On Points of Contact between Scientific and Technical Translation and Cognitive Linguistics

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ABSTRACT

This paper reports on potential points of contact between scientific and technical translation (STT) and cognitive linguistics (CL) and attempts to answer the question to what extent cognitive linguistics may be usefully applied to the study of STT. To do so, the paper surveys various theoretical components of the cognitive linguistic framework and illustrates how these components can be applied in modelling different contextual and textual aspects of scientific and technical translation. From a contextual perspective special consideration is given to the concept of *common ground* and the field of *cognitive semantics*, which can be used to model shared knowledge and implicit knowledge in the knowledge-intense field of STT. From a textual perspective the emphasis will be on the cognitive linguistic notion of *linguistic construal*, which can be used to model relevant linguistic aspects of STT from a cognitively plausible point of view. Several prototypical examples from the Cologne Specialized Translation Corpus (CSTC) will be discussed in cognitive linguistic terms in order to demonstrate the explanatory power of this framework in the context of translation studies.

KEYWORDS: cognitive linguistics, cognitive semantics, common ground, linguistic construal, scientific and technical translation, theory of domains

Introduction

It is a common observation in the theoretical discourse about scientific and technical translation[1] that this field of translation is highly relevant both from a societal point of view – fostering scientific and technical progress by the dissemination of information across linguistic and cultural borders (Pinchuck 1977:13; Krein-Kühle 2003:13; Byrne 2012:1) – and from the point of view of professional translators, who often generate a substantial amount of their income from the translation of scientific and technical texts (Schmitt 1999:41; Byrne 2012:1). At the same time, translation researchers concerned with scientific and technical translation often observe a sharp contrast between the high societal and professional relevance of STT and the scarcity of translational research carried out in this field (Krein-Kühle 2003:14; Byrne 2006:1; Salama-Carr 2013:20), leading Salama-Carr to conclude that STT

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[1] Scientific and technical translation is understood here as the translation of texts from the domains of science and technology. It covers pure scientific translation concerned with the results of basic science, pure technical translation concerned with marketable industrial products or processes (Pinchuck 1977:13) and hybrid texts at the interface between science and technology (Byrne 2012:63).

"remains relatively unchartered territory within the discipline and is deemed a less prestigious test case for translation models" (2009:43). This imbalance between the societal/professional relevance of and the theoretical reflection on scientific and technical translation may partly be due to the fact that STT has traditionally been considered as easier or more straightforward than other forms of translation (Schmitt 1986/1994:252; Wilss 1991:3; Horn-Helf 1999:101-102), which is generally attributed to the "perceived universality of the language of science and/or of scientific thought" (Olohan 1998/2009:247). This derogatory view of STT and specialized translation in general has a long tradition, as exemplified by Schleiermacher's quote that these forms of translation are "little more than a mechanical task which can be performed by anyone who has moderate knowledge of the two languages" (1813/2012:45). In the middle of the 20th century, when optimism about the potential of machine translation was at its height, some scholars such as Mounin even went so far as to claim that scientific translation could eventually be completely automated (1967:158). This view of STT as a near-mechanical or automated task again stands in sharp contrast to the views held by most professional translators and by translation researchers specifically concerned with scientific and technical translation, who both generally perceive their work or their object of study to be a highly complex field (see, for example, Byrne 2006:5-6). Contributing to this complexity is certainly the subject-matter knowledge which is generally accepted to be a necessary prerequisite for high-quality scientific and technical translation (Krein-Kühle 2003:11; Byrne 2006:5-6) and which, according to Byrne, has "in some quarters led to technical translation [and certainly also scientific translation] being feared and loathed [...]" (2006:1). After all, in scientific and technical discourse as in every other form of human verbal communication, textual surface structures are only the "tip of the iceberg", the larger part of which remains hidden under the surface (Faber Benítez (2009:108). As Faber and Ureña Gómez-Moreno 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]" (2012:83). Depending on the participants in scientific and technical discourse, various communicative configurations may arise that translate into different degrees of technicality of the texts to be translated by scientific and technical translators (Arntz 2001:195). When translating expert-to-expert discourse, for example, translators may be faced with highly underdetermined or implicit textual structures since author and intended audience will be experts on the topic at hand and can therefore fall back on a large amount of shared

specialized knowledge that does not need to be explicitly verbalized in communication.[2] This shared knowledge between the participants in scientific and technical discourse, which underlies the text to be translated as implicit knowledge and which may have to be accessed by the translator in order to create a high-quality translation, is one of the central contextual concerns of scientific and technical translation (see Krein-Kühle 2003:7). It also serves as a potential point of contact between STT and the framework of cognitive linguistics since CL is, among other things, concerned with theoretical means for knowledge organization and representation (León Araúz et al. 2012:174) and has developed specific tools for modelling both the shared knowledge of specific discourse communities and the implicit knowledge underlying verbal communication.

Discussing the applicability of linguistic theories to translation studies, Faber and Ureña Gómez-Moreno assume that "of the linguistic frameworks currently in the limelight, Cognitive Linguistics would have the most to say about translation" (2012:74). To date, there have been several attempts to apply cognitive linguistics to literary translation (Tabakowska 1993) and to the general field of specialized translation (Faber and Ureña Gómez-Moreno 2012). Also, Fillmore's (1982) *frame semantics*, a cognitive semantic theory, has been widely applied in the cognitive strand of German functionalism (for example, Kussmaul 2007/2010). The major proponent of a cognitive linguistic approach in translation studies is probably Halverson (2003, 2007, 2010, 2013), who works within the framework of Langacker's *cognitive grammar* (1987) and who advocates a research strand termed *cognitive translation studies*. The present paper also draws extensively on Langacker's framework and shares Halverson's central claim that "a cognitive theory of translation must build on cognitive theories of language" (2010:353). It can thus be situated within the research strand of cognitive translation studies. In his discussion of the usefulness of semantic theories to translation studies, Albrecht claims that most of the lexical phenomena discussed in cognitive semantics (as a subfield of cognitive linguistics) can also be coherently explained by traditional semantic theories (2005:226). However, as will be argued in more detail in the following sections, cognitive linguistics, as a usage-based theory of language, seems particularly well-suited to explain aspects of translation as a specific form of human verbal communication. Also, as already mentioned briefly above, cognitive semantics has developed fine-grained tools for knowledge organization and representation in verbal communication. It

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[2] This follows, for example, from Grice's cooperative principle and especially from his maxim of relation, according to which one should not make one's contribution more informative than required (1975).

will be argued here that, compared to traditional semantic theories, these tools may allow for a sounder theoretical discussion of the knowledge that is assumed to be shared between the participants in discourse or that is not explicitly verbalized in a text but deemed to be inferable or implicit in it (see the discussion of common ground and cognitive semantics below).

