential to generate revenues (*via* the use of CO_2 for enhanced hydrocarbon production through ECBM or EOR) (FS2) indicates that such sources currently emit approximately 360 Mt CO_2 per year.

Diejenigen dieser Emittenten, die sich im Umkreis von 50 km von Speicherformationen befinden und ein gewinnbringendes Potenzial bergen (Verwendung von CO_2 zur Erhöhung der Methangewinnung aus Kohleflözen (ECBM) oder für EOR), stoßen laut einer Analyse derzeit etwa 360 Mt CO_2 pro Jahr aus.

In example (30), the translator did not incorporate an equivalent of the preposition *via* in the translation, making the TT construal slightly more schematic. By leaving out the preposition, the bracketed phrase is somewhat "isolated" from the rest of the TT construal and has to be coherently incorporated into this construal by making reference to the CDS. Whereas the TT audience needs to infer that the use of CO_2 for enhanced hydrocarbon production is the reason for the revenue potential exhibited by the CO_2 sources, the preposition *via* with its tr-lm configuration explicitly encodes this information for the ST audience. Of course, the TT audience will readily make this inference since there seems to be no other way of coherently incorporating the bracketed information into the remaining sentence. Also, the semantic relation between the bracketed phrase and the rest of the discourse will be highly salient in the CDS.[25] Since this specific conceptualization can readily be formed based on the CDS, the translator possibly saw no risk in leaving out the preposition in this case.

(31) Automotive EN-DE

The rate of top groove plus ring deposit formation increased 270% (3.68 – 1/1 x 100 = 268%) with an increase in power output of 0.41 MPa BMEP (*from 0.76 to 1.17 MPa BMEP*).

Die Ablagerungsrate in der 1. Kolbennut und am Ring stieg um 270 % (3,68 – 1/1 x 100 = 268 %) bei einer Erhöhung der Motorleistung von 0.41 MPa BMEP).

The deletion of a prepositional phrase in example (31) above may seem like an instance of omission at first glance; and indeed, there is nothing in the immediately surrounding discourse that would point to the fact that the power output increased from 0.76 to 1.17 MPa (as a result of this shift, only the difference between these two values is stated in the TT). The example above is taken from page 10 of the German corpus text. On page 6 of this text, we find the information that the engine BMEP was increased in three steps (from 0.76 to 0.97 to 1.17 MPa), which corresponds to the information deleted in above example. How we classify this shift will depend on the difficult question of "how much co-text is allowed for a shift to qualify as explicitation/implicitation" (Kamenická 2007:51), which

[25] It is clear from the previous discourse frame that the high-purity sources refer to CO_2 sources; an enhanced hydrocarbon production will usually be associated with (higher) revenues; since this enhanced production is achieved by using CO_2, it seems logical that the revenue potential of the high-purity sources is associated with the use of CO_2 for hydrocarbon production.

I will not attempt to answer here.[26] Suffice it to say that, being part of the same text, this information may be salient in the CDS to a low degree since it is contained in the previous discourse frame. However, as there is a considerable "discursive distance" between the previous discourse frame containing this information and the current frame, this implicitation shift seems to tend toward the omission endpoint of the reduction-implicitation-omission continuum.

(32) Automotive EN-DE

Soot content *in* the piston deposits and *in* the crankcase oil.

Rußgehalt der Kolbenablagerungen und des Motorenöls

In example (32), the translator twice deleted the preposition *in* in the translation, thus rendering ST prepositional word groups as genitive constructions in the TT. The resulting TT construal is more schematic since it does not exhibit the spatial tr-lm configuration of the TT, which explicitly specifies that the soot is found *in* the deposits and the oil (instead of, for example, forming an outside layer).[27] Again, this more specific conceptualization will be highly salient to the expert discourse participants based on their extensive frame/domain knowledge with regard to the concepts discussed in the example. The translator may have opted for the more schematic version in order to avoid having to verbalize the preposition twice, which would be required for reasons of determiner-noun agreement in German (*in den Kolbenablagerungen und in dem/im Motorenöl*) and which would have been marked from a register point of view. The more schematic genitive construction is therefore in line with German register requirements and also provides for a more economic means of expression in this case.

(33) Automotive DE-EN

Wie bereits erwähnt, wurden unterschiedliche Nitrier- bzw. Nitrocarburierverfahren untersucht (Bild 2), bevor *aus verfahrenstechnischen Gründen* im Hinblick auf Serienstückzahlen die Entscheidung für das Kurzzeitgasnitrocarburieren gefällt wurde.

As mentioned previously, different nitriding and nitrocarburizing methods were tested (Fig. 2) before deciding upon short-time gas nitrocarburizing as the most suitable for mass production.

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[26] This may have to be established in experimental process studies on memory performance and attention span in text reception. Since the results may conceivably vary according to different psycho-physiological parameters, it may be difficult to reflect such dynamic factors in purely product-based studies, which are necessarily more "static" in character.

[27] For a similar discussion see example (18) above.

In example (33), the translator deleted the prepositional phrase *aus verfahrenstechnischen Gründen* (roughly: for process-related reasons), thus construing the decision for short-time gas nitrocarburizing as the most suitable method more schematically than the ST. The information that the decision was based on process-related reasons is also not present in the previous discourse frame (as may be indicated by the reference *as mentioned previously*; this only refers to a general discussion of various nitriding/nitrocarburizing methods in which it was stated that the results attainable with the different methods are basically similar). The information may still be recoverable by the TT audience since the frame/domain matrix of the lexical unit *mass production* may include the information that one of the main advantages of this production method is its economy of scale, which is only achievable by using automated and standardized processes. This information may be made salient by the discourse context and – together with the information that the results from the various nitriding/nitrocarburizing methods do not vary significantly – may yield the more specific interpretation that process-related reasons were the decisive factor in opting for short-time gas nitrocarburizing. However, we would probably not classify this shift as a central instance of implicitation but rather as an implicitation shift tending towards the omission endpoint of the continuum.

Conjunctions

(34) CCS EN-DE

> Demonstration phase means that the technology has been built and operated at the scale of a pilot plant, *but* further development is required before the technology is ready for the design and construction of a full-scale system.
>
> Demonstrationsphase heißt, dass die Technologie im Pilotmaßstab erprobt wird. Weitere Entwicklung ist nötig, bevor die Technologie bereit für eine großtechnische Umsetzung ist.

Example (34) is the last example in the category of *lexical insertion/deletion* to be discussed in this study. In this example, the translator did not encode an equivalent of the adversative conjunction *but*, instead opting for an asyndetic connection between the two sentences. The result is a higher cohesive schematicity of the TT construal since the TT audience has to infer the adversative relation between the two sentences (which correspond to two clauses in the ST) from the CDS. This inference will probably not pose any problem since it is a central aspect of the meaning of *pilot plant* and its textual equivalent *Pilotmaßstab* (i.e. it is highly salient in their frames/domain matrices) that the technology tested at pilot scale has already achieved a certain degree of maturity but that it needs to be

further developed before a large-scale or commercial application is feasible. Since part of this domain information (pertaining to the limitations of pilot scale technology) is explicitly coded in the second clause/sentence in the example above, the adversative cohesive link can readily be established by the TT audience. Concerning the potential translational motivation for this implicitation shift, there seem to be no linguistically induced reasons since the adversative relation could easily have been encoded by a fronted adverb such as *Allerdings*. We could hypothesize that – since example (34) is a footnote explaining the meaning of *demonstration phase* (which is evoked in the discussion of the current maturity of CCS system components) – the translator may have felt that a more condensed or "telegraphic" style may be appropriate since the footnote merely functions as a *paratext* (see, for example, Horn-Helf 1999:126) supplying additional information on the discourse presented in the main text. Given the high saliency of the deleted information in the CDS, there should be no risk that it will not be recoverable by the TT audience.

8.2.2 Linguistic distribution of lexical insertion/deletion shifts

Distribution of lexical insertion/deletion shifts over subcorpora and word classes							
	Noun	**Verb**	**Adverb**	**Pronoun**	**Preposition**	**Conjunction**	**TOTAL**
CCS EN-DE							
Lexical insertion	19	-	5	1	3	-	**28**
Lexical deletion	16	-	2	-	10	1	**29**
CCS DE-EN							
Lexical insertion	5	2	10	1	3	-	**21**
Lexical deletion	2	-	19	1	2	-	**24**
Automotive EN-DE							
Lexical insertion	40	-	7	3	4	-	**54**
Lexical deletion	3	-	3	-	5	-	**11**
Automotive DE-EN							
Lexical insertion	3	-	2	3	7	-	**15**
Lexical deletion	2	-	8	-	1	-	**11**
TOTAL	**90**	**2**	**56**	**9**	**35**	**1**	**193**

Table 5: Overview of lexical insertion/deletion shifts – distribution over subcorpora and word classes

Table 5 shows a detailed linguistic distribution of the lexical insertion/deletion shifts over subcorpora and word classes. I will be contented with the following two observations, which can be readily linked to the qualitative considerations in the previous discussion.

Firstly, the insertion of nouns is quite prevalent in the two EN-DE subcorpora (19 insertion shifts in CCS EN-DE and 40 insertion shifts in Automotive EN-DE). A trend that could be observed in this context was the tendency of English-German translators to reduce the perceived "propositional opaqueness" of the English ST by opting for a more specific TT construal that was often realized by inserting nouns. This tendency has been illustrated and discussed in detail in examples (2) to (5) and (7) above. The high number of noun insertions in subcorpus Automotive EN-DE (40 shifts) contributes to the unusually high overall number of explicitation shifts in this subcorpus; this was discussed in 8.1. Several of these noun insertion shifts could be linked to a possible attempt on the part of the translator to overcome the propositional opaqueness of the ST (see examples (5) and (7) above), but there were also instances, as in example (6), where a TT construal at the same level of schematicity as in the ST would have been possible and licensed by the German register. In subcorpus CCS EN-DE, the deletion of nouns is also quite prevalent (16 instances). These shifts were, for example, linked to the translator's efforts to reduce redundancy in the TT (example (21) above). The markedly lower number of deleted nouns in the translation direction DE-EN points to the fact that German-English translators, when faced with a relatively explicit German source text, do not reduce this encoded explicitness to raise the propositional opaqueness of the English TT as would be licensed by the English register. This observation would indeed be in line with the Asymmetry Hypothesis (see 6.3 and 8.1), according to which translators often fail to perform optional implicitation shifts when faced with a relatively explicit source text.

Secondly, we observe a clear trend in the category of adverbs. In the subcorpora with the translation direction EN-DE, more adverbs were inserted than deleted (5 vs. 2 shifts in CCS EN-DE and 7 vs. 3 shifts in Automotive EN-DE). The trend is reversed in the other translation direction. Here, more adverbs were deleted than inserted (19 vs. 10 shifts in CCS DE-EN and 8 vs. 2 shifts in Automotive DE-EN). This trend can, at least in part, be attributed to the higher availability of pronominal adverbs in German than in English, with a major share of the adverb shifts being attributable to such pronominal adverbs. Examples (10) and (13) above illustrate instances where a pronominal adverb was introduced into the German TT that has no immediate lexicalized counterpart in English. In the same vein, examples (27) to (29) illustrate the deletion of pronominal adverbs in the English TT since, again, no lexicalized counterpart of the German adverbs is available in English. The trend observed for pronominal adverbs points to a generally higher cohesive explicitness of

German in comparison to English discourse, which is in line with Becher's (2011:149, 175) results established in a similar study.

8.3 Lexical specification and schematization

For reasons outlined in 8.2, the category of lexical specification/schematization is the quantitatively most significant category in the classification of explicitation and implicitation shifts. It is also somewhat more complex than the category of lexical insertion/deletion since lexical specification/schematization shifts were shown to exhibit a larger variation and are often less "well-behaved" than the shifts in the previous category. To reflect this higher complexity, the present category is structured along two dimensions. The first structuring principle pertains to the word class on which the shifts operate, e.g. a lexical specification/schematization of nouns, verbs, pronouns, etc. This side of the classification is rather straightforward and mirrors the structuring principle of the previous category. The second structuring principle pertains to the prototypicality vs. non-prototypicality of the shifts. *Prototypical lexical specification/schematization shifts* are those shifts which can be said to operate along well-behaved "cross-linguistic" lexical hierarchies/taxonomies[28], such as *emissions* → *CO_2-Emissionen*, etc. The substitution of pronouns by noun phrases and vice versa is also understood as prototypical shifts, although they operate outside such lexical hierarchies.[29] The same applies to the substitution of more schematic definite determiners by (more specific) demonstrative determiners and vice versa (see footnote 30 below). *Non-prototypical lexical specification/schematization shifts* are, for example, those shifts which basically construe the same conceptual content but differ in the explicitness/implicitness or specificity/schematicity of what I will call – with reference to the cognitive linguistic basis of this thesis – their "surface construal". A prime example from the scientific/technical corpus would be *steam* → *Wasserdampf*. The two terms can be said to be full terminological equivalents, but whereas the English term only profiles the form of the substance, the German term additionally profiles the substance itself (water). Since this information is missing on the textual surface of the ST (although it will be highly salient in the domain matrix of the term *steam*), this shift would

[28] See Becher (2011:115).

[29] This is in line with Becher's (2011:98) "scale of coreferential explicitness". According to this scale, pronouns exhibit a low degree of cohesive explicitness whereas the lexical repetition of noun phrases exhibits a high degree of explicitness. See also Biber et al. (1999:240), who point out that "[f]ull noun phrases are more explicit than personal pronouns [...]".

be classified as an instance of (non-prototypical) lexical specification. Also understood as instances of non-prototypical lexical specification/schematization are shifts such as *efficiency* → *Wirkungsgrad* and vice versa. Again, these shifts operate outside of a well-behaved lexical hierarchy since we cannot say that *efficiency* stands in a hypernymic/schematic relation to *Wirkungsgrad*. It is also difficult to perceive a higher specificity/schematicity of their respective surface construals. However, *efficiency* is originally a general language term that has been "terminologized" (*terminologisiert*, see Fluck [5]1996:50). Since *efficiency* is also a general language term, it exhibits "external polysemy" (see Griebel 2013:178) and obtains its technical reading by contextually-induced "monosemizing" (see Krein-Kühle 2003:165). *Wirkungsgrad*, on the other hand, is a very specific technical term that does not exhibit such external polysemy and is thus more contextually autonomous than *efficiency*. Because of this higher contextual autonomy, comparable shifts were also classified as (non-prototypical) lexical specification/generalization shifts. Finally, preposition-based shifts were also counted as non-prototypical instances of lexical specification or schematization since it is difficult to make general statements about the explicitness or specificity or the implicitness or schematicity of prepositions. However, the analysis yielded various cases where a shift at the prepositional level seemed to entail a shift in specificity/schematicity (this was predominantly the case for spatial prepositions, such as *at/to* → *in*). This aspect will be discussed further in the relevant examples. In order to obtain a clear picture as to how many lexical specification/schematization shifts were classified as prototypical or non-prototypical, a percentage distribution is included in 8.3.2.

8.3.1 Qualitative discussion of lexical specification/schematization shifts

Overview of lexical specification and schematization shifts					
	Noun[30]	**Verb**	**Pronoun**	**Preposition**	**Determiner**
Lexical specification	494	11	4	10	9
Lexical schematization	369	2	-	13	9

Table 6: Overview of lexical specification/schematization shifts

Table 6 gives an overview of the distribution of lexical specification/schematization shifts over the word classes to which the specified/schematized elements belong, with the huge majority of shifts occurring in the category of nouns. The qualitative discussion below is again structured according to this table, starting with lexical specification shifts and proceeding from left (nouns) to right (determiners).

8.3.1.1 Explicitation: lexical specification

Nouns

(35) CCS EN-DE

From this perspective, the context for considering CCS (and other *mitigation options*) is that of a world constrained in CO_2 emissions, consistent with the international goal of stabilizing atmospheric greenhouse gas concentrations.

Aus dieser Perspektive ist die geforderte weltweite Einschränkung der CO_2-Emissionen gemäß dem internationalen Ziel einer Stabilisierung der Treibhausgaskonzentrationen in der Atmosphäre der Grund für eine Erwägung von CCS (und anderen *Klimaschutzmaßnahmen*).

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[30] In the discussion of lexical specification/schematization shifts, the category *noun* includes both nouns and nominals, nominals being "a unit intermediate between the noun phrase and the noun" (Huddleston/Pullum 2005:85). For example, in the noun phrases *the guy who fainted* or *a young woman*, the elements *guy who fainted* and *young woman* would be the nominals (each having a noun as their head), whereas the determiners are part of the noun phrase but not part of the nominal (ibid.:85-86). The distinction between nominals and determiners (as the two constituents of noun phrases) is useful for the present discussion since nominals provide the actual semantic content of a noun phrase, whereas determiners are semantically schematic and serve to *ground* nominals with respect to a particular speech event (see Taylor 2002:344). Since this grounding, which will be elaborated further in the discussion below, can be more or less specific, the category *determiner* has been added as a separate category in the discussion of lexical specification/ schematization shifts. Also, since the category *noun* includes both bare nouns and nominals (as for example, *young woman*), there is no separate category *adjective* in the table above. Since, from a semantic point of view, adjectives act as modifiers of nouns, respective shifts were included as noun shifts (which include nominals) and not as separate adjective shifts.

In example (35), the translator instantiated the schematic ST construal *mitigation options* by the more specific TT construal *Klimaschutzmaßnahmen* (climate change mitigation options), thereby raising the explicitness of the TT. It was mentioned in the introduction of the corpus text that CCS is considered as a potential climate change mitigation option; hence the information what the schematic term *mitigation options* actually refers to should be accessible from the previous discourse frame and, therefore, be salient in the current discourse space. The source text author may have opted for the shorter version for reasons of linguistic economy since the full English term is a quite lengthy 4-element compound and it would be quite cumbersome to encode it in full every time a reference is made to those mitigation options. Given the saliency of the full term in the CDS, this short version will certainly not pose any risk of misunderstanding.[31] In the context of LSP research, Roelcke ([3]2010:105-106) discusses examples such as the one above as techniques for establishing textual recurrence and isotopy by using hypernyms and hyponyms. In the present example, the hypernym *mitigation options* would be used to refer back to the hyponym *climate change mitigation options*. In the context of specialized translation, Horn-Helf (1999:123-124) discusses these phenomena as instances of "Terminus-kondensation" (term condensation).[32] In Horn-Helf's (ibid.:124) words, the construal *mitigation options* would be a "Textfortsetzungskondensat" (lit.: *text progression condensate*) that – again for reason of linguistic economy – can be used in the remainder of the text to refer to the uncondensed term *climate change mitigation options*. The German translator may have felt uncertain about the saliency of the uncondensed term in the CDS and thus opted to encode the full term again. Since the German term is a slightly shorter 3-

[31] Examples like (35) illustrate quite well the tension between the different postulates applying to languages for special purposes and to scientific and technical discourse, especially the tension between the postulate of *economy* (Fijas 1998), on the one hand, and the postulates of *explicitness* (v. Hahn 1998) and *exactness* (Baumann 1998) on the other. From the perspective of explicitness/exactness, a construal such as *climate change mitigation options* would certainly be preferable, whereas the postulate of economy would favour short forms such as *mitigation options*. This illustrates that these postulates should not be understood as absolutes but rather as dynamic tendencies that move to the foreground or recede to the background according to various contextual factors. If the context (in all its dimensions) rules out misunderstanding, the postulate of economy can confidently be evoked. If this is not so, the postulates of explicitness and exactness may have to be given more weight.

