Metaphor in academic discourse
Linguistic forms, conceptual structures, communicative
functions and cognitive representations

VRIJE UNIVERSITEIT

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List of Abbreviations

BNC = British National Corpus
CMT = conceptual metaphor theory
GFP = grammatical form preference
LGSWE = Longman Grammar of Spoken and Written English
LCSWE = Longman Corpus of Spoken and Written English
LM = Longman Dictionary of Contemporary English
MFlag= Metaphor flag
MIP = Metaphor identification procedure
MIPVU = Metaphor identification procedure VU University Amsterdam
MM = Macmillan English Dictionary for Advanced Learners
MRW = Metaphor-related word
Non-MRW = Non-metaphor-related word
MW = Merriam-Webster Online Dictionary
MWM = Merriam-Webster Medical Online Dictionary
OED = Oxford English Dictionary
VUAMC = VU University Amsterdam Metaphor Corpus

Reference and Formatting Style

- Fragments from the VUAMC are labeled by the BNC-file tag, followed by the fragment number (e.g., ECV-fragment05) – if not indicated otherwise, they indicate the academic prose subsection.

- Examples taken from the LGSWE bear the register codes ACAD, NEWS, FICT, and CONV followed by the page number on which they appear in the LGSWE (e.g., ACAD 315).

- Fragments taken directly from the BNC are labeled by the code BNC, the BNC-file tag, and a code indicating the register (e.g., BNC-HAJ, ACA).

- The general style of formatting and referencing accords with the guidelines published in the Publication Manual of the American Psychological Association (6th edition) (American Psychological Association, 2010).This includes punctuation after colons.

- Linguistic examples cited in the text (grammatically part of the text) are given in italics. For example, "There are three nouns in the phrase *the offences of murder and manslaughter*."

- Linguistic examples cited in the text (grammatically part of the text) that are related to metaphor are italicized and underlined. For example, "This can be seen in the sentence *English law <u>distinguishes</u> between the offences of murder and manslaughter*)." This includes metaphor flags such as *resembling* in *an elegant outline <u>resembling</u> that of an arab minaret*.

- MRWs and MFlags within independent linguistic examples headed by a number are underlined. For example, "(1) English law <u>distinguishes</u> between the offences of murder and manslaughter."

- Single quotation marks are used to indicate the meaning, or sense, of some lexical unit. For example, "the basic sense is 'in or to what place' (MM1) or 'in or to a particular place' (MM2)." They are also used to indicate concepts or domains. For example, "a comparison between 'nature' and a 'restaurant'."

CHAPTER 1
Metaphor in Academic Discourse

(1) I don't like nature. It's big plants eating little plants, small fish eaten by big fish, big animals eating each other. It's like an enormous restaurant. (Woody Allen, cited in Grothe, 2008, p. 67)

This quote from comedian Woody Allen is obviously not a piece of academic discourse. It does not claim "academic" veracity or an objective-informational purpose but instead has a humoristic, entertaining aim. This is also reflected in some of the linguistic characteristics of the quotation, including short, repetitive sentences and clauses with the frequent use of verbs, among which a personal stance verb (*like*), two contractions (*don't* and *it's*), and the prominent use of a personal pronoun (*I* as the first word). All of these are typical features of spoken, conversational discourse, which is characterized by heavy personal and interpersonal functions (e.g., Biber, Johansson, Leech, Conrad, & Finegan, 1999).

However, Allen's quotation also shares some aspects with academic discourse, one of which is metaphor. The verb *eat* normally requires human or animal agency (e.g., *big fish eating little fish*). In the above context, *eat* in *big plants eating little plants* (…) is thus metaphorically used. (It is also used humorously: There is a nutrition relation between plants, yet plants do not "eat" other plants but are nurtured by the products of plant decay). What is more, *eat* can also induce a figurative idea that is then directly expressed by the simile *It's like an enormous restaurant*. An underlying metaphorical structure may hence be identified in thought, a comparison between 'nature' and a 'restaurant', in which 'animals' and 'plants' appear to be matched with 'restaurant customers', and where 'animal's or plant's ways of ingesting food' is compared with human's 'eating', and the wild space of 'nature' with the cultural and spatial properties conventionally associated with a 'restaurant'. The three-sentence excerpt not only deals with the topic 'nature' (more specifically, aspects of the *food chain*), as often happens in disciplines such as biology or philosophy, but also manifests related metaphorical language use.

Linguistic studies have suggested that metaphorical language use is pervasive in natural language (cf. Deignan, 2005; Semino, 2008) across many different domains of discourse, including academic discourse. An influential theory, called conceptual

metaphor theory (CMT)[1], has proposed that metaphorical language indicates underlying figurative ideas (Lakoff, 1993; Lakoff & Johnson, 1980) which are assumed to be relatively systematic and to correspond to natural processes of thought: "[M]etaphor is primarily conceptual, conventional, and part of the ordinary system of thought and language" (Lakoff, 1993, p. 203).

Now consider (2):

(2) Poplar leaves have an elegant outline resembling that of an arab [sic] minaret. This species has a finely toothed margin; a large, wide leaf born on a long stem. (AMM-fragment02)

In contrast to (1), (2) is a piece of academic prose, taken from a monograph on fossils (paleontology). The topic of the fragment is 'poplar leaves' and, more specifically, their visual characteristics. The description of the poplar leaf also includes a number of what can be considered metaphorically used words. Among these are *elegant*, *toothed,* and *have*, as well as the simile *resembling that of an arab minaret*. The adjective *elegant* has a more basic meaning when ascribed to the appearance of persons, manufactured objects or places, namely 'attractive because they are beautiful in a simple way' (*Macmillan English Dictionary for Advanced Learners* [MM]; Rundell, 2002). The adjective *toothed* can be assigned a more basic sense relating to mammals' teeth ('one of the hard white objects inside your mouth that you use for biting and for chewing food', MM), or to the rows of pointed edges found on some tools or machines ('one of a row of narrow pointed parts that form the edge of a tool or machine', MM). The verb *have* has a more basic meaning in the human domain of possession of concrete objects ('used for showing possession', MM) but in (2) is used for the description of 'the physical features' (MM) of the leaf. Since the verb in its basic sense is typically used with an animate (human) subject (e.g., in *They have a house in the suburbs,* MM), its usage in (2) can be considered metaphorical also because it appears with an inanimate agent; in this sense, it is a personification. In sum, all three words are indirectly used and have a meaning in the poplar leaf context which is distinct from, but can be understood in comparison with, these more basic senses. The simile (*an elegant outline resembling that of an arab minaret)* shifts the referential domain from the fossil to the architectural object Arab minaret. The academic writer has hence drawn on metaphor as well, in a way that is similar to Woody Allen's.

In terms of underlying conceptual structures, the sentence matches the 'outline of a poplar leaf' with the 'outline of an Arab minaret', a building whose shape is generally considered attractive. The adjective *elegant* appears to be coherent with

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[1] There are two acronyms in use for this theory, CTM and CMT. In this thesis, I will use CMT.

this conceptual comparison between entities in the domains of 'nature' and 'culture'. The metaphorical idea underlying *toothed* may be assumed to match the fine bulges on the leaf's margin onto a row of (human or animal) teeth – or a finely-toothed comb or other tool. And lastly, the conceptual structure of *have* seems to match the more basic predicate 'possess' with an abstract 'logical relation' between the leaf and its outline. By inference, other elements indicated by the relation 'possess' are mapped: 'Poplar leaf' (the grammatical subject) is mapped onto 'person' (the basic meaning's typical subject), and the 'leaf's outline' (the grammatical object) onto a 'concrete object' (the typical object). In sum, this case of academic prose, with its several instances of metaphor both at the language surface and in the underlying conceptual structure, exemplifies the way in which metaphor can be observed not only in the informal realm of comedy but also in academic discourse.

Yet the second example differs from the first one in a number of ways. Firstly, there is a difference between communicative goals: While the comedian's quotation serves to express a personal feeling and opinion for entertainment, the academic example has the purpose of information and instruction. Secondly, a number of characteristic linguistic differences can also be observed: Where the comedy uses short and simple clauses, the academic text has more integrated and longer sentences; while the comedy conspicuously repeats simple words, the academic fragment uses more specific lexis; whereas the comedy uses the personal pronoun *I* and contractions, the academic text does not. And last, but not least, metaphor seems to differ as well: Woody Allen conveys a mini-narrative (*nature* compared to <u>*a restaurant*</u> *where plants* <u>*eat*</u> *plants*), in which the underlying metaphorical structure expresses the gist of the remark, but the academic text uses metaphor more locally, combining divergent metaphors in order to offer a precise description of a poplar leaf (<u>*arab minaret*</u>, <u>*elegant*</u> *outline,* <u>*toothed*</u> *margin,* and <u>*have*</u>). When we take into account these linguistic and communicative differences, as well as the suggestion that metaphor appears to be a basic linguistic and conceptual phenomenon, these examples illustrate how metaphor may be used in academic discourse in specific ways for particular purposes that may diverge from other domains of discourse.

Today it is widely assumed that metaphor plays a crucial role in academic discourse. Evidence comes not only from the inner circle of CMT-inspired metaphor studies, but from diverse other fields, such as psycholinguistics and cognitive psychology (Cooke & Bartha, 1992; Gentner, 1982; Gentner & Gentner 1983; Gentner & Grudin, 1985; Gentner & Jeziorski, 1993; Sternberg, 1990; cf. Hoffman, Eskridge, & Shelley, 2009) as well as from the philosophy and sociology of science and related disciplines (e.g., Black, 1962; Boyd, 1993; Brown, 2003; Hoffman, 1985, 1980; Hallyn, 2000; Hesse, 1966; Holton, 1995; Kuhn, 1993; Lakoff & Johnson, 1999; Lakoff & Núñez, 2000; Leatherdale, 1974; Martin & Harré, 1982; Maasen & Weingart, 2000; Ortony, 1975; Petrie & Oshlag, 1993; Winter, 2001).

Metaphors are seen as important tools of communication both in scientific writing and in scientific thinking.

> Without metaphor, there would be no philosophy. However, philosophy's debt to metaphor is no greater, no less, than that of any other significant human intellectual field or discipline. (Johnson, 2010, p. 39)

Johnson's claim about academia's general debt to metaphor finds broad support. The general acceptance of the importance of metaphor in academic language and thought is a product of a general change in the conception of the nature of science and its relation to truth. Kuhn's (1962) proposal that scientific theories are subject to radical paradigm shifts, and thus exhibit a dynamic nature, deeply challenged the previously held "positivistic" idea of truth which had no need for metaphor.

> When science is seen as a human activity rather than as the repository of ultimate truths, and cognition generally is seen as the creative shaping of our conceptions of the world, the creative imaginative play of metaphor is seen as characteristic not only of poetry, but also of science. (Kittay, 1987, p. 9)

However, despite these changes in the understanding of science and academia, amounting to the position that facts are at least mediated, if not constructed, by language (e.g., Myers, 1990), the long-standing positivist strand of philosophy of science and science education may still play a role in the stylistic conventions of academic writing, resulting in a negative evaluation of metaphorical language. Here, metaphor is seen as a threat to the scientific maxims of accuracy, truth, and explicitness (see discussions in Darian, 2003; Giles 2008; Hoffman 1980; Leary, 1990b; Semino, 2008). In a review of current technical and scientific writing textbooks and their position on the use of metaphor, Giles suggests that the ideal of a "plain", metaphor-less style is (to a certain extent) alive in scientific writing today: "Technical communication is still haunted by the idea of a plain style as the preferred, as Bacon casts his long shadow over the field" (2008, p. 41). Against the widespread assumption that Bacon disdained metaphor generally, Giles holds that Bacon did not wish to "eliminate metaphor as a tool", but "advised science writers who would communicate with a general, educated audience to use metaphor" (2008, p. 36).On a similar note, Musolff (2005) has pointed out that there is in fact little historical foundation for characterizing Hobbes as "the most complete and clear example of the epistemological basis for the empiricist attack on metaphor" (Johnson, 1981, p. 11). He argues that Hobbes's "emphasis on the dangers of the "abuse" of figurative language should be seen as an *acknowledgement* rather than as a denial of its cognitive force" (2005, p. 97, emphasis his).

In this thesis I will investigate the degree to which metaphor is present or absent in academic writing (asking whether academic prose shows a "plain", or, more specifically, a metaphor-less, style), beginning with the sheer frequency of metaphorically used words observed in academic prose as opposed to three other main registers of English, fiction, news, and conversation. Metaphor distribution will also be examined across word classes, and across different types of metaphor, again in comparison with the other registers. The basic assumption is here that "[w]hen speakers switch between registers, they are doing very different things with language" (Biber et al., 1999, p. 24), and that these "different things" will probably include the use of metaphor.

The notion of metaphor used in this study is the one proposed by Lakoff and Johnson (1980), with metaphor defined as a set of correspondences between two conceptual domains which is expressed in various linguistic forms (as well as in other modes of communication) in natural discourse. Driven by the widely-held assumption that metaphor plays a crucial role in academic discourse, I will examine linguistic forms, conceptual structures, communicative functions as well as – on a psycholinguistic level of analysis – cognitive representations of metaphorical academic language use against the background of some of the most recent developments in cognitive-linguistic metaphor studies (cf. Gibbs, 2008; Semino 2008; Steen, 2007, 2008; see also Cameron, 2003; Cameron & Maslen, 2010). This will allow me to offer a detailed and differentiated characterization of the role of metaphor in academic texts on empirical grounds.

This goal is pursued by first describing a comprehensive procedure for the identification of metaphor in language and applying it to written academic discourse, and then exploring metaphorical language patterns by means of a quantitative analysis of metaphorical word use in academic discourse as opposed to three other registers (news, fiction, and conversation). An exploratory psycholinguistic study is then presented which examines one aspect of the understanding of academic metaphors. The main emphasis of the thesis lies on the corpus-linguistic exploration of metaphorical language patterns in natural written academic discourse, proceeding on a "case by case" basis, identifying metaphor word by word in language. In order to come to terms with the "messy reality of metaphor use" (Gibbs, 2008, p. 4) in academic prose with scientific rigor, I will hence examine the distribution of metaphor in academic prose as compared to other main registers of English, with cross-register variation examined across the specific factors word class and type of metaphorical language.

1.1 General Framework

The present study is part of an already established broad framework, which prepares the grounds for a new, comparative type of corpus-linguistic examination of linguistic characteristics of metaphor. This is the recent cognitive-linguistically informed interdisciplinary discourse framework for metaphor studies which has developed among applied linguists, discourse analysts, psycholinguists, and corpuslinguists (e.g., Cameron, 2003, 2010; Cameron & Low, 1999b; Charteris-Black, 2004; Deignan, 2005; Gibbs, 1994; Goatly, 1997; Koller, 2004; Musolff, 2004; Semino 2008; Steen, 1994, 2007). Metaphor is here broadly defined as a set of correspondences, or a *mapping*, between two conceptual domains, following the central tenet of conceptual metaphor theory (CMT, Lakoff & Johnson, 1980), and discourse is understood as verbal communication in natural situations (cf. Schiffrin, Tannen, & Hamilton, 2001). Within this framework of metaphor studies, metaphor is assumed to be relatively pervasive and frequent in natural discourse, and held to exhibit crucial functions in "real world" language, thought, and communication: "The lowlands of prosaic discourse are the site of our investigation, with metaphor in everyday talk and text as our starting point for empirical study" (Cameron, 2003, p. 7).

In the last 30 years, CMT has been refined in a number of ways and one important step has been to treat the linguistic forms of metaphor as an area of metaphor research in its own right. Relations have been established between these post-Lakoffian metaphor studies and functional-systemic approaches to language as discourse, with reference to Halliday's meta-functions (*ideational, interpersonal*, and *textual*) of language (Halliday, 2004a; Halliday & Hasan, 1985/1989). Several relatively recent studies (e.g., Cameron, 2003; Koller, 2003, 2004; Semino, 2008, and especially Goatly, 1997) have suggested that specific instances of metaphorical language use can be interpreted with respect to the meta-functions of language. New links can still be forged, as will happen in this thesis with Biber's (Biber, 1988) and Biber et al.'s (1999) corpus-linguistic work on cross-register differences: Biber and colleagues take Halliday's meta-functions as a point of reference in their multidimensional and multi-feature analysis of registers. In using Biber and colleagues' work as a backdrop for my own empirical study, my thesis will thus be largely compatible with any study applying Halliday's theory to the study of language and discourse. However, with Biber, I will pay particular attention to specific lexico-grammatical features of metaphorical academic language in the written academic register, with *register* understood as a language variety documented by the co-occurrence of particular linguistic features and influenced by contextual factors (cf. Biber et al., 1999; cf. Eggins & Martin, 1997). Against this backdrop, I will analyze metaphor use in academic prose in direct comparison with

three other language varieties: news texts, fiction texts, and (transcribed) conversation.

The thesis is part of the research program "Metaphor in discourse: linguistic forms, conceptual structures, and cognitive representations" at *VU* University Amsterdam. This program's general aim is to explore the relationships between metaphor defined as a cross-domain mapping in thought on the one hand and its manifestations in linguistic forms in discourse and their cognitive representation in discourse processing on the other. The program pays close attention to metaphor variation between and within the four different registers. Understanding discourse as a multi-leveled phenomenon on linguistic (e.g., Biber & Conrad, 2001; Eggins & Martin, 1997), discourse-analytical (e.g., van Dijk, 2008), as well as psychological (cf. Kintsch, 1998; van Dijk & Kintsch, 1983) levels of analysis, we applied distinct approaches to distinct areas of metaphor description, describing linguistic forms, conceptual structures, communicative functions, and cognitive representations. Our studies were hence pitched on the semiotic level of analysis when examining linguistic forms, conceptual structures, and communicative functions, but on the behavioral level when dealing with individual cognitive processes and their products (see, e.g., Steen, 2011a, p. 44).

The overall research question of the program was what linguistic forms with which conceptual structures are used in which discourse situations, for which purposes and to which cognitive effects. After an initial phase of joint activity which included annotation of the corpus and methodological work on the levels of linguistic and conceptual identification, the program was divided into four separate research projects that were conducted by four individual Ph.D. candidates, each examining one of the registers. While the present thesis zooms in on academic prose, fiction is examined in Dorst (2011a), conversation in Kaal (2012), and news texts in Krennmayr (2011). A related project was carried out by Pasma (2011) on news texts and conversation in Dutch.

The heart and soul of the research program was the manual annotation of a sample of the BNC Baby, itself a sample of the *British National Corpus* (BNC), which has the same basic structure as the materials forming the basis of the *Longman Corpus of Spoken and Written English* (*LCSWE*; Biber et al., 1999). Since no reliable automatic software is available for exhaustive metaphor annotation, almost 190,000 words were manually annotated for relation to metaphor on a word-by-word basis. The materials were divided into the four different registers (academic, news, fiction, and conversations) with on average 47,000 words each. The application of a rigorous protocol in the individual analyses is deemed important for quality control in linguistic metaphor identification, increasing validity and reliability of the analysis (Pragglejaz Group, 2007; cf. Todd & Low, 2010). Therefore, annotation followed a protocol which included annotation of corpus fragments by individual researchers, followed by a group discussion on an intra-net

site, a team discussion *in vivo*, and then the final annotation by the annotator in charge. Reliability was repeatedly tested over the course of the corpus annotation phase, and yielded good results (see Chapter 2). The annotated corpus (*VU Amsterdam Metaphor Corpus, VUAMC*) is now publicly available (Steen, Dorst, Herrmann, Kaal, & Krennmayr, 2010b), as is the identification procedure and its application to the different registers (Steen, Dorst, Herrmann, Krennmayr, & Pasma, 2010).

In the following subsections, I will introduce the theoretical background of the thesis in more detail and from there develop my research questions. I will first present conceptual metaphor theory (CMT) and recent cognitively-informed discourse approaches to metaphor (1.1.1). In the next section, I will zoom in on such studies that deal with metaphor in academic discourse (1.2), and in a brief concluding section (1.3), I will give an overview of the whole thesis.