The present paper is structured as follows. The next section gives a brief overview of the field of cognitive linguistics, discusses its specific characteristics and delineates it from other linguistic theories. Then, the cognitive linguistic concept of *common ground* is elaborated and it is shown how this concept can be used to model shared specialized knowledge in scientific and technical translation. The paper then goes on to discuss the cognitive linguistic subfield of *cognitive semantics* and its tools for modelling implicit specialized knowledge in STT. Finally, the notion of linguistic construal is discussed and it is demonstrated how various linguistic aspects of scientific and technical translation can be conceptualized and described as cross-linguistic construal operations. To illustrate the explanatory power of the proposed approach, the paper discusses prototypical examples of scientific and technical translation in cognitive linguistic terms.[3] This is intended to demonstrate that cognitive linguistics indeed has important things to say about (scientific and technical) translation.[4]

An overview of cognitive linguistics

The framework of cognitive linguistics (e.g. Lakoff 1987; Langacker 1987) 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

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[3] The examples discussed in this paper were taken from the Cologne Specialized Translation Corpus (CSTC), 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. This tripartite corpus structure reflects the three major domains taught in the MA in Specialised Translation programme offered at Cologne University of Applied Sciences. The examples discussed in this article are taken from the CO_2 subcorpus and the Automotive subcorpus (these being further subcorpora of the scientific and technical subcorpus). The CO_2 subcorpus contains research reports on carbon dioxide capture and storage (CCS). The Automotive subcorpus contains articles in learned journals, which are primarily concerned with piston technology. The texts in both corpora were classified as progress-oriented actualizing texts (see Figure 1 below) and were translated by competent professional translators. For a detailed description of the CSTC, see Krein-Kühle (2013:8 ff.).

[4] It must be borne in mind, however, that the contribution of cognitive linguistics is primarily to the theoretical reflection on STT and that it cannot be used in a straightforward way to inform the practice of STT. However, a sound theoretical basis is certainly useful for high-quality translation teaching, which may ultimately contribute to a better or at least more informed translation practice.

of general human cognitive abilities, such as attention, memory, perception, etc. (see Dirven 1991/2002:76; Schwarz 1992/1996:52 ff.). Cognitive linguistics regards language as an integral part of general human cognition and is therefore opposed to the autonomous, modular and abstract approach to language as propagated, for example, by Chomskyan generative grammar (Taylor 2002:7). It also rejects the Saussurean dichotomy of *langue* vs. *parole* (Dirven 1991/2002:76) and, instead, follows a "usage-based" approach to language according to which "knowledge of language emerges from language use" (Croft and Cruse 2004:1). As argued above, this usage-based character of cognitive linguistics may make it specifically suitable as a linguistic foundation for (scientific and technical) translation. After all, it appears that, from a translational perspective, 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. Since 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 (see also Faber and Ureña Gómez-Moreno 2012:75).

According to Evans and Green, cognitive linguistics is based on two fundamental assumptions, the *generalisation commitment* and the *cognitive commitment* (2006:28 ff.). The generalisation commitment entails a search for common structuring principles that apply to different aspects of language. For example, cognitive linguistics makes no sharp distinction between semantics and syntax (which are both treated as symbolic systems, see Taylor 2002:25) or between semantic and pragmatic meaning. According to the cognitive commitment, the structuring principles postulated by cognitive linguistics have to reflect insights into human cognition gained in other disciplines, in particular the cognitive sciences (Evans and Green 2006:40). In line with the cognitive commitment, cognitive linguists try to give an account of linguistic phenomena which is plausible from a cognitive point of view. A further basic tenet of cognitive linguistics and more specifically in the subfield of cognitive semantics is that linguistic meaning is conceptual in nature, with the locus of meaning being the mind of individual speakers and hearers (Langacker 2008:4, 27-28).[5] Accordingly and in

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[5] Such a conceptualist or mentalist approach to linguistic meaning is not uncontroversial and has been subject to various criticisms, which cannot be elaborated here in detail. Taylor (2002:61 ff.) contains a list of objections raised against the cognitive linguistic approach to meaning (together with a refutation of the various points of

line with the generalisation commitment, cognitive linguistics/semantics rejects the modular or *dictionary* view of word meaning adopted by formal and structural semantics (Evans and Green 2006:207; Ziem 2008:117), which postulates a strict division between Aristotelian *essentialia* and *accidentialia*. According to such a dictionary approach, the essential or definitional properties of an entity constitute its dictionary meaning (semantic meaning) while the contingent properties constitute encyclopaedic information (pragmatic meaning) (Marmaridou 2000:45). Cognitive semantics, on the other hand, adopts a holistic or *encyclopaedic* view of word meaning according to which 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 and Green 2006:214). To take a translational perspective again, it seems that any clear-cut distinction between semantic/dictionary and pragmatic/encyclopaedic meaning as proposed by modular or dictionary accounts of linguistic meaning may be rather irrelevant for translational purposes. After all, translation always operates on instances of real language use, where it is 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 knowledge and has developed semantic accounts that have much more to say about this wider pool of knowledge and the contextual saliency or centrality of different aspects of this knowledge in actual discourse.[6] Dictionary approaches to meaning, on the other hand, gladly hand over this responsibility to the field of pragmatics.[7]

In this context, it has to be pointed out that the call made in this paper for cognitive linguistics as a linguistic foundation for scientific and technical translation is 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, quite convincingly, the multi-layered nature of

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criticism). A spirited defence of the subfield of cognitive semantics against "its cultured despisers" can be found in Busse (2012:788 ff.).

[6] Of course, such an encompassing approach to semantics brings with it its own problems; for example, the difficulty of neatly formalizing this more encompassing semantic meaning. However, Cruse rightly 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" (1986:20).