[32] Krein-Kühle (2003:282) refers to these shifts as terminological *ellipses*.

element compound, this solution was also slightly less uneconomic than the recurrent encoding of the 4-element compound would have been in the ST.[33]

(36) CCS EN-DE

Pre-combustion systems process the primary fuel in a reactor with *steam* and air or oxygen to produce a *mixture* consisting mainly of carbon monoxide and hydrogen ("synthesis gas") (FS1) .

CO_2-Abscheidung vor der Verbrennung: Der Primärbrennstoff wird mit *Wasserdampf* und Luft oder Sauerstoff zur Reaktion gebracht; dabei entsteht ein *Gasgemisch*, das hauptsächlich aus Kohlenmonoxid und Wasserstoff besteht (Synthesegas).

Example (36) also illustrates the TT specification of two more schematic ST elements; however, the two instances are slightly different in nature. As already discussed in 8.3 above, I consider the specification of *steam* by *Wasserdampf* to be a non-prototypical example of lexical specification since *Wasserdampf* is merely a more specific "surface construal" of basically the same conceptual content. The difference between the ST and the TT term is that the English term merely profiles the form of the substance (*steam*) whereas the German term profiles both the form of the substance (*Dampf*) and the substance itself (*Wasser*). In contrast to example (35) above, where the ST term was condensed *ad hoc* in discourse, the term *steam* is a fixed lexical unit of the English language, a more specific designation such as *water steam* not being an established default construal. Borrowing, for illustration purposes, the Saussurean dichotomy of *langue* vs. *parole*, we could say that the shift *climate change mitigation options → mitigation options → Klimaschutzmaßnahmen* in example (35) operates at the level of *parole*, whereas the shift *steam → Wasserdampf* in the present example operates at the level of *langue*. Since shifts like this are primarily due to two language systems (as storehouses of conventional imagery or default construals, see 5.2.2) coming into contact in translation and not due to any autonomous choices made by

[33] The German compound is shorter because the conceptual content is construed from another perspective (with reference to the terminological dimension in specialized translation, Horn-Helf (1999:119) calls this process *modulation*). In the English term, the process is construed as a change in climate that must be mitigated, while in German it is simply construed as a protection of the climate (see also the discussion of *horse-shoe*, *fer à cheval* and *Hufeisen* in 4.5.1).

the translator[34], they are considered as non-prototypical instances of lexical specification/schematization in this thesis.

The second shift in this example involves the instantiation of the schema *mixture* by *Gasgemisch* (gas mixture), which moves information in the frames/domain matrices of *carbon monoxide* and *hydrogen* (i.e. that these substances are gases, a specification in the domain MATERIAL of the constitutive role) to the textual surface. Of course, this information is indicated by the presence of the term *synthesis gas/Synthesegas*. However, it seems that the translator already wanted to construe this information in the designation *Gasgemisch*, so that it is easier for the audience to process what the subsequent term *Synthesegas* refers to. This explicitation shift could therefore be linked to the translator's attempt to improve the cohesion and coherence of the target text.

(37) CCS EN-DE

In some situations or locations, transport of CO_2 by *ship* may be economically more attractive, particularly when the CO_2 has to be moved over large distances or overseas.

Je nach Gegebenheit oder Standort ist der CO_2-Transport in *Tankschiffen* wirtschaftlich vorteilhafter, insbesondere auf langen Transportwegen oder beim Transport nach Übersee.

In this example, the translator specified the schematic ST construal *ship* by the instance *Tankschiff*, thus construing both the type of ship and the transport of the CO_2 more explicitly in the TT. The ST construal cannot, in this case, be interpreted as a condensed term in the sense of Horn-Helf (example (35) above) since the uncondensed more specific term *tanker/tank ship* was not introduced in the prior discourse.[35] It seems that the ST author was content with the relative schematicity of this construal and expected that the ST audience could infer the actual type of ship and the actual form of CO_2 transport based on their frame/domain knowledge about CO_2 (i.e. it is a gaseous substance at ambient conditions; hence, if transport by ship is intended, it will have to be transported in a gas tank). The translator, on the other hand, explicitly construed this domain information for the TT audience. Again, this shift seems to be register-induced since a construal such as

[34] Of course, the translator could have condensed the German term *Wasserdampf* to *Dampf*. However, this would have potentially violated the postulate of exactness since, unlike English *steam*, German *Dampf* can also refer to other gaseous substances besides water.

[35] Indeed, the term *ship* can be interpreted as a condensed form of the term *tank ship* but Horn-Helf's (1999:124) notion of "Textfortsetzungskondensat" only refers to those condensed terms that are used in the text to refer back to an uncondensed antecedent.

Transport in Schiffen is not very common in German, as opposed to *Transport mit Schiffen*.[36] If the spatially specific preposition *in* is used (as in the present example), there seems to be a slight communicative pressure to construe the transportation vehicle in a way that reinforces this spatial conceptualization (as the translator did with the German term *Tankschiff*).

(38) CCS DE-EN

Der CO_2-Gehalt des drucklosen Rauchgases eines konventionellen *Kohlekraftwerkes* wird nach der Rauchgasentschwefelung mit Hilfe eines MEA-Prozesses ausgewaschen.

The CO_2 content of the pressureless flue gas from a conventional *coal-fired power plant* is scrubbed after flue gas desulphurization with the aid of an MEA process.

Example (38) illustrates another instance of non-prototypical lexical specification by means of a more specific surface construal of the TT term *coal-fired power plant* as compared to the ST term *Kohlekraftwerk*. While both terms can be said to construe the same conceptual content, the designation of the TT term is more specific in that it does not only profile the energy carrier and the plant but also (part of) the process by which the energy carrier is converted into electrical energy (i.e. the coal is burned in the power plant).[37] In Horn-Helf's (1999:123-124) terms, this would be an instance of lexically established term condensation, meaning that the explicitation shift is not a result of any intentional action of the translator. Rather, it arises because the translator replaced the more condensed/schematic/implicit ST term with its less condensed or more specific/explicit TT equivalent. From both a translational and a cognitive linguistic perspective, Tabakowska (1993:39) comments on the fact that different degrees of specificity/schematicity will not only be features of (dynamic) discourse but also of (comparatively static) language systems:

As in the case of other dimensions, levels of specificity are subject to choice made not only from the point of view of individual conceptualizers, but also from the general perspective of particular languages: linguistic units correspond to such levels as a result from cognitive categories, which are conditioned by cultural patterns, individual experiences, etc., and which differ for different languages.

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[36] A Web search yielded only 1270 results for the search string *Transport in Schiffen*, compared to 48,200 results for *Transport mit Schiffen* (searched on 16/01/2014).

[37] This example has already been discussed briefly in 4.5.3.2.

Put another way, it is not only the discourse initiated by individual conceptualizers but also the lexical units or established default construals of different languages (in this case the terms established by a specialized discourse community) that can exhibit different levels of specificity/schematicity.[38] If these discourses and/or lexical units come into contact in translation, this may result in various forms of explicitation and implicitation. Of course, the actual translational relevance of such shifts may be questioned since, as mentioned in the discussion of example (40), they operate at the level of *langue* and usually arise because the translator replaces an ST term with its correct TT equivalent having a more specific (or schematic) designation.[39] However, they were still included in the analysis and the present discussion because they do actually result in a different degree of explicitness/specificity or implicitness/schematicity between ST and TT, as illustrated in the discussion of the present example (this is also specifically pointed out by Horn-Helf 1999:123). More importantly, if we refrain from postulating an "ideal translator" having full expert knowledge of the texts that s/he translates and, instead, subscribe to a more realistic view of a translator who usually knows less about the subject matter of the text than the author and the intended audience (at least in expert-to-expert and probably also in expert-to-semi-expert communication), the information encoded at the surface of a term may be of high value to the translator in order to reconstruct the frame of reference of the text and to understand its content. As Wright/Wright (1997:148) point out:

> Translators, in contrast to the experts for whom the original text was written, are frequently dropped on [...] isolated information atolls, and are left to fend for themselves, unfamiliar with the sea of knowledge that surrounds them.

From this perspective, it seems that the information actually encoded at the surface of a text may serve as an important compass for translators endeavouring to navigate across these information atolls and trying to work out the content of the text. Therefore, the different degrees of surface explicitness/specificity of ST terms and their TT equivalents may – depending on the actual degree of domain knowledge of the translator – at least have an indirect translational relevance.

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[38] On the principles of term designation see, for example, the international standard ISO 704 ("Terminology Work – Principles and Methods") or the German standard DIN 2330 ("Begriffe und Benennungen – Allgemeine Grundsätze").

[39] The potentially lower translational relevance of these shifts is part of the reason that they were classified as non-prototypical shifts in this thesis.

(39) CCS DE-EN

Von deutscher Seite ist die *BGR* Hannover im Rahmen des NASCENT-Projekts aktiv.

On the German side, the *Federal Institute for Geosciences and Natural Resources (BGR)* in Hannover is playing an active part in the NASCENT project.

In example (39), the translator unpacked the acronym *BGR* in the TT[40] by inserting the official English translation of the full German term (which would be *Bundesanstalt für Geowissenschaften und Rohstoffe*). This more specific surface construal in the TT can readily be explained by pragmatic or sociocultural differences between source and target cultures. While the intended German semi-expert audience can be expected to be familiar with the BGR and, hence, will only require the schematic abbreviation to access the corresponding conceptual content, this may not be the case for the intended English semi-expert audience. This TT audience may well be familiar with this Federal Institute but they may not be able to access this information based on the very schematic acronym *BGR*, which, moreover, refers to the German term. It seems therefore that, in order to avoid the risk of misunderstanding on pragmatic/sociocultural grounds, the translator opted for the lexical specification of this acronym in the form of a more specific surface construal.

(40) Automotive EN-DE

This paper reports results from a quantitative study of the effects of piston temperatures and *fuel* sulfur on piston deposits.

In dieser Abhandlung wird über Ergebnisse einer quantitativen Untersuchung der Auswirkungen der Kolbentemperaturen und des Schwefelgehalts im *Kraftstoff* auf Ablagerungen am Kolben berichtet.

Example (40) is concerned with the translation of the English term *fuel* by the German term *Kraftstoff* and illustrates an interesting phenomenon. In English, the term *fuel* has a very broad extension that must be narrowed down according to the respective context. German, on the other hand, differentiates – at the lexical level – between various subtypes of fuel. The differences between the corresponding ST and TT conceptual systems can be graphically represented as follows (figure taken from Frank 1980:141):

[40] For a discussion of the unpacking of acronyms as instances of explicitation see v. Hahn (1998:384).

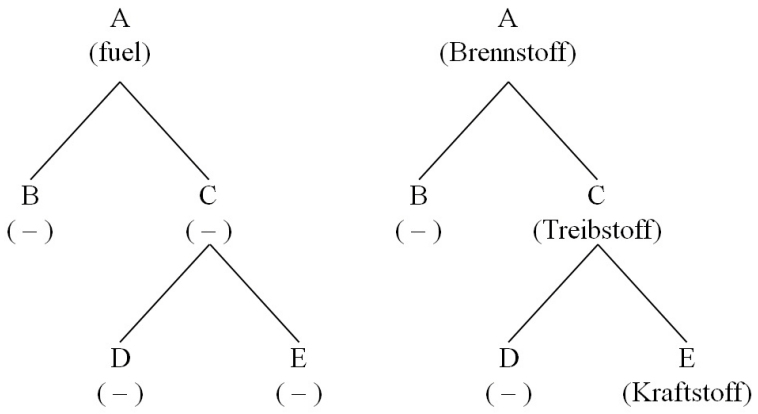

Figure 1: Fuel – differences between English and German conceptual systems

The 1:1 equivalent of *fuel* at the same level of specificity would be *Brennstoff*, which refers to any substance the burning of which results in a process of energy conversion. *Treibstoff* is more specific in that it only refers to those substances where, if the substance is burned, the energy is converted into *mechanical energy*. *Kraftstoff* is still more specific in that it only designates *liquid* substances the burning of which leads to the conversion into mechanical energy (see Franck 1980:142). So, while English has lexicalized only a comparably schematic and contextually highly variable conceptual content equalling the German *Brennstoff*, German has lexicalized finer distinctions at increasing levels of specificity, requiring German translators faced with the schematic term *fuel* to specify the corresponding schematic conceptual content according to the context.[41]

(41) Automotive EN-DE

This decision was also influenced by the fact that a large number of *runs* were required to achieve results of statistical significance, and prohibitively long engine test times would have been required to reach measurable deposit levels with compounded oils.

Diese Entscheidung wurde ebenso durch die Tatsache beeinflußt, daß eine große Anzahl von *Motorläufen* für die Erzielung von Ergebnissen mit statistischem Aussagewert sowie zu große Motorprüfzeiträume erforderlich gewesen wären, um bei Einsatz von legierten Ölen zu meßbaren Ablagerungen zu gelangen.

[41] The CCS subcorpora are also concerned with *fuel* at several points. However, in these cases the intended reading is the schematic one corresponding to German *Brennstoff* (see, for instance, examples (4) and (9) above). Therefore, the level of schematicity was held constant in the corresponding translations.

(42) Automotive EN-DE

We believe this may be due to the lack of natural inhibitors in the *synthetic fluid*, which may have made the oxidation rate more susceptible to other factors such as metal catalysis.

Wir sind der Ansicht, daß dies auf fehlende natürliche Hemmstoffe in den *Synthetikölen* zurückgeführt werden kann, wodurch die Oxidationsgeschwindigkeit eher von anderen Faktoren, wie z. B. die Metallkatalyse, beeinflußt werden kann.

Examples (41) and (42) again illustrate prime examples of lexical specification at the nominal level. In example (41), the translator instantiated the schematic term *run* with *Motorläufe*, thus specifying the patient of these runs (i.e. the engine). This example is somewhat striking in that the schematic or condensed term *run* is used consistently throughout the ST, without introducing the full term *engine run* at some point. The German register does not seem to allow the use of an equally condensed term such as *Läufe* in this case[42], prompting the translator to perform an explicitation shift.

In example (42), the translator instantiated the ST term *synthetic fluids* by *Synthetiköle*, thus specifying a) that the fluid in question is a liquid (*fluid* being a cover term for both liquids and gases, see Franck 1980:142) and b) that it is an oil, i.e. a specific type of liquid. The annex to the document states that the oils used in the engine tests were a neutral oil and a synthetic hydrocarbon-polyalpha olefin, so the more specific conceptual content to which *synthetic fluids* refers can be claimed to be salient in the current discourse space. Since this more precise term is quite lengthy and thus not very economic, the ST author opted for various condensed forms in the running text.[43] The reason for the explicitation shift may be that the technical term *fluid*, which was borrowed from English, seems to be less widely used in German scientific and technical discourse.[44] This may have led the translator to perform the explicitation shift just discussed.

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[42] The German translation in subcorpus Automotive EN-DE always uses the terms *Versuchsläufe* and *Motorläufe*. The German original text in subcorpus Automotive DE-EN (which can serve as a reference corpus to check, for example, lexical choices made in original language production, see Krein-Kühle 2003:50) uses the terms *Motorläufe* (profiling the patient of the runs) and *Prüfstandsläufe* (profiling the locus).

[43] Variations used were *synthetic hydrocarbons*, *synthetic oils* and *synthetic fluids*.

[44] The term *Fluid* seems to be a relatively "new" contribution to the German lexicon. Franck (1980:142), for example, does not yet account for *Fluid* as a hypernym for *Flüssigkeit* and *Gas* in German. Moreover, the term is absent from the entire German translation in subcorpus Automotive EN-DE. Also, in his study on explicitation and implicitation in translation, Becher (2011:201) discusses an example where English *fluid*

(43) Automotive DE-EN

In diesen Untersuchungen wird das Laufverhalten nitrierter Ringe im Motor verglichen mit *verchromten* und molybdänbeschichteten *Laufflächen* der Serienbestückung.

In these studies, the performance of nitrided rings in the engine is compared against *chromium plated* and molybdenum coated *running faces* of the production rings.

Example (43) illustrates a further instance of non-prototypical lexical specification by means of a more specific surface construal of basically the same conceptual content in the TT. The shift is concerned with the translation of the ST construal *verchromten Laufflächen* by the TT construal *chromium plated running faces*. The implicitation/ schematization shift may not be immediately obvious here but I would claim that the adjective *verchromt* is more schematic than its English counterpart *chromium plated* for the following reasons. The German adjective *verchromt*, which was converted from the verb *verchromen*, explicitly profiles the material that was used in a specific process (i.e. *chrome*) but the actual process is profiled only very schematically in the form of the prefix *-ver*. According to Reinhardt et al. (^{3}1992:27), the German prefix *ver-* has various different meanings – e.g. to process/transform (*verbiegen*), to join (*verschweißen*, *verkleben*), to add something, especially to a surface (*verkleiden*, *vergolden*), or to change position (*verschieben*, *verlagern*) –, which will be activated according to context or, more precisely, according to the conceptual content of the root morpheme. With regard to the above example, *ver-* profiles a kind of process but does so schematically since the information determining the actual kind of process (e.g., a transformation or a joining process) is supplied by the domain matrix of the root morpheme *chrome*. In this matrix, a domain such as PURPOSE (telic role) may specify that chrome is often used in electroplating processes in which a thin chrome layer is applied to a base material to increase the surface hardness (chrome plating). This information will probably be made salient in the domain matrix due to the discourse context, which is concerned with the wear behaviour of piston rings. The English construal *chromium plated*, on the other hand, profiles this process of chrome plating more explicitly since it does not use a semantically schematic bound morpheme (here, a prefix) in combination with a semantically contentful free morpheme but rather by employing two such semantically contentful free morphemes (*chrome* and *plate*). Thus, while the ST audience has to infer the exact nature of the process profiled by *verchromt*

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sampling was translated as *Ölprobennahme* in German. This shift is basically identical to the shift in example (42) above.

based on their domain knowledge of *chrome* and based on the current discourse space, this process is profiled explicitly in the TT construal. The ST author could also have opted for a more specific construal such as *chrombeschichtet* (analogous to the construal *molybdänbeschichtet* in the same example) but this option does not have the same default construal status as *verchromt*, which is more in line with the German technical register and, due to its more compressed form, also contributes to a slightly higher economy of expression.

(44) Automotive DE-EN

Bei den legierten *Gußwerkstoffen* (GOETZE-Werkstoffe IKA, F14, F15) ist der Härteabfall im Vergleich zu KV1 tendenziell flacher.

In the case of the alloyed *cast irons* (GOETZE materials IKA, F14, F15) the hardness decrease compared to KV1 tends to be less sharp.

Example (44) illustrates a prototypical instance of lexical specification where the German schema *Gußwerkstoffe* was instantiated by the English hypernym *cast irons*. The term *Werkstoff* is relatively schematic in that it profiles any material which can be processed in production processes. The profile of the compound *Gußwerkstoff* is more specific in that it profiles only those materials which are processed in casting processes. However, this more specific term still has a relatively broad extension, covering materials such as irons and non-ferrous metals (lead, zinc, nickel, etc.). The English term *cast irons*, on the other hand, profiles a specific subset of the German term's extension, i.e. iron. The ST author may have relied on the fact that the concise designations IKA, F14 and F15 – which are explained at other junctures in the text[45] and may therefore be salient in the CDS – are sufficient for the ST audience to narrow down the schematic construal *Gußwerkstoffe* to its intended more specific reading *cast irons*. The translator, on the other hand, may have felt that this information is not salient enough in the current discourse space (the explanation of the short forms is not given on the same page of the text) and hence opted to instantiate the schematic ST construal, thereby raising the level of lexical explicitness of the TT.