1.1.1 CMT: Concepts, kudos, criticism. Metaphor is cognitive-linguistically defined as a conceptual mapping (e.g., ARGUMENT IS WAR), a set of correspondences between two distinct conceptual domains, the source (e.g., WAR) and the target domain (e.g., ARGUMENT; cf. Lakoff, 1987, 1993; Lakoff & Johnson, 1980, 1999; cf. Gibbs, 1994; Kövecses, 2002). The sets of correspondences include single elements (e.g., INTERLOCUTOR VS. COMBATANT/ARMY; LANGUAGE VS. WEAPONS), as well as relations between these elements (e.g., *USE* LANGUAGE VS. *FIRE* WEAPONS). In original versions of CMT, conceptual domains are understood as mental representations (Lakoff & Johnson, 1980) or schematic cognitive-cultural models (Lakoff, 1987), but newer approaches have proposed smaller and more flexible units, such as *scenes* (Grady, 1997) or *schemas* (Musolff, 2004), while yet others have proposed to treat conceptual mappings strictly on the symbolic level of analysis (Steen, 2007). Conceptual units (concepts and domains) are conventionally signaled by SMALL CAPITALS in Cognitive Linguistics. Conceptual mappings are typically systematic, ubiquitous and conventional patterns of thought.

The basic view of metaphor in cognitive linguistics is:

> *The essence of metaphor is understanding and experiencing one kind of thing in terms of another.* (Lakoff & Johnson, 1980, p. 5; italics in original)

Burke's (1945/1969) definition, on which Cameron's (2003) "discourse dynamic" theory is based, is almost identical with Lakoff and Johnson's: "Metaphor is a device for seeing something *in terms of* something else" (Burke, 1945/1969, p. 503, Italics in original). Burke stresses that metaphor plays a crucial "rôle in the discovery and description of 'the truth'" (1945/1969, pp. 503-4). In CMT, metaphor is assumed to lend structure to abstract domains such as ARGUMENTATION (commonly understood in terms of WAR or PHYSICAL CONFLICT) and to simplify

complex matters such as the MIND (often understood in terms of a MACHINE). However, metaphors not only highlight particular aspects of some concept and domain, but simultaneously hide others (Lakoff & Johnson, 1980, pp. 10-14). Deignan proposes that in being "reductions of a complex and abstract topic" (2005, p. 24), many conceptual metaphors are "distortions of reality". Many scholars have pointed out that this general characteristic of metaphors is what ultimately enables ideologies, suggesting particular inferences while excluding others (Lakoff & Johnson, 1980, p. 156), also in academic contexts (e.g., Goatly, 2007; Semino, 2008).

Lakoff and Johnson's CMT and its refinements (Gibbs, 1994; Grady, 1997; Johnson, 1987; Musolff, 2004; Steen, 1994, 2007, 2011a) have yielded a most productive definition of metaphor in metaphor studies, whereas CMT is one of the major building blocks of Cognitive Linguistics (Langacker, 1987, 1991; Croft & Cruse, 2004), Dirven & Ruiz de Mendoza, 2010, pp. 38-44). Although metaphor is primarily approached by CMT on the level of concepts, or "thought", the identification of conceptual metaphors crucially depends on "linguistic evidence" (Lakoff & Johnson, 1980, p. 4). Metaphor is considered conventional in "thought" as well as in language: "Conceptual metaphor is a natural part of human thought, and linguistic metaphor is a natural part of human language" (Lakoff & Johnson, 2003, p. 247). Metaphorical expressions in language are taken to necessarily correspond to some conceptual mapping:

> It should be noted that contemporary metaphor theorists commonly use the term "metaphor" to refer to the conceptual mapping, and the term "metaphorical expression" to refer to an individual linguistic expression […] that is sanctioned by a mapping. (Lakoff, 1993, p. 209)

The cognitive-linguistic definition of metaphor is applicable to a wide range of highly conventional and even formulaic naturally occurring linguistic expressions across domains and genres of discourse (cf. Deignan, 2005). For example, *eat, have, elegant, toothed,* but also *arab minaret* and *enormous restaurant* from examples (1) and (2) can be identified as related to understanding (and possibly experiencing) one kind of thing in terms of another. Other cases of conventional metaphor use in academic prose are the verbs *distinguish* and *frozen*, the preposition *between*, and the noun *boundaries* in the following examples:

(3) English law <u>distinguishes</u> <u>between</u> the offences of murder and manslaughter […]. (ACJ-fragment01, emphasis mine, JBH)

(4) [In other words, does English law pick out the most heinous forms of killing as murders or manslaughters], or are the <u>boundaries</u> <u>frozen</u> by tradition? (ACJ-fragment01, emphasis mine, JBH)

As can be seen from these examples, abstract and complex domains are referred to by recourse to more basic and/or more familiar domains: DISCOURSE in terms of SPACE, as indicated by *between* (3), LAW in terms of a PERSON as indicated by the inanimate agent in subject position in *English law distinguishes* (3), or LAW in terms of a MATERIAL OBJECT or SUBSTANCE as indicated by *boundaries* and *frozen* (4), respectively. In conceptual metaphor research it has been proposed that metaphorical mappings often have source domains that are more concrete and/or structured than the target domains: A "relatively abstract or inherently unstructured subject matter" is typically understood in terms of "a more concrete, or at least a more highly structured subject matter" (Lakoff, 1993, p. 245). This domain imbalance is indeed present in the examples DISCOURSE IS SPACE, LAW IS A PERSON, and LAW IS A MATERIAL OBJECT or SUBSTANCE. The metaphors used by Woody Allen in (1) fit this pattern as well, with the abstract, complex, and (in its details) relatively unfamiliar concept of 'food chain' being conceptualized in terms of aspects of the more familiar and more concrete and simple domain of 'restaurant'. The (to humans) largely invisible and slow processes of plant nutrition are conceptualized with reference to the (human) bodily action of eating.

> Cognitive metaphor theorists emphasize that target domains typically correspond to areas of experience that are relatively abstract, complex, unfamiliar, subjective, or poorly delineated, such as time, emotion, life or death. In contrast, source domains typically correspond to concrete, simple, familiar, physical and well-delineated experiences, such as motion, bodily phenomena, physical objects and so on. (Semino, 2008, p. 6)

While many metaphors seem to feature some imbalance between target and source in terms of abstraction, other metaphors link domains on roughly the same level of concreteness – or abstraction. Consider for example (2), where both *leaf* and *minaret* refer to concrete objects (although with differences in scale, function, and familiarity). In Lakoff's terms, this is a *one-shot mapping*, which maps "only one image onto one other image" (1993, p. 229). By contrast, the linguistic term *valency* is a case of an abstract source concept mapped onto an abstract target. The term was first introduced to linguistic theory by the grammarian Tesnière to describe word dependencies in syntax in terms of chemical theory (cf. Rickheit & Sichelschmidt, 2007).

(5) LINGUISTICS the number of different types of clause that a word can be used with. (MM)
(6) CHEMISTRY a measurement of the ability of a chemical element to combine with other elements. The measurement is a number that shows how many

atoms of the element combine with a single atom of the element hydrogen. (MM)

The term *valency* thus corresponds with abstract concepts in the target (5) *and* in the source domain (6). The basic idea mapped from chemical to linguistic theory is that there is an ability of an element "to combine with other elements" and that it can be measured. In the mapping, chemical elements are mapped onto words, atoms onto predicates and arguments, and the binding force of chemical elements onto a structural characteristic of words in larger units. These and similar types of mappings between two relatively abstract and complex domains have been described by Semino (2008), and others, who have proposed that "metaphorical transfer" does not only occur "from everyday language to scientific language", but also from "scientific to scientific language" (Weingart, 1995, p. 127), possibly to account for the particularly abstract and complex nature of many target domains (cf. Nersessian, 2008, p. 135). For now, we can note that in general, mappings between domains and concepts may vary in terms of familiarity, complexity, and inherent structure as well as in terms of the degree of concreteness and abstraction – on both sides of the mapping.

The theory of metaphor as a primarily conceptual and conventional part of the ordinary system of thought and language (Lakoff, 1993) has challenged "traditional" approaches to metaphor that see "literal" language as the norm and regard metaphor as some form of deviance or mere embellishment. Such views were prevailing in linguistics, literary studies, and the philosophy of language when Lakoff and Johnson first proposed conceptual metaphor theory (cf. Deignan, 2005). One example is the "standard grammatical account of meaning" (e.g. Levin, 1977, 1988), which sees metaphor as "violation" of normal verbal meaning. Another kind of approach sees metaphor as a form of literal language use (Davidson, 1978), "brought off by the imaginative employment of words and sentences and depend[ing] entirely on the ordinary meanings of those words" (1978, p. 33). A somewhat similar position is defended by relevance theory (e.g., Sperber & Wilson, 2008), which sees metaphor as a form of "loose talk" with "no mechanism specific to metaphor, no interesting generalisation that applies only to them" (Sperber & Wilson, 2008, p. 84). Other views of metaphor, such as the "standard pragmatic model" of metaphor comprehension (Grice, 1975; Searle, 1993), do not seem to share assumptions about language as "literal" in general, but still treat metaphor as deviance, assuming that messages can always be paraphrased in literal language. Moreover, such approaches also hold that metaphors are understood by a special process that involves a detour through the literal meaning of the utterance, which needs to be rejected, and only then reaches the metaphorical meaning (cf. Deignan, 2005). CMT, by contrast, has successfully defended the idea of the conventional nature of metaphorical language and thought, as well as its ubiquity, and its particular cognitive structure, against the

once dominant tradition of viewing language as typically literal. Another distinctive feature of CMT is that it embraces a holistic theory of (language and) thought: Following an "experientialist" approach to language philosophy (see Lakoff & Johnson, 1980, 1999), the human body and its actions, as well as basic cultural experiences, are regarded as principal source domains for metaphorical mappings (see Gibbs, 1994, 2006; Gibbs & Matlock, 2010; Lakoff, 2010; Lakoff & Johnson, 1999). Vice versa, cognitively informed approaches assign metaphor a crucial role in the shaping of worldviews and beliefs (cf. Deignan, 2005; Goatly, 2007; Musolff, 2004; Semino, 2008). These cognitive-linguistic assumptions are not shared by the majority of other theories of metaphor, especially those that regard metaphor as "deviation" or "decoration", but find a broad basis in recent (psycho)linguistic, psychological, and philosophical theories of language (Barsalou, 2008; Clark, 1997; Thompson, 2007; Varela, Thompson, & Rosch, 1991). In all, the theoretical and empirical productivity of CMT is suggested by a large body of research (e.g., Charteris-Black, 2004; Chilton, 1996; Deignan, 2005; De Knop, Dirven, & Smieja, 2010; Koller, 2004; Low, 1999, 2008a; Reddy, 1993; Sweetster, 1990; Semino, 2002, 2008; Ungerer, 2000).

In spite of its great success, CMT has had to take significant flak both from within and outside cognitive-linguistic metaphor studies: Critics have shown that the above definition of metaphor (and other versions of it, e.g. Lakoff, 1993) is not precise enough in terms of actual cognitive behavior, i.e. representation and processing. Since it assumes cognitive validity, claiming that conceptual metaphors correspond with people's thoughts, psychologists have claimed that CMT lacks an adequate model of cognitive processing (e.g., McGlone, 1996, 2007; Murphy, 1996, 1997). CMT's relatively vague definition of conceptual metaphor and its role in human thought has even allowed for two alternative interpretations within the paradigm itself: One position "postulat[es] the existence of conceptual metaphors in people's long term memories" and the second "claim[s] that people perform cross-domain mappings during online comprehension when they encounter a metaphor in on-going discourse" (cf. Steen, 2011c, pp. 586-7). Some psychologists have pointed out that it is hard to subject CMT to empirical testing and to generate predictions about specific language behavior, because of the underspecified description of the relation between language and thought on the one hand and the vague claims about processing behavior on the other. Some, such as Keysar, Shen, Glucksberg, & Horton (2000), have suggested that specific predictions that may be derived from CMT are in fact mistaken. However, others such as Boroditsky (2000, 2001), Casasanto & Boroditsky (2008), and Gibbs (1994, 2006) have successfully tested aspects of CMT. Criticisms of CMT have also highlighted the idea that the very distinction between metaphor in language and in thought needs more attention, because CMT and other "cognitive-linguistic studies go back and forth between language and thought so often that it is sometimes unclear whether they intend to

make claims about language or thought" (2007, p. 10). A solution to this problem in metaphor theory and research is to separate the linguistic and cognitive aspects of metaphor, as well as the semiotic and behavioral levels of analysis.

As for the linguistic forms of metaphor, Deignan (1999, 2005, 2008) has made a point of examining metaphorical expressions in naturally occurring language, suggesting that there are collocational and syntactic patterns of language use that are not addressed by CMT, and stressing that "a mental mapping theory of metaphor is not in itself sufficient to account for the patterns found in language" (2008, p. 287). On a similar note, an ongoing debate about CMT concerns the lack of an explicit methodology for (a) the identification and analysis of metaphor in language (cf. Cameron, 1999; Deignan, 2005; Pragglejaz Group, 2007); and (b) the extrapolation of conceptual domains and of conventional mappings (e.g., Semino 2008, p. 20; Semino, Heywood, & Short, 2004; Steen, 1999, 2007 [Chapter 7], 2009). With regard to the identification of linguistic metaphor, especially in the early days of CMT, much evidence for linguistic metaphor has been obtained by way of "armchair reflections" (cf. Cameron, 2003; Hanks, 2010). Introspectively grounded and often not explicitly stated methodologies are part of what the Pragglejaz group identified as "the primary difficulty" with metaphor studies: "Metaphor scholars often do not provide criteria in their empirical investigations for specifying what is, and what is not, metaphorical" (2007, p. 2).

As for the extrapolation of conceptual mappings underlying the linguistic metaphors, Semino and colleagues point out that "lists of decontextualized expressions under the heading of a particular conceptual metaphor can, in some cases, lead one down a single interpretative route when others are also possible" (2004, p. 1274; see also Vervaeke & Kennedy, 1996). Vervaeke and Kennedy (1996) also emphasize that there is no fixed criterion in CMT to decide about the level of generality of mappings; for example, ARGUMENT IS WAR could be seen as derived from the more general metaphor "ARGUMENTS ARE SPACE", since "wars involve motion in space" (1996, p. 276). Ritchie (2003) followed up on this, arguing that particular metaphorical expressions can be related to a range of different conceptual metaphors:

> Most of the metaphorical expressions Lakoff and Johnson (1980) cited as evidence for an underlying metaphor, *"ARGUMENT IS WAR,"* are also consistent with *"ARGUMENT IS CHESS"* or *"ARGUMENT IS BOXING"*. (Ritchie, 2003, p. 132, Italics in original)

Together, these arguments highlight the fact that the systematic and rigorous identification of metaphor in language as well as in conceptual structure has been problematic for classical CMT. In particular, there seems a substantial level of arbitrariness involved in choosing from several alternative conceptual mappings, as

well as in determining the level of generality on which the mapping are pitched. Newer theories break down conceptual mappings to more basic units such as *scenes* (Grady, 1997) or *scenarios* (Musolff, 2004), which are treated as rich mental representations (cf. Semino, 2008, p. 10), while the issue of more exact metaphor identification has been tackled by a number of studies, both in language (e.g., Cameron, 2003; Charteris-Black, 2004; Pragglejaz Group, 2007) and conceptual structure (e.g., Semino et al., 2004; Steen, 1999, 2009). Related to the need for a clear distinction between metaphor in language and metaphor in thought is the need for differentiation between thought approached as symbolic structure and thought approached as actual cognitive behavior, since "symbolic structure does not necessarily equal psychological process and its product, cognitive representation" (Steen, 2007, p. 11). The systematic structures underlying language (conceptual mappings) can hence be treated as thought on a symbolic level of analysis, reflecting knowledge patterns on a relatively high level of abstraction. However, analyses on this conceptual level (arriving at e.g., ARGUMENT IS WAR or ARGUMENT IS PHYSICAL COMBAT from expressions such as *he attacked every weak point)* cannot make assertions about what is going on in actual people's minds when dealing with the language that can be related to particular assumed mappings. It has thus often "remained an act of faith that particular metaphors reflect particular metaphors in thought" (Steen, 1999, p. 58). As a consequence, questions about metaphor in language and thought on the symbolic level need to be approached differently from questions that aim to assess cognitive representations and processes involved in metaphorical language processing directly.

Lakoff and Johnson's *Metaphors we live by* (1980) has played a pivotal role in shaping the current cognitively-oriented metaphor paradigm, but their theory did not come out of the blue: Two other volumes were published at roughly the same time, the interdisciplinary collective volumes *Metaphor and thought* (Ortony, 1993, first published in 1979) and *Cognition and figurative language* (Honeck & Hoffman, 1980). Also, CMT has in fact been attacked for not explicitly referencing its many historical predecessors that recognized cognitive and communicative functions as well as the linguistic ubiquity of metaphor, such as Aristotle's (*Poetics* and *Rhetoric*), Vico, Descartes, Kant, Nietzsche (cf. Debatin, 1995; Jäkel, 1999; Mahon, 1999); and, more recently, Richards (1936), Black (1962, 1979/1993), and Ricoeur (1977; cf. Cameron, 2003; Giles, 2008; Kittay, 1987). CMT thus appears as just one fruit of a general interdisciplinary development towards acknowledging the role of metaphor in language and thought in the late 1970s.

Since the 1990s, cognitive approaches to metaphor have got back in touch with semiotics (cf. Eco, 1976, 1984) and structuralist linguistics and poetics in the sense of Jakobson (cf. Dirven & Pörings, 2002; Steen, 2005, 2007), probably for the first time since the young Lakoff sat in on Jakobson's lectures at Harvard (reported by Dirven, 2002, p. 1). Currently, there are at least three main alternative approaches to

metaphor that make claims about metaphor in language *and* thought: Conceptual integration / blending theory (e.g., Fauconnier & Turner, 2008), class-inclusion theory (e.g., Glucksberg, 2008), and the structure mapping / career of metaphor theory (Bowdle & Gentner, 2005; Gentner & Bowdle, 2008). CMT and the last three mentioned conceptualizations of metaphor converge in taking metaphor as essentially a conceptual phenomenon and in taking "the linguistic expression of metaphor […] as derivative" (Steen, 2007, p. 49), but differ in terms of the number and nature of proposed conceptual structures and in the "assessment of what it is for a linguistic expression to be used indirectly, that is, when metaphorical relations between indirect use and direct or literal or basic use can still be observed" (2007, p. 56). This means that disagreement is largely about specific questions of metaphor processing, in particular, whether just one or more conceptual structures might be activated during comprehension. In these four approaches metaphor consists in "at least two conceptual structures and some relation between them" (2007, p. 57) – there are thus more basic convergences among these alternative theories than the divergences. A fifth theory of metaphor, Relevance Theory (e.g., Sperber & Wilson, 2008), however, does not fulfill this basic criterion; it does not assume that cross-domain mappings are a central part of metaphor understanding (Tendahl & Gibbs, 2008, p. 1832), and sees metaphors as a form of loose talk. In all, CMT shares the basic view of metaphor as a conceptual phenomenon (with at least two conceptual structures) with most of the current cognitive metaphor theories, which means that a study that applies the conceptualization of metaphor advocated by CMT is accessible by most other approaches without difficulty.

In sum, CMT's great achievement has been to show that conventionalized metaphorical language use (and, possibly, thought) is widespread and seems to play a systematic role in structuring language and possibly in shaping reality, emphasizing the role of mundane (bodily and cultural) experience as capital sources of metaphorical meaning ("embodiment"). Despite critical evaluations of CMT, particularly of its lack of methodology in identifying metaphor in language and conceptual structures, many scholars have embraced the basic hypothesis that metaphor is ubiquitous and corresponds with systematic underlying structures. Even scholars that maintain a rather critical view of CMT such as Vervaeke and Kennedy concur that "[m]etaphors come not as single spies, but in battalions" (Vervaeke & Kennedy, 1996, p. 283). The notion *conceptual metaphor*, if treated as symbolic structure, hence still provides a versatile instrument to locate cross-domain systematicity underlying discourse events.