[7] These approaches, for example Anglo-American pragmatics, often link pragmatic/encyclopaedic meaning with somewhat imprecise and insufficiently differentiated notions such as the "cognitive environment" (Sperber and Wilson 1986/1995:39).

translation (which is by no means restricted to the relation between a source text and its target text) 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 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).[8] Also, as will be shown in the following sections, cognitive linguistics transcends the purely linguistic dimension and also provides tools for modelling the contextual dimension of STT.

Common ground – modelling shared specialized knowledge in STT

As discussed in the introduction to this paper, the texts to be translated by scientific and technical translators may exhibit different degrees of technicality, which derive from the communicative configuration underlying these texts. This relation can be illustrated in the following classification of scientific and technical texts:[9]

Figure 1: Three-dimensional classification of scientific and technical texts
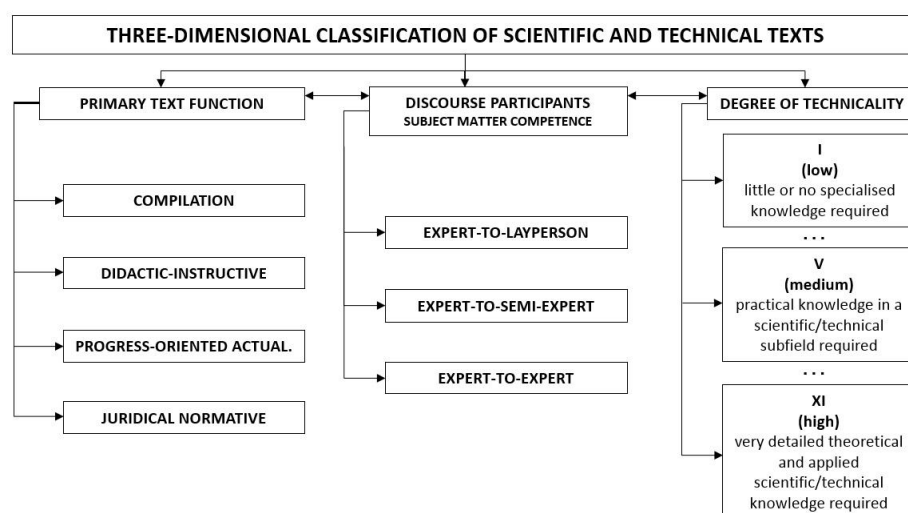
As can be seen from this classification, there are three possible communicative configurations along the dimension of subject matter competence, i.e. expert-to-layperson, expert-to-semi-

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[8] The present paper can therefore be situated in the tradition of the cognitive turn in translation studies, with a certain sympathy for a "linguistic re-turn" (see Saldanha 1998/2009:149).

[9] I developed this classification based on the works of Göpferich (1995), Arntz (2001) and Vargas (2005). For the purpose of the present discussion, the primary text function, which is derived from Göpferich (1995), will be ignored (note, however, that the examples discussed in this paper were taken from texts with the primary text function *progress-oriented actualizing*).

expert and expert-to-expert communication (see Möhn 1979; Vargas 2005).[10] These communicative configurations correlate with the degree of technicality of the corresponding texts, with the knowledge required to understand these texts becoming more and more extensive (ranging from little or no specialized knowledge to very detailed theoretical and applied scientific/technical knowledge). In cognitive linguistics, the shared knowledge underlying communication within a given discourse community (for example, expert-to expert discourse in science and technology) is modelled with the concept of *common ground* (see, for example, Taylor 2002:346; Langacker 2008:466).

The notion of common ground was originally introduced in theoretical discourse by Stalnaker (1978) but the major theoretical contribution to the concept is generally attributed to Clark (1996). Clark defines the common ground between two or more people as "the sum of their mutual, common or joint knowledge, beliefs and suppositions" (1996:93). He further distinguishes between three representations of common ground, which are *CG-shared*, *CG-reflexive* and *CG iterated*, and argues for CG-shared as the psychologically most plausible and most fundamental concept to be theoretically elaborated further (Clark 1996:94-95).[11] 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" (Clark 1996:94). 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*.

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[10] The notion of *expert* is understood here as referring to persons having "a specific knowledge in a professional field acquired through learning" (Vargas 2005:306). With reference to the knowledge requirements illustrated in Figure 1, the basic requirement for expert status would probably be a thorough theoretical and applied knowledge in a given professional field (this description is derived from the more fine-grained discussion of the degree of technicality of texts and the corresponding knowledge requirements in Arntz 2001:203-204). Of course, the seemingly clear-cut distinction between experts, semi-experts and laypersons is oversimplified. In reality, there will be a continuum of degree of competency between expert, semi-expert and layperson. However, for the aims of the present paper, this coarse-grained classification should serve its purpose.

[11] CG-reflexive is a representation where the proposition in question contains a reference to itself as in "This sentence contains five words" (Clark 1996:95). CG-iterated is argued to be a cognitively implausible representation of common ground since it requires the following propositions: 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* (Clark 1996:96).

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 the author of a specialized article on sulphur deposits on pistons in a learned journal and an (intended) reader of this journal. In order for the author to assume that the location of the piston is common ground between him/her and the intended reader (and hence does not have to be specifically verbalized in the text), s/he 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 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. (1996:96)

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 calls "quality of evidence", which can be used to "rank" potential shared bases according to their strength of justification (1996:98). A high-quality piece of evidence may be the high degree of specialized education (for example, a university degree in automotive engineering) that is required to count as part of the intended audience of a learned journal. The formal representation of CG-shared may thus look like this:

> 1. every member of C [author and intended reader] has the information that *b* [they form part of the intended pool of authors/intended audience of the learned journal by virtue of their specialized education] 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 [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.

After this formal elaboration of the common ground concept, Clark goes on to distinguish two types of common ground, namely *communal common ground* and *personal common ground* (1996:100 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" (Clark 1996:102). According to Clark, 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 (ibid.). Examples of the bases of shared expertise that binds a cultural community together are nationality, residence, education (see the example above), occupation, employment, etc. (Clark 1996:103).