[45] All three designations refer to irons, F15 being alloyed ductile iron, F14 alloyed break-resistant grey cast iron and IKA nitrocarburized cast iron.

(45) Automotive DE-EN

Der *eindiffundierende Stickstoff* bildet eine Verbindungszone, die aus einer reinen Nitridschicht besteht, und eine Diffusionszone, in welcher der Stickstoffgehalt kontinuierlich bis auf den Restgehalt des *Grundwerkstoffs* abfällt. Bild 1a zeigt den schematischen Aufbau der Randschicht nach dem Nitrieren.

The *nitrogen diffusing into the surface* forms a white layer consisting of pure nitride, and a diffusion layer, in which the nitrogen content decreases progressively down to the residual content of the *base metal*. Fig. 1a contains a schematic diagram of the structure of the nitrided case.

Example (45) illustrates two lexical specification shifts. Firstly, the translator rendered the ST construal *eindiffundierender Stickstoff* as *nitrogen diffusing into the surface* and thereby explicitly construed the "receptor" of the nitrogen (i.e. the surface). In the German construal, this information could be left schematic because of the availability of the prefix *ein-*, which profiles (again in a very schematic way, see the discussion of *verchromen* in example (43) above) the process of one element being "inserted" into another (Reinhardt et al. ^{3}1992:38). English, being generally slightly more restricted in its use of prefixation than German (Jumpelt 1961:112), does not offer an equally condensed form of expression in this case, which required the translator to opt for the more specific construal. In the ST, this explicitated information will certainly be available both from the figure the text refers to and from the expert audience's domain knowledge about diffusing processes.

The second shift involves the instantiation of the schematic term *Grundwerkstoff* by the more specific construal *base metal*. A similar shift has already been discussed in example (44) above. However, in example (44) the correct instantiation of *Werkstoff* was *iron*, whereas in the present example it is *metal*.

Verbs

(46) CCS EN-DE

Currently, CO_2 is typically *removed* to purify other industrial gas streams (FS2).

Gegenwärtig wird das CO_2 typischerweise zur Reinigung anderer Industriegase *abgetrennt*.

Example (46) is concerned with a cross-linguistic hypernym-hyponym or schema-instance relation at the level of verbs (see Taylor 2002:123-124), with the translator construing the removal process more explicitly in the TT. The verb *to remove* is semantically schematic in that it only profiles the general process of taking something away from or off the position occupied, while the actual process is not specified by the semantics of the verb but rather by the frames/domain matrices of the element to be removed and/or of the position from which this element is removed. With regard to the above example, the exact removal

process is not specified in the verb itself but has to be supplied by information in the frame/domain matrix of CO_2. The German translation solution *abtrennen* is more specific in this regard since it points directly to the procedure of gas separation (*Gastrennung*), for example by means of membranes or membrane contactors. This very specific frame/domain information relating to CO_2 is thus moved to the textual surface in the TT construal. With respect to the potential translational reason for this shift, Schmitt (1999:211) points out that the English technical register seems to tolerate the use of non-specific verbs such as *to remove* to a much higher degree than the German technical register[46], which usually prompts for a more specific verb. German has a verb at the same level of schematicity as *remove* (*entfernen*) but its use in German scientific/technical discourse is somewhat marked from a register point of view.[47] Schmidt (ibid., italics added) nicely illustrates this difference between English and German technical registers with the following list:

remove the two bolts	=	beide Schrauben *lösen*
remove filler cap	=	Verschlusskappe *aufdrehen*
remove the spark plugs	=	Zündkerzen *herausdrehen*
remove the plug leads	=	Zündkabel *abziehen*
remove dipstick	=	Ölmeßstab *herausziehen*
remove filter element	=	Filtereinsatz *herausnehmen*
remove distributor cap	=	Verteilerdeckel *abnehmen*
remove rotor arm	=	Verteilerläufer *abziehen*

The versatility of the verb *to remove* in English technical register is made very clear here. The German technical register, on the other hand, does not seem to tolerate this level of schematicity so that the corresponding process has to be specified according to the context by using a semantically more precise or contentful verb. Therefore, it seems very likely that the explicitation shift above was triggered by register considerations on the part of the translator (meaning that she was aware of the German register constraints with regard to verb specificity/schematicity).

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[46] This observation is in line with House's (2002:200) general observation of a higher propositional opaqueness of English as compared to German discourse. See examples (2) to (5) above.

[47] There are only 4 instances in all corpus texts investigated where a removal process was construed by means of the verb *entfernen*, the substantivized verb *das Entfernen* or the deverbal noun *Entfernung*.

(47) Automotive EN-DE

The groove deposits on the thrust and antithrust sides were *recovered* and weighed separately (and combined with the weight of deposit recovered from the top ring to give the total deposit weight).

Die Nutablagerungen auf den Druck- und Gegendruckseiten wurden *entnommen*, getrennt gewogen und mit dem ermittelten Gewicht der Ablagerungen am 1. Ring zur Erzielung des Gesamtgewichtes der Ablagerungen zusammengefaßt.

(48) Automotive EN-DE

Thus, the rate constants for "sump oil oxidation" should reflect the ring zone oxidation at each temperature barring some drastic change in types or amounts of oxidation products *reaching* the sump over the measured temperature range.

Daher sollten die Konstanten für die Oxidationsgeschwindigkeit im Ölsumpf die Oxidationsgeschwindigkeit in der Ringzone bei jeder Temperatur wiedergeben, es sei denn, es tritt eine drastische Änderung in der Art und Menge der innerhalb eines bestimmten Temperaturbereiches in den Ölsumpf *fließenden* Oxidationsprodukte ein.

(49) Automotive EN-DE

The reaction rate is *controlled* by both Ea and the "collisional" PZ term, however, and may deviate widely from this general behavior.

Die Reaktionsgeschwindigkeit wird sowohl durch den Faktor Ea und den molekularen Stoßfaktor PZ *gesteuert*, kann jedoch u. U. erheblich von diesem allgemeinen Verhalten abweichen.

Examples (47) to (49) illustrate three further instances of lexical specification at the level of verbs. In example (47), the more specific German verb *entnehmen* (and here specifically the prefix *ent-*) construes the source from which the deposits were recovered (which would be the groove of a Diesel engine piston) as a container, whereas the English verb *to recover* exhibits a degree of schematicity parallel to that of the verb *to remove* (example (46) above) and leaves the topological structure of the source indeterminate.[48] Again, the German technical register does not seem to license an equally schematic construal such as *Die Nutablagerungen wurden entfernt* in this context.

The shift in example (48) was already mentioned in the discussion of example (20), which was concerned with the insertion of the preposition *in* in the TT. This preposition was governed by the more specific German verb *fließen* (as opposed to English *reach*), which profiles the movement of a liquid. This liquid character of the oxidation products reaching

[48] For example, you could also recover the deposits that form at the outside of a piston (instead of in its groove); however, German would, in this case, require a more specific verb with the prefix *ab-* (to do justice to the different topological structure of the source), e.g. *abtragen*.

the oil sump remains schematic in the ST construal and has to be inferred either based on the frame/domain matrix of the compound *oxidation products* (which may be quite schematic due to the equally schematic nucleus *products*) or based on other information salient in the CDS.[49] Again, a TT construal at the same level of schematicity as the ST construal (*die den Ölsumpf erreichenden Oxidationsprodukte*) seems to clash with German register requirements, possibly prompting the translator to raise the degree of explicitness of the TT.

The verb *to control* in example (49) does not have a German 1:1 equivalent at the same level of schematicity, i.e., in this case, the target language exhibits a *generalization gap* (Schreiber 1993:38, see 5.2.1). Accordingly, the translator had to specify whether the described process is a control process where the actual value is continuously compared to a given set point and where the difference between the two values entails a change in the control process (this would be *regeln* in German) or whether the process merely involves the control of an actual value without any comparison with a given set point (this would be *steuern*, see Franck 1980:52; Schmitt 1999:97-98).

Pronouns

(50) CCS DE-EN

Im Vergleich zur EOR-Möglichkeit sind die Lagerungspotentiale innerhalb von Aquiferen sehr viel größer. *Dies* sind salzwasserführende Schichten, die wegen dichter Abdeckung für die Verbringung des CO_2 geeignet sind.

In comparison to the possibility of EOR, the storage potential within aquifers is very much greater. *Aquifers* are saltwater-bearing layers which are suitable for transporting CO_2 due to their tight cover.

(51) CCS-DE-EN

Aufgrund ihrer weiten Ausdehnung und Mächtigkeit stellen tiefe salzwasserführende Aquifere das größte Speicherpotenzial für CO_2 dar, *welches* allerdings noch nicht genauer erfasst und quantifizierbar ist.

Due to their wide area and considerable thickness, deep salt-water-bearing aquifers represent the greatest storage potential for CO_2, although *this potential* has not yet been explored in detail and is not yet quantifiable.

Examples (50) and (51) illustrate the lexical specification of an ST pronoun by its nominal referent (which is schematically present in the pronoun's profile) in the TT. In example

[49] The previous discourse is concerned with the oxidation of sump oil; so the information that the oxidation products reaching the oil sump are components of a liquid should indeed be salient to the audience.

(50), the translator encoded the nominal referent of the anaphoric demonstrative pronoun *dies* in the TT. This shift is not very relevant from a translational perspective since both a pronominal and a nominal solution work equally well in this case. In example (51), the translator specified the nominal referent of the relative pronoun *welches* in the TT. In this case, a possible translational motivation is perceivable since, at first glance, the ST provides two potential referents for the pronoun (*storage potential* and *CO_2*). Since *CO_2* is positioned closer to the relative pronoun, the first accessible interpretation would probably be that it is the CO_2 and not the storage potential which has not yet been explored in detail (although this interpretation will then be cancelled based on the domain knowledge of the intended semi-expert audience). It seems that, in order to remedy this perceived defect of ST coherence, the translator opted to raise the level of cohesive explicitness of the TT by explicitly specifying the intended referent of the pronoun.

(52) Automotive EN-DE

Given the demonstrated effect of sulfur on the total piston deposit, however, it can only be concluded that *it* has significant effect on formation of deposits on the lower part of the piston.

Angesichts des gezeigten Einflusses des Schwefels auf die Ablagerungen am Gesamtkolben kann jedoch nur gefolgert werden, daß *der Schwefel* einen erheblichen Einfluß auf die Bildung von Ablagerungen im unteren Bereich der Ringzone hat.

The phenomenon illustrated in example (52) is similar to that observed in example (51), albeit occurring in the other translation direction. It will therefore be elaborated only very briefly here. In example (52), the translator increased the cohesive explicitness of the TT by specifying the nominal referent of the English pronoun *it*, possibly because the first potential antecedent *Gesamtkolben* may lead the audience to a misleading interpretation that has to be abandoned during further processing of the sentence.

Prepositions

(53) CCS EN-DE

The transport step may be required to carry captured CO_2 *to* a suitable storage site located at a distance from the CO_2 source (FS2) .

Der Transport ist gegebenenfalls zur Beförderung des abgeschiedenen CO_2 *in* eine von der Emissionsquelle entfernte geeignete Speicherstätte erforderlich.

(54) CCS EN-DE

a) CO_2 post-combustion capture *at* a plant in Malaysia.

(a) CO_2-Abscheidung nach der Verbrennung *in* einer Anlage in Malaysia.

Examples (53) and (54) illustrate two instances of non-prototypical lexical specification that occur at the level of prepositions (see 8.3). In both cases, spatially more schematic ST prepositions (*to* and *at*) were substituted by the spatially more specific TT preposition *in*, thereby encoding additional spatial information in the TT. In example (53), the preposition *to* merely encodes that the CO_2 is moved in the direction of the storage site and is then present in the vicinity of this site. The preposition *in*, on the other hand, has a more specific relational profile in that it construes the storage site as a container (see example (20) above) and makes explicit that its trajector (the captured CO_2) is stored *inside* its landmark (the storage site). The same applies to example (54), where the ST preposition *at* only encodes that the capture occurs in the immediate vicinity of the plant; the TT preposition *in*, on the other hand, makes the locus of the capture process spatially more explicit. In example (53), the use of an equally schematic German preposition (for example *zur*) may have been feasible; however, in example (54), this would have been quite difficult. A preposition such as *bei*, which merely profiles the relative proximity of tr and lm, would probably have conflicted with the prevailing register requirements, whereas an equally schematic preposition such as *an* would prompt for the interpretation that the capture took place in the vicinity but not inside the plant (which would contradict the actual process). It therefore seems that it was the lack of acceptable options at the same level of prepositional schematicity that led the translator to construe the spatial relations in a more specific way in the TT.

(55) Automotive DE-EN

Die Bilder 3a und b zeigen Beispiele des Aufbaus einer Nitrierschicht *bei* grauem Gußeisen (GOETZE-Werkstoff IKA) und Chromstahl 1.4109.

Figures 3a and b show examples of the structure of a nitrided case *on* grey cast iron (GOETZE material IKA) and the chromium steel 1.4109.

In example (55), the translator performed another lexical specification shift at the level of prepositions by substituting the German preposition *bei* with the English preposition *on*, which profiles the spatial configuration of its trajector and landmark in a more specific way. For the intended expert audience of the ST, this information will again be salient based on their domain knowledge of nitriding processes and iron and based on the figures to which the text refers. The reason for this shift may be that English does not seem to provide an equally schematic preposition in this context, with a construction such as *structure of a nitrided case in the case of grey cast iron* being very cumbersome,

linguistically not very economic and not in line with English technical register. Therefore, it seems that, in order to achieve the same ease and economy of expression as the German ST and to adhere to prevailing TT register requirements, the translator was forced to use a more specific preposition which makes the spatial arrangement of its tr and lm more specific. The use of the relatively schematic preposition *bei*, which was ruled out for register reasons in example (54) above, is acceptable and even a preferable solution in the German ST sentence in example (55). The reason may be that, in example (55), the complement of the prepositional phrase is iron in its generic sense (meaning that the formation of a nitrided case is discussed as a phenomenon of iron in general and not as a phenomenon exhibited by a particular piece of iron), whereas example (54) is concerned with a particular plant in Malaysia (which is also depicted in a figure). Therefore, it seems that in German the use of relatively schematic prepositions may be licensed to a stronger degree in generic or abstract in comparison to specific or concrete construals.

Determiners

(56) CCS EN-DE

The high-concentration sources are potential candidates for the early implementation of CCS because only dehydration and compression would be required at the capture stage (see Section 3).

Diese Emittenten wären für einen ersten Einsatz von CCS denkbar, da bei der Abscheidung lediglich die Dehydrierung und Verdichtung des CO_2 erforderlich wären (s. Kapitel 3).

Example (56) is considered as a prototypical lexical specification shift at the level of determiners. In cognitive linguistic terms, determiners are semantically schematic, their primary function being to *ground* the nominal content of a noun phrase (Taylor 2002:344). According to Taylor (ibid.:346), "[g]rounding is a process that 'locates' an entity with respect to the ground", the ground here being equatable with the current discourse space (Langacker 1991:97).[50] The definite determiner *the*, in the example above, "profiles an instance that the speaker has singled out for attention" (Taylor 2002:354), with this instance having been prototypically introduced in the previous discourse frame (Langacker 1991:98). In example (56), *The high-concentration sources* profiles or singles out an instance with which the audience is assumed to be already familiar since it has been

[50] The similarity between *ground* and *CDS* is made clear by Taylor (2002:346), according to whom "[t]he ground comprises the participants in the event, its time and place, the situational context, previous discourse, shared knowledge of the speech-act participants, and such like." This description basically mirrors the description of the current discourse space in 5.3.5.

introduced in the previous discourse frame and is hence salient in the CDS (otherwise, the indefinite determiner or the zero determiner would have had to be used). The translator further specified this process of singling out by substituting the definite determiner by a demonstrative determiner (*diese*), which is considered to be slightly more contentful or specific than the definite determiner (Langacker 1991:102-103; Taylor 2002:354). Demonstrative determiners serve a specific anaphoric pointing function and usually refer to the immediately preceding discourse (i.e., they cannot exhibit this pointing function over longer discursive distances where there is considerable linguistic content between them and the intended antecedent).[51] In the example above, *Diese Emittenten* refers not only to an instance that is supposed to be known by the audience but it specifically points to an occurrence of this instance in the immediately preceding discourse (in this case, the antecedent can be found in the previous sentence), thereby raising the cohesive explicitness of the TT.[52]

(57) CCS DE-EN

Verglichen mit einem konventionellen Kraftwerksprozess ohne Abgasdekarbonisierung liegt der Gesamtwirkungsgrad *der* Schaltung mit 33 –37 % deutlich niedriger (Tabelle 17).

Compared to a conventional power plant process without flue gas decarbonization, the overall efficiency of *this* cycle is significantly lower at 33 – 37 % (cf. Table 17).

Example (57) illustrates another lexical specification at the level of determiners. The translator specified the German definite determiner *der* by using the English demonstrative determiner *this*, thereby grounding the nominal of the noun phrase *this cycle* more firmly in the current discourse space. The more specific grounding function of the demonstrative determiner in comparison to the definite determiner has already been discussed in the previous example. With regard to example (57), it is interesting from a translational perspective that the sentence comments on a preceding figure which depicts the cycle of a coal-fired power plant with flue gas decarbonization. Since the sentence is specifically concerned with this figure, the translator may have felt the need to establish a stronger

[51] For a discussion of the demonstrative pronoun/determiner *this* in the context of scientific and technical translation see Krein-Kühle (2002).

[52] However, this shift is counterbalanced, to some extent, by the shift from *high-concentration sources* to *Emittenten*, i.e. the gain in TT specificity at the level of determiners is counterbalanced by the loss of TT specificity at the level of nominals. To account for this, the nominal schematization was counted as a separate instance of lexical schematization.

cohesive tie between the figure and the corresponding discourse and thus may have used the more specific demonstrative determiner as an anaphoric pointer to this figure. Compared to this TT construal, figure and discourse are more isolated in the ST. The demonstrative determiner profiles an instance (*die Schaltung*) which is supposed to have been introduced in the previous discourse frame but it does not specifically point to the immediately preceding discourse as the source of this instance. Therefore, the ST audience may have to search the wider previous discourse and then interpret the figure as the previously introduced instance to establish a coherent interpretation of the sentence.

8.3.1.2 Implicitation: lexical schematization

Nouns

(58) CCS-EN-DE

In this way, the oceans have taken up about 500 Gt CO_2 (140 Gt C) of the total 1,300 Gt CO_2 (350 Gt C) of *anthropogenic emissions released to the atmosphere* over the past 200 years.

Auf diese Weise haben die Ozeane in den letzten 200 Jahren etwa 500 Gt CO_2 (140 Gt C) der gesamten *anthropogenen Emissionen* im Umfang von 1.300 Gt CO_2 (350 Gt C) aufgenommen.