1.1.2 The cognitively-informed discourse approaches. Moving away from CMT's dictum "the locus of metaphor is not in language at all" (Lakoff, 1993, p. 203), a recent trend is to give the study of "metaphor in language use" its own place, accounting for the complexities of metaphor in authentic usage across diverse domains of discourse (e.g., Cameron, 2003, 2010; Deignan, 2005; Low, Todd, Deignan, & Cameron, 2010; Musolff & Zinken, 2009; Pragglejaz Group, 2007; Semino, 2008; Steen, 1994, 2007; Zanotto, Cameron, & Do Couto Cavalcanti, 2008). Cognitively informed discourse approaches to metaphor "build on conceptual metaphor theory, while also challenging it through [their] position that the language of metaphor must be integral to theory and method" (Zanotto et al., 2008, p. 1).

This interdisciplinary framework is attuned to "the prosaics of metaphor" (cf. Cameron, 2003, p. 6), that is, the details and complexities of linguistic forms of metaphor in various natural contexts. Discourse approaches to metaphor emphasize that metaphor originates from and in turn shapes discourse (cf. Gibbs & Lonergan, 2009, p. 251), manifest in multimodal ways in communication (Forceville & Urios-Aparisi, 2009), for example in gesture (Cienki, 2010; Mittelberg, 2008; Müller & Cienki, 2009). Within newer cognitively informed approaches to metaphor, metaphor as a research topic has thus increasingly been treated as a phenomenon that is not primarily a matter of thought, possibly even residing predominantly "in language structure without giving rise to much metaphorical thought, simply because it is processed via lexical disambiguation" (Steen, 2011, p. 58). Since in this kind of research often no ultimate decision can be made about whether or not a particular unit of language is being processed as metaphorical by some particular language user, metaphorical forms of language have been treated as "potentially" metaphorical by many (e.g., Cameron, 2010, p. 102; Deignan, 2003; Semino, 2008, p. 13).

As a rule, studies that can be subsumed under the recent approach to metaphor apply a range of methods to examine natural and elicited (mostly verbal) data, ranging from very small to rather large data samples. Studies with a more emphasized discourse-analytical orientation emphasize the power of metaphor in "constructing social realities" (cf. Zinken & Musolff, 2009). In such studies, the actual properties of metaphorical language forms are less in focus because metaphor analysis is generally treated as a means for the goal of "answer[ing] questions about people's ideas, attitudes and beliefs" (Cameron, 2010, p. 4). Others, such as Goatly's (1997) functionally oriented analysis of metaphor, pay systematic attention to the linguistic details of metaphor. Goatly's seminal study, positioned between pragmatics and functional linguistics, filled a gap that then existed between "philosophical and psychological theories" (1997, p. 4). He emphasized the range of forms that metaphors actually have in natural language – in terms of conventionality (original and more and less conventional ones), as well as in terms of syntactic forms and word classes (e.g., the verbal *The stone <u>died</u>*, the nominal *The past is a*

foreign country), and in terms of communicative functions (e.g., ideational, but also interpersonal functions). Goatly also advocated the analysis of "metaphors from a corpus of written/spoken material, within particular and identifiable genres" (1997, p. 5).

Newer metaphor studies do exactly this, such as Semino (2008), which combines CMT with corpus-linguistic methods á la Deignan (2005), newer ideas about conceptual units (Musolff, 2004) and a comparative discourse-analytical framework (comparing metaphor use mostly qualitatively in three genres of discourse – literature, politics, and science /education). Others, such as Steen (2007, 2011a) and colleagues (e.g., Steen, Dorst, Herrmann, Kaal, & Krennmayr, 2010a; Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010) regard metaphor as a multi-leveled phenomenon whose analysis can and should be separated analytically on the levels of language, thought, and communication, applying corpus-linguistic, discourse-linguistic and experimental-psychological methods to the respective tasks (Dorst, 2011a; Kaal, 2012; Krennmayr, 2011; Pasma, 2011; this thesis). Across the board, the post-Lakoffian approaches to metaphor analysis seek to scrutinize metaphorical expressions with heightened empirical rigor in language-in-use, aware of socio-cultural, cognitive, and functional-grammatical dimensions, and their interactions.

1.2 Metaphor in Academic Discourse

In the following, I will give an overview of current research relevant to the study of metaphor in academic discourse. First, a brief conceptualization of *academic discourse* will be given for the current thesis, delineating main lines of research. Subsequently, four sections will outline the state of the art of cognitively-informed metaphor research relevant to the present study of metaphor in academic discourse on the levels of symbolic structure and cognitive behavior. The first of these sections will discuss research on the linguistic structures related to metaphor in academic discourse, the second will summarize research dealing with the communicative functions ascribed to linguistic metaphors in academic contexts, the third one will approach research on metaphorical conceptual structures underlying academic discourse, whereas the fourth section will discuss research on the cognitive processes and representations associated with metaphor in academic prose. Through this, I will introduce the five main research questions of the present thesis.

My work will concentrate on a small, well-defined subsection of academic discourse: written language in academic textbooks and academic journal articles. For this goal, it seems most adequate to work with the term *register*, since it is normally defined as a general language variety influenced by contextual factors (cf.

Halliday & Hasan, 1985/1989). Biber et al. define register "in non-linguistic terms, with respect to situational characteristics such as mode, interactiveness, domain, communicative purpose, and topic" (1999, p. 15), which enables them to provide linguistic register profiles of lexico-grammatical features. According to Biber et al., key non-linguistic features of academic prose are its written mode, a not-interactive production, and no shared immediate situation, informational discourse function, including argumentation and explanation, geared towards a specialist audience which uses a global variety (of English). Key linguistic features of academic prose are informational elaboration and explicit, situation-independent reference as expressed for example in the frequent use of noun phrases, prepositional phrases, and attributive adjectives (Biber, 1988, p. 42). Written academic discourse is generally associated with a high degree of linguistic formality (cf. Eggins & Martin, 1997), as well as a high degree of abstract information (Biber, 1988), which is related to "the use of specialist vocabulary, impersonal voice and the ways that ideas are packed into relatively few words" (Hyland, 2006b, p. 13). For example, in sentences (7) and (8), the choice of the impersonal subject *English law* creates an impersonal voice (similarly the use of the passive voice in example [8]).

(7) *English law* distinguishes between the offences of murder and manslaughter, as we shall see […]. (ACJ-fragment01, emphasis mine, JBH)

(8) In other words, does *English law* pick out the most heinous forms of killing as *murders or manslaughters*, or are the <u>*boundaries frozen*</u> by tradition? (ACJ-fragment01, emphasis mine, JBH)

The same stylistic choice enables the author to condense information: Instead of referring to the particular paragraphs that contain the exact legal definitions, the text refers to an umbrella term *English law* (the 'system of rules […] dealing with people's behaviour and activities', MM). In (8), the contextual meaning 'to define category distinctions' is packaged by means of the metaphorically used words *frozen* and *boundaries*, with the inanimate and abstract *tradition* in logical subject position. Furthermore, the terms *murder* and *manslaughter* are highly precise terms which correspond with meticulous definitions that need to be borne in mind when engaging in this particular kind of academic discourse.

While there may be differences between the purposes of (metaphorically used) language across domains and disciplines of academic discourse, in the following I will treat *scientific* and *academic discourse* as synonymous, tentatively extending such findings reported for scientific discourse(s) to academic discourse in general (and conversely). This is supported by the general assumption that all academic disciplines share some common functionalities (see Halliday's, 2004, p. 130, definition of science based on its function of extending someone's knowledge in some technical domain).

1.2.1 Linguistic forms. Aspects of metaphor in language use have been examined in many domains, among which are the natural sciences, including chemistry (e.g., Brown, 2003), physics (e.g., Drewer, 2003; Pulaczewska ,1999), neurosciences (e.g., Goschler, 2008), Biology (e.g., Keller, 1995, 2000; Maasen, Mendelsohn, & Weingart, 1995; Ouzounis & Mazière, 2006) and environmental studies (e.g., Larson, 2011), as well as medicine (e.g., van Rijn-van Tongeren, 1997; Richardt, 2005; Salager-Meyer, 1990) and psychotherapy (Tay, 2011). Metaphorical language has been extensively researched in the Humanities and Social Sciences as well: in philosophy (e.g., Black, 1962; Jäkel, 1997; Johnson, 2010; Hoffman, 1985), historiography and history of philosophy (e.g., Ankersmit, 1994; Demandt, 1978; White, 1978; Topitsch, 1979), sociology (e.g., Rigney, 2001; Levine, 1995; Maasen et al., 1995), administrative science (e.g., Cornelissen, Oswick, Christensen, & Phillips, 2008; Grant & Oswick, 1996; Morgan, 1986), legal studies (e.g., Smith, 2007; Winter, 2001), and especially in economics (e.g., Charteris-Black, 2004; Crawford Camiciottoli, 2006; Lindstromberg, 1991; Skorszynska, 2010; Skorczynska & Deignan, 2006; White, 2003; Henderson, 1986, 2000), and educational studies (e.g., Aubusson, Harrison, & Ritchie, 2006; Cameron, 2003; Cameron & Low, 2004; Charteris-Black, 2000; Darian, 2003; Giles, 2008; Hoffman, 1980; Littlemore, 2001, 2003, 2008, 2011; Littlemore & Low, 2006; Low, 2008a, Low, 2010). The list is not exhaustive by far and in addition includes a broad category that has been termed *popularization of science* (e.g., Crawford Camiciottoli, 2006; Goatly, 2007; Hellsten, 2005; Knudsen, 2003; Low, 2005). Generally, the studies vary in terms of defining, identifying, and evaluating metaphorical word use, and many are conducted from perspectives that diverge from the current cognitively-informed framework (e.g., analytic-philosophical, classical-rhetoric/stylistic, sociological, semiotic, and so on). Additionally, although all of them have taken aspects of linguistic forms and patterns into account, very few have approached linguistic structures of metaphor from a linguistic point of view. All of this considerably complicates the attempt to draw a comprehensive picture of metaphorical language use in academic discourse.

Some of the typical issues discussed regarding metaphor in language use in general are raised also with respect to academic language, such as conventionality. The topic of metaphor originality versus conventionality is intrinsically linked with metaphor's role in technical lexis (e.g., Darian, 2000; Giles, 2008; Low, 2008b; Pulaczewska, 1999; Semino 2008; Skorczynska & Deignan, 2006). Gibbs notes that metaphors in scientific discourse typically end up conventionalized:

> [S]cientific metaphors are made to be overused. […] Successful scientific metaphors become dead when they become a well-established part of our knowledge. (Gibbs, 1994, p. 173)

The conventional nature of metaphorical technical lexis used in academic discourse has been documented by a great number of studies. Semino (2008) reports that metaphorical expressions found in academic texts are "a central and indispensable part of expert vocabulary" (2008, p. 159) and in this largely "highly conventionalized technical senses" (2008, p. 163). In a comprehensive cognitive-linguistic work Pulaczewska (1997) offers a wealth of linguistic data on the language of physics, ranging across many subfields, such as optics (*band*, *bandwidth*, and *signature*), electronics (*electron jump*, *pulse valley*) and astrophysics (*giant* and *dwarf stars*), showing that the language of physics includes a great number of conventional metaphorical expressions. Low's (2008) examination of authors' self-positioning in academic book reviews shows that "the contribution of metaphor to many of the claims to authority by the reviewer is purely via conventional metaphors, unless an academic advance is suggested" (2008, p. 96), with the latter occurring rather infrequently. Similar observations were made by Giles (2008) in an empirical study of journal articles on the cloning of sheep Dolly in 1997: By close reading, he found that the scientific reports involved a great extent of "dead" or otherwise conventionalized metaphors. This dead metaphorical terminology could be retrieved in relevant technical dictionaries (*gene expression, colony* etc.), while other categories were "technical" metaphors (e.g., *programming* and *remodeling)* that exploit objects and process that are "byproducts of science and technology" (2008, p. 133), and "natural metaphors" (*ethical shock waves, donor and recipient cells*) which use the natural world as source domains (2008, p. 133), "personification" (*donor cells <u>behave</u>; molecular <u>conversation</u>*, 2008, p. 135). His study demonstrates how the use of metaphor makes up an important part of the scientific terminology in the area of cloning.

Many scholars have pointed out that conventional metaphors in academic contexts are *technical*, rather than conventional in a *common*-language user's sense (e.g., Cameron, 2003; Low, 2008b; Semino, 2008; cf. Goschler, 2007). To account for the specificity of conventionalized scientific metaphorical expressions Cameron proposes the term *technical metaphor*:

> These metaphors […] are familiar to group members through previous shared discourse. (Cameron, 2003, p. 112)

Technical metaphor's dependence on rather exact definition by discourse communities is also emphasized by Baake's (2003) study on oral inter-disciplinary communication. He shows that the use of metaphorical expressions is potentially problematic in interdisciplinary settings, precisely because metaphorical expressions can have conflicting meanings and "connotations" in different discourse communities. He discusses the technical *rule*, which means "regular observable

behavior in an organism" (1) in biology, whereas in political science it refers to an "action that is permitted by a social group" (2). Both contextual meanings (1) and (2) can be compared to a more basic meaning of *rule* (3):'an object used for measuring or drawing straight lines, consisting of a long flat piece of plastic, wood, or metal marked with units of measurement' (MM). In biology, the behavior of organisms is thus seen as mostly involuntary, while in social groups some kind of conscious choice among autonomous agents is involved, and *rules* are hence seen as enforceable. Technical terms such as *rule* thus not only have different contextual meanings in the different scientific discourse communities, but these meanings may involve vital differences in the respective underlying theories.

Another topic that has been investigated by a number of studies is *metaphor signaling* in academic contexts. This has been addressed by for example Beger (2011), Cameron (2003), Darian (2000), and Low (2010), and Cameron gives evidence for the use of similes and other direct expressions of metaphor in an adjacent type of discourse (primary classroom discourse), where the teacher used them to introduce and explain difficult concepts. Low, however, notes that these are rare in his samples of academic discourse: In his study of academic book reviews (Low, 2008), he observed a "virtual absence of similes", and only very few more in his corpus of four academic lectures (Low, 2010). Similarly, Darian (2000) found that forms of direct metaphor (forms of similes and analogies) are the least common figuratives in his sample of textbooks (chemistry and biology). By contrast, Beger's study (2011) identified a number of similes, simile-like structures and analogies in psychology lectures, which seemed to play an important role in the educational discourse, used to prompting "students to consider […] concepts from a new perspective" (2011, p. 58). Metaphorical language is hence commonly assumed to make up a conventional part of the technical lexis of specialist academic discourse communities, but the extent to which metaphor and analogy (the latter dubbed "direct forms" of metaphor, cf. Cameron, 2003) are explicitly marked in such contexts is still a controversial issue. There are thus different types of linguistic metaphors, with some being indirect and others directly signaled. This area of research hence needs more studies that examine natural language data from academic discourse for different linguistic types of metaphor, especially such studies that adopt a quantitative perspective.

Studies that have analyzed – or measured – metaphor use in academic discourse with a quantitative or near-quantitative approach are rare, with exceptions such as the work by Skorczynska and colleagues and Low and colleagues. Skorczynska and colleagues have examined the largest textual samples, with Skorczynska & Deignan (2006) comparing two 400,000-word samples of academic and popular business discourse respectively for their use of metaphor, and Skorczynska & Piqué-Angordans (2005) searching the same corpora for "metaphor marking" following Goatly's (1997) taxonomy. Applying the same small-corpus/big-corpus method as

Skorczynska and Deignan, Skorczynska (2010) examined an approximately 1,000,000 word corpus of business English (periodicals and academic journals) for the occurrence of a number of metaphorical expressions previously identified in a business English textbook. Such studies have, however, had to make sacrifices in terms of precision: In first identifying linguistic metaphors in a smaller sample and then tracking these in the main corpora, results "cannot be taken to indicate the frequency of all metaphors in the main corpora" (Skorczynska & Deignan, 2006, p. 92). The representativeness of findings is hence an issue.

Another methodological approach was taken by Cameron, Semino, and Low and colleagues. Low (2008b) conducted an examination of metaphorical language used for author's positioning in twenty academic book reviews, which amounted to approx. 19,000 words, using the Metaphor Identification Procedure (*MIP*) proposed by the Pragglejaz Group (2007). Low, Littlemore, & Koester (2008) analyzed three academic lectures for the proportion of metaphorical language (following up on a similar studies by Littlemore, 2002, 2003), on the basis of an approximately 17,500 word sample, using *MIP* as well. Low (2010) expanded the same corpus by one lecture in his examination of simile, applying Cameron's (2003) inductive procedure for identifying similes and simile-like expressions in multi-word units. Semino (2008) ran two case studies on metaphorical language (including similes) in academic genres (a sample of specialist science discourse with approximately 20,000 words and an exemplary sample of educational science discourse of approximately 1,300 words), applying *MIP* as well. Cameron's (2003) work on educational discourse is also notable in this context, despite the fact that she did not examine academic discourse in the strict sense (but educational discourse on the primary school level): It is among the first metaphor studies that offer quantitative observations on the distribution of metaphor in a particular domain very close to academic prose, on the basis of indicative metaphor identification. Similarly, Goatly's study identified metaphorical expressions as well as metaphor markers in a relatively small sample of popularization of science, by means of an inductive method. What is especially notable about both Cameron and Goatly is that they included specific lexico-grammatical features such as word class in the analysis, something which brings metaphor studies in closer contact with the mainstream of corpus-linguistic studies. However, in examining popularization of science discourse (Goatly) and educational discourse (Cameron), neither of them studied metaphor in academic discourse in the strict sense. An analysis of the relation between metaphor and basic lexico-grammatical features – such as word class – in academic discourse is hence still lacking.

As can be seen from the review, the attempts to approach metaphorical academic language use by counting words (or larger units) have often had to make concessions in two ways: Some studies use very small corpora (comprising a few hundred or thousand words), which limits the representativeness of findings, while

others use methods that are relatively imprecise in metaphor identification and cannot account for all instances of metaphor of a given corpus.

Despite a wealth of studies documenting conventional technical metaphor use in many areas of academic discourse, some aspects of metaphorical language use in written academic discourse still remain widely unexplored, for example the variation in metaphor distribution across academic disciplines, but also the distribution of metaphor in larger samples in general. Research is in particular needed on the relation of metaphor to particular lexico-grammatical features in academic discourse, such as word class, and on the distribution of different types of metaphor use in academic prose, such as direct versus indirect metaphor. This is especially true for quantitative approaches in the tradition of corpus linguistics. A quantitative approach is especially fruitful when carried out on a comparative basis, confronting the register in question (here, academic prose) with other registers that have different non-linguistic and linguistic features, such as news, fiction, and conversation (cf. Biber, 1988; Biber et al., 1999). When combining the lexico-grammatical perspective on register variation with that of cognitive-linguistic metaphor research the question arises in how far metaphor plays a role in the register profile of academic prose, especially in comparison with other main registers. From the cognitive-linguistic perspective, which assumes a crucial role for metaphor especially in abstract domains of discourse (e.g., Jäkel, 1997; Lakoff & Johnson, 1980; 1999), one possibility is that metaphor may be quantitatively more important in academic prose. This position may be supported by findings from register studies that show that academic prose overall has a higher degree of abstract information than other registers (Biber, 1988, pp. 151-4). However, another possibility is that metaphor use in academic prose may be regulated by a specific stylistic maxim (cf. Giles, 2008), possibly in concert with other features of academic prose, such as its high degree of formality (Biber, 1988; Hyland, 2006b), which may predict comparatively low quantities of metaphor in academic prose. At the same time, metaphor may be especially frequent in fiction, where it counts among the register-constitutive features (cf. Jakobson, 1956; Lodge, 1977; cf. Semino & Steen, 2008). It is thus an open question how metaphor is distributed across word classes in academic prose as compared to the other registers. In order to examine the lexico-grammatical nature of metaphor use in academic prose, I will attempt to answer the following questions:

> *How is metaphor distributed across the four main registers of English?*
> *How are particular linguistic features of metaphor such as word class and metaphor type distributed in academic discourse as opposed to other main registers of English, such as news, fiction, and conversation?*

However, in face of the variability and specificity of academic discourse (e.g., Halliday, 2004b; Hyland, 2006a) the general approach to main registers in English will be complemented by an exploratory study on a finer-grained level with regard to sub-levels of the academic register. Here, I will approach the following question:

How is metaphor type distributed across four academic sub-registers?