The common ground concept can thus be used to model the shared knowledge of a specific cultural or discourse community and, therefore, provides a link between the conceptual and the social dimensions of knowledge. With regard to the classification of scientific and technical texts in Figure 1, it can be argued that 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. Common ground can also be seen as the intersection of the knowledge contexts of authors and readers with regard to the topic of a certain text. Linking the common ground concept to the three communicative configurations identified above, we would obtain the following graphical representation:

Figure 2: Common ground in expert-to-expert, expert-to-semi-expert and expert-to-layperson communication (A = author, R = reader)
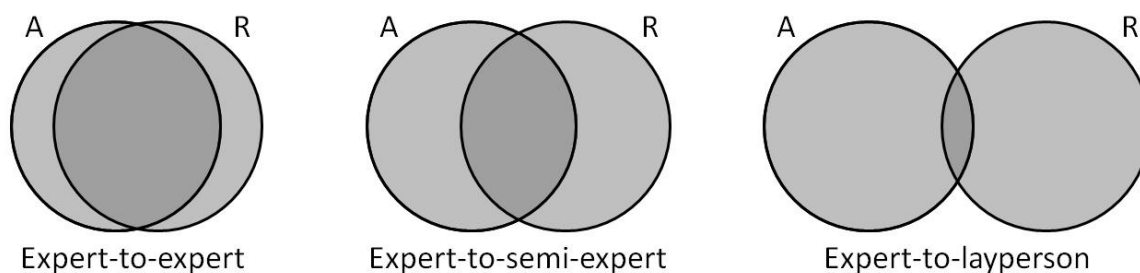
Expert-to-expert communication will be characterized by a high degree of shared knowledge between author and reader (represented by the large intersection of the two corresponding circles above). This shared knowledge can remain largely implicit in this form of communication, usually leading to a high degree of linguistic economy of the corresponding texts. 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 Figure 2) and, therefore, more and more contextual

information has to be explicitly verbalized in the text to secure its understanding by the intended audience.

The common ground concept was shown to constitute a sound theoretical tool for modelling the shared specialized knowledge of participants in scientific and technical discourse. The actual organization of this knowledge implicitly underlying the discourse of specific discourse communities can be modelled within cognitive semantics, to which we turn next.

Cognitive semantics – modelling implicit specialized knowledge in STT

Cognitive semantics is one of the central components of the cognitive linguistic framework. In line with the encyclopaedic approach to linguistic meaning adopted by CL, cognitive semantics is concerned with the organization of knowledge configurations underlying overtly encoded textual structures in actual discourse and, therefore, provides tools for modelling the implicit specialized knowledge that translators may have to access in high-quality scientific and technical translation. 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. Probably the best-known cognitive semantic theory is Fillmore's *frame semantics* (e.g., 1982, 1994/2006), a version of which (*scenes and frames semantics*) has been widely applied in translation studies (see, for example, Albrecht 2005:225). Fillmore was the first to develop an encyclopaedic *semantics of understanding* or *U-semantics*, which stood in direct opposition to the traditional dictionary account of *truth-conditional semantics* or *T-semantics* (Croft and Cruse 2004:8; Albrecht 2005:225). The present paper will not be concerned with Fillmore's frame semantics but rather with Langacker's *theory of domains* (1987, 2008), which shows several parallels to Fillmore's frame semantics and which complements this theory in various ways.

The theory of domains

In the theory of domains, 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 and Green 2006:230). 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], 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).[12] 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 in the theory of domains is the so-called profile-base organization. The profile of a linguistic unit is that part of its semantic structure upon which the linguistic unit focuses attention (Evans and Green 2006:166-167). The base, on the other hand, is the essential part of the domain matrix, which is necessary for understanding the profiled entity (Evans and Green 2006:237). In the words of Langacker:

> 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. (1987:183)

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

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[12] 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 adopted by cognitive linguistics, which rejects a clear-cut distinction between (strictly delimited) semantic and (potentially open-ended) pragmatic meaning.

different knowledge configurations or domains constitute the expression's 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.[13] The term *Kohlekraftwerk* profiles a specific configuration in the expression's domain matrix. The profile of the English equivalent *coal-fired power plant*, on the other hand, 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. The relation between profile, base, domain and domain matrix is illustrated quite clearly in Figure 3 taken from Taylor (2002:197).

Figure 3: The distinction between profile, base, domain and domain matrix
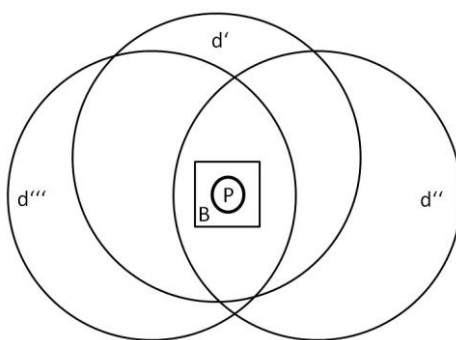
In this figure, a certain lexical unit profiles an entity P (the profile). The profiling takes place against the base B (containing the domain information that is essential for understanding the profiled entity). The profile-base relation is conceptualized with respect to (usually overlapping) knowledge configurations in the form of the domains d', d'' and d'''. The set of domains that serves as the overall knowledge configuration of the lexical unit is its domain matrix.

The internal structure of domain matrices

A general problem with the structuring and distribution of information in domains and domain matrices is that a domain is defined in such general terms that it can be applied in very different ways. There is, for example, no uniform way of determining whether a given

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[13] The distinction between an expression's essential base and its wider domain matrix involves several problems which cannot be addressed here. For a detailed discussion of these problems, see Krüger (2013:305).

body of information is to be subsumed under one domain or to be distributed over several domains (see also Faber Benítez 2009:122). In this context, Langacker points out 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" (2008:44). This is somewhat unsatisfactory since it means that different researchers applying the theory of domains may end up distributing semantic information in very different ways. A formalism that could be useful to provide a coherent internal structure to domain matrices is Pustejovsky's *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*) (1991). These roles are derived from Aristotle's *four causes* and correspond to the *causa materialis*, the *causa formalis*, the *causa efficiens* and the *causa finalis*. Pustejovsky lists several values that each role may assume for a given linguistic expression (1991:426-427). The four roles of the *qualia* structure together with their possible values can be represented as follows:

Figure 4: Detailed overview of Pustejovsky's *qualia* structure
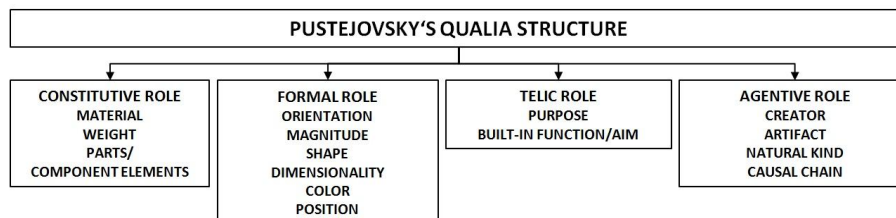
Criticising this *qualia* structure, Taylor (2002:457) rightly points out that this classification seems primarily suitable for man-made artefacts and cannot capture the semantics of more abstract concepts (e.g., what would be the substance or the purpose of abstract concepts such as TIME?). However, as a means of semantic representation in scientific and technical translation, the *qualia* structure may well prove useful. 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 be used as a kind of 'core formalism' for modelling the internal structure of domain matrices in STT.[14] We would just have to accept that not all the roles in

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[14] 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).

this structure will assume a value on every occasion (for example, time does not have any purpose) 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.

Application of the theory of domains to STT

To illustrate the applicability of the theory of domains to relevant aspects of scientific and technical translation, consider the following example from the CO_2 subcorpus of the Cologne Specialized Translation Corpus (see fn 3 above):[15]

> Depending on the process or power plant application in question, there are three main approaches to *capturing the CO₂ generated from a primary fossil fuel* [...]:

If we look at the English source text, we see that the CO_2 is described as *resulting* from a primary fossil fuel, with no further information on the corresponding process. Applying Langacker's theory of domains, we could establish the following domain matrix containing the encyclopaedic (semantic) information associated with the lexical unit *CO₂*:

Figure 5: Possible domain matrix of the term *CO₂*
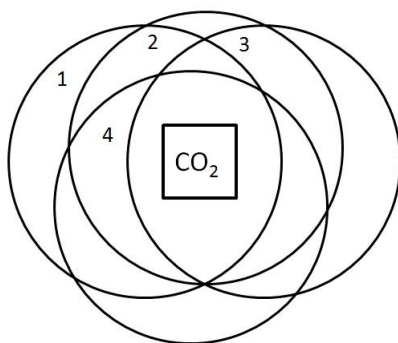
The domains in this matrix could include the following:

1) SHAPE/FORM (constitutive role of the *qualia* structure): colourless, odourless gas, can be liquefied

2) CHEMICAL COMPOSITION (constitutive role): two oxygen atoms covalently double-bonded to a carbon atom

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[15] Due to length restrictions, the number of examples discussed in this paper is quite limited. A wealth of linguistic examples of STT discussed from a cognitive linguistic perspective can be found in Krüger (forthcoming).

3) PRODUCTION (agentive role): combustion of coal or hydrocarbons, respiration of living organisms

4) SOCIETAL RELEVANCE (not covered by *qualia* structure): greenhouse gas contributing to anthropogenic climate change

Considering the discourse context of the lexical unit *CO₂* in the example above (specifying that the CO_2 is generated from a primary fossil fuel), it seems reasonable to assume that the domain PRODUCTION will be highly salient in the domain matrix while other domains, such as SHAPE/FORM or SOCIETAL RELEVANCE, may be backgrounded. Given that the text from which this example was taken was classified as expert-to-semi-expert communication, we can further assume that the intended audience of this text has reasonably detailed knowledge about the domain of PRODUCTION (which will be common ground between the author and the intended audience). Let us now take a look at the German translation solution:

> Abhängig vom jeweiligen Verfahren oder Kraftwerkstyp gibt es drei Hauptansätze zur *Abtrennung des **bei der Verbrennung** eines fossilen Primärenergieträgers* [...] entstandenen CO₂:
>
> gloss: [...] *to capturing the CO₂ generated **during the combustion** of a primary fossil fuel* [...]

We see that the translator raised the level of explicitness of the target text by introducing the prepositional phrase *bei der Verbrennung* (during the combustion). Going back to the domain matrix of the term *CO₂* illustrated above, we can say that the translator accessed this domain matrix (which is the semantic representation of the encyclopaedic knowledge associated with the lexical unit *CO₂*) and verbalized a specific piece of information associated with the domain PRODUCTION as part of the agentive role of this domain matrix. This information remains implicit in the source text and was explicitated by the translator in the target text. While in other semantic frameworks, we would have to debate whether the information that CO_2 is generated by the combustion of a primary fossil fuel is part of the expression's dictionary meaning or where in the unspecified *cognitive environment* of the discourse participants we may locate this information, cognitive semantics (and here especially the theory of domains) provides a fine-grained theoretical toolset for making statements about implicit aspects of knowledge in translation or in communication in general. If we complement this account with the *qualia* structure as a core formalism providing internal structure to domain matrices in scientific and technical translation, the domain matrices we

posit in the theoretical discussion of implicit aspects of STT become adequately stable and consistent. The linguistic dimension of the process of explicitation observed in the example above provides a good link to the cognitive linguistic notion of linguistic construal, which can be used to model relevant linguistic aspects of STT (the processes of explicitation and implicitation among them) and to which we turn now.

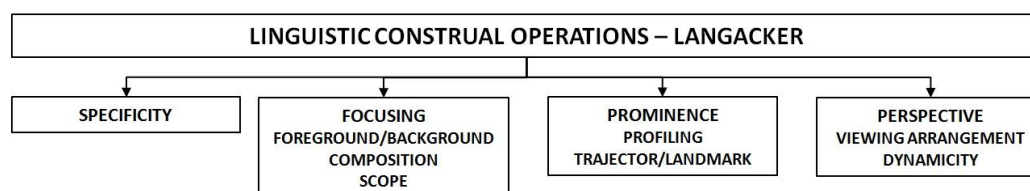## Linguistic construal – modelling linguistic aspects of STT

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). Langacker compares the conceptual content to a scene and the construal of this content to a particular way of viewing this scene (2008:55). Take, for instance, a glass of water in which the water occupies about half of the volume of the glass (Langacker 2008:43-44). 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. However, if we want to communicate this conceptual content we have to encode it linguistically and will thereby impose a certain construal. For example, a construal such as *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. Langacker 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 mentioned in section 2, cognitive linguistics rejects the view that language is an autonomous cognitive faculty but instead claims 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 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 cognitive linguistic literature, two major models of linguistic construal operations can be identified: the original model developed by Langacker (1987, 2008) and the more encompassing model developed by Croft and Cruse (2004). The following discussion will be

based on Langacker's model since it is more flexible than Croft and Cruse's model and more readily applicable to the corpus examples to be discussed in this paper.