In example (58), the translator rendered the ST construal *anthropogenic emissions released to the atmosphere* more schematically in the TT by not encoding an equivalent of the past participle construction *released to the atmosphere*.[53] As a result, the direction of the anthropogenic emissions remains implicit in the TT. However, the sentence preceding this example mentions that the oceans gradually take up additional CO_2 if the *atmospheric concentration* of CO_2 increases. From this perspective, it seems that the past participle phrase *released to the atmosphere* can be considered as redundant since the information that the emissions are released to the atmosphere was mentioned in the previous discourse frame and will therefore be highly salient in the CDS. If we follow Krein-Kühle (2003:264) and consider the ST construal *anthropogenic emissions released to the atmosphere* as a *text-related terminological unit* that "occur[s] in the production of texts" (instead of being "officially" established by terminologists as a lexicalized default construal), we can interpret this shift as an instance of *ad hoc* term condensation in the sense of Horn-Helf (1999:123-124, see example (35) above). The translator, possibly

[53] This shift could, in principle, also have been classified as an instance of lexical deletion. However, since it passes the "is a" test for hyperonymy-hyponymy (an emission released to the atmosphere is an emission but an emission is not necessarily an emission to the atmosphere), it was instead classified as lexical schematization (see the discussion in 8.2).

trying to avoid redundancy or to increase the economy of expression in the TT, opted for a more condensed and hence more schematic construal of a text-related terminological unit since the schematized information is highly salient in the CDS and will therefore be readily inferable by the intended audience.

(59) CCS DE-EN

Hierbei wird auf *Wirkungsgrad*einbußen sowie auf mögliche zusätzliche Investitionen eingegangen.

Consideration will also be given to *efficiency* losses and possible additional investments.

This example illustrates a non-prototypical instance of lexical specification. It is concerned with two terminological equivalents (*Wirkungsgrad* and *efficiency*) where one of the terms exhibits a higher contextual autonomy than the other. Whereas German *Wirkungsgrad* is the specific technical term for the ratio between input and output power in energy conversion processes (see, for example, Franck 1980:122), the English term *efficiency* is originally a general language term that can also be used to refer to well-organized or optimized processes in general (see 8.3). Only in its terminologized technical reading can it be considered as a 1:1 equivalent to the German term *Wirkungsgrad*. The English term therefore exhibits a higher "contextual variability" (Cruse ^{3}2011:97) than the German term.[54] As more contextual input is needed to arrive at the technical meaning of *efficiency* (compared to the contextually more autonomous *Wirkungsgrad*), corresponding shifts were counted as instances of lexical schematization (and vice versa). However, I consider these cases as non-prototypical lexical specification/schematization shifts since they are again anchored at the level of *langue* and are not the consequence of any intentional translational decision to explicitate at the level of *parole* (see example (36) above).

(60) CCS DE-EN

Eine weitere Variante besteht in dem Einsatz von SOFC-Brennstoffzellen mit *Zumischung* des Anodenabgases zur Kathodenluft und Kathodenrauchgas-Dekarbonisierung.

Another variant is the application of SOFC fuel cells with the *addition* of the anode exhaust gas to the cathode air and decarbonization of the cathode flue gas.

[54] Franck (1980:122) discusses an example from technical translation where *efficiency* is used in its general and not in its technical sense, which may cause problems in translation. German *Wirkungsgrad*, on the other hand, can only be used in a technical sense.

Example (60) illustrates the TT schematization of a more specific deverbal ST noun. While the German term *Zumischung* profiles both the process of adding something and the subsequent relation between the added element and the element to which the first element was added (the two elements form a mixture, a gas-air mixture in this case), the English term *addition* only profiles the process and not the relation between the elements. In order to form the more specific conceptualization based on the more schematic TT construal, the audience would have to access their domain knowledge about the lexical units *exhaust gas* and *air* since it is the frames/domain matrices of the two terms that supply the additional information for the schematically construed addition process.[55] The reason for this shift may be found in the slightly higher productivity of prefixation in German compared to English technical discourse (Jumpelt 1961:112, see also example (45) above). In German, the term *Mischung*, which is used to specifically profile the relation between the component elements, can be combined with the prefix *Zu-*, which basically profiles the process of addition, yielding the highly specific term *Zumischung* found in the example above. English does not offer a comparable means of adding a semantically equivalent prefix to the semantic equivalent of *Mischung* (which would be *mixture*). A verbal solution such as *mix with* seems feasible, but this would require rearranging the whole sentence and may entail a lower degree of linguistic economy. Therefore, it seems that the implicitation shift above may have been induced by a specific restriction of the target language system (see example (15) above).

The shift also serves to illustrate another, more general, phenomenon, namely the extremely high number of noun shifts compared to the extremely low number of verb shifts in the category of lexical specification/schematization (see the overview in 8.3.1). As Krein-Kühle (2003:160) points out, "the nominalized register is a typical characteristic of both English and German scientific and technical discourse". This is illustrated in the present example by the use of the deverbal nouns *Zumischung* and *addition* to describe a verbal process. Due to the strong nominalization tendencies exhibited by both English and German technical register, a major share of the conceptual content to be communicated

[55] This example shows some parallels to example (46) above, where the schematic SL verb *to remove* was translated by the more specific TL verb *abtrennen*.

will be construed in a nominal fashion[56] and hence a major share of lexical specification/ schematization shifts will be attributable to these nominal construals.

(61) CCS DE-EN

Erdgasgefeuertes GuD-Kraftwerk mit Rauchgasdekarbonisierung

GCC power plant with flue gas decarbonization

In example (61), the translator rendered the ST more schematically by deleting the past participle modifier *Erdgasgefeuertes* and thereby construing the TT term *GCC power plant* in a more schematic way than *Erdgasgefeuertes GuD-Kraftwerk* (see 8.2). This shift was classified as a non-prototypical instance of lexical schematization in the form of a more schematic surface construal. The German term is somewhat redundant in that *GuD* is an abbreviation of *Gas und Dampf* (English *GCC* stands for *gas combined cycle*). In these power plants, the heat of a gas turbine (in which (usually) natural gas is burned) is used to power a downstream steam turbine. The information *gas-fired* is therefore already present in the profile of *GCC power plant*, albeit in very schematic form.[57] Also, the example above is a caption of the following figure illustrating the arrangement of the different components in a GCC power plant:

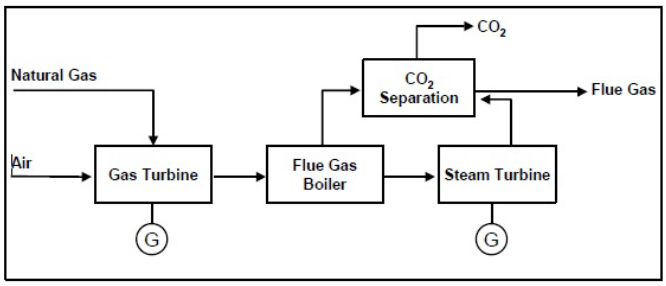

Figure 2: Functional principle of a GCC power plant

[56] The distinction between verbal and nominal construals of a given conceptual content is captured by the notions of "sequential scanning" and "summary scanning" in cognitive linguistics (Langacker 1987:144-145; Croft/Cruse 2004:53-54). *Sequential scanning* involves the "scanning of a scene in conceived time" (Croft/Cruse 2004:53) and would apply to verbal construals such as *the exhaust gas is added to the cathode air*. *Summary scanning*, on the other hand, refers to "a holistic conceptualization of a scene in its entirety" (ibid.) and would apply to nominal construals such as *the addition of the exhaust gas to the cathode air*.

[57] Actually, the designation *(natural) gas-fired GCC power plant* does not seem to be an English default construal since a Web search for this string yielded zero results.

This figure shows that natural gas (along with air) is fed into the gas turbine and that the overall power plant is therefore a natural gas-fired plant. This figure, together with the schematic information in the TT term's profile, therefore makes the information *natural gas-fired* highly salient in the CDS. As a result, the non-verbalization of this information in the TT will not result in any significant semantic loss.

(62) CCS DE-EN

Druckkohlenstaubfeuerung (DKSF) mit Abgasdekarbonisierung unter Druck

Pressurized pulverized combustion (PPC) with flue gas decarbonization under pressure

Example (62) is similar to example (61) above in that it also involves the more schematic surface construal of basically the same conceptual content. The German term *Druckkohlenstaubfeuerung* profiles not only the combustion process but also the actual medium that is burned in this process (*Kohle*, coal). The profile of the English term *Pressurized pulverized combustion* does not include this information and therefore is more condensed that the ST term. Again, the example is the caption of a figure illustrating the setup of such a combustion process:

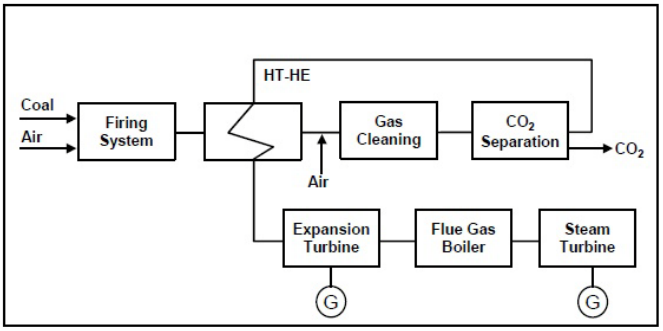

Figure 3: Functional principle of PPC technology (pressurized pulverized combustion)

Since it is again obvious from this figure that it is coal (along with air) which is fed into the firing system, we can resort to the argument laid out in example (61). At different points in the same document, the more specific designation *pressurized pulverized coal combustion* was used.

(63) Automotive EN-DE

Our experience indicates that the functional piston problems, such as ring sticking, *ring scuffing*, ring side face wear, or a loss of blow-by control, occur due to high deposit levels in the top and second groove.

Unsere Erfahrungen haben gezeigt, daß funktionsbezogene Kolbenprobleme wie Ringstecken, *Brandspurbildung*, Ringflankenverschleiß oder ein Verlust der Blowby-Kontrolle auf große Ablagerungsmengen in der 1. und 2. Nut zurückzuführen sind.

Example (63) is again concerned with a more schematic surface construal of basically the same conceptual content in the TT. The German term *Brandspurbildung* cannot be claimed to be a hypernym of the English term *ring scuffing* since *Brandspurbildung* is a specific process that can only occur on piston rings. Hence, *ring scuffing* is no hyponym or instantiation of *Brandspurbildung* since it construes the same conceptual content – only in a more specific way by profiling not only the process but also the patient of the process. In German, there is no more explicit lexicalized default construal such as *Ringbrand-spurbildung* or *Brandspurbildung am Ring* and a corresponding *ad hoc* construal would not have been licensed by the German technical register (see, for example, Mahle GmbH 2009). Also, the preferred English designation seems to be the more schematic surface construal *scuffing* (Mahle GmbH 2010), with the ST solution *ring scuffing* being slightly overspecified.[58] The schematization shift above can thus be linked to such a slight overspecification in the English ST, which the translator remedied by opting for a more schematic (but terminologically correct) German construal in the target text. As a result, the information that the scuffing will occur on the ring is no longer profiled in German but rather remains hidden in the domain matrix of the term *Brandspurbildung*, from where the intended expert audience can certainly recover it by virtue of their corresponding domain knowledge.

(64) Automotive DE-EN

Die Hauptanwendungen an Automobilteilen liegen bisher an Teilen, die hohen Gleitbeanspruchungen unterworfen sind, wie z. B. *Stirnräder für Getriebe*, Kurbel- und Nockenwellen [1, 2], sowie in begrenztem Umfang Zylinderlaufbuchsen von LKW-Dieselmotoren [3].

The chief application in the area of automotive components has hitherto been for parts working under high sliding friction stresses, such as *transmission gears*, crankshafts and camshafts [1, 2], and to a limited extent cylinder liners of heavy duty diesel engines [3].

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[58] Krein-Kühle (personal communication) calls the ST solution *ring scuffing* a case of "terminological redundancy".

Example (64) is a prototypical example of lexical specification where the German instance or hyponym *Stirnrad* has been rendered by the English hypernym or schema *gear*, which is a 1:1 equivalent of the equally schematic German term *Zahnrad* (see Franck 1980:51). *Stirnrad* (spur gear), on the other hand, is an instantiation of *Zahnrad*, i.e. it is a specific type of gear. The reason for this shift may be that a spur gear is the most basic and most commonly used type of gear (see Grote/Feldhusen [22]2007:G117) so that, when simply a gear without any further specification is mentioned, a spur gear may be what immediately comes to mind. The hypernym *gear* would thus function as a quasi-synonym for its hyponym *spur gear*. However, this reasoning is rather speculative and it does not explain the fact that the more specific construal *spur gear* could have easily been incorporated in the TT, for example as *transmission spur gears* or *spur gears for transmissions*.

(65) Automotive DE-EN

In diesen Untersuchungen wird das *Laufverhalten* nitrierter Ringe im Motor verglichen mit verchromten und molybdänbeschichteten Laufflächen der Serienbestückung.

In these studies, the *performance* of nitrided rings in the engine is compared against chromium plated and molybdenum coated running faces of the production rings.

In this example, the translator rendered the specific ST term *Laufverhalten* (lit. *running behaviour*) as the more schematic TT construal *performance*, which Krein-Kühle (2003:296) classifies as a "semi-technical term" and which, according to Franck (1980:122), can be used to refer to the general performance of humans and machines. The German term *Laufverhalten* profiles, albeit in a rather schematic way, the specific kind of performance with which the text is concerned, i.e. the performance of the running face of the ring in its permanent contact with the cylinder liner. This information is not included in the profile of the TT term *performance*. The TT audience therefore has to infer this information from their domain knowledge on piston rings (probably instantiations in the domain MATERIAL of the constitutive role and in the domain PURPOSE of the telic role) or from the surrounding discourse, which is concerned with the *running faces* of the production rings. It seems that English, in this context, does not provide any readymade default construal equivalent to the German term *Laufverhalten*, which probably led the translator to opt for a more schematic construal which is in line with the English technical register and which should not entail any processing difficulties for the intended expert audience of the target text.

(66) Automotive DE-EN

Thermochemische Behandlungen sind nach DIN 17014 Wärmebehandlungen, mit denen die chemische Zusammensetzung eines *Werkstoffs* durch Diffusion eines oder mehrerer Elemente absichtlich verändert wird.

Thermochemical treatments, according to DIN 17014, are heat treatments by means of which the chemical composition of a *material* is deliberately transformed by the diffusion of one or more elements.

Example (66) is again concerned with the German term *Werkstoff* (see examples (44) and (45) above) although, in this case, the term was not instantiated by a more specific TT term but construed at basically the same level of schematicity using the term *material*. However, the English term *material* exhibits a higher contextual variability than *Werkstoff* parallel to *efficiency* vs. *Wirkungsgrad* discussed in example (59). *Material* is originally a rather schematic general language term[59] that exhibits external polysemy, has been terminologized and obtains its specialized reading in specific contexts. The German term *Werkstoff*, on the other hand, is contextually more autonomous since it can only be used to refer to materials which are used in production processes. In line with the argument laid out in 8.3 and in the discussion of example (59), this shift was classified as a non-prototypical instance of lexical specification.

(67) Automotive DE-EN

Die *Nitrierhärtekurven* der Stähle SAE 9254 und 1.8159 sind typisch für unlegierte bzw. niedrig legierte Stähle.

The *hardness curves* for the steels SAE 9254 and 1.8159 are typical for unalloyed and low-alloy steels.

(68) Automotive DE-EN

Das Verschleißverhalten der Stahllamellen-*Ölabstreifringe* (Typ: GOETZE VF) (s. 3.3.2) wurde in einem 1,6 l- und einem 1,8 l-Vierzylinder-Ottomotor untersucht.

The wear behaviour of the steel rail *oil control rings* (type GOETZE VF) (see 3.3.2) was studied in a 1.6-liter and a 1.8-liter four cylinder gasoline engine.

Examples (67) and (68) are the last instances of nominal specification/schematization to be discussed here. Example (67) illustrates another prototypical instance of lexical schematization where the hyponym *Nitrierhärtekurven* was translated by the more schematic term *hardness curves*, which leaves implicit what this hardness actually refers to

[59] Referring quite generally to "the matter from which a thing is or can be made" or the "things needed for an activity" (Oxford Dictionaries Online, accessed on 29/11/2013).

or how it came about (by nitriding in this case). The reason for this shift seems to be that English does not provide a lexicalized default construal that could act as 1:1 equivalent to the German construal *Nitrierhärte*. This hypothesis is supported by the fact that *Nitrierhärte* is a widely used term in the German text of subcorpus Automotive DE-EN (occurring 11 times in this text) whereas the English translator always avoided using a construal such as *nitriding hardness*, instead opting for more a schematic construal such as *hardness* or shifting the perspective to the *nitrided case*, i.e. to the element that exhibits this hardness.

Example (68), on the other hand, is concerned with a more specific surface construal of basically the same conceptual content. While the German term *Ölabstreifring* profiles the purpose of the ring in a very specific way (the ring serves to *scrape off* the oil), the profile of the English term *oil control ring* leaves the actual process hidden in the term's frame/domain matrix since it merely profiles that the oil is controlled or handled in some way by using the ring, while leaving the exact nature of this control or handling process very schematic. While English offers the more explicit synonym *oil scraper ring* (which is used in the original English text in subcorpus Automotive EN-DE), the translator consistently used the more schematic construal *oil control ring* in the translation.

Prepositions

(69) CCS EN-DE

In most of these pipelines, the flow is driven by compressors at the upstream end, although some pipelines have intermediate (booster) compressor stations.

Bei den meisten dieser Pipelines wird der Gasstrom von Verdichtern am Ort der Einspeisung angetrieben; einige Pipelines verfügen darüber hinaus über Zwischenverdichterstationen.

(70) CCS EN-DE

In oil and gas reservoirs, the displacement of in situ fluids by injected CO_2 can result in most of the pore volume being available for CO_2 storage.

Bei Erdöl- und Erdgaslagerstätten kann dadurch der Großteil des Porenvolumens zur CO_2-Speicherung genutzt werden.

(71) CCS EN-DE

In saline formations, estimates of potential storage volume are lower, ranging from as low as a few percent to over 30% of the total rock volume.

Das Speichervolumen *von* salinaren Formationen ist geringer und liegt schätzungsweise zwischen wenigen Prozent und über 30 % des gesamten Gesteinsvolumens.

Examples (69) to (71) illustrate three examples of non-prototypical lexical schematization at the level of prepositions. In all three cases, the spatially specific ST preposition *in* was replaced by a spatially more schematic TT preposition (*bei* and *von*). As a consequence, the container construal of the tree landmarks in the prepositions' profiles is lost in the TT and the spatial tr-lm configuration is rendered more schematically (see example (20) above). For instance, in the ST sentence in example (69), we have a specific spatial perspective on the process of a flow driven by a compressor since the preposition *in* construes a scene in which the compressor drives this flow *inside* the turbine. The shift to the more schematic preposition *bei* in the TT entails a shift in perspective since now the pipeline and the compressor process are construed in a more abstract way that does not immediately evoke the spatial dimension. The schematization shifts which are observed in examples (70) and (71) seem to be in line with the German technical register which, as discussed in example (55), seems to favour spatially more schematic prepositions for the construal of generic conceptualizations. In both examples (70) and (71), we are concerned with such generic conceptualizations, i.e. the text refers to oil and gas reservoirs and to saline formations in general and not to any specific reservoirs/formations. Example (69), on the other hand, refers to specific pipelines (running through Texas, see example (22) above). However, in this case the more schematic preposition *bei* is also licensed or even favoured by the German register. In this context, Jumpelt (1961:80) points out that English generally seems to favour more precise prepositions than German since there may be a difference in the degree of concreteness with which the two cultures conceptualize spatial and other relations. Of course, this is a rather tentative explanation that would have to be confirmed in more extensive empirical analyses. It is, however, consistent with the (statistically not significant) frequency and distribution of preposition shifts established in this thesis (see the overview in 8.3.2).