1.2.2 Communicative functions. The linguistic forms that can be described for metaphorical language use in academic discourse are one side of the coin. The other side concerns the level of communicative or discourse functions that can be associated with metaphorical language use in academic discourse generally, but potentially also with particular linguistic features. In metaphor studies, discourse analysis, and functional and applied linguistics, the notion *communicative function* has been often used interchangeably with *discourse function*, but the notions have been defined on different levels of generality. Some use the term communicative function in a more narrow sense, for example Steen (2011a), who opposes "linguistic", and "conceptual functions" to the "communicative function" of metaphor; the latter being to "facilitate social and cultural interaction as well as change" (2011a, p. 59).[2] Others use the term in a broader sense, relating more generally to the "functional correlates" of textual features and situational circumstances (cf. Biber, 1988; Biber et al., 1999). In the following, I will briefly summarize the research associated with the communicative/discourse functions of metaphorical language in academic discourse in a broad sense, leading on to the next research question.

That the communicative functions of metaphor use vary across different domains of discourse has been stated by many, and was most recently underlined by Semino's comparative discourse-linguistic metaphor analysis across different genres (2008). As for the specific functions that metaphor can have in academic contexts, Semino suggests that metaphor may be used specifically for representational purposes (including explanation and modeling), but also for interpersonal purposes such as persuasion,[3] and even humor, as well as for textual purposes (contributing to the internal coherence of a text, foregrounding main points; cf. Semino, 2008, p. 218). Along the same lines, many philosophers and natural scientists ascribe essential and permanent roles to metaphor in academic contexts (e.g., Boyd, 1993; Brown, 2003; Hoffman, 1980, 1985; Keller, 1995; Leary, 1990b; Sternberg, 1990). Especially Boyd's account of theory-constitutive (and pedagogic) metaphors has

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[2] Steen dubs the linguistic function "naming", the conceptual function "framing" and the communicative function "changing" (2011a, p. 59).
[3] Semino uses a slightly different framework than the current thesis, grouping persuasion with the representation of experience (cf. Semino 2008, pp. 217-8).

guided much of the research on metaphor in academic discourse (cf. Gibbs, 1994; cf. Goatly, 1997; cf. Knudsen, 2003; cf. Pulaczewska, 1999; cf. Semino, 2008). Theory-constitutive metaphors are "*constitutive* of the theories they express" (1993, p. 486). They are discipline-dependent, often non-paraphrasable conventional technical terms linked to systematic correspondences between two conceptual domains (e.g. *processing* in cognitive psychology, or *code* in genetics). They also fill lexical gaps in academic discourse, or, more specifically, terminological gaps, since they serve to "supply a term needed by the discipline rather than by the language as a whole" (Skorczynska & Deignan, 2006, p. 97). By contrast, pedagogical metaphors merely "play[s] a role in the teaching or explication of theories which already admit of entirely adequate nonmetaphorical (or, at any rate, less metaphorical) formulations" (1993, p. 485). Goatly has proposed that the theory-constitutive function be regarded as an instantiation of the ideational meta-function of language in the sense of Halliday (Halliday, 2004a; Halliday & Hasan, 1985/1989). In Goatly's understanding, the ideational meta-function of language can be paraphrased as "understanding the environment" (1997, pp. 148-9) – in the case of theory-constitutive metaphors, this includes the tasks of lexical gap filling, explanation, and especially reconceptualization (1997, pp. 150). For example, the metaphorical term *language processing* filled a lexical gap in cognitive psychology with reference to a particular (figurative) theory of the mind's linguistic working; it can form a part of a figurative explanation of how the mind deals with language ("as a computer"), and it was once introduced into cognitive psychology to reconceptualize prior ideas about language comprehension and production. By contrast, Halliday's interpersonal meta-function is dubbed by Goatly as "acting on others in the environment" (Goatly 1997, p. 149). Although Goatly does not discuss how Boyd's pedagogical function of metaphor in scientific texts should be categorized in terms of Halliday, pedagogical functions have at least in part interpersonal functions since they serve to explain aspects of theories to lay audiences, and possibly induce reconceptualization in learners ("in which specific ways the mind can be seen as functioning as a computer when dealing with language"), both of which means "acting on others". Lastly, Goatly suggests that science "is a Field of activity devoted to making explicit theoretical models or metaphors" (1997, p. 302). A similar perspective is taken by Gentner (1982), who puts an emphasis on "clarity" as a feature indicative of scientific metaphors and analogies, with clarity defined as the exactness with which an analogical transfer maps sets of content elements from base to target (cf. Gentner, 1982, pp. 124-5). It is opposed to "richness" (roughly, the quantity and detail of the content transferred from base to target within an analogy), which is assumed to be more typical of literary texts. One function of metaphor in academic discourse hence appears to delineate the conceptual structure of scientific theories and concepts in a clear, exact, and explicit way. This can be especially related to ideational/theory-constitutive functions, but also to interpersonal functions.

In her review of Boyd, Semino (2008) emphasizes that Boyd's functions are not mutually exclusive, and do not capture all possible tasks of a given metaphor (see also Goatly, 1997, p. 166-7, who stresses that metaphors in discourse fulfill more than one function simultaneously). Semino (2008, p. 134) proposes that

> the 'same' metaphor may have a primarily educational function in one context and a primarily educational function in another, or may perform both functions at the same time. In addition, these two main functions of scientific metaphors can co-exist with other functions, such as argumentation, persuasion, vividness, humor and so on.

Going beyond Boyd, contemporary metaphor scholars such as Semino and Goatly thus appear to suggest that metaphorical language in academic discourse can be used for ideational as well as for interpersonal Functions in the sense of Halliday and colleagues – sometimes even simultaneously. In Goatly's approach to metaphor, the third metalinguistic function is the textual function, dubbed as "the providing of the resources to ensure that that what is said is relevant and relates to co-text/context" (1997, p. 149), in particular, "Textual structuring" and "Enhancing memorability Foregrounding and Informativeness" (cf. Goatly, 1997, p. 300). Goatly states that "[m]etaphor can be used […] to structure the development of a text, as the organizing principle which gives the text a lexical cohesion" (1997, p. 163). Similarly, Ponterotto (2003) suggests that "overarching metaphors" lend cohesive structure to discourse in general, with instances binding together the text on a semantic and conceptual level (see also Koller, 2003), especially in spoken language (Cameron, 2003; Corts & Meyers, 2002). Analyzing a written expository text extract (describing ant colonies), Goatly noted that "the explanatory and the textual structuring function operate simultaneously" (1997, p. 163), with the "organizing metaphor" of "ants as an 'army' or 'soldiers'" developed throughout the text. Similar textual functions have been identified in a number of studies of academic texts, for example a summarizing function (cf. Cameron& Low, 2004; Low, 2010). Systematic conceptual mappings such as "discourse as space" have been assigned a binding function (e.g., Lakoff & Johnson, 1980), with lexical units with more basic spatial meanings (e.g., *above, below, here*) used for the structuring of abstract discourse (Fleischman, 1991). Metaphor patterning in written academic discourse has been analyzed by Darian (2000), who describes three patterns that he observed among metaphors in his sample of textbooks: (1) "one-liners" ("in which an image appears in an isolated sentence"), (2) extended metaphors or clusters ("one or several paragraphs that embellish an original metaphor and carry it through several permutations", for example, the explanation of DNA in terms of 'library' across three paragraphs), and (3) recurring metaphors ("the recurrence of the same image at different places in the text", with themes found in the two textbooks being "war,

hunting, and relationships, particularly family relationships"; 2000, p. 171). In terms of discourse coherence, linguistic forms of metaphor seem to create textual coherence and co-reference by means of establishing relationships between lexical units in terms of association with shared source and target domains. In one particular case of metaphor, coherence and co-reference seem to be created by establishing pronominal and elliptical links to conceptual mappings already set up by the surrounding context – this is what has been termed "implicit metaphor" in the metaphor in discourse research project. It is an empirical question how this type of metaphor with strong textual functions is distributed across registers, and whether it plays a particular role in academic discourse.

In sum, within the broader field of discourse-oriented metaphor studies across disciplines inspired by CMT, metaphorical language (and thought) in academic discourse is taken to play an important role in a range of functional dimensions of academic discourse, which may (partially) overlap. Following the basic functional categories proposed by Goatly (1997), the most typical functions of metaphors in academic prose are:

- Ideational function
    - Theory-constitutive function (also Boyd, 1993; Semino, 2008): establishment of reference, lexical gap filling, explanation and reconceptualization.
- Interpersonal function
    - Pedagogical function (also Boyd, 1993; Semino, 2008): explanation and (individual) reconceptualization.
    - Argumentation and evaluation (also Semino, 2008).
- Textual function
    - Creation of textual cohesion and textual structuring (also Darian, 2000; Low, 2010; Semino, 2008).

On this basis, it is an empirical question whether and how particular instances of metaphorical word use and general patterns of metaphorical word use in academic prose may be related to these particular communicative functions. In this sense, but also with regard to the functional linguistic account as represented by Biber and colleagues (Biber et al., 1999; Biber, 1988), this thesis will raise the question:

> *What discourse functions may be inferred from the analysis of linguistic forms of metaphor in academic discourse?*

1.2.3 Conceptual structures. In this thesis, metaphor is defined as a set of correspondences between two distinct domains, and it is conceptual analysis, not linguistic analysis, which traditionally has been the main level of analysis of cognitive linguistics. While linguistic analysis of metaphor can be largely independent of specific assumptions about underlying mappings, conceptual analysis of metaphor underlying academic writing depends by definition on the prior identification of metaphor in language (cf. Steen, 1999). Since my main goal in this thesis is to provide a fuller picture of metaphor use in natural academic language "as language", the conceptual analysis will remain secondary to the identification and analysis of the linguistic forms of metaphor. However, since the identification of conceptual mappings plays a vital part in the cognitively inspired research on metaphor informing the present thesis, and since I will also examine aspects of metaphorical thought in academic discourse, this section is dedicated to introducing metaphor in academic discourse on the conceptual level of analysis.

The academic fields covered by conceptual metaphor analyses largely coincide with the ones covered by linguistic metaphor analyses sketched out above – in fact, most metaphor studies, and definitely not only the ones directly inspired by CMT, are motivated by the goal to arrive at systematic and larger-scale underlying metaphors. A few metaphors that supposedly underlie academic discourse were already proposed by CMT, such as ARGUMENT IS WAR (*he attacked every weak point in my argument*; Lakoff & Johnson, 1980, p. 4), THEORIES ARE BUILDINGS (*Is that the foundation for your theory?*; 1980, p. 46) and UNDERSTANDING IS SEEING (*It is a transparent argument;* 1980, p. 48). Many analogies with apparent theory-constitutive status have been discussed in the literature on theory change and history of science, such as ATOMS ARE SOLAR SYSTEMS (cf. Brown, 2003; Darian, 2003; Giles, 2008), THE GENOME IS A BOOK (cf. Nerlich, Dingwall, & Clarke, 2002), EVOLUTION IS BREEDING (e.g., Young, 1988), ELECTRICITY IS WATER (e.g., Gentner & Gentner, 1983, THE MIND IS A COMPUTER (e.g., Boyd, 1993; Draaisma, 2000; Leary, 1990b), SCIENCE IS VISION (e.g., Jäkel, 1997), DISEASE IS AN ENEMY (Richardt, 2005). This list is by no means exhaustive, and open by definition, if academic discourse is taken to be a constructed affair (Halliday & Martin, 1993; Hyland, 2011b; Myers, 1990).

Jäkel (1997) is one of the CMT-inspired studies that stay relatively close to the original theory and methodology while applying a high level of analytical rigor. Jäkel identified several mappings underlying the conceptualization of 'science' in seminal theories of the European philosophy of science in a diachronic corpus (in the German language). He suggested that in each theory, the conception of science underwent re-focalization (*Umfokussierung*) by means of metaphor, which was exemplified by the fact that each of the writers he examined used "a clearly prevalent system of conceptual metaphors" (1997, p. 274; translation mine, JBH): Aristotle's early metaphor for 'science' (VISION) was followed by the competing

views of Descartes (JOURNEY) and Bacon (COERCION OF NATURE), which in turn were followed by Kant (BUILDING OF AN EDIFICE). In the twentieth century, according to Jäkel, competing models by Popper (ARMED STRUGGLE FOR THE SURVIVAL OF THE FITTEST) and by Kuhn (A RELIGIOUS WAR OVER THE ACCEPTANCE OF A CERTAIN KIND OF GAME) could be observed. He thus found that 'science' has been conceptualized throughout by means of cross-domain mappings, and that conceptualization has been subject to both diachronic and synchronic variation.

Semino's (2008) work was also inspired by CMT, but used *MIP* (Pragglejaz Group, 2007), as a linguistic metaphor identification procedure. In one case study, she examined five scientific articles in the field of immunology, suggesting that the wide variety of metaphorical expressions that describe 'cellular processes' by means of conventional lexis could be reduced to four almost equally proportioned systems of mappings: LANGUAGE/COMMUNICATION, WAR/PHYSICAL CONFLICT, HUMAN BEINGS, and MACHINES. In addition, she observed that a few metaphorical expressions among the materials were "more novel" (such as *hard-wired mechanism* or *cellular cousins*); this seemed to indicate that the conventionally used source domains (machines and human beings) were actively exploited in the corpus "to produce more novel metaphorical expressions" (2008, p. 162). Her second case study, an analysis of extracts from educational discourse, yielded metaphorical expressions with largely the same source domains, but with a much more pronounced reliance on just one particular source domain, WAR/PHYSICAL CONFLICT. Semino suggested that this domain was used in a specifically vivid and novel way, aiming to provide students with a "comprehensible and memorable account" (2008, p. 162) of the phenomena – a predominant pedagogical function. By contrast, the scientific articles of the first case study used the range of conceptual metaphors to highlight distinct aspects of the model of the immune system (e.g., external elements described as *attacking* the body [WAR], and developmental relationships within groups of cells captured by terms such as *family* and *lineage* [HUMAN BEINGS]; 2008, pp. 160-1).

Darian's (2003)[4] study on the use of figurative language in university textbooks from biology and chemistry is one of Semino's (2008) points of reference for metaphorical language use in scientific discourse. Although his approach is methodologically different, based on a more traditional view of rhetoric, using Richards'(1936) definition of metaphor, and applying the method of close reading, Darian's findings about principal "metaphorical themes" ('war'/'hunting', '[family] relationships', instances of personification [language/communication and human beings] and reification ['machines']) accord largely with Semino's four principal source domains of WAR/PHYSICAL CONFLICT, HUMAN BEINGS, LANGUAGE/COMMUNICATION, and MACHINES. This overlap may in part be explained

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[4] Chapter 4 in Darian (2003) is except for minor lexical changes identical with Darian (2000).

by the relatively high level of generalization of mappings. However, first of all, it seems to indicate that the fields of immunology and the broader areas of biology and chemistry broadly converge in the general source domains.

The sociologist Rigney (2001) examined the target domain 'social theory'. He arrived at a number of general source domains that were exploited for conceptualizing the target domain. The various mappings seemed to explain synchronic (and diachronic) lexical variation of metaphorical language use within the disciplines:

> [W]e find sociological theorists, as well as their neighbors in anthropology and political science, variously comparing human societies to (1) biological systems, (2) machines, (3) wars, (4) legal codes, (5) economic markets, (6) games, (7) theatrical productions, and (8) linguistic discourses. (Rigney, 2001, p. 6)

When comparing this list to Semino's and Darian's findings, we see that the domains *machines, war,* and *linguistic discourses* are very similar to the findings above, and only the source domains *human beings* (Semino) and *family relationships* (Darian) do not directly match (however, aspects in which human beings are involved can be found in legal codes, economic markets, games, and theatrical productions). In contrast to Rigney, Darian, and Semino, some of the source domains identified by Jäkel (1997) are very specific and consist of a combination of domains (e.g. SCIENCE IS A RELIGIOUS WAR OVER THE ACCEPTANCE OF A CERTAIN KIND OF GAME). This may result from differences in the domain analyzed, but may also be due to differences in the degree of generation of mappings, with Jäkel's analysis pitched on a more specific level (e.g., in principle possible were the more general SCIENCE IS WAR; SCIENCE IS A GAME).

The German-written pre-CMT work by Demandt (1978) studied the conceptualization of 'history' in European texts from antiquity on. Demandt singled out six overarching metaphors: organic metaphors (*organische Metaphern*), seasonal and time-of-the-day metaphors (*Jahres- und Tageszeiten-Metaphern*), metaphors of movement (*Metaphern der Bewegung*), technical/mechanic metaphors (*Metaphern aus der Technik*), and theatre metaphors (*Metaphern aus dem Umkreis des Theaters*). But in opposition to others, he suggested that this finding indicated constancy rather than variation, his argument being that the observed source domains without exception could be traced back to classical antiquity and the Bible (1978, p. 436). In my view, however, his findings do not necessarily exclude variation – the fact that he identified six principal domains on the basis of a large number of metaphorical expressions indicates divergent conceptualizations of history by divergent scholars or schools. The source domains identified by Demandt again largely coincide with the previously mentioned ones (e.g.,

technical/mechanical metaphors, theatre metaphors, organic metaphors, and metaphors of movement).

At least at the very general level, the mappings discussed here fit into the basic categories of mappings proposed by Lakoff and Johnson (orientational, ontological, and structural metaphors and personification; Lakoff & Johnson, 1980), but, as has been suggested in the literature, this observation alone may offer little descriptive or heuristic value. Other proposals from philosophy and the history of sociology for uncovering and grouping beliefs that have existed for some time, for example Pepper's (1942) *root metaphors*, Hesse's (1966) *models* and *analogies* and, from the background of the *Wiener Kreis*, Topitsch's (1979) *anthropomorphic/technomorphic projections*, may be used to account for these findings as well.

So far, I have discussed conceptual mappings that at least in terms of their target domains are specific to academic discourse and to particular disciplines and subdisciplines, on varying degrees of generality. They can be assigned theory-constitutive functions (e.g. talking/thinking about the mind in terms of the computer), as well as pedagogical and other interpersonal functions, such as argumentation and persuasion (e.g., the gene as agent, the genome as book). In addition to these types of metaphors, scholars have pointed out a number of conceptual mappings that seem to play an important role in academic discourse for textual reasons. Among these are DISCOURSE IS SPACE (e.g., Fleischman, 1991), where metaphorical items with spatial basic meanings are used to refer to abstract discourse (*here, above* etc.); ENCODING MEANING IN WRITTEN TEXT IS SPEAKING (cf. Cameron, 2008), where metaphorical units with basic meanings that refer to speaking denote acts of writing (*the next little bit of information says*), and AN ESSAY IS A PERSON (cf. Low, 1999), where the text is put in subject-position in clauses with verbs that normally require human entities in subject position (e.g., *this essay discusses*). These mappings seem to be of a different kind than many of the mappings mentioned above, catering to basic textual and conceptualizing functions of abstract discourse (cf. Fleischman, 1991).

Another issue discussed in the literature is that mappings in academic discourse may possibly be pitched at a higher level of abstraction or complexity than conceptual metaphors in other domains. One example mentioned above is the linguistic concept *valency*, which was borrowed from chemistry to describe particular dependency relations in syntax (see Rickheit & Sichelschmidt, 2007). Richardt (2005) compared conceptual models underlying the domains of medicine, computing, and economics, suggesting that these were in part "cultural/folk models" and in part "scientific paradigms are likewise structured by metaphor" (2005, p. 237). Semino (2008) suggested that technical metaphors can have "rather complex and abstract" (2008, p. 155) source concepts. She gives an example that goes one step further than the interdisciplinary borrowing described by Richardt or Weingart (1995): a "fictive" source domain (an "octopus network") that was "constructed

precisely to fit the basic characteristics of the phenomena it is designed to model"
(2008, p. 157) (in this case, parallel computational networks, and neurons in the
brain). From all this it follows that the conceptual mappings underlying academic
discourse seem to vary in terms of complexity and abstraction of source domains,
possibly even systematically.