Langacker's model of linguistic construal operations

Using the metaphor of visual perception, Langacker 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" (2008:55). Accordingly, he distinguishes between the following four major construal operations:

Figure 6: Langacker's (2008) model of linguistic construal operations

In this model, *specificity* refers to "the level of precision and detail at which a situation is characterised" (Langacker 2008:55). The construal operation of *focusing* involves "the selection of conceptual content for linguistic presentation, as well as its arrangement into […] foreground vs. background" (Langacker 2008:57, boldface removed). *Prominence* is concerned with the relative saliency of various aspects of a structure foregrounded in the process of focusing (Langacker 2008:66), and *perspective* describes the vantage point from which a given scene is viewed (Langacker 2008:73). For the purpose of the current discussion, the focus will be on the construal operations of *specificity* and *dynamicity* (as a sub-process of *perspective*). The following sections discuss the two construal operations in more detail and illustrate their applicability to scientific and technical translation.

The construal operation of specificity

As stated above, specificity is concerned with the level of precision or detail at which we describe a certain situation. For example, when stating the temperature we could say that it is *hot*, *in the 90s*, *about 95 degrees* or *exactly 95.2 degrees* and would thus describe the situation with progressively greater specificity (Langacker 2008:55). The counterpart of specificity

(which is not illustrated in Figure 6) would be *schematicity*. This means that moving from more specific to less specific construals entails a progressively greater schematicity. Langacker 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 (2008:56). 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. At the level of novel expressions, on the other hand, the construal *Something happened* 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 (ibid.). 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).

The construal operations of specificity and schematicity seem well suited to capture the process of explicitation identified in the example above (together with its counterpart implicitation). Let us look at the example again:

> 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:
>
> gloss: [...] *to capturing the CO_2 generated **during the combustion** of a primary fossil fuel* [...]

In the context of cognitive semantics, we observed that the translator explicitated a piece of information which remains implicit in the source text and which can be claimed to be salient in the domain matrix of the lexical unit CO_2. From the perspective of linguistic construal, we could say that the translator adjusted the level of specificity of the target text by introducing the process of combustion into this text. Since this shift does not operate on a lexical unit

already present in the source text we could classify it as an instance of explicitation (or specification) at the level of novel expressions.

The notions of specificity/schematicity can also be used to describe differences in source and target language registers[16] that regularly lead to explicitation and implicitation in translations between the two languages. Consider the following list by Schmitt (1999:211):

remove the two bolts	=	beide Schrauben *lösen* (to loosen)
remove filler cap	=	Verschlusskappe *aufdrehen* (to unscrew)
remove the spark plugs	=	Zündkerzen *herausdrehen* (to unscrew)
remove the plug leads	=	Zündkabel *abziehen* (to pull off)
remove dipstick	=	Ölmeßstab *herausziehen* (to pull out)
remove filter element	=	Filtereinsatz *herausnehmen* (to take out)
remove distributor cap	=	Verteilerdeckel *abnehmen* (to take off)
remove rotor arm	=	Verteilerläufer *abziehen* (to pull off)

This list illustrates that the English technical register licenses the construal of *removal* processes at a higher level of schematicity than the German register, which requires a specification of the verb according to the respective nominal concept. The German verbs in the list above are semantically more specific or precise (i.e. they have a more specific domain matrix). In English, on the other hand, the verbal removal process can, in all cases, be construed using the more schematic verb *to remove* and the exact information on the removal procedure has to be supplied by the domain matrices of the nominal concepts. In translation from English to German, source text instances of the verb *to remove* will, in line with German register requirements, regularly be explicitated or, in cognitive linguistic terms, instantiated by a more specific target language verb.

Linking explicitation and implicitation to Langacker's model of linguistic construal operations, we could say that explicitation occurs when basically the same conceptual content is construed more schematically in the source text or more specifically in the target text. In contrast, implicitation occurs when this conceptual content is construed more specifically in the source text or more schematically in the target text. Thus, explicitation and implicitation result from a difference between the construal of a given source text and the construal of the corresponding target text along the specificity/schematicity dimension. Therefore, the two

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[16] For the purpose of this article, the term *register* is understood as a diaphasic (situation-bound) (Albrecht 2005:248) or use-related (Hatim and Mason 1990:46) language variety. *Register* therefore refers to a choice of linguistic means that is appropriate in a given communicative situation.

concepts can be characterized as cross-linguistic construal operations (see also Krüger 2013:294 ff.).

The construal operation of dynamicity

As stated above, the construal operation of perspective is concerned with the vantage point from which we describe a certain situation. The sub-process of dynamicity refers to "how a conceptualization develops and unfolds through processing time" (Langacker 2008:79). In this context, cognitive linguistics makes a distinction between "sequential scanning" and "summary scanning" (Langacker 1987:144-145; Croft and Cruse 2004:53-54). This distinction can be illustrated with the following prototypical example, which is taken from the Automotive subcorpus of the Cologne Specialized Translation Corpus:

> *Bei Demontage des Ringes* vom Kolben zerbrachen die Stahllamellen aufgrund ihrer Sprödigkeit glasartig in mehrere Stücke.
>
> gloss: *During the removal of the ring* from the piston [...]
>
> *When the ring was removed* from the piston, the steel rails were so brittle that they broke like glass into a number of pieces.