(72) Automotive EN-DE

Three major factors contribute to the formation of piston deposits *in* the high speed diesel engine using distillate fuel:

Drei Hauptfaktoren tragen zur Bildung von Kolbenablagerungen *bei* schnellaufenden Dieselmotoren unter Verwendung von Destillatkraftstoff bei:

(73) Automotive EN-DE

In addition, they found that piston deposits and wear increased significantly *in* a motored engine, when sulfur trioxide (an exhaust product) was introduced into the intake air.

Außerdem stellte man fest, daß bei Zugabe von Schwefeltrioxid (ein Auspuffabgasprodukt) zur Ansaugluft ein Anstieg der Kolbenablagerungen und des Verschleißes *beim* geschleppten Motor erfolgte.

Examples (72) and (73) illustrate further instances of lexical schematization at the level of prepositions parallel to those in examples (69) and (70). In both cases, the English preposition *in* has been replaced by the German preposition *bei*, thereby cancelling the container construal imposed by the English preposition and leaving the spatial configuration of the preposition's trajector and landmark implicit. As a result, both TT construals license a rather abstract conceptualization of the engines and the processes observed in these engines, and the spatial dimension is not immediately evoked. Again, the more abstract or schematic construal opted for by the translator is in line with the German technical register since both examples are concerned with a generic conceptualization of an engine (see the discussion of examples (55) and (70) to (71) above).

Determiners

(74) CCS EN-DE

These numbers would increase by 25 % if 'undiscovered' oil and gas fields were included in *this* assessment.

Diese Werte würden bei Einbeziehung „unentdeckter" Öl- und Gasfelder in *die* Bewertung um 25 % ansteigen.

Example (74) is concerned with a schematization at the level of determiners and mirrors the specification shifts in examples (56) and (57). In the present example, the demonstrative determiner *this* was replaced by the definite determiner *die* in the TT. Since the anaphoric pointing function of the demonstrative determiner is lost in the TT, the level of cohesive explicitness decreases slightly. In cognitive linguistic terms, the grounding of the nominal in the current discourse space is more schematic in the TT compared to the ST. The translational reason for this schematization shift may be as follows. The example is a footnote of a table which illustrates the lower and upper estimate of CO_2 storage capacity for different reservoir types. Since this footnote has the function of a paratext (see example (34) above) and is thus somewhat isolated from the main text for which it supplies

additional information, the translator may have refrained from explicitly tying it cohesively to the main text in order to highlight this isolated function of the footnote.

(75) Automotive EN-DE

This deposit on the lower half of the piston was predominantly amber lacquer.

Bei *den* Ablagerungen im unteren Bereich der Ringzone handelte es sich hauptsächlich um eine bernsteingelbe Lackbildung.

Example (75) is the last instance of lexical specification/schematization to be discussed in this thesis. This example illustrates another instance of lexical schematization at the level of determiners. The more specific/schematic grounding of nominal content by means of demonstrative/definite determiners in the current discourse space has already been extensively discussed; we can thus focus on the possible motivation for this implicitation shift. The previous discourse frame is concerned with the fact that fuel sulfur increases deposits on the lower land and lower grooves of the piston. In example (75), these lower lands and lower grooves were construed as *the lower half of the piston* (in German *unterer Bereich der Ringzone*) thereby establishing an explicit link between this instance of *deposits* and the deposits mentioned in the previous discourse frame. The translator may have felt that this explicit link is cohesively sufficient to ensure a coherent integration of the previous and the current discourse frames and that no additional anaphoric pointer in the form of the demonstrative determiner *diesen* is necessary. And indeed, a more explicit construal such as *Bei diesen Ablagerungen im unteren Bereich der Ringzone* may – from a cohesive perspective – be slightly overspecified in this context.

8.3.2 Linguistic distribution of lexical specification/schematization shifts

Distribution of lexical specification/schematization shifts over subcorpora and word classes						
	Noun	**Verb**	**Pronoun**	**Preposition**	**Determiner**	**TOTAL**
CCS EN-DE						
Lexical specification	138	5	-	3	2	**148**
Lexical schematization	75	2	-	4	1	**82**
CCS DE-EN						
Lexical specification	38	-	3	-	2	**43**
Lexical schematization	68	-	-	-	-	**68**
Automotive EN-DE						
Lexical specification	211	6	1	2	3	**223**
Lexical schematization	129	-	-	7	7	**143**
Automotive DE-EN						
Lexical specification	107	-	-	5	2	**114**
Lexical schematization	97	-	-	2	1	**100**
TOTAL	**863**	**13**	**4**	**23**	**18**	**921**

Table 7: Overview of lexical specification/schematization shifts – distribution over subcorpora and word classes

Table 7 shows a detailed linguistic distribution of lexical specification/schematization shifts over subcorpora and word classes. As pointed out in the discussion of example (60), the strong nominalization tendencies of both English and German technical registers entail that the major share of the identified shifts operates at the level of nouns, with the number of verb shifts being correspondingly low. Adverb and pronoun-based shifts hardly occur at all, while there are several preposition shifts (with the exception of CCS DE-EN) and several shifts at the level of determiners.

The focus of the following discussion will be on the category of nouns since it is the quantitatively most relevant category. At this level, lexical specification shifts always outbalance lexical schematization shifts in the EN-DE subcorpora (138 vs. 75 shifts in CCS EN-DE and 211 vs. 129 shifts in Automotive EN-DE). In the other translation direction, a reversed trend can be observed in subcorpus CCS DE (38 specification shifts vs. 68 schematization shifts). In subcorpus Automotive DE-EN, the ratio is more balanced (107 specification shifts vs. 97 schematization shifts). The overall trend that nominal specification seems more prevalent in the translation direction EN-DE and vice versa can, in part, be linked to differences between English and German register requirements. It was shown, for instance in the discussion of examples (41), (42) and (65), that the German

technical register often requires more specific construals than the English technical register, which generally seems to license a higher degree of schematicity.[60] This observation concurs with the higher propositional opaqueness in English as compared to German technical discourse that was observed in the discussion of lexical insertion and deletion. It is also in line with Becher's (2011:197) large-scale investigation of explicitation and implicitation which showed that "the German authors [...] tend to use rather explicit terms for denoting entities, whereas the terminology found in the English part of the corpus is characterized by a considerable degree of implicitness."

Again, the high number of noun specification shifts in the subcorpus Automotive EN-DE (211 shifts) contributes to the unusually high overall number of explicitation shifts in this subcorpus (see 8.1). This high number of noun specification shifts is partly due to the fact that the topic of subcorpus Automotive EN-DE is, among other things, concerned with *fuel* (see 7.1.2.2) and that this term, due to lexicalized differences between the corresponding conceptual systems in English and German, was consistently specified by the more explicit term *Kraftstoff* in German (see example (40) above). At various point, the texts are also concerned with *engine test runs*, which were consistently rendered by the schematic term *run* in English and which were always specified as *Motorlauf* or *Prüfstandslauf* by the German translator (see example (41) above). These two instances alone accounted for 88 shifts which, to some extent, "inflated" the number of noun specification shifts of subcorpus Automotive EN-DE and the overall number of explicitation shifts in this subcorpus. The "anomaly" observed for this subcorpus in 8.1 and the idiosyncratic features that were assumed to be responsible for this anomaly can therefore be partly linked to the topic of the corpus texts. This topic results in a high occurrence of various ST units which, for systemic and discursive reasons, were consistently explicitated in the TT.

Since a distinction was made in 8.3 between prototypical and non-prototypical lexical specification/schematization, we will also have to consider, very briefly, the corresponding distribution of shifts, which is illustrated in the table below.

[60] A similar observation could be made for verbs, see examples (46) to (48).

Prototypicality of lexical specification/schematization shifts (in %)		
	Prototypical	**Non-prototypical**
CCS EN-DE		
Lexical specification	74	26
Lexical schematization	67	33
CCS DE-EN		
Lexical specification	70	30
Lexical schematization	58	42
Automotive EN-DE		
Lexical specification	72	28
Lexical schematization	57	43
Automotive DE-EN		
Lexical specification	64	36
Lexical schematization	53	47

Table 8: Prototypicality of lexical specification/schematization shifts

This table allows the following observation. For all four subcorpora, there is a clear trend towards prototypical lexical specification, with this trend being most prominent in subcorpus CCS EN-DE (74 vs. 26 percent). In all four subcorpora, the same trend towards prototypicality can also be observed for lexical schematization; however, in this case, it is less pronounced, with the distribution in subcorpus Automotive DE-EN being almost balanced (53 vs. 47 percent). If we equate prototypical specification/schematization shifts with those shifts which require an intentional decision on the part of the translator to explicitate/implicitate (at the level of *parole*) and non-prototypical shifts with those shifts that are primarily induced by features of the two language systems coming into contact in translation (at the level of *langue*)[61], we can interpret the distribution above as follows: In both translation directions, there is a clear trend towards prototypical and hence intentional explicitation, whereas this trend is still intact but less pronounced for intentional implicitation. This suggests that both English-German and German-English translators may be more willing to perform intentional explicitation shifts and are somewhat more hesitant with intentional implicitation shifts. Again, this observation would be broadly in line with

[61] This is not quite correct since preposition-based shifts, which are generally associated with intentional decisions on the part of the translator, were also counted as instances of non-prototypical (and hence non-intentional) lexical specification/schematization. However, as can be seen in table 7 above, these shifts are quantitatively negligible (although they are qualitatively very interesting) and can therefore be ignored in the present discussion.

the Asymmetry Hypothesis (see 6.3 and 8.2.2), according to which translators often fail to perform optional implicitation shifts to outbalance optional explicitation shifts.

8.4 Relational specification and schematization

In contrast to lexical insertion/deletion, which is concerned with the introduction of new meaningful elements into the TT or the deletion of such elements in the TT, and lexical specification/schematization, which operates along the paradigmatic dimension of lexical units already present in the ST, relational specification and schematization operate on the syntagmatic plane, "where two or more [component] structures [...] combine to form a composite structure of greater size" (Langacker 1987:75, boldface removed, see also 7.2.2.2). It must be pointed out in this context that – although this "horizontal" dimension of explicitation and implicitation is considered in Klaudy/Károly's well-known classification discussed in 7.2.2.1 (in the form of grammatical specification/generalization and grammatical elevation/lowering) – it does not seem to be widely recognized as a prototypical form of explicitation and implicitation in translation studies since it is missing in most of the major studies of explicitation and implicitation in the discipline (e.g. Øverås 1998; Englund Dimitrova 2005; Becher 2011). And indeed, relational specification/ schematization seems to be somewhat set apart from the other two categories of explicitation and implicitation investigated in this thesis since part of the corresponding shifts can be attributed to systemic differences between English and German (see 8.4.2 below). On the other hand, most of the explicitation and implicitation shifts in the other two categories could be linked to intentional decisions of the translators at the discourse or *parole* level (see the previous discussion in 8.3.2). Relational specification/schematization therefore exhibit traits of Klaudy's *obligatory explicitation*, which "is dictated by differences in the syntactic and semantic structure of languages" (Klaudy ^{2}2009:106).[62] This partially obligatory character of relational specification/schematization shifts may be the reason why this dimension of explicitation and implicitation often fails to feature in studies which are positioned with regard to the Explicitation Hypothesis (see 6.1.3). Since this hypothesis postulates the universal character of explicitation regardless of "differences between the two linguistic and textual systems involved" (Blum-Kulka 1986:19), studies trying to confirm or falsify this hypothesis often aim to exclude instances of obligatory

[62] The obligatory shifts in the category of relational specification/schematization are, of course, related to syntactic (or rather grammatical) and not to semantic differences between English and German.

explicitation from analysis (see Becher 2011:36). This decision is certainly justifiable in the context of the Explicitation Hypothesis, but studies taking a more neutral view on explicitation (and implicitation) should certainly include this dimension in their investigation.[63] After all, if we view explicitation and implicitation as potential indicators of text-context interaction in translation, there is no reason why obligatory shifts should be any less interesting than those which are not obligatory (see also 8.1).

The investigation of relational specification and schematization shifts in the scientific/technical corpus yielded the following patterns of linguistic realization:

Firstly, relational specification/schematization could be observed when ST compounds were rendered as prepositional word groups in the TT and vice versa. An example of such a shift would be the "unpacking" of the English compound *diesel piston deposit formation* in the German prepositional word group *Bildung von Ablagerungen an Kolben in Dieselmotoren* (see example (81) below). According to Heyvaert (2011:237), the integration of the various component structures of this term into the overall composite structure "depend[s] on (semantic and phonological) 'correspondences' established between substructures within the component elements". These (semantic) correspondences remain "hidden" or implicit in the ST term and are made explicit in the TT prepositional word group. In this context, Krein-Kühle (2003:267) points out that

> [c]ompounds [...] are one of the greatest challenges faced by translators due to the differences in SL and TL term formation processes and the complexity of the relations between their constituents [...] so that their semantic-pragmatic analysis and translation is a very creative performance.

Excluded from the category of relational specification/schematization were English prepositional word groups in *of*-relation encoding genitive relations (e.g. *mixture components → components of the mixture*) and corresponding German genitive constructions (*Mischungskomponenten → Komponenten der Mischung*) since the genitive relation made explicit by these shifts is still very schematic[64] (see examples (9), (18) and (32) above). This also applies to the "condensation" of such ST genitive constructions into TT compounds. Due to the lack of significant semantic content involved in these shifts, they were classified as clear-cut instances of expansion or reduction.

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[63] For a criticism of the "narrowing of perspective" that a universalist view on explicitation may entail, see 6.1.2.

[64] On the relative schematicity of the preposition *of* see 4.2.4.

Secondly, relational specification/schematization was observed in the context of (non-) hyphenation in coordinated constructions involving ellipses. An example of such a shift would be *sulphur and nitrogen oxides → Schwefel- und Stickoxide* (see example (84) below). Due to different hyphenation requirements in English and German, the German construal makes the relations between the components of this coordinated construction more explicit (more on this in the actual examples). Since (non-)hyphenation is guided by rules of grammar of the two languages, corresponding shifts will always be instances of obligatory explicitation/implicitation and will be strictly bound to the translation direction investigated.

Thirdly, relational specification/schematization can be linked to the (non-)inflection of certain lexical units. An example of such a shift would be *Kalziumoxid und CO_2, das in einfacher Weise abgeführt werden kann → calcium oxide and CO_2, which can be readily removed* (see example (91) below). In German, the relative pronoun *das* and the finite verb *kann* are inflected to show number agreement with the modified head structure and thus make explicit that the relative clause modifies only one and not both potential heads. Due to the (grammatically induced) non-inflection of these elements in English, this information remains implicit in the TT. Such (non-)inflection-based shifts are again prime examples of obligatory explicitation/implicitation and will also be strictly bound to the translation direction investigated.

Finally, relational specification/schematization can be brought about by a change in word order in the translation. Consider the following example:

Das […] MEA/Wassergemisch wird unter erheblicher Wärmezufuhr regeneriert und rezirkuliert.
The MEA/water mixture […] is regenerated with considerable input of heat and recirculated.

In the German ST, it remains unclear whether the prepositional phrase *unter erheblicher Wärmezufuhr* modifies both the regeneration and the recirculation process or only the regeneration process (see also 5.4.2). By changing the word order, the translator cancelled one of these possible interpretations, thus making explicit that it is only the regeneration process that occurs with considerable input of heat (see example (88) below). The analysis showed that such shifts can be both obligatory and non-obligatory.

8.4.1 Qualitative discussion of relational specification/schematization shifts

Overview of relational specification and schematization shifts				
	Compound ↔ prepositional word group	**(Non-) hyphenation**	**(Non-) inflection**	**Change of word order**
Relational specification	147	16	5	7
Relational schematization	-	18	12	3

Table 9: Overview of relational specification/schematization shifts

Table 9 gives an overview of the distribution of relational specification/schematization shifts according to their linguistic realization, with the large majority of shifts being realized by rendering ST compounds by TT prepositional word groups. The qualitative discussion below is structured according to this table, starting with relational specification shifts and proceeding from left (compound ↔ prepositional word group) to right (change of word order).

8.4.1.1 Explicitation: relational specification

Compound → prepositional word group

(76) CCS EN-DE

Ocean storage has not yet been deployed or demonstrated at a pilot scale, and is still in the research phase.

Die CO_2-*Speicherung im Ozean* befindet sich derzeit in der Forschungsphase, eine Demonstration im Pilotmaßstab steht noch aus.

(77) CCS EN-DE

For a modern pulverized coal (PC) power plant or a natural gas combined cycle (NGCC) power plant, current *post-combustion capture systems* would typically employ an organic solvent such as monoethanolamine (MEA).

Bei modernen kohlenstaubgefeuerten Kraftwerken oder erdgasbefeuerten Kombikraftwerken (Natural Gas Combined Cycle, NGCC) würde bei den aktuellen *Abscheidungsverfahren nach der Verbrennung* in der Regel ein organisches Lösungsmittel wie z. B. Monoethanolamin (MEA) eingesetzt werden.

(78) CCS EN-DE

Existing *CO_2 storage projects*

Bestehende *Projekte zur CO_2-Speicherung*

Examples (76) to (78) illustrate instances of relational specification by "unpacking" relatively schematic ST compounds into more specific TT prepositional word groups. As a

result, the relations between the component structures of the overall composite structures are made more explicit in the TT. In example (76), the TT preposition *im* imposes a relational profile that arranges the two component structures of the original ST compound into a spatial trajector-landmark configuration, specifying that the CO_2 is stored *in* the ocean itself and not, for example, in geological formations *under* the ocean.[65] This semantic correspondence between the component structures *ocean* and *storage* remains hidden in the ST compound and has to be inferred by the ST audience from their domain knowledge about the component structures. According to Langacker (2008:61, boldface in original), "[h]ow an expression's composite meaning relates to those of its components (at successive levels of organization) is called its **compositional path**", which, in the present case, would correspond to the spatial arrangement of the component structures *ocean* and *storage*. Therefore, the translation of ST compounds by TT prepositional word groups entails that the compositional path between the component structures is made explicit in the word group.

Example (77) illustrates a similar case. Here, especially the semantic contribution of the component structure *post-combustion* (which, at a lower level of organization, consists of the two component structures *post* and *combustion*) to the overall composite structure *post-combustion capture systems* is made more explicit in the TT prepositional word group. The TT construal *nach der Verbrennung* specifies that, in this capture system, the capture is a process downstream of the combustion process; it is not a capture system that involves the post-combustion of specific elements (this would have to be rendered, for example, as *Abscheidung mit Nachverbrennung*). Again, this compositional path between the individual component structures of the composite structure is made explicit in the TT prepositional word group, whereas it remains implicit in the highly condensed/schematic ST compound.