This overview has indicated that conceptual metaphors can reveal systematic
patterns of both metaphorical language and metaphorical thought in academic
discourse. However, mappings can be constructed at very different levels of
generality – identifying larger-scale mappings ("metaphors of movement") can mean
that finer grades of observation are excluded, and vice versa, identifying highly
specific (and/or mixed) mappings (SCIENCE AS A RELIGIOUS WAR OVER THE
ACCEPTANCE OF A CERTAIN KIND OF GAME) may exclude a more general
perspective. Also, mappings in academic discourse seem to vary not only in degree
of generality, but also in complexity and abstractness of the source domains. And of
course, since the identification of metaphor at the conceptual level generally
involves a greater amount of interpretation than the identification of linguistic forms,
the step from language to domains and then to correspondences between the
domains is less constrained than the identification of more basic senses of a given
word – and thus less accurate. In the present thesis, in order to explore as many
directly observable aspects of metaphorical language in academic discourse as
possible, I decided to stay largely at the level of *linguistic metaphor*, making
occasional jaunts to the conceptual level. In one psycholinguistic study, however, I
will venture directly into an exploration of aspects of metaphorical thought, more
specifically, metaphorical thought as cognitive behavior. The next section is
designed to provide some backdrop for this endeavor.

1.2.4 Cognitive behavior. There is still little psycholinguistic evidence of the
processing and representation of metaphor in academic discourse (Cooke & Bartha,
1992; Gentner, 1982; Gentner & Gentner, 1983; Gentner & Grudin, 1985; Gentner
& Jeziorski, 1993; Hoffmann, 1992; for a more recent overview see Hoffman et al.,
2009).

Gentner and Gentner (1983) suggest the "generative analogy hypothesis", which
holds that the metaphorical language applied to the description of scientific theories
actually indicates people's analogical thinking. In an experimental study that
examined analogical reasoning about simple electricity problems (serial and parallel
types of electrical circuits), they found that the use of particular base (or source)
domains facilitated the understanding of particular aspects of the circuits. In a
second experiment, they induced three different analogies (a "moving-crowd" and
two different "water" analogies) in the participants, finding that learning a particular
analogy enhanced differentiation between circuit configurations at least in part. The

results of the two experiments taken together were taken to provide evidence for figurative analogies underlying inferences in reasoning:

> People who think of electricity as though it were water import significant physical relationships from the domain of flowing fluids when they reason about electricity; and similarly for people who think of electricity in terms of crowds of moving objects. (Gentner & Gentner, 1983, p. 125)

Building on this generative analogy hypothesis, Gentner and Grudin (1985) used a different kind of approach to give evidence of scientific analogies on thought: They analyzed a diachronic corpus of issues of an academic psychological journal (*Psychological Review*, issues ranging from 1894 through 1975) for metaphorical language applied to mental phenomena. They found two things: Firstly, there was variation in the type of the identified mental model over time, with "spatial metaphors" and "animate-being metaphors" predominating in the early decades, but then declining in favor of "systems metaphors", often "taken from mathematics and the physical sciences" (1985, p. 181). Secondly, mental metaphors varied over time in frequency. They were more frequent in the early and late decades captured by the corpus than in the middle decades (1935 to 1955). Both findings were related to an evolution of models of the mind in the academic discipline of psychology. Gentner and Jeziorski (1993) used a different approach towards metaphor and analogy in academic/scientific thought. Their diachronic historical-scientific study compared the use of metaphor and analogy in seminal works by alchemists and by scientists of the Modern Age. They found crucial differences in the use of similarity between alchemists and modern scientists: The alchemists did not use analogy "in the modern sense", which means that "surface similarity" and "richly interconnected but unclarified forms of similarity" including metonymy (1993, p. 475) were not distinguished from the structurally and relationally consistent and deep similarity that analogy has in the modern sense (cf. 1993, p. 450). The authors suggest that the "shift from metaphor to analogy is one aspect of the general change in the style of scientific thought that occurred" (1993, p. 475) during the "scientific revolution" of the sixteenth century. In all, Gentner and colleagues' work suggests that metaphor and analogy are an active force in science that can be evidenced in both language and thought.

Cooke and Bartha's (1992) experimental study focused on metaphor production. They found that experts in psychology produce overall more (technical) metaphors to explain phenomena, and that participants produce more metaphors in the slightly more abstract subdiscipline of cognitive psychology than in social cognition (1992, p. 229). While the novice-group relied on vaguer and more basic metaphors (the "explanation that the mind or brain 'does it' seems sufficient for the less experienced subjects"; 1992, p. 228), the experienced participants were more

specific in their explanations, both in everyday and technical metaphors. In all, expert production of metaphorical language seemed to reflect a higher degree of exactness and complexity of knowledge, but also appears to depend on academic subdomain.

Despite this converging evidence of metaphor production in the scientific domain, it is assumed by many that individuals who belong to a specific scientific/academic discourse community actually may not understand metaphorical language by means of metaphorical processing strategies. For example, Semino suggests that "metaphorical technical terms […] often tend to be perceived as nonmetaphorical, at least by experts" (2008, p. 133). This proposal has to be seen against the backdrop of processing theories in contemporary psycholinguistic metaphor research, where views have diverged about processing strategies applied to metaphorical language in general (for an overview see e.g., Bowdle & Gentner, 2005). Of the current main theoretical strands relevant for psycholinguistic and psychological metaphor research, the career of metaphor theory seems to propose the most flexible account of the processing of literal and metaphorical language. *Metaphorical processing* is here understood as an on-line comparison between two distinct domain-specific knowledge representations in the sense of Gentner's structure mapping theory (cf. Gentner, 1982, 1983; Gentner et al., 2001), while *non-metaphorical processing* is the categorization of a concept as a member of domain-general category (cf. Bowdle & Gentner, 2005; Gentner & Bowdle, 2008; cf. Gibbs, 1999; Glucksberg, 2008; Glucksberg & Haught, 2006; Glucksberg & Keysar, 1990). The career of metaphor also works with the assumption that there is a strong relation between the conventionality of some metaphorical term and its processing mode, with novel metaphors more likely to be processed by means of metaphorical *comparison* than conventional metaphors, which are normally processed by means of *categorization*.

From the career of metaphor theory, it may be deduced that with regard to technical metaphors of some discipline, experts may process specialized metaphorical language in a nonmetaphorical way, by categorization, and, by contrast, novices may process the same expressions in a metaphorical way, by comparison. This hypothesis, as also suggested by Cameron (2003) and Hoffman (1992) in similar ways, was probed in the experimental study of my thesis. The research question is:

> *Do contextual factors such as the domain of discourse and expert knowledge play a role in the processing of academic metaphors?*

In this chapter, I have introduced the general theme, the theoretical framework, and the general research questions of this thesis. A general introduction was followed by a description of the theoretical and practical background and short overviews of

current metaphor studies and studies on academic discourse, as well as of studies of metaphor in academic discourse on the levels linguistic forms, communicative functions, conceptual structures, and cognitive behavior. I have thus positioned my project and motivated the specific research questions that will be answered in the empirical chapters of this thesis:

> RQ1 *How is metaphor distributed across the four main registers of English?*
>
> RQ2 *How are particular linguistic features of metaphor such as word class and metaphor type distributed in academic discourse as opposed to other main registers of English, such as news, fiction, and conversation?*
>
> RQ3 *What discourse functions may be inferred from the analysis of linguistic forms of metaphor in academic discourse?*
>
> RQ4 *How is metaphor type distributed across four academic sub-registers?*
>
> RQ5 *Do contextual factors such as the domain of discourse and expert knowledge play a role in the processing of academic metaphors?*

1.3 Overview of the Thesis

Chapter 2 introduces the analysis of linguistic forms of metaphor in more detail, gives an overview of recent developments in the field of linguistic metaphor identification and analysis (with special attention to academic discourse), and thereby prepares the linguistic metaphor analysis in Chapters 3-6.

Chapter 3 is a methodological chapter. It presents a comprehensive procedure of metaphor identification in natural discourse (*MIPVU*), which resulted from the application and elaboration of *MIP*, the Metaphor identification procedure (Pragglejaz Group, 2007).

Chapter 4, another methodological chapter, explains in some detail how *MIPVU* is applied to academic writing, with attention to specific issues of metaphor identification in academic discourse and with regard to possible functions of metaphor use in academic prose.

Chapter 5 is the first empirical chapter. It reports a quantitative corpus-linguistic analysis along the lines of Douglas Biber's functional register analysis (e.g. Biber, 1988; Biber & Conrad, 2001; Biber et al., 1999), examining the distribution of metaphorical language use in academic prose across word classes and metaphor types (indirect, direct, and implicit, see Chapter 2) in direct comparison with the registers of news, fiction, and conversation. Findings will be related to

discourse functions, for example informational, argumentative, evaluative, and persuasive, and Biber's (1988) dimensions of lexico-grammatical register variation.

Chapter 6 is a second empirical chapter. It interprets the results obtained in Chapter 5 for metaphor distribution across registers and word classes on the basis of relevant findings from Biber et al.'s (1999) comprehensive grammar of English with regard to academic prose. It also yields more corpus-linguistic insight into the distribution of metaphor in the word class, with overviews of the most common lemmas per word class in academic prose. The aim of this chapter is to explore how metaphor interacts with word class on the micro-level of lexico-grammar.

Chapter 7 is a third empirical chapter. It presents two psycholinguistic studies that explore cognitive behavior involved in understanding metaphors in academic discourse. Specifically, it investigates the role of specialized knowledge, or expertise, in metaphor processing within one specific academic discourse, psychology. As mentioned above, it operates on a different level of metaphor analysis than the rest of the thesis, approaching metaphor in academic discourse not as symbolic structure, but as cognitive representation and processing. Following a post-hoc analysis of the obtained data, this chapter offers a critical discussion of the concept of conventionality as applied in the career of metaphor theory (e.g., Bowdle & Gentner, 2005).

Chapter 8 presents the conclusions of Chapters 1 through 7. It gives a summary of theoretical, methodological, and empirical findings, an interpretation and evaluation of these findings, and implications for further research and application.

CHAPTER 2
The Linguistic Analysis of Metaphor in Academic Discourse

The aim of the present chapter is to prepare the linguistic metaphor analysis to be presented in two empirical chapters that follow later: the macroscopic corpus analysis of metaphor in academic prose (Chapter 5) and the microscopic analysis of metaphor and word class (Chapter 6). As corpus linguistic studies have shown, a scholar's and even a native speaker's intuitions about language can be misleading (e.g., Biber et al., 1999, Chapter 1; Sinclair, 1991). Similarly, recent metaphor studies have highlighted that relying overly on intuition hampers the identification of metaphor as an intersubjectively observable "fact of the world" (cf. Steen, 2007; Cameron, 1999, 2003). Corpus-linguistic approaches to metaphor have found characteristics of metaphorical language that were not described before (e.g., Deignan, 2005; Semino, 2008). Deignan shows that metaphor is much more dependent on syntagmatic relations (relations with other elements of the text) than could be expected on the basis of CMT and other theories of metaphor. For example, the metaphorically used lemma *rock* is hardly found by itself in natural language, but occurs as part of lexical strings, such as in the fixed compound adjectives *rock-solid, rock-bottom* or in the collocation *rock of stability* (Deignan, 2005, pp. 218-9). Much more empirical work is thus needed to examine the full picture of the specificities of metaphor in language, which in turn may help formulate new linguistic theoretical claims and predictions that account for these findings.

In order to provide a thorough background for the subsequent linguistic analyses of this thesis, the present chapter offers a comprehensive review of the study of written academic language use and metaphorical language use in academic discourse, including issues relating to the identification of metaphorical language. In the course of this chapter, I will thus review the study of academic language use, conceptualizing and operationally defining important concepts relevant to my study, and gradually zooming in on the lexico-grammatical features that will be examined in Chapters 5 and 6. I will also review the study of metaphorical language in academic contexts, identifying state-of-the-art issues and problems, and again zoom in on the aspects that I will examine in my own studies. Eventually, I will arrive at issues important in the identification of metaphor in academic prose, introducing the operational definition of metaphor used in the linguistic analyses, and preparing the

introduction of the comprehensive identification manual that will be described in full detail in Chapter 3.

One of the main issues that an analysis of metaphor in academic discourse has to deal with is the degree of specialization – or technicality – of the academic varieties. These do not only differ substantially from the standard language, but also vary heavily among each other (e.g., Hyland & Bondi, 2006). A study of metaphor in academic discourse thus needs to decide whether the goal is to explore differences of metaphor use across disciplines or fields, or whether the objective is to arrive at a global profile of metaphor use in the academic register in contrast with other registers. The present dissertation chose to do the latter, linking metaphor analysis to the more general lexico-functional register study presented by Biber and colleagues (Biber et al., 1999). It will be sketched out in some more detail in section 2.1 below, with specific attention to the academic register, and will reappear in the analyses of metaphor in academic prose in Chapters 5 and 6.

Many studies on metaphorical language in academic discourse start off with mentioning the great wealth of studies on metaphorical language use in diverse academic fields and disciplines (e.g., Maasen et al., 1995), often with reference to the comprehensive metaphor bibliographies (e.g., De Knop et al., 2010) that, however, comprise only a fraction of all studies on metaphor in academic contexts. As was shown in Chapter 1, the majority of studies support the position that metaphorical language is ubiquitous, conventionally used and largely inevitable in academic discourse. Most of the studies that have focused on aspects of metaphorical language (rather than thought) are descriptions of lexis – and only very rarely have addressed more specific lexico-grammatical characteristics of metaphorical language such as word class or variation in type of metaphor, especially in terms of cross-register differences and/or quantitative approaches. Section 2.2 will present in some more detail studies that examine metaphor on the linguistic level of analysis, starting from approaches that deal with lexical diversity of metaphorical terms, and homing in on studies that center on other lexico-grammatical as well as register-related and quantitative differences.

In the present dissertation, metaphor is understood as a relational phenomenon, which means that metaphor is *metaphorical to some language user* (cf. Charteris-Black, 2004; O'Halloran, 2007). Decisions about the metaphoricity of technical terms such as *electrical field* (electromagnetics) or *flooding* (behavioral psychology) are potentially problematic: While experts will probably not see these as metaphorical terms, non-experts may very well "try out metaphorical interpretations" (Cameron, 2003, p. 67; see also Semino, 2008, p. 133). In the present thesis, this problem was operationally solved by adopting the position that the language user is the idealized native speaker of English as represented in the description of English by the dictionary of a particular period. This decision yields direct quantitative comparability with the three other main registers of English,

news, fiction, and conversation. Details about the identification of metaphorical language in (academic) discourse will be explained in section 2.3, which will introduce the Metaphor identification procedure (*MIP*) as proposed by the Pragglejaz Group (2007). Here, I will also broach the particular questions that led to the refinement of *MIP*, called *MIPVU*, which was the method used for metaphor annotation in the present thesis. The same section will deal with questions such as what to take as the basic unit of analysis (for example, the word) and which types of figurative language (for example, similes) to include. It will also address the issues of validity and reliability (cf. Pragglejaz Group, 2007) in metaphor identification

2.1 Written Academic Language Use

This section introduces the current research on written academic language use. Approaching language use from the perspective of a functional lexico-grammatical register profile of written academic discourse (cf. Biber, 1988; Biber et al., 1999), I will zoom in on such terms as *academic discourse*, *register*, and *linguistic feature*.

Academic discourse. Approaches to "academic discourse" vary in terms of generalization or specification (Flowerdew & Peacock, 2001; Halliday, 2004b; Hyland, 2006a). Both linguistic and conceptual variation across academic discourse have been accounted for by a few established concepts, in particular *discourse community*, *genre*, and *register* (cf. Biber, 1988; Biber et al., 1999; Conrad & Biber, 2001; Eggins & Martin, 1997; Halliday, 2004b; Hyland, 2006b; Swales, 1990).

The notion discourse community highlights the interactional and constructed character even of highly formal written prose and suggests that writers' rhetorical choices depend on communicative purposes, topics, settings, and audience (for the constructed nature of disciplinary knowledge, see Bazerman, 1981; MacDonald, 1992). Each discourse community can be understood as the "center of a set of ideas" (Swales, 1990, p. 22), which means that different discourse communities inevitably vary in constructing their discourse (e.g., " 'doing biology or 'doing sociology' "; Hyland, 2006b, p. 41). What can be deduced from this is that "discourse" does not exist independently of discourse communities – language use operates within conventions defined by these communities, and, vice versa, communities operate within conventions defined by language. On a more general level, it follows that language is a social affair that plays an important part in constructing knowledge, while knowledge is a social affair that plays an important part in "doing language".

The notion of genre is widely accepted as a socially recognized way of using language in (academic) discourse communities (cf. Crawford Camiciottoli, 2007; Hyland, 2006b; Swales, 1990). Genres are defined as classes of communicative events that are linguistically realized in terms of specific patterns of structure, style,

content, and intended audience, as well as by labels that arise from discourse practices within discourse communities. Typical written academic genres are "[r]esearch articles, conference abstracts, grant proposals, undergraduate essays, submission letters, book reviews, Ph.D. dissertations, textbooks, reprint requests, editor response letters" (Hyland, 2006b, p. 50). One central feature of genres is that they are based on expectations, which enables members of a discourse community to understand and produce particular types of texts without difficulty (cf. Swales, 1990, p. 58).

Register is also a widely-used term, and to some extent synonymously used with genre in the literature. Both terms can be used to denote academic genres/registers such as the "research article" and "textbook", but also to refer to overarching genres/registers such as "academic prose" (cf. Biber et al., 1999; Halliday, 2004b; Swales, 1990, 2004). The term register is normally defined as a general language variety influenced by contextual factors (cf. Eggins & Martin, 1997; Halliday & Hasan, 1985/1989). The major distinction between register and genre is that register studies have focused more on the analysis of formal characteristics of language use, whereas genre studies have been associated more with socio-cultural actions and concerns of ideology and social power (cf. Biber, 2006b, p.11). Romaine describes register as a "clustering of features" that is "concerned with variation in language conditioned by uses rather than users" (Romaine, 2000, p. 21). That is, rather than indicating "where we come from" (as regional dialect does), or "what our status is" (as social dialect does), register "gives a clue about what we do" (2000, p. 21). A register is conditioned by "the situation or context of use, the purpose, subject matter, and content of the message, and the relationship between the participants", and differences between registers are identified on the level of lexico-grammatical features, especially vocabulary (Romaine, 2000, p.21). Similarly, Biber et al.'s (1999) *Longman Grammar of Spoken and Written English* (*LGSWE*) defines register "in non-linguistic terms, with respect to situational characteristics such as mode, interactiveness, domain, communicative purpose, and topic" (1999, p. 15). These situational characteristics ultimately result in important differences in the use of lexico-grammatical features among registers. For example, the interactive mode and interpersonal functions of conversation (referring directly to speakers and listeners) are correlated with the frequent use of the first person pronouns *I* and *we* – whereas newspaper texts, which are not directly interactive, and have a predominant informational purpose, use these forms comparatively rarely, but instead show a comparatively higher frequency of proper nouns (referring to known people, places, or situations).

For the purposes of the linguistic analyses in the present thesis, *academic discourse* is largely approached through *register* in the sense of Biber and colleagues as just described: as defined by situational characteristics (e.g., the mode, the level of interactiveness, the general purpose) which are non-arbitrarily correlated to

variation on the lexico-grammatical level of analysis. In the following, aspects of the written academic register will be described in more detail.

The written academic register. The *Longman Grammar of Spoken and Written English* (Biber et al., 1999) describes and explains a wide range of lexico-grammatical "forms", in terms of general cross-register distribution patterns of lexico-grammatical features. Their findings obtained from over 40,000,000 words of written and spoken English will serve as a backdrop for the analyses in Chapters 5 and 6, where metaphor use is examined in relation to lexico-grammatical features in academic prose on a general level of analysis – as compared to news, fiction, and conversation. Table 2.1 summarizes combinations of situational characteristics that define registers. It shows how Biber et al. define the academic register in comparison with the three other registers of news, fiction, and conversation.

First of all, academic prose is written, and as a rule carefully planned, edited, and revised. This has implications for the style of academic texts, which are condensed, well structured, and information-packed.