In the German source text, the removal of the ring from the piston is construed in a nominal way (*Demontage des Rings*), whereas we find a verbal construal in the English target text (*the ring was removed*). In cognitive linguistic terms, nominal construals such as *Bei Demontage des Rings* are a form of *summary scanning*, which refers to "a holistic conceptualization of a scene in its entirety" (Croft and Cruse 2004:53). Verbal construals such as *the ring was removed*, on the other hand, are a form of *sequential scanning*, which involves the "scanning of a scene in conceived time" (ibid.). With regard to the example above, the nominal German construal *Bei Demontage des Rings* would represent a holistic conceptualization of the entire removal process whereas the verbal English construal *the ring was removed* represents a sequential scanning of the removal process as it unfolds through conceived time. It seems then that the construal operation of dynamicity can add a cognitive dimension to differences between nominalization or verbalization tendencies of source and target language registers. However, while the proposed link between explicitation and implicitation and the construal operation of specificity/schematicity has already been investigated in more detail (see Krüger 2013), the link between nominalization/verbalization tendencies in translation and the

construal operation of dynamicity is rather tentative, awaiting a more detailed theoretical reflection and empirical investigation.

Concluding remarks

This paper has reported on potential points of contact between scientific and technical translation and cognitive linguistics and it has attempted to answer the question to what extent cognitive linguistics may be usefully applied to the study of STT. It was demonstrated that the concept of common ground can be used to model the shared knowledge of specific discourse communities, which may – both in STT and in monolingual scientific and technical discourse – result in communicative configurations such as expert-to-expert, expert-to-semi-expert and expert-to-layperson communication. The actual organization of this shared knowledge, which implicitly underlies verbal communication, can be modelled using the tools provided by cognitive semantics and here especially by Langacker's theory of domains. Complemented by Pustejovsky's *qualia* structure, the theory of domains provides a coherent and consistent means of describing the (encyclopaedic) semantic knowledge associated with individual lexical units. It was also shown how this cognitive semantic toolset can be used in the theoretical description of contextual aspects of scientific and technical translation. Finally, it was shown that the concept of linguistic construal and the various construal operations developed by Langacker can capture relevant linguistic aspects of STT, for example explicitation and implicitation and potentially also different nominalization or verbalization tendencies in translation. Although the current paper focused on the application of cognitive linguistics to examples from the translation direction English-German, the framework will certainly also be applicable to other language pairs. It seems, then, that cognitive linguistics can serve as a fruitful linguistic basis for scientific and technical translation since it provides relevant theoretical components for both the wider contextual and the more specific textual dimensions of scientific and technical translation. The usage-based character of cognitive linguistics and the emphasis on the cognitive plausibility of its explanations should also ensure that this framework will not only be applicable to product-based accounts of translation but also to more macroscopic approaches such as translation process research. From the reverse perspective, it seems that cognitive linguistics can also profit from STT and from translation in general since (scientific and technical) translation may provide an ideal test bed for cognitive linguistic theories. After all, these theories 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.

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References

Albrecht, Jörn (2005) *Übersetzung und Linguistik* [Translation and Linguistics], Tübingen: Narr.

Arntz, Reiner (2001) *Fachbezogene Mehrsprachigkeit in Recht und Technik* [Domain-Related Multilingualism in the Fields of Law and Technology], Hildesheim: Olms.

Busse, Dietrich (2012) *Frame-Semantik. Ein Kompendium* [Frame Semantics. A Compendium], Berlin/Boston: de Gruyter.

Byrne, Jody (2006) *Technical Translation. Usability Strategies for Translating Technical Documentation*, Dordrecht: Springer.

Byrne, Jody (2012) *Scientific and Technical Translation Explained. A Nuts and Bolts Guide for Beginners*, Manchester: St. Jerome.

Clark, Herbert H. (1996) *Using Language*, Cambridge: Cambridge University Press.

Croft, William and David A. Cruse (2004) *Cognitive Linguistics*, Cambridge: Cambridge University Press.

Cruse, David A. (1986) *Lexical Semantics*, Cambridge: Cambridge University Press.

Dirven, René (1991/2002) 'Cognitive Linguistics', in Kirsten Malmkjær (ed.) *The Linguistics Encyclopedia*, London/New York: Routledge, 76-82.

Evans, Vyvyan and Melanie Green (2006) *Cognitive Linguistics. An Introduction*, Edinburgh: Edinburgh University Press.

Faber, Pamela and José Manuel Ureña Gómez-Moreno (2012) 'Specialized Language Translation', in Pamela Faber (ed.) *A Cognitive Linguistics View of Terminology and Specialized Language*, Berlin/Boston: de Gruyter, 73-92.

Faber Benítez, Pamela (2009) 'The Cognitive Shift in Terminology and Specialised Translation', in *MonTI. Monografías de Traducción e Interpretación 1*, 107-134.

Fillmore, Charles J. (1982) 'Frame Semantics', in The Linguistic Society of Korea (eds) *Linguistics in the Morning Calm*, Seoul: Hanshin, 111-137.

Fillmore, Charles J. (1994/2006) 'Frame Semantics', in Keith Brown (ed.) *Encyclopedia of Language and Linguistics*, Amsterdam: Elsevier, 613-620.

Göpferich, Susanne (1995) 'A Pragmatic Classification of LSP Texts in Science and Technology', *Target*, 7(2): 305-326.

Grice, Herbert P. (1975) 'Logic and Conversation', in Peter Cole and Jerry L. Morgan (eds) *Syntax and Semantics*, Volume 3, New York: Academic Press, 41-58.

Halverson, Sandra (2003) 'The Cognitive Basis of Translation Universals', *Target*, 15(2): 197-241.

Halverson, Sandra (2007) 'A Cognitive Linguistic Approach to Translation Shifts', *Belgian Journal of Linguistics*, 21(1): 105-121.

Halverson, Sandra (2010) 'Cognitive Translation Studies: Developments in Theory and Method', in Gregory M. Shreve and Erik Angelone (eds) *Translation and Cognition*, Amsterdam/Philadelphia: Benjamins, 349-369.

Halverson, Sandra (2013) 'Implications of Cognitive Linguistics for Translation Studies', in Anna Rojo and Iraide Ibarretxe-Antuñano (eds) *Cognitive Linguistics and Translation. Advances in Some Theoretical Models and Applications*, Berlin/Boston: de Gruyter, 33-73.

Hatim, Basil and Ian Mason (1990) *Discourse and the Translator*, London: Longman.