In example (78), the translator also specified the compositional path between the component structures of an ST compound by rendering it as a prepositional word group in the TT. Again, the component structures are arranged into a tr-lm configuration, with the final preposition *zu* making explicit that CO_2 storage is the primary aim or objective of these projects. The more schematic profile of the ST compound would also have licensed the interpretation that we are concerned with projects having another primary focus, for

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[65] For the purpose of this example, we will ignore the fact that *storage* has been specified as *CO_2-Speicherung* in the target text. This shift was counted as a separate instance of lexical specification.

example, power plant projects that employ CO_2 storage as an additional technology. While, in the case of the more schematic ST construal, the correct interpretation must be established by making reference to the current discourse space in its relevant dimensions, it has actually been explicitly encoded in the more specific TT construal.

(79) CCS DE-EN

Ein wichtiges Forschungsfeld ist die Prognose möglicher Reaktionen zwischen CO_2, *Lagerstättenwasser* und den Gesteinen der Speicher- und Deckschichten.

An important field of research is the forecasting of possible reactions between CO_2, *water in the gas fields*, and the rocks of the storage and overlying strata (see below).

(80) CCS DE-EN

Die Adsorptionseigenschaften der Kohle für CO_2 und Methan unter *Lagerstättenbedingungen* sind noch nicht hinreichend bekannt und durch Hochdruckexperimente zu ermitteln.

The adsorption properties of coal for CO_2 and methane under *conditions in coal deposits* are not yet adequately known and should be determined by high-pressure experiments.

Examples (79) and (80) illustrate instances of relational specification by rendering ST compounds as TT prepositional word groups for the translation direction DE-EN. While this type of shift is more prevalent in the translation direction EN-DE (see 8.4.2), several instances were also identified in the other translation direction, although to a significantly smaller degree. In both examples, the compositional path between the component structures of the overall composite structure is made more explicit in the TT since the preposition *in* imposes a relational profile that assigns trajector and landmark status to the two component structures and arranges them in a specific spatial configuration (see also example (76) above).[66] As a result of this shift, the component structure or landmark *Lagerstätte* (deposit, reservoir or storage site) is construed as a container and it is specified that the other component structure/the trajector (the substance *water* in the first example and a more abstract state of affairs (*conditions*) in the second example) is "located" inside the landmark. This interpretation remains implicit in the more schematic ST compound, although it will be highly salient to the audience due to their assumed semi-expert knowledge on the topic covered in the text and due to the semantic interaction of the component structures of the compound. For example, the profile of *Wasser* will certainly

[66] For the purpose of the present discussion, we will ignore the fact that the ST term *Lagerstätten* was specified as *gas fields* and *coal deposits* in the two examples. These shifts were counted as separate instances of lexical specification.

highlight the CONTAINER domain in the domain matrix of *Lagerstätte*, thus making the correct interpretation *water in the field/deposit/storage site* the most plausible interpretation (see also Langacker 2008:53, 166). It must be pointed out that the translation solutions in both example (79) and (80) seem to be somewhat idiosyncratic since the English technical register generally seems to favour compounding over the use of prepositional word groups in these contexts. This is evidenced both by the statistical figures of the present investigation (see 8.4.2) and by a search of the original English text of subcorpus CCS EN-DE (serving as a reference corpus for CCS DE-EN). This search showed that, in original English texts on the same subject, both *water* and *deposits* (or rather the synonym *reservoirs* in this case) generally occur within compounds.[67] The prepositional word groups in examples (79) and (80) may therefore be slightly marked from the point of view of English technical register.

(81) Automotive EN-DE

The foregoing review indicates the need for more fundamental understanding of the factors affecting *diesel piston deposit formation*.

Aus dem zuvor gegebenen Überblick wird deutlich, daß ein fundierteres Grundwissen im Hinblick auf die Faktoren erforderlich ist, die die *Bildung von Ablagerungen an Kolben in Dieselmotoren* beeinflussen.

(82) Automotive EN-DE

Second, the *top groove and ring deposits* were measured gravimetrically.

Zweitens wurden die *Ablagerungen in der 1. Kolbennut sowie am Ring* durch eine Gewichtsanalyse bestimmt.

(83) Automotive EN-DE

CONSEQUENCES OF THE *TOP GROOVE DEPOSIT TEMPERATURE CORRELATION*

KONSEQUENZEN DER *BEZIEHUNG ZWISCHEN DER BILDUNG VON ABLAGERUNGEN IN DER 1. KOLBENNUT UND DER TEMPERATUR*

Examples (81) to (83) are the last instances of compound → word group specification to be discussed here. All examples illustrate the high productivity of compounding in English expert-to-expert discourse, the 5-element compound *top groove deposit temperature correlation* in (83) being a prime example. Although German technical discourse also relies heavily on compounding as a productive means of linguistic economy, Wüster

[67] For example, *in situ water* and *deep ocean water* or *reservoir engineering* and *reservoir dynamics*.

([2]1985:34) and Arntz et al. ([6]2009:117) point out that English has a much higher capacity of stringing together root morphemes than German (see also Franck 1980:108). In examples (81) and (82), the schematic ST compounds "hide" the spatial relations between their component elements whereas these relations have to be made explicit in the TT prepositional word groups. This is illustrated quite nicely by the construal *Bildung von Ablagerungen **an** Kolben **in** Dieselmotoren* in example (81). Given the broad common ground that can be assumed between the expert-to-expert discourse participants, the very dense English compounds are certainly an appropriate means of condensing information and ensuring a high linguistic economy in the ST without there being any risk of misunderstanding (since the expert audience will certainly be able to form the intended specific conceptualizations based on the highly schematic compound construals). However, in many of these cases, German does not seem to provide a lexicalized default construal that condenses the information at the same level of schematicity as the ST. In example (81), for example, there exists no German equivalent at the same level of structural schematicity such as *Diesel(motor)kolbenablagerungsbildung* and the *ad hoc* formation of such a compound as a *text-related terminological unit* (Krein-Kühle 2003:264, see also example (58) above) would be highly marked from the perspective of German technical register. Consequently, many of the multi-element compounds occurring in the English ST[68] had to be rendered as prepositional word groups in the TT since the German technical register often does not seem to license the formation of structurally analogous TT compounds at the same level of schematicity.

(Non-)hyphenation

(84) CCS EN-DE

However, the need for additional gas treatment systems to remove pollutants such as *sulphur and nitrogen oxides* (FS1) lowers the level of CO_2 captured to slightly more than 90%.

Allerdings wird die Menge des abgetrennten CO_2 aufgrund der erforderlichen zusätzlichen Gasbehandlungssysteme zur Entfernung von Schadstoffen wie *Schwefel- und Stickoxide* auf etwas über 90 % herabgesetzt.

[68] Many of which, such as *top groove deposit temperature correlation* in example (83) above, seem to be such instances of *text-related terminological units*. Krein-Kühle (2003:264) contrasts these *ad hoc* compounds with "terminology proper, by which unequivocal designations are established via definitions".

(85) CCS EN-DE

Capture processes also have been used to obtain commercially useful amounts of CO_2 from flue gas streams (FS2) generated by the combustion of *coal or natural gas*.

Auch zur Gewinnung von wirtschaftlich nutzbaren Mengen von CO_2 aus dem Rauchgas bei der Verbrennung von *Kohle oder Erdgas* werden Abtrennungsverfahren eingesetzt.

Examples (84) and (85) illustrate instances of relational specification by hyphenation or non-hyphenation in the target text. In example (84), the coordinated ST construction *sulphur and nitrogen oxides* leaves implicit whether we are concerned with a) sulphur oxide(s) (S_xO_y) and nitrogen oxide(s) (NO_x) or b) sulphur (S) and nitrogen oxides (NO_x). In other words, it does not become clear from the ST construal whether *oxides* was used elliptically once, i.e. *sulphur (oxide) and nitrogen oxide*. The plural form *oxides* may point in this direction; however, there are various nitrogen oxides (e.g. dinitrogen tetroxide or dinitrogen pentoxide) so that interpretation b) above seems admissible based on the ST construal and the domain-related reality that serves as frame of reference for this text. In the case of elliptical usage in coordinated constructions, the German grammar prescribes the use of a hyphen to mark the ellipsis (see Duden vol. 4 ^{8}2009:88), whereas no such marking is required in English. Due to this mandatory German hyphenation, the translator had to make explicit whether the first element in the coordinated construction is an independent composite structure (***Schwefel*** *und Stickoxide*) or whether it serves as a component structure of a higher-level composite structure (***Schwefel-oxid*** *und Stickoxid*). Therefore, the hyphen in the German construal *Schwefel- und Stickoxide* in the example above makes explicit that interpretation a) was the intended one. Again, the compositional path – in this case the information that *sulphur* and *oxide* are component structures that form the composite structure *sulphur oxide(s)* – is made more explicit in German. Without this relational specification, the explicitated information would have to be inferred from the current discourse space.[69]

[69] The inferencing process may look like this: The discourse context makes explicit that CO_2 capture is employed in power plants that burn fuel to convert it into electrical energy. The domain matrix of *oxides* will contain the information that such oxides are by-products of combustion processes (CREATION or CAUSAL CHAIN, agentive role) and that they are generally considered to be pollutants (not covered by *qualia* structure). This information can also be claimed to be salient for the intended semi-expert audience. Since the elements to be removed are classified as pollutants in the text, the information that it is sulphur oxide(s) and not sulphur that is to be removed should be reasonably salient in the CDS.

Example (85) illustrates a similar case. Due to the strict German hyphenation rules, the non-hyphenation in the German TT construal makes explicit that it is not a) coal gas or b) natural gas but rather a) coal or b) natural gas that produces flue gas streams if it is burned. At least this is the intended interpretation in this case since, generally, the combustion of coal gas is also a feasible process in power plants (see, for example, Doležal 2001:166). This means that the domain-related reality serving as a frame of reference for the text would, in principle, license both interpretations above. Again, due to German grammar requirements the compositional path underlying the coordinated construction or the composite structure is made more explicit in the target text, thus cancelling the unintended interpretation. Again, the intended semi-expert audience of the ST would have to resort to the relevant dimension(s) of the CDS (primarily the discourse context or the knowledge context) to infer the intended interpretation.

Inflection

(86) CCS EN-DE

In addition, there is an increase in the consumption of chemicals such as ammonia and limestone *used* by PC plants for nitrogen oxide and sulphur dioxide emissions control.

Darüber hinaus kommt es zu einer Zunahme des Verbrauchs von Chemikalien wie Ammoniak und Kalkstein, *die* in kohlenstaubgefeuerten Kraftwerken zur Regulierung der Stickoxid- und Schwefeldioxidemissionen eingesetzt *werden*.

This example illustrates an instance of relational specification by means of TT inflection. The reduced relative clause using the past participle (*used by PC plants*) has no structural correspondence in German and thus had to be rendered as a non-reduced relative clause in the TT (an alternative would have been a (probably too lengthy) premodification). As a consequence, the translator had to make the compositional path between the component structures of the composite structure more explicit. For the present discussion, the relevant composite structure would be the phrase *chemicals such as ammonia and limestone used by PC plants*. This ST construal leaves implicit whether the reduced relative clause modifies only the head structure *limestone* or both potential heads, i.e. *ammonia* and *limestone*. Therefore, it is not clear from the ST construal whether there is a compositional path between *ammonia* and the reduced relative clause, in other words, whether *ammonia* is a component structure of the composite relative clause structure. Again for grammatical reasons, the German translator had to make this information explicit since, in German, the relative pronoun and the finite verb of a relative clause have to show number agreement

with their head(s), whereas the English past participle is not inflected for number. The plural form of the relative pronoun (*die*) and the plural form of the finite verb (*werden*) thus make explicit that the relative clause modifies both heads, i.e. that it is both ammonia and limestone that are used in PC plants in order to control emissions (this will also be the most plausible interpretation of the above ST construal). This shift is again an instance of obligatory explicitation, this time resulting from different inflection requirements of English and German grammar.

Change of word order

(87) CCS EN-DE

> This type of release is likely to be *detected quickly and stopped using techniques* that are available today for containing well blow-outs.
>
> Diese Art der Freisetzung wird wahrscheinlich *schnell entdeckt und mithilfe von Techniken* zur Eindämmung von Bohrlochausbrüchen *gestoppt* werden.

Example (87) is concerned with an instance of relational specification by changing the word order of the TT, thus eliminating one of two possible interpretation licensed by the relationally more schematic ST construal. It does not become clear from the ST's present participle construction *using* whether it modifies one or both of the possible verbal heads (see example (86) above). This gives rise to two possible interpretations: a) techniques available for containing well blow-outs are used to detect and stop the release and b) the release is detected by whatever means and then stopped by specific techniques for containing well blow-outs. The information that these techniques were specially designed for *containing* well blow-outs may point to interpretation b) but there seems to be no plausible reason why such a containment technique should not be equipped with a corresponding detection mechanism as well. Again, the German translator made the compositional path within the composite structure more explicit, this time by rendering the English participle construction as a prepositional phrase (*mithilfe von Techniken*) and moving this prepositional phrase between the two verbs *entdeckt* and *gestoppt*. As a result of this explicitation shift, interpretation a) above is eliminated since it is made clear that no compositional path runs between the verb *detected*/*entdeckt* and the participle construction/prepositional phrase.

It seems that this shift was actually an obligatory shift since there is no translation solution that would preserve the same level of structural schematicity as the ST construal. A postmodification similar to the English present participle construction is grammatically

impossible in German. A premodification in front of the two verbs (*wird mithilfe von Techniken [...] schnell entdeckt und gestoppt*) would have been feasible from a structural point of view and it would be schematic as to whether one or both verbs are modified by the prepositional phrase. However, this premodification would, in any case, give rise to the false interpretation that the release is detected by means of techniques for containing well blow-outs. Therefore, it seems that, in the present example, the translator could only mistranslate (premodification in front of the two verbs) or opt for a more explicit construal licensing the correct interpretation (premodification between the two verbs).

(88) CCS DE-EN

Das nach der Absorption mit CO_2-beladene MEA/Wassergemisch *wird unter erheblicher Wärmezufuhr regeneriert und rezirkuliert*.

The MEA/water mixture loaded with CO_2 after absorption *is regenerated with a considerable input of heat and recirculated*.

Example (88) illustrates another instance of relational specification by changing the word order in the TT. This shift is comparable to the shift discussed in example (87) above, although the translation direction is reversed. It is not clear from the ST composite structure *wird unter erheblicher Wärmezufuhr regeneriert und rezirkuliert* whether the component structure/prepositional phrase *unter erheblicher Wärmezufuhr* modifies only the verb *regenerieren* or also the verb *rezirkulieren* (see also the discussion in 5.4.2). In other words, it is not clear whether there is a compositional path running between the verb *rezirkulieren* and the prepositional phrase. In the target text, the translator moved the prepositional phrase *with a considerable input of heat* between the two verbs, thus specifying that it is only the regeneration process and not the recirculation process that requires the input of heat. As in example (87), this seems to be an obligatory explicitation shift since the target language does not allow a construal at the same level of structural schematicity as the source language. A premodification parallel to the ST construal is grammatically impossible in English. A postmodification after the two verbs would be schematic as to whether it modifies one or both potential heads, but it would, in any case, give rise to the false interpretation that the recirculation process requires the input of heat (*regenerated and recirculated with a considerable input of heat*). As in example (87), it seems that the translator only had the choice to either mistranslate (postmodification after the two verbs) or to opt for a more specific construal giving rise to the correct

interpretation (postmodification between the two verbs). There seems to be a linguistic regularity at work in examples (87) and (88) that could be stated as follows:

English postmodification with two or more potential heads has no structural equivalent at the same level of schematicity in German and must therefore be specified in translation.

German premodification with two or more potential heads has no structural equivalent at the same level of schematicity in English and must therefore be specified in translation.

8.4.1.2 Implicitation: relational schematization

(Non-)hyphenation

(89) CCS DE-EN

Bei dieser Technologieroute wird *Kohle oder Erdgas* in einer Atmosphäre aus O_2/CO_2 verbrannt.
In this technology route, *coal or natural gas* is combusted in an O_2/CO_2 atmosphere.

(90) CCS DE-EN

Grundsätzlich fehlt bislang eine katastermäßige Erfassung, Bewertung und Kapazitätsermittlung potenzieller *Speichergesteine und -strukturen* sowie der Deckschichten.
There is a basic lack of a systematic survey, evaluation and capacity identification of potential *storage rocks and structures* and also of the overlying strata.

Examples (89) and (90) illustrate instances of relational schematization due to different hyphenation rules in English and German. Example (89) mirrors example (85) from subcorpus CCS EN-DE. In the present case, the non-hyphenation in the German source text makes explicit that either a) coal or b) natural gas is burned in the O_2/CO_2 atmosphere. Since there is no corresponding hyphenation rule in English, the TT construal *coal or natural gas* can give rise to two different interpretations, i.e. that either a) natural gas or coal or b) natural gas and coal gas are burned in the O_2/CO_2 atmosphere. As was shown in example (85), both interpretations would principally be licensed by the domain-related reality serving as the frame of reference of the text. Again, this is an obligatory explicitation shift induced by different grammatical requirements in German and English. As the comparison with example (85) shows, such shifts will be strictly bound to specific translation directions.

Example (90) illustrates a similar case. Here, the German coordinated construction *Speichergesteine und -strukturen* is an elliptical construction, as indicated by the hyphen. As a result, the German construal makes explicit that the determinant *Speicher-* and the nucleus noun *-strukturen* are two component structures that are integrated to form the composite structure *Speicherstrukturen*; in other words, we are concerned with both

storage rocks and storage structures. Due to the non-hyphenation in English, the TT construal is more schematic in this regard since it does not make explicit that there is a compositional path running between *storage* and *structures*. Therefore, the TT construal could also give rise to the – somewhat less likely but still probable – interpretation that we are concerned with storage rocks and some general structures pertaining to something else than the storage formation. In order to cancel this second interpretation, the translator could have opted for a more specific construal such as *storage rocks and storage structures*, which, however, would have been less economic.

Non-inflection

(91) CCS DE-EN

> Die hohe Abwärmetemperatur der SOFC ermöglicht die thermische Zerlegung von Kalziumkarbonat in Kalziumoxid und CO_2, *das* in einfacher Weise aus dem Reaktor bei 1 bar abgeführt werden *kann*.
> The high waste heat temperature of the SOFC enables calcium carbonate to be thermally decomposed into calcium oxide and CO_2, *which* can be readily removed from the reactor at 1 bar.

Example (91) illustrates an instance of relational schematization due to the non-inflection of English relative pronouns and finite verbs for number. This example is similar to example (86) from subcorpus CCS EN-DE, although the translation direction is reversed. Again, we are concerned with a relative clause and two potential heads that this relative clause can modify (calcium oxide and CO_2). In the German ST, both the relative pronoun *das* and the finite verb *kann* are inflected for number (singular) to agree with their head, thus making explicit that there is only a compositional path between one head and the relative clause; in other words, it is only the CO_2 that can be removed from the reactor at 1 bar. The non-inflection for number of the English relative pronoun *which* and the finite verb *can* in the TT construal would principally also license the incorrect interpretation that it is both calcium oxide and CO_2 that can be removed from the reactor. For the intended semi-expert audience of this text, this incorrect interpretation will certainly be cancelled in light of the wider discourse context, which is specifically concerned with the capture (or removal) of CO_2. It will therefore be obvious from this discourse context (or from the domain knowledge of the audience) that the process described in this example is intended to remove only the CO_2 and not the CO_2 and the calcium oxide from the reactor.