Table 2.1

Summary of the Major Situational Differences Among the Four Primary Registers Used in LGSWE

	CONV	FICT	NEWS	ACAD
mode	spoken	written (+ written dialogue)	written	written
interactiveness and online production	yes	(restricted to fictional dialogue)	no	no
shared immediate situation	yes	no	no	no
main communicative purpose/content	personal communication	pleasure reading	information/ evaluation	information/ argumentation/ explanation
audience	individual	wide-public	wide-public	specialist
dialect domain	local	global	regional/ national	global

Note. Reprinted from "The Longman Grammar of Spoken and Written English," by D. Biber, S. Johansson, G. Leech, S. Conrad, & E. Finegan, 1999, London: Longman, p. 16. Copyright by Pearson Education Limited.

Secondly, according to the *LGWSE*, the production in academic texts is generally not interactive; addressees are virtually never "directly referred to, and don't 'talk back' in the text" (Biber et al. 1999, p. 23), and authors less often refer to themselves overtly, at least in comparison with other registers. This is in stark contrast with conversation, which is highly interactive by definition (there is, however, a view that puts more emphasis on the interactive aspects of academic prose, which are less explicit; cf. Hyland, 2009b).

The primary goal (and function) of academic writing is to facilitate detailed and precise information, arguments, and explanations. This is again opposed to the openly (inter)personal purposes of participants in conversational communicative events (cf. Biber et al., 1999, p. 23), but also to the prevalent goal of fiction, reading for pleasure. Meanwhile, academic prose and news texts share one of their communicative purposes, information, as well as a number of situational characteristics, such as the written mode and the non-interactiveness. A growing body of research has pointed out that academic prose uses language for evaluative purposes (cf. Del Lungo Camiciotti & Tognini-Bonelli, 2004; Hyland, 2000) – for example when writers "intrude into the discourse to stamp their personal authority onto their arguments" (Hyland, 2004b, p. 15). However, it is generally accepted that news texts have a much more explicitly evaluative function than academic prose (cf. Hyland, 2004b). In comparison with news, academic prose generally focuses much more on argumentation and explanation.

Other crucial differences between the registers are audience and dialect domain. While news texts are written for a wide public (just as fiction), with specialist sections generally intelligible, and conversation is directed toward an individual audience, academic prose has a number of highly differentiated specialist audiences. Academic texts have a global dialect domain, utilizing a variety of English that is relatively unmarked locally. This feature tends to be shared by fiction (according to Biber et al.), while news texts are written for a variety of public circles, ranging from local to national audiences. In contrast, conversations are typically restricted to local dialect domains.

Biber et al. point out that the four registers "are ordered (from left to right) according to the extent of their situational differences" (1999, p. 16). This is explained by the six main situational characteristics (Table 2.1) which account for lexico-grammatical variation across the four main registers of English. In their lexico-grammatical corpus findings, this ordering often re-appears (for example, in the description of the frequencies of the distribution of adjectives across registers, where adjectives are shown to occur most frequently in academic prose, followed by news, and then fiction, with conversation having the lowest frequency of all four, 1999, p. 64). However, by no means all cases display a consistent rise or fall of frequency from left to right (1999, p. 17). One such case is lexical variation, measured by means of type-token ratios (TTR). In the Longman Corpus, TTR is

consistently lower in academic prose is than in fiction and news (but higher than in conversation; 1999, p. 54).

Biber et al.'s main claim is that in the production of texts, an important motivation for paradigmatic and syntagmatic lexico-grammatical choices is the underlying tasks or functions that a text or text element is intended to perform: The situational circumstances of production "have direct functional correlates, and, as a result, there are usually important differences in the use of grammatical features among registers" (1999, p. 15). Thus, the communicative functions of academic prose (e.g., information, explanation, and argumentation) are mirrored in a text's linguistic features, and conversely, linguistic patterns can be interpreted in terms of communicative functions. The following section is dedicated to an overview of central linguistic patterns of academic prose.

The linguistic features of written academic discourse. There is wide consensus about some language features that can be identified in academic prose on a general level of analysis. Academic prose is generally ascribed a high degree of formality (cf. Eggins & Martin, 2007; Hyland, 2006b) and a morphologically complex technical and academic vocabulary (cf. Biber et al., 1999). The *LGSWE* found that academic prose uses more derivational suffixes across word classes, for example derivational noun suffixes to form abstract nouns (e.g., *-tion, -ity*) (1999, p. 322), and derivational prefixes (*re-, over-*) and suffixes (*-ize, -en*) to form both common and specialized verbs (1999, pp. 400-1). According to Hyland (2006b, pp. 13-4), the typical features of academic discourse can be summed up by three main features, which are high lexical density, high nominal style, and impersonal constructions.

- *High lexical density.* "A high proportion of content words in relation to grammar words such as prepositions, articles, and pronouns, which makes academic writing more tightly packed with information" (Hyland, 2006b, p. 13). The work by Biber et al. indeed shows that academic prose has one of the highest lexical densities of all registers. However, it is slightly lower than that of news – which reflects that in this register "the framing of information, including argumentation and evaluation, are [sic] also important" (1999, p. 62).

- *High nominal style.* "Actions and events are presented as nouns rather than verbs to package complex phenomena as a single element of a clause. This freezes an event […] and repackages it as an object […]. Turning processes into objects in this way expresses scientific perspectives that seek to show relationships between entities" (Hyland, 2006b, p. 14). This can be related to Halliday's (2004b) *grammatical metaphor* – the nominalization of actions, attributes and events. Biber et al. report that nouns are indeed the

most common word class by far in the academic register (1999, p. 64), with three to four nouns per lexical verb.

- *Impersonal constructions.* "First-person pronouns are often replaced by passives ('the solution was heated'), dummy 'it' subjects ('it was possible to interview the subjects by phone') and what are called 'abstract rhetors', where agency is attributed to things rather than people ('the data suggest', 'Table 2 shows')" (Hyland 2006b, p. 14). For example, Biber et al. show that academic prose has the highest proportion of the impersonal "short dynamic" passives of all registers (1999, pp. 938, 943), which is explained with the concern "with generalizations, rather than the specific individuals who carry out an action" (1999, p. 938). They also report that verbs with inanimate subjects are notably common in academic prose, for example 99% of the occurrences of *apply, lead, provide* and *suggest* used with full noun subjects have inanimate subjects in academic prose (1999, pp. 378-9).

Academic discourse research has more recently turned its attention towards the examination of multi-word units beyond "traditional" idioms and phrases. The phenomenon has been called *formulaic language*, or *lexical bundles* (e.g., Biber et al., 2004; Corrigan, Moravcsik, Ouali, & Wheatley, 2009; Wray, 2002, 2008). While definitions vary, these are as a rule defined as multi-word sequences which have been identified by corpus tools that can detect such "hidden" patterns. Recent studies suggest that there are specific "academic" multi-word sequences, which exhibit particular discourse functions (e.g., Biber, 2006b; Biber, 2009; Biber, Conrad, & Cortes, 2004; Biber et al., 1999; Barlow & Kemmer, 2000; Dorgeloh & Wanner, 2009; Hyland, 2008a). For example, Dorgeloh and Wanner (2009) suggest that formulaic constructions involving an inanimate entity in subject position of an active verb, such as *This paper argues…* and *This fact suggests…*, play a crucial role in linguistic strategies of constructing and presenting scientific knowledge, allowing the writer to background the agent without having to use the passive, to highlight the constructional quality of some argument (e.g., *this paper argues*) and to exert politeness by instead of profiling researchers letting data and results speak for themselves.

In sum, it seems that features such as formality, morphological and grammatical complexity of sentences, as well as lexical density, nominal style, impersonal constructions, and recurrent multi-word patterns, can be assumed to distinguish academic prose from other main registers on a linguistic level. In the following, I will home in on Biber's (1988) quantitative register analysis. His observations on co-occurrence patterns of lexico-grammatical features (*dimensions*) will be used in the interpretation of my own corpus-linguistic findings.

Registers and dimensions. Biber's method of approaching register variation is multidimensional analysis (MD) (e.g., Biber, 1986, 1988; Conrad & Biber, 2001). In MD studies, a wide range of linguistic characteristics across different registers and modes of communication (spoken vs. written discourse) has been analyzed. What Biber and colleagues found is that lexico-grammatical features configure themselves in particular ways into underlying *dimensions of variation* (cf. Biber & Conrad, 2001, pp. 183-7). As a result, particular registers are distinguished to different extents along each dimension, with "systematic patterns of variation across registers" (Biber & Conrad, 2001, p. 184), which means that rather than by a single parameter, relations among registers are described by "a multidimensional space".

Dimensions are co-occurrence patterns among linguistic features that are statistically computed. These dimensions are interpreted in terms of the communicative functions shared by the co-occurring features. To give an example, the most important dimension (Dimension 1) contrasts *involved* with *informational production*. This dimension has two extremes, the involved extreme, which features a high occurrence of verbs, pronouns, *that* deletion, discourse particles etc., and, complementary to it, the informational extreme, with a high co-occurrence of nouns, prepositions, and attributive adjectives. This dimension is interpreted as "involved vs. informational production" because it distinguishes between involved features (that have the function to involve speakers and addressees with each other and their direct environment) – and informational features (that are used for packaging and organizing information) on the other.

In the MD analysis, *dimension scores* provide a "cumulative characterization of a text with respect to the co-occurrence pattern underlying a dimension" (Biber & Conrad, 2001, p. 184). By means of these scores, each text can thus be assigned a position on the continuum between the two extremes, interpreted with regard to the dimension, and compared to other texts – and registers. With regard to Dimension 1, texts falling under the label "conversations" are situated at the involved extreme, as characterized by frequent co-occurring use of verbs, pronouns, and discourse particles etc., while texts that fall into the category "academic prose" are situated at the informational extreme, with frequent co-occurrence of nouns, prepositions, and attributive adjectives. Other registers gravitate towards the middle of the dimension, such as fiction texts, apparently combining lexico-grammatical features associated with both ends of the dimension.[5]

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[5] In addition to the involved/informational Dimension, Biber (1988) revealed five other dimensions on which academic prose is respectively situated: On *Dimension 2* (*narrative* vs. *non-narrative concerns*), academic prose has a low score, associated with infrequent use of past tense and frequent use of attributive adjectives, while on Dimension 3 (explicit vs. situation-dependent reference), academic prose has a relatively high score associated with frequent WH relative clauses and nominalizations, as well as infrequent occurrences of time adverbials and other adverbs), *Dimension 4* (*overt expression of persuasion*) sees academic

It may, overall, be assumed that reliance on the findings offered by Biber (1988, 1989) and Biber et al. (1999) is a valid way of approaching linguistic features in academic prose. This appears to be the case even though disciplinary variation has been attested in terms of rhetorical style and the presentation of knowledge (cf. Hyland, 2006a, Hyland & Bondi, 2006), as well as among lexico-grammatical bundles (e.g., as noun phrase + *of*; passive + prepositional phrase; Hyland, 2008b). With Biber et al., we assume that the four main registers have "the virtue of being (a) important, highly productive varieties of language, and (b) different enough from one another to represent a wide range of variation" (1999, pp. 15-6).

2.2 Metaphor in Academic Language Use

There are surprisingly few studies that examine metaphor in academic discourse from a strictly linguistic point of view (i.e., in terms of linguistic forms and patterns of metaphor use). Probably because of the cognitive and communicative functions of metaphor, most studies that deal with aspects of metaphorical language as linguistic forms have integrated a linguistic perspective with a conceptual, communicative, and/or cognitive approach. Most of these studies concentrate on the role of metaphor in disciplinary jargons (e.g., Charteris-Black, 2000; Henderson, 1986; Lindstromberg, 1991; Smith, 1990), showing that topics such as economy, history, behavior, and memory are to a large extent expressed by metaphorical lexis. For example, historical processes are conveyed by metaphorically used verbs such as *make, move, grow,* or *flow* (Demandt, 1978, p. 453); memory models are termed by means of *input, read-in,* or *encoding* (Draaisma, 2000, p. 157). Chapter 1 discussed the wealth of studies that have focused on lexical aspects of metaphorical (and/or educational) language use in one field, discipline, or topic (Section 1.2.). Considerably fewer studies have aimed for a more integrative or a comparative perspective (e.g., Darian, 2003; Giles, 2008; Reeves, 2005; Richardt, 2005; Semino, 2008), have adopted a quantitative perspective (e.g., Cameron, 2003; Goatly, 1997; Skorczynska, 2010; Skorczynska & Deignan, 2006), or focused on other specificities of academic language, such as word class (e.g., Cameron, 2003; Goatly,

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prose in a middle position between professional letters at the positive extreme and broadcasts at the negative one (linguistic features associated with high scores are for example prediction and other modals and suasive verbs), on Dimension 5 (abstract vs. non-abstract information) academic prose has the highest positive score, which is achieved for example by frequent use of conjuncts, agentless and *by* passives. Finally, on *Dimension 6* (*on-line informational elaboration*), academic prose, quite surprisingly, has a minor positive score (features with positive weight are for example demonstratives and demonstrative pronouns, while phrasal coordination has a negative weight).

1997), metaphor signaling (e.g., Low, 2010; Skorczynska, 2010), or personification (e.g., Dorst, 2011b; Low, 1999). In the following, I will give an outline of such studies.

Cross-register and cross-genre comparison. Although an increasing number of studies examine metaphor use comparatively in academic discourse communities (with variation in native/non-native and expert/novice audiences), a majority focuses on just one particular genre and/or mode. Among the written genres are university textbooks (e.g., Darian, 2000; Semino, 2008; Skorczynska, 2010), book reviews (e.g., Low, 1997, 2008), educational internet websites (e.g., Semino, 2008), academic journal abstracts (e.g., Hidalgo Downing & Kraljevic Mujic, 2009), technical scientific dictionaries (e.g., Pulaczewska, 1999; Siqueira, Flávia, Dienstbach, Faé, & Moreira, 2009), and, most of all, academic and popular-scientific articles and books (e.g., Giles, 2008; Jäkel, 1997; Knudsen, 2003; Low, 2005; Semino, 2011; Skorczynska, 2010; Skorczynska & Deignan, 2006). Spoken genres that have been examined for metaphor are academic lectures (e.g., Beger, 2011; Corts & Pollio, 1999; Low, 2010; Low et al., 2008; Littlemore, 2001, 2003; Mittelberg, 2008; Mittelberg & Waugh, 2009; see also Crawford Camiciottoli, 2007), with the studies by Mittelberg and Waugh and Corts and Pollio examining linguistic metaphor in interaction with gesture.

Examinations of metaphor use in academic discourse in terms of genre or register comparison have mostly been limited to comparisons between academic vs. popular journal articles (Knudsen, 2003; Semino, 2008; Skorczynska, 2010; Skorczynska & Deignan, 2006), and few have compared spoken and written modes of communication of academic discourse (e.g., Crawford Camiciottoli, 2006). Similarly, few studies have attempted to compare metaphor use between distinct fields of academic discourse or between academic discourse and other types of discourse. Exceptions are Semino's (2008) work that aims to give a comparative account of academic metaphorical language as opposed to other general domains of discourse (literature and politics), Richardt's (2005) study of conceptual metaphor in written texts from three scientific disciplines, and Goatly's (1997) study, which compared metaphorical language use in popular science with five non-scientific genres (conversation, national news reports, magazine advertising, modern novels, modern English poetry). Among the latter three, Goatly offers the so far most direct linguistic comparison of metaphor use between different genres, showing that, in comparison, popular science pays more attention to the linguistic specification and explication of the topics and grounds of metaphors than modern Poetry, and, to a lesser extent, than modern novels. He stresses that this is in line with Gentner's (1982) theory about the evocativeness of typical literary metaphors and the conceptual clarity of "good" scientific metaphors (1982, p. 318). Semino provides a number of relatively independent case studies within and across genres, which lead

to more general conclusions about metaphor theory and method on a discourse level, but no direct linguistic comparison of genres. Comparing genres on the level of functions, she concludes that "metaphor has different dominant functions in different genres (e.g. persuasion in political speeches, explanation in educational materials)" (2008, p. 218). She adds that "in scientific articles, metaphors are used for the purposes of persuasion, and occasionally, humor, as well as modeling and explanation" (2008, p. 218). On the level of metaphor conventionality, she concludes that "examples of metaphorical creativity are not exclusive to literature, but are drawn from a variety of genres, including novels, newspaper articles, science textbooks and so on" (2008, p. 222). Richardt's (2005) goal is "a linguistic-philosophical discussion about knowledge representation and information processing by means of metaphor" (2005, p. 237), and, as a result, her direct comparison of genres is limited to a comparison between conceptual metaphors per discipline, with "medicine display[ing] the smallest and computer science the largest number" (2005, p. 240). She related this finding tentatively to the degree of abstraction of the respective objects of study, with "the body" as the object of medical research being "more concrete" and "more easily observable" (2005, p. 242) than the object of research in theoretical computer science, "mathematical processes" (2005, p. 242). Another explanation offered is the "stage of knowledge" of disciplines, with computer science as "a very young science in a preliminary stage of cognition, as compared to medicine as a much older discipline with a very advanced stage of knowledge" (2005, p. 242).

Other analyses have been pitched more at the social-communicative level and compared metaphor use across discourse communities such as native/non-native and expert/non-expert members of some discipline. Littlemore (forthcoming) ran a case study in which verbal and gestural metaphor production was examined across different groups of participants talking about aspects of management theory. Metaphor production in native/non-native speakers of English in classroom management language has been examined for example by (Low & Littlemore, 2009), and descriptions of illness and pain by academic experts, by sufferers, as well as by fiction authors by (Semino, 2008, 2011). These studies were indeed conducted with a comparative focus, but zoomed in on specific topics or subdomains of academic discourse.

In all, few studies that examined the various genres and the written/spoken modes of academic discourse have approached metaphor in academic discourse from a comparative genre/register point of view, but there is a growing number of studies that entertain a comparative focus on metaphor use in academic discourse communities (e.g., native/non-native; expert/novice). Some of the studies have suggested that within particular fields metaphor use is related to different underlying conceptualizations of a topic in question.

Quantitative analysis. The quantification of metaphorically used language is still quite novel in the study of metaphor in general. There are hence few quantitative analyses in academic contexts, and these are often relatively limited in terms of sample sizes and therefore in representativeness of findings (see 1.2.1). What is more, some of the most relevant investigations were run on non-core academic genres, such as science popularization (e.g., Goatly, 1997; Skorczynska & Deignan, 2006), or adjacent domains, such as primary education (Cameron, 2003). One approach to "counting metaphor" within cognitive linguistics has been to assess the number of different conceptual metaphors by number of linguistic metaphors that indicate the mappings (e.g., Richardt, 2005; Semino, 2008; see also Darian, 2000). Richardt (2005, p. 240) used content analysis for her comparative conceptual metaphor study of LSP in three academic domains, on the basis of a corpus of 33 English academic publications (N=10 from economics, N=10 from medicine, and N=13 from computation). She reported more distinct underlying conceptual metaphors in the expert discourse on computing (N=11) than in economics (N=5) and medicine (N=2) and related this to the level of abstraction of the prototypical topics of the target domains, as well as the general level of development in the respective discipline. Semino's (2008, pp. 157-63) case study of scientific articles on immunology found that metaphor was relatively evenly distributed across four source domains (war/physical conflict, human, machines and language/communication), suggesting that expert writers draw on various ways of conceptualizing a topic. Darian (2000) counted the appearances of metaphorical expressions in science textbooks according to underlying metaphorical "theme". He found a strong relation between "the major metaphoric themes of a discipline and the figurative forms that are used to present them" (2000, p. 183), with 'war' being most frequent (used for describing the immune system), followed by 'family relationships' (used for describing aspects of genetics, cell biology, and plant heredity), and 'hunting' (describing aspects of bacteriology and zoology).

Another approach is assessing raw frequencies of metaphorical expressions, often as *metaphor density*, the proportion of metaphorical language to the total of words. In Semino's study, metaphorical tokens that can be related to one of the "main" metaphorical patterns that were identified amounted to 5.5% of all words in the five scientific journal articles on immunology. This number may appear low – however, it does not reflect the total number of metaphorically used words, but only those which were related to one of the dominant source domains. A metaphor density that appears to be even lower is reported by Cameron for spoken primary classroom discourse (2003) – across educational discourse events, it ranged between 14 and 27 linguistic metaphors per 1,000 words (2003, pp. 86-89). However, figures cannot be directly compared between the two studies, as they had different aims and, most importantly, used different identification procedures: By contrast to Semino, who went by single words and lexical units, Cameron identified whole *metaphor*

vehicles comprising multiple words as one linguistic metaphor (e.g., (1) *spokes of a wheel*, (2) *deserve a medal* each count as *one* instance of linguistic metaphor; 2003, p. 60). As a result, one instance of metaphor in the first procedure potentially corresponds with multiple instances in the second.