Horn-Helf, Brigitte (1999) *Technisches Übersetzen in Theorie und Praxis* [Technical Translation in Theory and Practice], Tübingen: Francke.

Krein-Kühle, Monika (2003) *Equivalence in Scientific and Technical Translation. A Text-in-Context-based Study*, PhD Thesis, University of Salford.

Krein-Kühle, Monika (2013) 'Towards High-quality Translation Corpora: The Cologne Specialized Translation Corpus (CSTC) – a New Tool Designed to Improve Translation Research', in Monika Krein-Kühle, Ursula Wienen and Ralph Krüger (eds) *Kölner Konferenz zur Fachtextübersetzung (2010)*, Frankfurt/M.: Lang, 3-17.

Krüger, Ralph (2013) 'A Cognitive Linguistic Perspective on Explicitation and Implicitation in Scientific and Technical Translation', *trans-kom*, 6(2): 285-314.

Krüger, Ralph (forthcoming) *The Interface between Scientific and Technical Translation Studies and Cognitive Linguistics. With Particular Emphasis on Explicitation and Implicitation as Indicators of Translational Text-Context Interaction*. Berlin: Frank & Timme.

Kussmaul, Paul (2007/2010) *Verstehen und Übersetzen. Ein Lehr- und Arbeitsbuch* [Understanding and Translating. A Course- and Workbook], Tübingen: Narr.

Lakoff, George (1987) *Women, Fire, and Dangerous Things. What Categories Reveal About the Mind*, Chicago: University of Chicago Press.

Langacker, Ronald W. (1987) *Foundations of Cognitive Grammar I: Theoretical Prerequisites*, Stanford: Stanford University Press.

Langacker, Ronald W. (2008) *Cognitive Grammar. A Basic Introduction*, Oxford: Oxford University Press.

León Araúz, Pilar, Pamela Faber and Silvia Montero Martínez (2012) 'Specialized Language Semantics', in Pamela Faber (ed.) *A Cognitive Linguistics View of Terminology and Specialized Language*, Berlin/Boston: de Gruyter, 95-175.

Marmaridou, Sophia S. A. (2000) *Pragmatic Meaning and Cognition*, Amsterdam/ Philadelphia: John Benjamins.

Mounin, Georges (1967) *Die Übersetzung. Geschichte, Theorie, Anwendung* [Translation. History, Theory, Application], München: Nymphenburger.

Möhn, Dieter (1979) 'Zur Aktualität der Fachsprachenforschung' [On the Current Relevance of LSP Research], in Wolfgang Metrup (ed.) *Fachsprache und Gemeinsprache* [Language for Special Purposes and Language for General Purposes], Düsseldorf: Schwann, 10-24.

Olohan, Maeve (1998/2009) 'Scientific and Technical Translation', in Mona Baker and Gabriela Saldanha (eds) *Routledge Encyclopedia of Translation Studies*, London/New York: Routledge, 246-249.

Pinchuck, Isadore (1977) *Scientific and Technical Translation*, London: Deutsch.

Pustejovsky, James (1991) 'The Generative Lexicon', *Computational Linguistics*, 17(4): 409-441.

Salama-Carr, Myriam (2009) 'Translation and Knowledge', in Barbara Ahrens, Lothar Černý, Monika Krein-Kühle and Michael Schreiber (eds) *Translationswissenschaftliches Kolloquium I*, Frankfurt/M.: Lang, 43-54.

Salama-Carr, Myriam (2013) 'The Translation of Scientific Discourse – Constraints and Challenges', in Monika Krein-Kühle, Ursula Wienen and Ralph Krüger (eds) *Kölner Konferenz zur Fachtextübersetzung (2010)*, Frankfurt/M.: Lang, 19-32.

Saldanha, Gabriela (1998/2009) 'Linguistic Approaches', in Mona Baker and Gabriela Saldanha (eds) *Routledge Encyclopedia of Translation Studies*, London/New York: Routledge, 148-152.

Schleiermacher, Friedrich (1813/2012) 'On the Different Methods of Translating' (translated by Susan Bernofsky), in Lawrence Venuti (ed.) *The Translation Studies Reader*, London/New York: Routledge, 43-63.

Schmitt, Peter A. (1986/1994) 'Die "Eindeutigkeit" von Fachtexten: Bemerkungen zu einer Fiktion' [The Lack of Ambiguity in Specialised Texts: Comments on an Illusion], in Mary Snell-Hornby (ed.) *Übersetzungswissenschaft – Eine Neuorientierung. Zur Integrierung von Theorie und Praxis* [Translation Studies – A Reorientation. On the Integration of Theory and Practice], Tübingen: Francke, 252-282.

Schmitt, Peter A. (1999) *Translation und Technik* [Translation and Technology], Tübingen: Stauffenburg.

Schwarz, Monika (1992/1996) *Einführung in die Kognitive Linguistik* [Introducing Cognitive Linguistics], Tübingen: Narr.

Sperber, Dan and Deirdre Wilson (1986/1995) *Relevance: Communication and Cognition*, Oxford: Blackwell.

Stalnaker, Robert C. (1978) 'Assertion', in Peter Cole (ed.) *Syntax and Semantics 9*, New York: New York Academic Press, 315-332.

Tabakowska, Elżbieta (1993) *Cognitive Linguistics and Poetics of Translation*, Tübingen: Narr.

Taylor, John R. (2002) *Cognitive Grammar*, Oxford: Oxford University Press.

Vargas, Chelo (2005) 'A Pragmatic Model of Text Classification for the Compilation of Special-Purpose Corpora', in Francisco Yus (ed.) *Thistles. A Homage to Brian Hughes. Essays in Memoriam*, Volume 2, Alicante: University of Alicante, 295-315.

Wilss, Wolfram (1991) 'Zur Praxisrelevanz der Übersetzungswissenschaft' [On the Practical Relevance of Translation Studies], *Lebende Sprachen*, 36(1): 1-7.

Ziem, Alexander (2008) *Frames und sprachliches Wissen. Kognitive Aspekte der semantischen Kompetenz* [Frames and Linguistic Knowledge. Cognitive Aspects of Semantic Competence], Berlin/New York: de Gruyter.