(92) Automotive DE-EN

Der unlegierte Sphäroguß (GOETZE-Werkstoff KV1) hat erwartungsgemäß einen höheren Verschleiß als der legierte Sphäroguß F15 bzw. das legierte bruchfeste Gußeisen mit Lamellengraphit F14, wobei jedoch die Ringe aus den drei nitrocarburierten Gußeisenwerkstoffen den verchromten Ringen deutlich unterlegen sind, und zwar sowohl in den Werten des Absolutverschleißes als auch in der Steigung der Verschleißkurve, *die* Rückschlüsse auf das Langzeitverschleißverhalten *gestattet*.

As expected, the unalloyed ductile iron (GOETZE material KV1) exhibits higher wear than the alloyed ductile iron F15 and the alloyed break-resistant grey cast iron F14, though the rings made of the three nitrocarburized cast iron materials are markedly inferior to the chromium plated rings both in terms of the absolute wear values and the slope of the wear curve, from *which* the long-time wear behaviour *can* be inferred.

Example (92) illustrates a further instance of relational schematization due to non-inflection. The German relative pronoun and the finite verb are inflected for number to show agreement with the head(s) of the relative clause. In the ST, the relative pronoun *die* and the finite verb *gestattet* are inflected for singular[70], making explicit that the relative clause modifies the head *Steigung der Verschleißkurve*; i.e. it is only the slope of the wear curve from which the wear behaviour can be inferred. In cognitive linguistic terms, there is only a compositional path running between one of the potential heads and the relative clause and only this head and the clause are the component structures that are integrated to form the relevant composite structure. In the English TT, neither the relative pronoun *which* nor the finite verb *can* are inflected for number. Due to this higher grammatical schematicity, it is not clear whether it is a) only the slope of the wear curve or b) this slope plus the absolute wear values from which the wear behaviour can be inferred.

Change of word order

(93) CCS DE-EN

In der Feuerung entstehen bei der Verbrennung von Kohle und Sauerstoff hauptsächlich CO_2 und Wasserdampf, die zunächst einem Dampferzeuger zugeführt werden.

During the combustion of coal and oxygen, CO_2 and water vapour are mainly produced in the firing system and are then fed into a steam generator.

Example (93) is the last shift to be discussed in this thesis. This example illustrates an instance of relational schematization by changing the word order in the TT. The ST

[70] Although *die* is inflected for singular plus female gender in this case and, as a result, shares its shape with the plural form *die*. Therefore, in this example, the responsibility for indicating whether the relative clause modifies one or both potential heads falls on the inflected verb *gestattet*.

explicitly states that the firing system is the locus where, during the combustion of coal and oxygen, the elements CO_2, water vapour and small quantities of one or more other, not further specified, products are produced. In the TT, the lexical unit *firing system* was moved to the end of the clause, with the resulting construal licensing two qualitatively different interpretations: 1) the interpretation illustrated above, and 2) that CO_2 and water vapour are mainly produced in the firing system but that small quantities of these products are also produced in one or more other systems. These two interpretations seem to require a different phonological stress. For interpretation 1) (which would be the correct interpretation), the stress would be on *CO_2 and water vapour*, whereas for interpretation 2) it would be on *firing system*. Since the word order shift in the ST construal licenses an unintended second interpretation by making the relations between the component structures within the clause more schematic, this shift was classified as an instance of relational schematization. It must be pointed out in this context that the target text is not a very good translation solution since the information structure of the sentence is not very clear. The ambiguous reading of the TT construal could easily have been avoided, for example by moving the adverb *mainly* in front of the subject position (*During the combustion, mainly CO_2 and water vapour are produced in the firing system*). Contrary to the other shifts associated with a change of word order (examples (87) and (88) above), this schematization shift was not obligatory since it resulted from a deliberate (and somewhat unfortunate) choice of word order by the translator, where an alternative (more explicit) word order would have been possible. This shows that some explicitation and implicitation shifts can also be the result of defective or suboptimal translation solutions.

8.4.2 Linguistic distribution of relational specification/schematization shifts

Distribution of relational specification/schematization shifts over subcorpora and linguistic realization					
	Compound ↔ prep. word group	**(Non-) hyphenation**	**(Non-) inflection**	**Change of word order**	**TOTAL**
CCS EN-DE					
Relational specification	25	13	3	5	**46**
Relational schematization	-	-	-	-	**-**
CCS DE-EN					
Relational specification	4	-	-	2	**6**
Relational schematization	-	13	5	3	**21**
Automotive EN-DE					
Relational specification	118	3	2	-	**123**
Relational schematization	-	-	-	-	**-**
Automotive DE-EN					
Relational specification	-	-	-	-	**-**
Relational schematization	-	5	7	-	**12**
TOTAL	**147**	**34**	**17**	**10**	**208**

Table 10: Overview of relational specification/schematization shifts – distribution over subcorpora and linguistic realization

Based on table 10, we can make the following observations. Firstly, in the subcorpora CCS EN-DE and Automotive EN-DE, no instances of relational schematization were identified. This may not come as a surprise if we recall that two of the four linguistic manifestations of relational specification/schematization discussed in 8.4 are types of obligatory explicitation/implicitation resulting from systemic differences between English and German grammar. These systemic differences (relating to (non-)hyphenation and (non-) inflection) point to a higher grammatical explicitness of German compared to English – at

least with regard to the two grammatical subsystems concerned.[71] Therefore, the corresponding shifts will be strictly bound to the translation direction investigated; in other words, hyphenation or inflection-based schematization shifts are not possible in the translation direction EN-DE. Also, in both subcorpora, the identified shifts from prepositional word groups to compounds were restricted to schematic prepositional word groups in *of*-relation (e.g. *emissions of greenhouse gases* → *Treibhausgasemissionen*), which were excluded from analysis for reasons laid out in 8.4. Finally, shifts pertaining to changes in word order are quantitatively impoverished in all of the four subcorpora and for both translation directions, so the absence of corresponding schematization shifts in the subcorpora CCS EN-DE and Automotive EN-DE is also not very striking.

Secondly, there are very few instances of relational specification in subcorpus CCS DE-EN (6 shifts) and no instances of such specification in subcorpus Automotive DE-EN. This observation mirrors the observation above. Since German inflection and hyphenation rules result in a higher structural explicitness of German as compared to English, there can be no corresponding explicitation shifts in translations from German into English. Also, given the slightly higher compounding capacity of English, it is also not surprising that there are only few or even no instances of explicitation by unpacking German compounds into English prepositional word groups.

Finally, there is a very high number of compound → prepositional word group shifts in subcorpus Automotive EN-DE (118 shifts), which again contributes to the high overall number of explicitation shifts in this subcorpus (see 8.1). This is primarily due to the fact that the source text of this expert-to-expert subcorpus contains a high number of highly condensed text-related terminological units or compounds, such as *diesel piston deposit formation* or *top groove deposit temperature*, which, primarily because of German register restrictions, could not be recreated at the same level of structural schematicity in the German ST and had to be rendered as prepositional word groups instead (see the discussion of examples (81) to (83) above). The markedly lower number of such compound → prepositional word group shifts in subcorpus CCS EN-DE is probably due to the fact that the texts of this subcorpus are geared toward a semi-expert audience and hence

[71] Becher (2011:224) rightly argues in this context that we need to be careful with statements about the explicitness of the grammar of a language *per se* (which may exhibit traits of both relative explicitness and relative implicitness) and should instead focus on comparing "individual systems and subsystems of English and German grammar in order to answer more specific research questions."

exhibit a lower degree of technicality. This lower degree of technicality translates, among other things, into a lower number of highly condensed multi-element ST compounds that would probably have to be unpacked in the German target text.[72]

8.5 Borderline cases

The designation *borderline cases* may be somewhat misleading since all of the shifts illustrated below were classified as instances of expansion/addition or reduction/omission (as they were perceived to be situated sufficiently close to the corresponding endpoints of the two continua). Therefore, they do not feature in the statistical figures on explicitation and implicitation discussed in 8.1. I still chose to call them *borderline cases* because these shifts exhibit a certain "family resemblance" with explicitation and implicitation and, more importantly, because they are often treated as instances of explicitation/implicitation in studies which (intentionally or unintentionally) remain ignorant of the adjacent concepts pairs of expansion/addition and reduction/omission and the resulting continua. Of course, other researchers with other theoretical backgrounds may come to different conclusions with regard to these shifts, meaning that they may classify them differently. However, my treatment of these shifts should concur with the theoretical reflections on explicitation and implicitation made in chapter 6, and the arguments laid out in the discussion below are theoretically backed by the cognitive linguistic basis of this thesis. The table below, illustrating the frequency and distribution of these borderline cases, only serves informational purposes. I will not discuss the quantitative dimension of these shifts or try to establish any patterns concerning translation direction or degree of technicality. Rather, the focus will be on the qualitative discussion of several examples, which is intended to illustrate the sometimes fuzzy transition zone between expansion/reduction, explicitation/ implicitation and addition/omission.

[72] See also the discussion of term complexity in the expert-to-expert and expert-to-semi-expert subcorpora in 7.1.3.2.

Overview of borderline cases					
	CCS EN-DE	**CCS DE-EN**	**Automotive EN-DE**	**Automotive DE-EN**	**TOTAL**
Expansion vs. explicitation	4	6	4	10	**24**
Explicitation vs. addition	-	-	8	-	**8**
Reduction vs. implicitation	8	10	2	6	**26**
Implicitation vs. omission	6	-	8	6	**20**
TOTAL	**18**	**16**	**22**	**22**	**78**

Table 11: Overview of borderline cases identified in the analysis

8.5.1 Expansion vs. explicitation

(i) Automotive EN-DE

Due to the *differences in test lengths*, all the deposit data were reduced to weight of deposit formed per 10 hours.

Aufgrund der *unterschiedlichen Dauer der Versuchszeiträume* wurden alle Meßwerte bezüglich der Ablagerungen auf das Gewicht der in 10 Std. gebildeten Ablagerungen reduziert.

In example (i), the translator rendered the ST construal *differences in test lengths* as *unterschiedliche Dauer der Versuchszeiträume*. This shift could, at first glance, be classified as an instance of explicitation since the meaningful element *Dauer* (duration) has been inserted in the TT. However, it was classified as an instance of expansion since the semantic contribution of this insertion shift is extremely low. This is not to say that the inserted lexical unit *Dauer* is not semantically contentful. However, the aspect of duration is so central to the meaning of *Zeitraum* (period of time)[73] that *Dauer* can almost be regarded as synonymous with *Zeitraum*. Thus, we could say that, probably for stylistic reasons, the conceptual content TIME SPAN was construed in one lexical unit in the ST (*test lengths*) whereas it was distributed over two lexical units (*Dauer*, *Versuchszeiträume*) in the TT. Recall that, in the present thesis, the TT distribution of a given conceptual content over more lexical units than in the ST is considered a definitional criterion of expansion (see 6.2.3.1).

[73] This means that the word *Zeitraum* can hardly be used in any context without evoking the idea of a specific span of time.

(ii) Automotive EN-DE

Our test matrix to determine the effect of piston temperature and fuel sulfur on deposits also allowed us the opportunity to study *oil oxidation*.

Aufgrund unserer Versuchsbasis zur Bestimmung des Einflusses der Kolbentemperatur und des Schwefelgehaltes im Kraftstoff auf die Bildung von Ablagerungen konnte auch *das Phänomen der Öloxidation* untersucht werden.

In example (ii), the translator inserted the noun phrase *das Phänomen* in the TT, which could again be taken as an instance of explicitation. However, unlike the lexical unit *Dauer* in example (i) above, the unit *Phänomen* is indeed semantically very schematic since it is situated at a very high level of abstraction and can be used to refer to almost everything that humans can perceive or conceive. In cognitive linguistic terms, *Phänomen* exhibits such a high degree of schematicity that it can be instantiated by an enormous range of, qualitatively very different, more specific units. This extremely high schematicity and the correspondingly low semantic contribution of this lexical unit should justify its classification as another instance of expansion. The translator may have opted for the expanded TT construal for stylistic reasons, trying to give the lexical unit *Öloxidation* a slightly higher stress compared to the ST.

8.5.2 Explicitation vs. addition

(iii) Automotive EN-DE

Crankcase oil oxidation appeared *to correlate with* piston temperature.

Die Oxidation des Motorenöls steht offensichtlich *in unmittelbarem Zusammenhang* mit der Kolbentemperatur.

In example (iii), the translator construed a new meaningful element in the form of the adjective *unmittelbar* (immediate, direct) in the TT, making the correlation between the oxidation and the temperature more explicit (if two parameters correlate directly, they are not linked via a third parameter). This element lacks a counterpart in the ST and thus begs the question whether its meaning can be inferred from this text or whether it is salient in the current discourse space which is evoked based on this text. The ST does not give any more specific information on the oxidation-temperature correlation, so the discourse context is excluded as a potential source of this information. This leaves us with the knowledge context or the common ground between ST author and the intended ST audience. From the situational context, we know that the source text is an instance of expert-to-expert discourse, with a correspondingly broad common ground between the

discourse participants. However, it is doubtful whether this very specific piece of information can be claimed to be common ground between them since the text is an article in a learned journal (see 7.1.3.1) which aims to present new research results to its audience. Since the observed oxidation-temperature correlation is one such new research result, it seems unlikely that the intended audience was aware of the direct link between the two parameters by virtue of their expert knowledge. The assumed non-saliency of the information in the CDS of the intended ST audience constitutes a strong argument for classifying this shift as an instance of addition (the translational motivation of which remains unclear).

(iv) Automotive EN-DE

Therefore, the Arrhenius relationship and *experimental errors* will be considered prior to actual presentation of the data.

Die Arrhenius-Gleichung und *eventuelle Versuchsfehler* werden also vor der tatsächlichen Vorlage der Versuchswerte berücksichtigt.

Example (iv) illustrates another shift which was classified as an instance of addition. The ST adjective *eventuell* indicates that there is a possibility that experimental errors occur. Only if they do occur, will they be considered prior to the presentation of the data. This aspect of probability is missing in the ST, where it is stated as a fact that the experimental errors will be considered. And indeed, later in the text, such errors (occurring in temperature measurements and deposit weights) are considered so that the aspect of probability introduced in the TT is completely absent from the ST. Since this shift seems to contradict rather than explicitate aspects of the domain-related reality as presented in the ST, it was again classified as an instance of addition, which probably led to a mistranslation in this case.

8.5.3 Reduction vs. implicitation

(v) CCS EN-DE

Dry (moisture-free) CO_2 is not corrosive to the carbon-manganese steels customarily used for pipelines, even if the CO_2 contains contaminants such as oxygen, hydrogen sulphide, and sulphur or nitrogen oxides.

Trockenes CO_2 hat keine korrosive Wirkung auf die üblicherweise für Pipelines verwendeten Kohlenstoff-Mangan-Stähle, selbst wenn das CO_2 Verunreinigungen wie Sauerstoff, Schwefelwasserstoff und Schwefel- oder Stickoxide enthält.

In example (v), the translator did not encode an equivalent of the compound adjective *moisture-free* in the TT, which may point to an instance of implicitation. However, parallel to the discussion of *Dauer* and *Zeitraum* in example (i), it seems that *dry* and *moisture-free* can again be regarded as synonyms construing the same conceptual content and that this construal has been reduced to one lexical unit (*trocken*) in the TT. Of course, it could be argued that *moisture-free* is more transparent with regard to its meaning than *dry* but I would claim that the absence of moisture is again so central to the meaning of *dry* that this word can hardly be used without evoking the corresponding information. Therefore, this shift was classified as an instance of reduction.

(vi) CCS DE-EN

Eine intensive Vorerkundung potenzieller Standorte und ein Monitoring der Gasausbreitung während und nach der Einspeicherung sind *essentiell und unverzichtbar*.

Intensive preliminary exploration of potential sites and monitoring of gas dispersion during and after introduction of the CO_2 is *essential*.

Example (vi) illustrates another instance of reduction, where the German ST construal *essentiell und unverzichtbar* was reduced to the TT construal *essential*. This shift is reminiscent of Schreiber's (1993:221) discussion of hendiadys (*just and equitable treatment → gerechte Behandlung*, see 6.3.1.1) as a prototypical case of reduction. The German adjectives *essentiell* and *unverzichtbar* can be considered to be full synonyms and show full conceptual equivalence with the English adjective *essential* in this context. The conceptual content is construed twice in German[74] but only once in English, without any perceivable semantic loss in the TT. Consequently, this shift was also classified as an instance of reduction.

8.5.4 Implicitation vs. omission

(vii) CCS EN-DE

CO_2 emissions in the residential, commercial and transportation sectors have not been considered in this analysis because these emission sources are individually small and *often mobile*, and therefore unsuitable for capture and storage.

CO_2-Emissionen durch private Haushalte, Gewerbe und Verkehr wurden in dieser Analyse nicht berücksichtigt, da diese Emittenten aufgrund ihrer geringen Größe und ihrer *Standortunabhängigkeit* nicht für CCS geeignet sind.

[74] Which may rather have a stylistic than any significant semantic effect; see Schreiber (1993:221).

In example (vii), the translator did not encode an equivalent of the adverb *often* in the TT. Therefore, the qualification that not all of the discussed emission sources are mobile is lost in the TT. We could argue that this is inferable from the actual sources elaborated since CO_2 sources in the residential sector will more often than not be immobile while CO_2 sources in the transportation sector are bound to be mostly mobile. This being the case, the TT construal *Standortunabhängigkeit*, without any qualification such as *häufigen* or *generellen*, hardly seems admissible since it attributes mobility to all of the CO_2 sources previously stated while some of these sources are not mobile but immobile. Therefore, this shift seems to be a translation error that brings about a defect of coherence in the TT. It was classified as an instance of omission because an equivalent of the ST adverb *often* would have been required in the TT to establish a coherent construal. It seems, then, that both omission and addition (see example (iv) above) can – but by no means have to – result in translation errors. Unlike Delisle et al. (1999:115, 165), who always classify addition and omission shifts as translation errors, I would favour a principally neutral perspective on the two concepts since there may be various conditions under which addition and omission seem to be perfectly legitimate translation techniques.[75]

(viii) Automotive EN-DE

If the oil contains soot particles, however, the soot will absorb both the insoluble and *some of the soluble resins* onto its surface.

Enthält das Öl jedoch Rußteilchen, so werden sowohl lösliche als auch *unlösliche Harze* auf der Rußobefläche absorbiert.

In example (viii), the translator did not encode an equivalent of the pronoun *some* in the TT. As a result, the information that all insoluble plus some of the soluble resins are absorbed onto the soot surface is not carried over to the TT. The use of the "zero determiner" in the TT construal *sowohl lösliche als auch unlösliche Harze* can give rise to two interpretations: a) all insoluble plus all soluble resins are absorbed, or b) some of the insoluble plus some of the soluble resins are absorbed. The intended ST interpretation, however, is unlikely to be triggered by this construal. In the absence of any further cotextual information which would ensure the saliency of the information *all of the insoluble plus some of the soluble resins* in the current discourse space, we would have to

[75] For example, sociocultural differences between source and target cultures or functional variance of the translation; see the discussion in 2.6.

evoke the common ground between the expert-to-expert discourse participants if we wanted to classify this example as an instance of implicitation. However, as argued in the discussion of example (iii) above, the text is an article in a learned journal that presents new research findings to an interested expert audience. Given the innovative nature of these results and the high specificity of the information in question, it seems highly unlikely that the information that only some of the soluble resins are absorbed can be inferred from the common ground of the discourse participants. This constitutes a strong argument for classifying this shift as an instance of omission, again corresponding to a potential mistranslation.