Goatly (1997) ran a small corpus study of excerpts from six different genres (conversation, national news report, popular science, magazine advertising, modern novels, and modern English poetry) from *The New Scientist* and a bestselling popular book on natural history. He found that 18% of all the metaphors identified in his "Popular Science" excerpt were "active" (as compared to for example 56% in "Poetry" and only 4% in "national News reports"; 1997, pp. 312-3). Again, this finding cannot be directly compared to the figures reported by other studies, nor can it be easily transferred to academic prose in general, as metaphor use in expert and popular science differs in a number of ways (e.g., Semino, 2008; Skorcynska & Deignan, 2006). For his corpus of textbooks, Darian (2000) reported a substantial use of figurative language use in "[b]oth chemistry and biology texts" (2000, p. 170), but a slightly higher frequency in the biology sample. While he could not rule out idiosyncrasy as a cause, he related the greater occurrence of metaphor in the biology corpus to a strong historical and more speculative component of (evolutionary) biology in comparison with chemistry, and to a tradition of describing the body and its functions in metaphoric ways (2000, p. 170).

One of the very few larger-scale studies is Skorczynska and Deignan (2006), who compared two 400,000-word samples of academic and popular economics discourse respectively for their use of metaphor (and metaphor markers). They showed that relatively few linguistic metaphors are shared between academic and popular business discourse, with popular business discourse making "use of a wider range of Vehicle types than scientific business discourse" (2006, p. 94). However, the difference in overall metaphorical use is "slightly less marked, because scientific business discourse tends to reuse the same Vehicle terms more frequently" (2006, p. 94). More specifically, they found that metaphors that were "generic" (with sense descriptions found in a general purpose dictionary) occurred much more often in the popular corpus (60%) than in the scientific one (40%), but that the balance was reversed for "genre specific metaphors", which were identified by means of specialist dictionaries and informants: 66% occurred in scientific, and 34% in popularized discourse. Their findings thus indicated a pronounced difference in linguistic realizations of metaphor between the two related genres, which was explained by the higher lexical specification of scientific texts and by communicative functions: Specialized metaphors are used more often in academic discourse, since they are needed for theory modeling and filling terminological gaps. In terms of methodology, Skorczynska and Deignan followed Charteris-Black (2004), examining approx. 30,000 words each by hand for "all instances of linguistic metaphor" and then searched for these items in the main corpora using a

concordancing program. One disadvantage of this method is that only those metaphors can be found in the main corpora that have been previously identified by hand in the sample corpus.

Applying the same small-corpus/big-corpus method, Skorczynska (2010) examined an approximately 1 million word corpus of business English (periodicals and academic journals) for the occurrence of a number of metaphorical expressions marked as typical of business discourse by a business English textbook. She identified metaphorical language relating to three source domains in the textbook, and searching for these in the bigger corpus, found that the source domains 'war' and 'health' appeared more commonly than 'sports', suggesting that especially the sports metaphors proposed by the textbook failed to be representative of business discourse. Overall, she found that "nearly a third" of the particular metaphorical terms in the textbook were not detected in the examined corpus, and that of the remaining previously identified metaphors reappeared only a small number in the large corpus. In all, Skorcyznska found a "slight overlap of the textbook and corpus sample metaphors" (2010, p. 37), suggesting that actual metaphor use in academic and journalistic business English is different from what was suggested by the textbook in question.

Since these quantitative approaches to metaphor use in academic discourse vary in many respects, and have left open quite a few questions, so far no direct answers have been given about the actual frequency of metaphor (as opposed to non-metaphor) in academic discourse, as well as of the occurrence of distinct types of metaphor. Studies such as Semino (2008) seem to suggest that metaphorical word use in general is relatively infrequent in comparison with non-metaphorical word use in academic discourse. However, since its aim was not to investigate the overall distribution of metaphor, but to point out dominant source domains, it excluded some kinds of metaphorical language from the analysis. Others, such as Goatly (1997), make it hard to judge metaphor frequency in academic prose as compared to other general registers, since they are based on small (non-core) samples and/or focused on specific types of metaphor (e.g., "active metaphors"). In all, new research is needed to paint a fuller picture of metaphorical language use in academic prose as compared to other registers, including different forms of metaphor.

Word class. There is a stark contrast between the extensive studies on lexico-grammatical features of academic discourse in functional-linguistic studies (see 2.1) and the absence of studies on metaphor and word class in academic texts. There are two studies that addressed metaphor and word class (Cameron, 2003; Goatly, 1997), but neither of these investigated academic discourse in the strict sense. Semino (2008) included word class among the relevant factors of metaphor analysis, but did not discuss it in detail for academic prose.

In general terms, Goatly (1997, pp. 82-92) proposed a basic linkage between word class and the establishment of reference: "[N]ouns represent things, adjectives the properties of things, verbs realize states and processes, adverbs the properties of processes, and prepositions the relationships between things" (1997, p. 83). In Goatly's sample of Popular Science, most metaphors were nouns and verbs, followed by adjectives and adverbs (1997, pp. 312-3): Among the "active" metaphors[6], nouns made up the greatest part (58%), followed by verbs (35%), while for "inactive" metaphors, the highest proportion was held by verbs (47%), followed by nouns (34%). The first finding is explained by Goatly with regard to his concept of "activeness" in terms of an expression's recognizability as metaphor and openness to interpretation (cf. 1997, pp. 83-92): "[T]he more Active the metaphor, the more likely it is to be nominal" (1997, p. 315). On the other hand, conventional metaphors in popularized academic prose are more often verbs than nouns, which may be explained by the same idea. Also, adjectives and adverbs play a more important role in inactive metaphors than in active ones (adjectives provided 7% of the active metaphors, while adverbs were not featured among the active metaphors, but 16% of all inactive metaphors were adjectives and 3% adverbs). These findings appear to support Goatly's theory, which assumes that compared to nouns, "verbs/adjectives, adverbs, and prepositions in that order are less likely to be recognized as metaphorical, or give rise to rich interpretations" (1997, p. 92). In all, it is an open question whether these findings obtained for popular science may be extended to academic prose in general.

Another of the few examinations of metaphor use across word classes is Cameron (2003), for educational discourse. Similarly to Goatly, Cameron (2003, p. 89) reported that metaphors in educational discourse were distributed rather unequally across words classes. Similar to Goatly's results, *verb metaphors* (whose vehicles "centre around verbs") were an important source of metaphoricity (47% of all metaphor vehicles, total number of vehicles was N=711), but *nominal metaphors* (vehicles centering around nouns) provided only 15%. (This is a much lower proportion than in both of Goatly's active/inactive categories, but needs to be put into perspective by noting that Goatly did not include prepositions in his count, with percentages indicating proportions of the total count of metaphors). In Cameron's sample, *prepositional metaphors* accounted for 34% of all identified metaphor vehicles. Verb and preposition metaphors were hence much more common than nominal metaphors. *Adverbial metaphors* made up the smallest proportion in Cameron's sample (1.3%), followed by *adjectival metaphors* (3.1%), both of which

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[6] In *active* metaphors, the metaphorical sense is evoked entirely through the literal sense; there is no established lexical relationship between the two senses. By contrast, in *inactive* metaphors, the two senses of a word are often related by homonymy or polysemy (see Goatly, 1997, pp. 32-34).

are relatively similar to what Goatly found. The common verbal and prepositional metaphors were found in extended verbal expressions, and in highly conventional use (2003, p. 95). Nominal metaphors were either used with *of* (*a feast* of fun), as copular metaphors (*you're spokes* _in a wheel_), or as premodification metaphors (*butterfly clips*). As the verbs, most noun metaphors were highly conventional – as were the adjective and adverb metaphors. In all, Cameron relates the generally high degree of conventionality across word classes to the prosaic nature of spoken classroom discourse. Since both Goatly and Cameron examined registers that are definitely non-core academic discourse, and Cameron's data were not written text, it is an empirical question whether similar findings may be obtained on a more general level of written academic discourse.

Such figures cannot be directly compared across studies for evident reasons (for example differences in the identification procedures), but they show a trend of nouns and verbs being used metaphorically much more often than adjectives and adverbs. Prepositions, as function words with clear spatial meanings, have a special status: Goatly describes the "metaphorical weakness" of prepositions, but also assumes that they give evidence for "certain cultural or universal Root Analogies" (Goatly, 1997, p. 91); Semino treats prepositions as straightforward cases of metaphor (2008, p. 18), as does Cameron (2003, p. 73). In all, specifically when regarding the extensive studies on lexico-grammatical register profiles offered by Biber and colleagues, the need for examining the relation of metaphor to word class on a general level of discourse is evident.

Metaphor type. Figurative and metaphorical language comes in different types, among which are directly signaled forms such as simile ("direct metaphor"), and implicit forms that establish metaphorical reference by ellipsis and substitution. While there is no prior research on implicit forms of metaphor as such, the metaphor literature implies that the use of direct forms of metaphor, such as simile and analogy, should be expected in academic writing.

Drew and Holt (1998) showed that similes play a crucial role in marking discourse boundaries in general, while Carter (2004, p. 125) suggested that "simile is more frequent than metaphor in everyday speech". Goatly (1997) emphasized the tentative and introductory function of similes in popular science texts, and Cameron (2003) showed that teachers in schools use similes to introduce and explain concepts. For scientific discourse, Gentner (1982) and Gentner and Gentner (1983) highlighted specific cognitive function of explicitly expressed academic analogies. For academic immunology texts, Semino (2008) noted the use of quotation marks as a metaphor signaling device, specifically in two uses. The first use was the signaling of more informal, less technical metaphorical expressions (e.g., the article refers to immune cells' " 'agenda' ", and regulatory T-cells are dubbed as a " 'double edged sword' "; 2008, pp. 158-9). The second use was the signaling of the first occurrence

of metaphorical technical terms and the term thereafter used without signaling (e.g., " 'regulate' and 'suppressor cells' "; 2008, p. 159).

In a sample of academic lectures, Beger (2011) identified a number of similes, simile-like structures and analogies, to which she ascribed crucial pedagogical and re-conceptualizing functions. In contrast to these findings, Low (2010) found a relatively scarce occurrence of similes in his corpus of four university lectures (N=33,000 words), specifically with regard to *theory-constitutive metaphors* (he found only one extended simile that seemed to establish reference to a complex scientific theory, "the onion analogy", where the speaker "compared the business environment to an onion"; 2010, p. 298). This finding was extended to written discourse, since in his prior study of academic book reviews (Low 2008), he had noted even fewer similes/analogies. Darian (2000) found a similar situation in another written genre, textbooks, with analogies being far less common in his sample of textbooks than metaphors and "personification, animation, and reification", and similes being the least frequent type of figurative language in his sample. He found both lexical and typographic markers for figurative language in his corpus, with quotation marks "by far the most frequent", followed by lexical markers, and thirdly, italics (2000, p. 181). For the group of lexical markers, he found, in addition to *like* and *as*, "15 to 20 other words or phrases […] that mark a simile" (cf. Darian, 1973) and "analogies", for example *equals, is equal to, is analogous to, just as*, and *imagine.* He showed examples of personification marked by *so to speak,* e.g., *Together with the organ system shown in Figure 26.1, the circulatory system helps maintain favorable neighborhood conditions, so to speak.* (2000, p. 182). Similes occurred in "the same highly restricted" form in both samples (*X-like* and *X-shaped*) and were used mostly to describe parts of the human body (e.g., *a pea-like wrist bone*) (2000, p. 180). Skorczynska & Piqué-Angordans (2005) searched the same corpora as Skorczynska and Deignan (2006) for *metaphor marking*, finding a similar pattern, with the scientific sample using much fewer metaphorical markers than the popularization sample. This was tentatively related to "a more overt attitude towards the handling of metaphorical language and possibly a more frequent use of metaphor" (Skorczynska & Piqué-Angordans, 2005, p. 126) in the popular business discourse, while overlap in marker use was attributed to "the fact that both corpora have a common characteristic of being samples of non-literary discourse" (2005, p. 127). They also reported that the overall frequency of metaphorical markers was "remarkably low", with the highest value being 0.15 per thousand words and the lowest 0.002 per thousand words (2005, p. 118). However, they pointed out that further research is needed in form of a "contrastive study of marked and unmarked metaphors" (2005, p. 118).

There appears to be a strong connection between metaphor signaling and *deliberate metaphor* use in the sense of Steen (2008, 2011a, in press; for a critical discussion see Gibbs, 2011a). According to Steen, metaphors are deliberate when

"the sender asks the addressee to change their perspective and intentionally look at one thing in terms of something else" (Steen, in press, p. 8). Since similes and other signaled forms of metaphors directly express source domain referents, and since the addressee is likely to represent and attend to these referents separately from the rest of the discourse, such forms of metaphor "may be deliberate by definition; the more extended or marked they are, or the more prominent their source domain appearance, the greater the chance may be that they also impinge on consciousness eliciting conscious metaphorical thought" (in press, p. 11). Direct metaphors may hence be seen as probable instances of deliberate metaphor use in academic prose. Examples from different academic genres were identified by Semino (2008), for example in a Cognitive Neuroscience article, where attention is guided to the metaphoricity of information processing terms (cf. Semino, 2008, p. 135), or a seminal genetics article that deliberately applied metaphor and metaphor signaling in labeling chromosomes as "some kind of code-script" (Schrödinger, 1944, cited in Semino, 2008, p. 137). In both examples metaphorical language use is not only marked linguistically (e.g., by means of scare quotes), but also metaphoricity is addressed on a metalinguistic level. However, in a cross-genre analysis of an academic and a popular-scientific article on 'longlivety', Semino notes that metaphorical expressions are linguistically more backgrounded in the scientific text, as are the processes captured by them. In contrast, the popular-scientific article highlights figurative processes (2008, pp. 142-5). This result can be related to Low's (2008) finding of a general lack of recurrent, more creative and signaled metaphor in academic book reviews. One of his explanations is that "formality" of written academic language "implied limiting the use of deliberate metaphor" (2008, p. 97), with deliberateness (now in the sense of Cameron, 2003), lying in the use of the linguistic metaphor "in its discourse context, for a particular purpose on a particular occasion" (2003, p. 101). In all, there is reason to assume that (expert) academic prose uses metaphor in a less explicit and "deliberate" way than popular science (see Semino, 2008 for a discussion) and, possibly, other registers. A different situation seems to apply to Giles's (2008) finding, who suggests that scientists involved in cloning seemed to use metaphor largely "unconsciously" (2008, p. 147), with explicit description and signaling of cross-domain relations (e.g., similes and analogies) not observed in his sample. While Giles argued that the scientists missed the opportunity of coining a dominant and productive metaphor for cloning, a possible explanation for his observations may be related to the fact that cloning is an ethically highly sensitive issue (cf. Nerlich et al., 2002). Writers may hence have strategically avoided open exploitation of underlying analogies that may potentially attract stark negative public reactions (cf. Semino, 2008 for a similar comment).

In all, there are conflicting views on the role of direct forms of metaphor, as well as on the role that creative and/or deliberate metaphor use plays in academic discourse. It may be very tentatively suggested that such cases of explicitly signaled

and inventive metaphors of Cognitive Neuroscience (cf. Semino, 2008) and some lectures (Beger, 2011) are particular to relatively new areas of (natural) sciences and possibly some types of more informal discourse, and that metaphor use in written academic discourse in general may be more backgrounded, and conventional. This in turn may be related to the stylistic conventions of academic prose linked to the ideal of a plain style (cf. Giles, 2008, see also Chapter 1). In all, it is an interesting question whether direct metaphor is indeed relatively common in academic prose, or whether it may be limited, for instance on the basis of stylistic conventions.

Personification. Another aspect of metaphor that has been examined from a quantitative point of view is *personification / animation* (cf. Low, 1999). Personification was described by Lakoff and Johnson (1980) and Lakoff and Turner (1989) in relation to the EVENTS ARE ACTIONS metaphor, which allows us to "conceive of agentless events as if they were caused by agents" (1989, p. 36). Personification can be identified in nouns, as well as in adjectives, adverbs, and verbs with a more basic meaning that requires an animate or human agency, but is "often realized by verbs and adjectives rather than nouns" (Dorst, 2011b, p. 120). This is reflected in discourse studies, where "impersonal construction of agency" in action/activity verbs (with an inanimate entity in subject position of a verb that normally requires an animate subject) is viewed as one of the central features of academic discourse (cf. Biber, 1988; Dorgeloh & Wanner, 2009; Master, 1991). From within metaphor studies, it has been widely suggested that the phenomenon of animation/personification plays an important role in academic language (Low, 1999, 2008; see also Charteris-Black, 2000; Charteris-Black & Musolff, 2003; Darian, 2000; Giles, 2008; Goschler, 2008; Pulaczewska, 1999; Semino, 2008). In his study of the role of metaphor in the positioning in academic book reviews, Low (2008) found that personification (*The book says*) is more prevalent than other conceptually systematic ways of metaphor use, and Darian (2000) noted a high occurrence of personification in his sample of biology/chemistry textbooks: "[I]t is surprising to find [personification and animation] so prevalent in our corpus, since one does not normally think of them as major figures of speech in expository writing in general or in scientific writing in particular" (2000, p. 175).

The corpus-linguistic work by Dorgeloh and Wanner (2009) on "formulaic argumentation" reported two types of impersonal formulaic construction of authorship that use inanimate agency: the so-called "paper construction" (e.g., *the paper argues)* and "fact-construction" (e.g., *this fact suggests*). Based on a corpus of 160 abstracts from different disciplines, they found that both are today used more often than their "conventional alternatives", the "agentive construction" (*I argue / suggest)* and the "passive construction" (*it is suggested that*). The authors suggest a "rhetorical shift from presenting scientific evidence as discoveries to a more

constructional approach" (2009, p. 523). These formulaic constructions have two characteristics: They avoid "direct reference to the author who is making his or her argument, thereby minimizing politeness violations" and make "the act of constructing an argument visible (through the use of a non-passivized agent-oriented verb)" (2009, p. 525). While both constructions allow the writer "to deprofile the agent without resorting to stigmatized passive", the *paper*-construction seems to fulfill a "constructionist" function, since in contrast to the *fact*-construction, it "does not present an argument as neutral and self-evident, but reminds the reader of the constructional (and textual) nature of the argument" (2009, p. 542). The *fact*-construction, meanwhile, seems to be related to a "politeness" function, since it allows authors more clearly to let data and results "speak for themselves" (2009, p. 538).

In all, with evidence of personification/animation in academic discourse from diverse fields, the topic of personification/animation (cf. Low, 1999) is relevant for the current thesis, which will include the violation of selection restrictions and inanimate agency in the use of verbs in the examination of the relation of metaphor and word classes. Apart from Dorst (2011b), who applied the *MIP* procedure to the identification of personification in a corpus of literary discourse, no metaphor study so far has examined aspects of personification in relation to word class at a quantitative level of analysis. The present thesis will hence offer new evidence for the area of academic discourse.

My review of studies that examined metaphor in academic prose suggests the following problems:

(1) Studies are often limited to one sub-area of academic discourse (e.g., physics) or academic genre (e.g., textbooks).

(2) Studies are generally quite small in terms of sample size or need to make concessions in terms of exactitude of metaphor identification. They are normally limited to specific subdomains of academic discourse.

(3) Most studies examine technical lexis (and their relation to theories). Other features of metaphorical language in academic discourse have remained largely unconsidered. One exception is cognitive-linguistically driven work on the cohesive function of metaphors in discourse. Other exceptions are the small number of studies that have examined types of metaphor (indirect/direct) and studies that have addressed the phenomenon of personification.

As a result, in order to arrive at a more differentiated and valid account of metaphor in academic discourse, the study of particular linguistic features and their functions needs more attention:

(1) The direct cross-register/cross-genre comparison of metaphor use in academic discourse.

(2) Larger-scale studies that compare metaphor use in academic discourse to other main registers (of English), on a quantitative basis.