8.6 Chapter summary

This chapter provided a detailed discussion of the results of the investigation of the scientific/technical corpus for instances of explicitation and implicitation. The quantitative analysis showed a higher overall number of explicitation shifts compared to implicitation shifts but it further revealed that implicitation can still be a quantitatively significant factor in STT, which should warrant empirical investigation and theoretical reflection in its own right. There was a strong correlation of the frequency and distribution of explicitation shifts with the translation direction, with far more explicitations occurring in the direction EN-DE than in the direction DE-EN.[76] The frequency and distribution of implicitation shifts, on the other hand, was more balanced between the two translation directions. The correlation between explicitation/implicitation shifts and the degree of technicality of the subcorpora was very pronounced, with both more explicitation and more implicitation shifts occurring in expert-to-expert discourse than in expert-to-semi-expert discourse.

The qualitative discussion, which proceeded along the categories of lexical insertion/ deletion, lexical specification/schematization and relational specification/schematization, revealed a plethora of different shift types and potential translational motivations. These motivations ranged from specific grammatical features or restrictions of SL and TL systems and aspects of cohesion and coherence to considerations concerning redundancy reduction and linguistic economy. They could also be linked to differences in the specificity or schematicity of lexicalized default construals between source and target language and to different English and German register requirements concerning the

[76] This was partly due to an "anomaly" of subcorpus Automotive EN-DE, which was discussed in detail in 8.2.2, 8.3.2 and 8.4.2.

admissible explicitness or implicitness at discourse level. An overall trend which could be observed in this qualitative discussion and which corresponds to similar studies by other researchers (e.g. House 2002; Krein-Kühle 2003; Becher 2011) was that German (scientific and technical) discourse seems to be characterized by a higher cohesive and denotational explicitness than English discourse, which seems to license a higher degree of "propositional opaqueness" (House 2002:200). Also, there are two relevant grammatical subsystems (hyphenation and inflection) which exhibit a higher explicitness in German compared to English, resulting in several obligatory explicitation/implicitation shifts in the corresponding translation directions.

The qualitative discussion also showed the considerable usefulness of the cognitive linguistic framework for describing both the linguistic/textual and the contextual dimensions of explicitation and implicitation. The linguistic dimension benefited especially from the various linguistic construal operations developed within CL (particularly specification and schematization) and from the notions of compound structure, composite structure and compositional path, which were particularly helpful for describing explicitation/implicitation shifts at the syntagmatic level. The cognitive semantic concepts of frame/domain matrix and the notion of profiling also proved useful for describing aspects of the linguistic/textual dimension of explicitation and implicitation. The contextual dimension could be modelled, in a very fruitful way, by using the concept of current discourse space and especially Clark's (1996) concept of common ground.

Finally, the discussion of several borderline cases served to illustrate the often fuzzy transition zone between explicitation/implicitation and the adjacent concepts of expansion/ reduction and addition/omission. The potential complexity involved in making a distinction between these concepts should be properly captured by the two continua proposed in this context and by the cognitive linguistic means for describing the transition zones between the endpoints of these continua.

9 Conclusion

This thesis has explored the interface between scientific and technical translation (STT) and cognitive linguistics (CL), placing particular emphasis on the phenomena of explicitation and implicitation as potential indicators of text-context interaction in translation.

Setting the scene, we first surveyed the field of scientific and technical translation as the main area of investigation with reference to which the theoretical and empirical work in this thesis was primarily carried out. Particular emphasis was placed on the high societal and professional relevance of STT, which, as I have argued, warrants a more prominent place of this field of translation in translation studies. The thesis also highlighted the complexity of scientific and technical translation, which follows from the highly specialized subject matters underlying scientific and technical texts and from the general underdeterminacy of language, which requires a constant text-context interaction in STT and in human verbal communication in general.

Starting from the highest level of abstraction, we surveyed the philosophy of embodied realism as the first potentially fruitful point of contact between scientific and technical translation and cognitive linguistics. Embodied realism attempts to steer a middle path between the two opposing paradigms of subjectivism and objectivism and posits a dialectal relationship between the human mind and the world in the emergence of human conceptual systems. It was argued that embodied realism, together with its more specific manifestation embodied scientific realism, could also serve as an epistemological basis for scientific and technical translation, which is assumed to operate on stable frames of reference but which seems, at the same time, to be at odds with – currently predominant – subjectivist accounts of translation questioning the possibility of such stable frames of reference. By linking the success and the stability of the scientific enterprise to technologically extended human basic-level abilities, embodied (scientific) realism offers a high-level explanation for the relatively stable epistemological basis of science and technology from a human point of view – without requiring any objectivist God's Eye perspective on the way the world is. While the link between embodied realism and scientific and technical translation proposed in this thesis is both tentative and rather abstract (in the sense that it is hard to tie down to more practical matters of STT), it may still be a first step towards an alternative to the relativist epistemology currently dominating translation studies – an alternative which, as

Halverson (2013:62) points out, is currently missing in our discipline and which, in my opinion, is acutely needed.

From a more microscopic perspective, it was shown that the cognitive linguistic framework offers various elements that could fruitfully be exploited to the advantage of scientific and technical translation. At a general level, the commitment to a cognitive linguistic basis entails the commitment to a usage-based theory of language. As a consequence, no principled gap has to be bridged between this usage-based linguistic theory and (scientific and technical) translation as a prime field of language use. From a cognitive linguistic perspective, this would make STT or translation in general an ideal test bed for cognitive linguistic theories, which have to stand the test of real language use (for example, in translation) if they are to be taken as a useful contribution to this usage-based linguistic framework. At the same time, the commitment to a cognitive linguistic basis entails a commitment to a particular approach to linguistic meaning (in this case, a conceptualist and encyclopaedic approach). This should add to the overall coherence of the account of STT proposed in this thesis, and it also makes it comparable to other accounts of translation – provided these are equally transparent with regard to their epistemological and linguistic basis. The view on linguistic relativity endorsed by cognitive linguistics concurs with the philosophical basis of this account, is intuitively appealing from a practical point of view and at the same time compatible with STT, which generally subscribes to the possibility of invariance of meaning but which is, at the same time, confronted with various conceptual and linguistic asymmetries between source and target languages. From the cognitive linguistic perspective, language facilitates, but does not determine, the conceptualization of domain-related reality, while different languages may provide different default construals for encoding such conceptualizations.

In exploring the interface between STT and CL, this thesis also surveyed various specific components of the cognitive linguistic framework with direct relevance to scientific and technical translation. Firstly, the cognitive linguistic notion of linguistic construal and the two corresponding models of Croft/Cruse (2004) and Langacker (2008) were discussed, and it was argued (and later demonstrated) that the construal operations proposed by these authors can be used to model certain linguistic aspects of translation (such as explicitation and implicitation) in a cognitively plausible way. It was then demonstrated how Clark's (1996) concept of common ground can be used to model the shared knowledge of specific discourse communities, which – in specialized translation and specialized communication

in general – can yield communicative configurations such as expert-to-expert, expert-to-semi-expert and expert-to-layperson communication. Common ground can be seen as the intersection of the knowledge contexts of specific discourse participants and will influence the linguistic construal of a text, for example, along the dimension of specificity/schematicity. The common ground concept can also be used to make theoretically sound statements about the amount of knowledge that is required in a certain communicative event and thus provides a link between the conceptual and the social dimensions of knowledge. The actual organization of knowledge in scientific and technical translation could then be modelled with the toolset provided by cognitive semantics, and here especially by Fillmore's frame semantics and Langacker's theory of domains. The knowledge required to understand particular lexical units was claimed to be organized in frames or domain matrices, with the relative saliency of certain aspects of this knowledge being subject to contextual pressures acting in specific usage events. The important notion of context (here, the three specifically relevant dimensions of situational, discourse and knowledge context) could be subsumed under the cognitive linguistic notion of current discourse space, which proved to be a very useful concept in the subsequent discussion of explicitation and implicitation. Finally, it was demonstrated how the cognitive process of comparison involved in establishing invariance of meaning or a corresponding *tertium comparationis* in translation could be accommodated in the cognitive linguistic framework. As Halverson (2013:47) rightly points out, "[t]here is no obvious or agreed solution to the question of how an invariant may be established." Therefore, it is all the more important that the actual solution opted for by a researcher shows a high coherence with the researcher's underlying theoretical framework. It is hoped that the present thesis has achieved this task.

Narrowing down the perspective even further, it was shown how explicitation and implicitation as potential indicators of text-context interaction in translation could be captured within the CL framework. The various components of this framework proved to be particularly useful for modelling the implicit component of communication and for reconceptualizing explicitation and implicitation as cross-linguistic construal operations. Linking explicitation and implicitation to the notion of linguistic construal (and here specifically to Langacker's construal operations of specificity and schematicity) underlined the cognitive plausibility of the two concepts and ensured their compatibility with the general cognitive linguistic basis of this thesis. This link also provided the theoretical input

for developing a cognitive linguistic classification of explicitation and implicitation that served to structure the discussion of the results of the corpus analysis.

The analysis of the scientific/technical corpus and the discussion of results showed that explicitation and implicitation are indeed well-suited concepts for illustrating the interface between text and context in scientific and technical translation. The quantitative investigation showed that explicitation shifts occur more frequently in the translation direction EN-DE than in the direction DE-EN while, for implicitation, the relation is far more balanced. A very clear trend could be observed with regard to the degree of technicality of the corpus texts, where both more explicitation and more implicitation shifts occurred in the expert-to-expert subcorpora than in the expert-to-semi-expert subcorpora. The qualitative investigation revealed a plethora of different shift types and potential translational motivations (such as aspect of cohesion and coherence, redundancy reduction, linguistic economy and register considerations) and it pointed to a higher cohesive and denotational explicitness of German as compared to English technical register. More importantly, the qualitative discussion showed the considerable usefulness of the CL framework in discussing explicitation and implicitation shifts in STT. At the most general level, Langacker's construal operations of specificity/schematicity could be used to describe the overall linguistic dimension of explicitation and implicitation. The notions of frame/domain matrix – together with Pustejovsky's *qualia* structure as a core formalism providing internal structure to these concepts – were particularly useful for making statements about the implicit encyclopaedic knowledge associated with particular lexical units. The notion of current discourse space, on the other hand, proved to be very fruitful for making statements about the relative saliency of a given piece of information in the wider context, for example the discourse context or the knowledge context of the discourse participants. Finally, the CL framework also proved useful in describing the sometimes fuzzy transition zone between explicitation/implicitation and their adjacent concepts on the expansion-explicitation-addition continuum and the reduction-implicitation-omission continuum.

This thesis has hopefully shown that the interface between scientific and technical translation and cognitive linguistics is indeed a very promising one and that CL – with reference to Faber/Ureña Gómez-Moreno's words from the introductory chapter – has indeed a lot of interesting things to say about (scientific and technical) translation. Naturally, the thesis could only address a limited number of aspects of this interface so that

both its theoretical framework and the empirical investigation offer various starting points for further research.

At a very general level, the tentative link between (scientific) embodied realism and scientific and technical translation as an epistemological justification for the stability of the frames of reference underlying STT could be further elaborated. A number of scholars, such as Scarpa (2002) and Halverson (e.g. 2002, 2013), have proposed this link between embodied realism and specialized translation or translation in general, but it seems that we are still a long way from the desired alternative to the relativist epistemology currently dominating our discipline.

More specifically, the concept of linguistic construal and the various construal operations developed by Croft/Cruse (2004) and Langacker (2008) seem to offer huge potential for capturing important linguistic aspects of STT or translation in general. This potential could only be exploited in a cursory way by the present thesis since the focus was intentionally narrowed down to the two specific phenomena of explicitation and implicitation. A further potential link between linguistic construal and the linguistic dimension of STT are, for example, the notions of *sequential scanning* and *summary scanning* (Langacker 1987:144-145; Croft/Cruse 2004:53-54) as manifestations of Langacker's construal operation of *dynamicity* (see 4.5.1.1). These construal operations were already briefly discussed in chapter 8, example (60). Sequential scanning and summary scanning could, for example, be used to capture differences in the degree of nominalization/verbalization between SL and TL registers. Also, Croft/Cruse's (2004:62-63) construal operation of *subjectivity/ objectivity* could be linked with the *postulate of anonymity* (Oksaar 1998) posited in LSP research and with the relative (non-)adherence to this postulate in STT. As a final suggestion, Croft/Cruse's (2004:63-64) construal operation of *structural schematization* (as part of the higher level construal operation of *constitution/gestalt*, see 4.5.1.2) could be used to describe how source and target texts differ in "the conceptualization of the topological, meronomic and geometrical structure of entities and their component parts" (ibid.:63). A possible difference in these conceptualizations was identified in chapter 8 in examples (69) to (71), where spatially more specific English prepositions were replaced by spatially more schematic German prepositions in the target text. This phenomenon may warrant further and more extensive investigation. The construal operation of structural schematization identified above could serve as theoretical frame for such an investigation.

This overview suggests that a detailed investigation of Langacker's and Croft/Cruse's linguistic construal operations with regard to their applicability to linguistic aspects of STT should indeed be a fruitful and worthwhile endeavour.

Concerning the field of cognitive semantics, the present study may not have done proper justice to Fillmore's frame semantics, which was treated rather as an annexe to Langacker's apparently finer grained theory of domains. The University of Düsseldorf currently hosts a Collaborative Research Centre which is concerned with "The Structure of Representations in Language, Cognition, and Science".[1] Within the context of this Research Centre, Fillmore's frame concept as refined by Barsalou (e.g. 1992a) is being developed into an overall theory of conceptual representation in language (see, for example, Busse 2012). The present thesis largely ignored this current work on the frame concept and, particularly, on frame semantics in favour of the theory of domains, which could be more readily and more coherently integrated into the overall cognitive linguistic approach adopted here. However, the work done by the Collaborative Research Centre – especially on frame semantics (again, see Busse 2012) – looks very promising, and the refined frame semantic account being developed in this context should certainly be explored with regard to its potential for modelling knowledge organization and representation in STT and potentially in translation in general.

With regard to the explicitation and implicitation research conducted in this thesis, a larger-scale, more quantitatively oriented study is desirable which would show whether the trends established in this thesis also hold for a larger data basis.[2] As was pointed out in the quantitative discussion in chapter 8, the results of the present investigation were somewhat skewed due to an "anomaly" in subcorpus Automotive EN-DE. A larger-scale analysis would smooth out such anomalies and it could, in particular, show whether a clearer correlation is perceivable between the frequency and distribution of explicitation/ implicitation shifts and the respective translation direction. On the other hand, the correlation between the shifts and the degree of technicality of the corpus texts was rather straightforward, and it is expected that the corresponding trend will clearly be confirmed in quantitative investigations.

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[1] http://www.sfb991.uni-duesseldorf.de/en/the-structure-of-representations-in-language-cognition-and-science [last accessed: 22/01/2014]

[2] Such a larger-scale study should ideally make the same distinction as the present study between explicitation/implicitation, expansion/reduction and addition/omission.

A further *desideratum* for explicitation and implicitation research would be a process-oriented study of the two concepts that takes the theoretical foundations laid in this thesis and the patterns established in the empirical investigation as a starting point and investigates "what happens in the minds of translators" (Krings 1986) when they perform explicitation and implicitation shifts. Such a process-oriented approach would also be in line with the cognitive linguistic basis of this thesis or, as Halverson (2013:59) claims, will eventually even be required by it. Both the extensive theoretical work conducted in this thesis and the need for testing the viability of the proposed framework in a product-based corpus analysis should justify excluding an actual process-based analysis from the present study. However, such a process study would be the logical – and perhaps even the required – next step in enriching our knowledge about the actual functioning of explicitation and implicitation as indicators of text-context interaction in translation. In this context, it has to be pointed out that the frames and domain matrices postulated in this thesis as organizing and representation structures for specialized knowledge were, to some extent, idealized constructs since we always assumed that the discourse participants had extensive domain knowledge that translated into richly specified frames/domain matrices. This can reasonably be claimed to be the case for the expert authors and (semi-)expert recipients of the corpus texts investigated here but the subject-matter competence of the translators of such texts may arguably vary. For these translators, the frames/domain matrices evoked by particular lexical units may be comparatively impoverished since they may not share (all of) the common ground between expert authors and (semi-)expert audiences. If we want to know more about the actual cognitive load involved in explicitation and implicitation or about the strategies translators employ when performing such shifts, we eventually have to move from the product to the process level. Such a process-oriented study on explicitation was already conducted by Englund Dimitrova (2005). However, Englund Dimitrova restricted her investigation to inter- and intrasentential cohesive links and correlated her findings with different degrees of general translation expertise (professional translators, translation students and language students at university level, see 6.1.3). For highly specialized texts such as those investigated in this thesis, it may be more interesting to choose the test subjects not according to their general translation expertise but rather according to their subject-matter or domain knowledge with regard to the topic of the text.[3]

[3] For example, translation students having completed a scientific and technical translation class on the subject matter of the text and in-house translators in industrial companies, who are specifically trained in this subject matter.

Also, the study should not be restricted to cohesive links but should ideally include the full range of shift types identified in this thesis (for example, the insertion of nouns and prepositions, the specification of lexical units already present in the source text or the unpacking of ST compounds in the target text). As mentioned above, such a study could shed light on the actual cognitive load involved in performing explicitation and implicitation shifts and it could also show whether the shifts identified in this thesis are considered trivial or demanding by the test subjects (which will certainly be dependent on their subject-matter knowledge). If such a study were conducted in the natural translation environment of the test subjects, this would ensure the ecological validity of the study (see Göpferich 2008:54) and it would – in line with the paradigm of situated translation (Risku 2004) – allow us to observe the natural translational action of the test subjects. Such a study could elicit, for example, how translators "enrich" impoverished frames/domain matrices (i.e. how do they build up domain knowledge) in real translation. Do they consult dictionaries/encyclopaedias, subject-matter experts or the internet? And which strategies do they employ in this context? The study could also identify whether translators are actually aware of the need to explicitate or implicitate because of certain register requirements or audience expectations, i.e. whether the (tentative) explanations proposed in the present thesis are actually a real factor in the translators' decision-making processes. In any case, the cognitive linguistic basis of explicitation and implicitation proposed in this thesis should ensure that the two concepts can be coherently integrated into the more macroscopic field of translation process research.

I would like to conclude this thesis with the following observations: The interface between scientific and technical translation and cognitive linguistics turned out to be a very fruitful one and exploring this interface yielded relevant theoretical insights not only into the linguistic/textual but also into the wider contextual dimension of STT. Further exploration of this interface may be of great benefit not only to STT but to the field of cognitive linguistics as well. After all, it seems that not only cognitive linguistics has important things to say about translation but that translation as an authentic field of language use can also yield important insights into the explanatory power of cognitive linguistics. These mutual benefits should be exploited and expanded by future studies in both fields.

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