(3) The detailed linguistic examination of all aspects of metaphorical language as *language* (e.g., the distribution of metaphor types and lexico-grammatical forms of metaphorical language).

All of this should be combined with a linguistic methodology that applies maximal scientific rigor in terms of conceptualization, operationalization and the reliable identification of metaphor and which at the same time works inductively, on an exploratory basis – regarding all possible forms and functions of metaphor in academic discourse.

2.3 The Identification of Metaphor in Written Academic Language

In this section, I will present an introduction to the annotation procedure used in the present thesis (*MIPVU*, cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010), starting out with a few general observations on metaphor identification in recent metaphor studies. Subsequently, I will zoom in on the particular annotation procedure *MIPVU* and its basis *MIP*, as well as on the particular problems that arise when confronting metaphor in academic use.

Although metaphor is established as a pervasive phenomenon in natural language, its rigorous identification is generally a problematic issue (e.g., Low & Todd, 2010; Steen, 2007, Chapter 2). This is specifically true with regard to the contextual circumstances of usage (Cameron, 1999, p. 105), in particular in specialized settings (e.g., Goschler, 2007). First of all, they might be seen as closed discourse communities in which certain meanings are not metaphorical (cf. Cameron, 2003, pp. 66-7; Kittay, 1987; Steen, 2007). Secondly, metaphor identification within such domains of discourse may be hindered by the high specificity of word meanings in the respective contexts (see Baake, 2003; Goschler, 2007; Semino, 2008).

Even within the wider circle of cognitively informed metaphor studies that use CMT as a reference point, metaphor identification methods are quite heterogenic, ranging from "non-methods" (for example, when researchers simply state that metaphors "emerged" from reading texts, see Low & Todd, 2010, for a discussion) to highly explicit procedures such as *MIP*. They also vary in the basic "direction" of identification, with some studies leaning towards a hypothesis-driven strategy (deductive, or *top down* identification, e.g., "which are the linguistic instances of ARGUMENT IS WAR in academic prose?"), while others favor an inductive (or *bottom up*) identification. The latter is more open-ended, striving to identify patterns on the

basis of specific observations (e.g., "which linguistic features are metaphorically used in academic prose?").

In Cognitive Linguistics, linguistic metaphors have traditionally been identified in a deductive way, based on the (*a priori*) assumption of rather large-scale mappings between conceptual domains that are expressed by various conventional and novel metaphorical expressions. This means that the identification of metaphor in language has often involved "simply locating suitable metaphors" (Low & Todd, 2010, p. 224) as indicators of particular underlying mappings. Another, related, problem has been that of "invented evidence" produced by "armchair reflections" (cf. Cameron, 2003; Hanks, 2010). Deignan's corpus-linguistic work has shown that many of the linguistic expressions that have been presented in the (classical) field of CMT as prototypical evidence for particular conceptual metaphors are in fact either quite rare, or plainly non-existent in natural language (e.g., Deignan, 2005, 2006, 2009). For example, Deignan (2005, pp. 95-6) examined a range of linguistic manifestations of the conceptual metaphor ANGER IS HEAT[7] reported by Yu (1995, p. 161). Deignan found that out of seven linguistic metaphors from Yu's list, only two are indeed frequent in similar metaphorical use in the examined corpus, the U.S. section of the Bank of English (*These are <u>inflammatory</u> remarks; After the argument, Dave was <u>smoldering</u> for days*), while two others are quite rare (*He was breathing <u>fire</u>; Your insincere apology has added <u>fuel to the fire</u>*), and three more "do not occur at all in the corpus" (*She was doing a slow burn; Boy, I am burned up; Smoke was pouring out of his ears*).

The identification of conceptual mappings in (classical) CMT is seen as methodologically problematic as well. Difficulties have arisen not only in the extrapolation of the particular conceptual domains underlying the utterances, but have concerned also the complexity and extent of the established mappings (e.g. Semino, 2008, p. 10; cf. Steen, 2007, chapter 8). The deductive method of identifying linguistic metaphor runs the risk of being imprecise in mainly two ways. First, it has often had a strong intuitive basis, which includes the summation of linguistic evidence as realizations of a particular metaphor as well as the invention of examples. As Deignan showed, a first step towards the empirical study of metaphor is to mistrust intuition here and to let corpus data reveal "the existence and frequency of literal and metaphorical senses, detailed aspects of their meanings, and their collocational and syntactic behavior" (2005, p. 96). However, even if natural data are examined, and corpus-linguistic methods are used, deductive approaches to metaphor identification still need to be applied with caution, since they carry the danger of overgeneralization (if I am looking for instantiations of a particular metaphor, I will probably tend to include all cases that appear to be consistent with it, such as *attack* with ARGUMENT IS WAR). Second, and probably most importantly,

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[7]While Yu refers to HEAT as the source domain, Deignan refers to FIRE.

a deductive approach is prone to overlook unexpected (patterns of) linguistic metaphors (cf. Deignan, 2005), since it normally seeks to test whether a given conceptual metaphor can be verified in discourse, which by definition excludes an open-ended exploration of other types and (lexico-grammatical) forms of metaphor.

However, inductive approaches to metaphor have their perils too. The main one is that they need criteria for defining and identifying metaphor in language to be specified openly if they do not wish to run the risk of producing invalid evidence. If the aim is to produce intersubjectively observable evidence, then the influence of subjectivity on decisions about what counts as a metaphor and what not needs to be controlled as much as possible (cf. Pragglejaz Group, 2007). In other words, important issues that have often been neglected in the study of metaphor are reliability and validity. Questions that need to be answered are

> *Does the method really measure what it is supposed to, and is it consistent? Are the results reliably reproducible by others? (Reliability)*
> *Are the results based on consistent and /or explicit decisions about the nature of metaphor? Can they really be generalized to assertions about (aspects of) metaphor in general? (Vali*dity)

Recently, within the current framework of metaphor studies, the identification of metaphor in language has in overall terms become much more valid and reliable than it was only fifteen years ago. In the last few years, a number of (inductive) identification procedures have been devised that address the issue of inter-coder and/or inter-case reliability (Cameron, 2003; Cameron & Maslen 2010; Pragglejaz Group, 2007; Steen, 2007; Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010). At the same time, consistent and explicit operational definitions of metaphor have been put forward (e.g., Cameron 2003; Pragglejaz Group, 2007) and (quantitative) findings have been put into perspective with regard to their generalizability and representativeness of the data much more often (e.g., Charteris-Black, 2004; Deignan, 2005; Deignan & Cameron, 2003; Deignan & Semino, 2010; Koller, 2004; Stefanowitsch & Gries, 2006).

Yet corpus-linguistic approaches have their own limitations: If an inductive procedure is used, metaphor needs to be annotated manually, which restricts corpus size for practical reasons (it is time consuming to annotate a corpus manually). If metaphor is identified in a top-down approach, concessions need to be made with regard to the scope of the phenomena under scrutiny – for example, exact frequency counts of metaphorically vs. non-metaphorically used units are virtually impossible, since any search identifies only subsets of metaphorical expressions (e.g., see Deignan, 2005 for a source-domain-oriented approach; see Stefanowitsch, 2006b, for a target-domain-oriented approach called metaphorical pattern analysis; for an overview see Stefanowitsch, 2006a). Furthermore, those types of deductive research

in which one or several conceptual metaphors are hypothesized and the identification criterion of data as indicating the mapping is a rather broad notion of *consistency* appear to run the risk of *over-identification*: a lack of accuracy that results from a desire for consistency which "is one of the most common problems in published studies" (Low & Todd, 2010, p. 224). For example, Labbo (1996) interpreted children's literal play in a classroom setting as indicative of a conceptual metaphor SCREEN AS PLAYGROUND without showing striking linguistic evidence to support this assumption (cf. Low & Todd, 2010). In opposition to inductive procedures, in deductive procedures, the need to justify identification by means of data is noticeably reduced because the researcher "assumes that there must be an underlying metaphor there somewhere" (Low & Todd, 2010, p. 224). Top-down approaches, however, have the advantage of allowing for searching larger corpus sizes (all other things being equal), since a previously composed list of lexical instantiations of metaphor is searched for in potentially great corpus sizes (cf. Stefanowitsch, 2006a). Many studies have thus used a mixed approach, with a small corpus annotated by hand, using the obtained results for searching bigger corpora (Charteris-Black, 2004; Deignan & Cameron, 2003; Skorczynska & Deignan, 2006).

Given these restrictions of corpus analysis of metaphor, various attempts have been made to facilitate automated metaphor identification in electronic corpora (e.g., Berber-Sardinha, 2008; Fass, 1991; Martin, 1994; Mason, 2004; and the Lancaster group including Koller, Hardie, Rayson, & Semino, 2008; Semino, Hardie, Koller, & Rayson, 2009), but automated procedures either still involve a substantial amount of human work and are limited to particular language features (e.g., verbs or nouns, see Shutova, Sun, & Korhonen, 2010). They also vary considerably in terms of accuracy (e.g., see Mason, 2004). In all, recent metaphor studies are generally aware of the need for systematic and reliable metaphor identification methodologies.

One goal that motivates the present research is to minimize intuitive moments both in identification and analysis. *MIP* was therefore chosen as a basis for annotation of the *VU* Amsterdam Metaphor Corpus (*VUAMC*) as it is an explicit and systematic procedure for linguistic metaphor identification in language usage and has been tested for reliability. It is presented below in this section. *MIP* takes a synchronic stance toward metaphor, which coincides with the research goal to quantitatively compare metaphorical word use in the four main synchronic registers of English (a quantitative corpus/based analysis is another step towards the goal of more "objective" metaphor studies). *MIP* provides an operational way of identifying metaphors in actual usage, independently of domain of discourse. One of its great advantages is that it allows researchers to remain agnostic towards potentially problematic assumptions about underlying conceptual structures and questions about language processing while being largely compatible with conceptual metaphor theory.

As described in Steen, Dorst, Herrmann, Krennmayr, and Pasma (2010), the application of *MIP* to the *VUAMC* eventually led to a more refined and somewhat extended version of *MIP*. The result, called *MIPVU*, will be described in detail in the next chapter, which comprises the complete manual for metaphor identification. In Chapter 4, the manual is then applied to aspects of metaphor identification in academic prose. The remainder of the present chapter will first comment more generally on the implementation of *MIP* and on additions in *MIPVU* (cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010, pp. 1-23) and then pinpoint the specific issues of metaphor identification in academic prose in some more detail.

The Pragglejaz Group's procedure *MIP* allows the linguistic analysis of metaphorically used words, or, more accurately, lexical units, in discourse. *MIP* was offered as a tool to account for most of such linguistic forms of metaphor that have been discussed in the literature since the advent of CMT (and before). Here is the four-step manual (Pragglejaz Group, 2007, p. 3):

> 1. Read the entire text/discourse to establish a general understanding of the meaning.
> 2. Determine the lexical units in the text/discourse.
> 3. a. For each lexical unit in the text, establish its meaning in context, i.e. how it applies to an entity, relation or attribute in the situation evoked by the text (contextual meaning). Take into account what comes before and after the lexical unit.
> b. For each lexical unit, determine if it has a more basic contemporary meaning in other contexts than the one in the given context. For our purposes, basic meanings tend to be
> — more concrete; what they evoke is easier to imagine, see, hear, feel, smell, and taste;
> — related to bodily action;
> — more precise (as opposed to vague);
> — historically older.
> Basic meanings are not necessarily the most frequent meanings of the lexical unit.
> c. If the lexical unit has a more basic current/contemporary meaning in other contexts than the given context, decide whether the contextual meaning contrasts with the basic meaning but can be understood in comparison with it.
> 4. If yes, mark the lexical unit as metaphorical.

The rationale of the Pragglejaz Group's procedure is that metaphorical meaning in usage is indirect meaning. This indirect metaphorical meaning stems from a contrast between the contextual meaning of a lexical unit and its more basic

meaning, the latter being absent from the actual context but observable in others. By this definition, there is no metaphorically used word that does not have a more basic, non-metaphorical meaning in another context. For instance, see the following fragment introduced in Chapter 1, which contains three metaphorically used words; the verb *distinguish*, the preposition *between,* and the verb *see*:

(1) English law <u>distinguishes</u> <u>between</u> the offences of murder and manslaughter, as we shall <u>see</u> […]. (ACJ-fragment01, emphasis mine, JBH)

The highlighted words have more basic meanings in the following contexts:

(2) I could not *distinguish* her face in the darkness (MM, entry *distinguish*)
(3) Gatwick is about halfway *between* London and Brighton. (MM, entry *between*)
(4) If the operation is successful, he will be able to *see* again. (MM, entry *see*) (emphasis mine, JBH)

In Chapter 1, I demonstrated that expressions such as *distinguish*, *between, see, boundaries,* and *frozen* are used metaphorically in academic discourse as cases of indirect language signaled by the contrast and non-literal similarity between two related word senses. As can be seen now, the basis of this was *MIP*.[8] Charteris-Black (2004, p. 37) and Deignan (2005) have used the same rationale, without formalizing or testing the approach. Some of *MIP*'s strengths and weaknesses have been discussed in Steen (2007), and a concrete application is reported by Steen, Biernacka et al. (2010). In the remainder of the present section I will call attention to some of the issues involved with the identification of metaphor in academic discourse in order to prepare the full description of *MIPVU* in the next chapter. These are *novelty/conventionality*; *conceptual mappings; operational definition of metaphor; unit of analysis;* and *resources.*

Novelty/conventionality. An important issue in the literature is that metaphor is a gradable phenomenon: Different types of metaphor range from truly novel to etymologically dead metaphors (e.g., Deignan, 2005; Goatly, 1997; Müller, 2008). Along these lines, one of the questions that any identification procedure needs to answer is whether it can accommodate novel metaphors. It turns out that *MIP* can: When the linguistic form *wipe out* is used in the context of argumentation, as in Lakoff and Johnson's example *If you use that strategy, he'll wipe you out,* its

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[8] The interpretation in Chapter 1 involving underlying domains and mappings between them is not part of *MIP*, or of *MIP*VU (see Steen, 1999, Semino et al., 2001 for a systematic procedure forth identification of metaphor on the conceptual level of analysis).

contextual sense is clear. However, that contextual sense, having to do with argumentation, has not become conventionalized. For instance, it has not ended up in the *Macmillan English Dictionary for Advanced Learners* (Rundell, 2002). Yet *MIP* does not have a problem with this: The ad hoc or situation-specific contextual sense of argumentation that may be constructed for *wipe out* may simply be contrasted with and compared to the basic sense of *wiping out,* which has to do with cleaning. As a result, *wipe out* is also identified as metaphorical language use (cf. Steen, 2007).

As far as academic discourse is concerned, this is interesting since technical word use is prone to feature words that may not be intended metaphorically within a circle of discourse, but which appear novel to *MIP*. For example, see the technical lexical unit *column* in the following extract from a paleontological text treating "ocean-going" fossils:

(5) In fact many of the arthropods that inhabit the *water <u>column</u>* have large, globular eyes of this kind. (AMM-fragment02, emphasis mine, JBH)

The compound *water column* as such is not featured by Macmillan or the comparable Longman dictionary (LM; Summers & Bullon, 2005), which means that in general discourse, it is not lexicalized, and thus is split up for identification (see Chapters 3 and 4 for more details on the demarcation of lexical units in metaphor identification). Just like the contextual meaning of *wipe out* in the context of argumentation above, the contextual sense of *column* is not found in the resource dictionaries (a web search of *water + column* rendered the approximate meaning '[a] conceptual column of water from lake surface to bottom sediments'[9]). The basic sense of *column*, however, is clearly concrete ('a tall thick post used for supporting a roof or decorating a building', MM). Since a virtual column in water resembles an actual column, but is obviously different from it, *<u>column</u>* can be identified as a metaphor.

By contrast, historical or etymological metaphor is not identified as metaphorical by *MIP*. For instance, the words *fervent* and *ardent* used to have two senses, one for temperatures and one for emotions (see the *Concise Oxford Dictionary* published in 1974, McIntosh, 1974).[10] However, in contemporary British English, both terms have lost their original temperature sense: in the Macmillan

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[9] Axler et al. (2011, January 31).
[10] OED shows that *ardent* is used in the 'burning' sense still in 1882 (*The sun was not very ardent.*). (But see the lexicographer Hanks, 2010, p. 142, who argues that *ardent* has "never been alive" as a metaphor [with reference to Samuel Johnson who allegedly said that the word has never been used in English to mean 'burning']. I would argue that even if *ardent* was falsely assigned this English meaning by the dictionary in 1974, it was possible for the word to acquire this meaning from then on, by way of public reception of the dictionary).

dictionary, for instance, they only have their present-day emotion senses. Hence expressions like *fervent admirers* are not judged to be metaphorical when analyzed by *MIP* because there is no contrast between the contextually appropriate emotion sense and the historically older and more basic temperature sense: there is good reason to assume that the latter is simply not available to the typical contemporary language user anymore, as is reflected by the descriptions of the words in the modern users' dictionary (Deignan, 2005).

This is interesting for metaphor identification in specialized academic language for two reasons: On the one hand, terms that may once have been metaphorical (within public discourse) are not treated as metaphorically used by *MIP* if they do not have a more basic meaning in public discourse, which is the defining discourse. For example, the adjective *scalar*, which today has just one, technical, meaning in English ('used for describing a quantity that has size but no direction, for example area', MM),[11] is listed in the OED with the meaning 'resembling a ladder' (last recorded in Modern English in 1880). Since this meaning is not listed in the dictionaries, *scalar* (for example in the technical term *scalar function*) is not treated as a metaphor. On the other hand, for *MIP*, any term is potentially metaphorical if a more basic meaning in some other context can be found – even if a term is not metaphorically used (any more) within a particular academic discourse community. One example is the technical term *flooding* from behavioral psychotherapy, which has just one, technical, sense in the Merriam-Webster Medical dictionary ('exposure therapy in which there is prolonged confrontation with an anxiety-provoking stimulus'), but has a more basic sense in general discourse ('a situation in which water from a river or from rain covers large areas of land', MM). Even though *flooding* may not be a metaphor within the specialist discourse community, it is metaphorical from the point of view of general discourse. In all, *MIP* allows one to detect metaphor regardless of whether some term is used as a metaphor for the first time or in a highly conventional way. *MIP* also allows for identifying metaphor in specialist settings such as academic discourse – albeit from the perspective of general discourse.

Conceptual mappings.   In opposition to common practice in cognitive linguistics, *MIP* identifies the linguistic forms of metaphor, but not its conceptual structures. The procedure thus saves the analysts much work (the identification of particular conceptual domains) while providing them with a straightforward method for identifying metaphorically used words: They only need to find a more basic sense than the one that is used as the metaphorical discourse meaning. In order to identify a word or set of words as metaphorically used, it is often sufficient to be

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[11] No entry can be found in the Longman Online Dictionary.

able to say that there are two senses and that they may be related by comparison, or nonliteral similarity (e.g., Crisp, 2002, pp. 9–10).

For an example, consider the verb *reached* in an extract from a biology text:

(6) With these developments beyond his mid-September 1838 positions, Darwin had <u>reached</u> the theory of natural selection much as he would publish it later. (CMA-fragment 01, emphasis mine, JBH)

It may be relatively easy to agree that *reached* is metaphorically used, but relatively difficult to agree that *reached* is to be understood as a movement of an isolated body part, or as a person's movement to arrive at a destination. If the identification of metaphorically used words is made dependent on the identification of underlying conceptual structures, disagreement or lack of agreement about conceptual structures (source domains of body part versus entire person) would also mean disagreement about the identification of words as metaphorically used. *MIP* thus offers a valuable tool for such situations, which are actually quite common. With its linguistic approach, it allows analysts to remain agnostic about conceptual structures (for similar approaches, see Cameron, 2003; Charteris-Black, 2004). This helps the identification of metaphor in language as opposed to conceptual structure (or thought), since the same analysts often have less difficulty in agreeing that a word or expression is metaphorical than in establishing the precise nature of the underlying metaphorical concepts and structures.

The operational definition of metaphor (indirectness by similarity). *MIP*'s way of operationalizing the cognitive-linguistic definition of metaphor as a cross-domain mapping in language is based on a conception of indirectness plus similarity. In this respect it concurs with Lakoff (1986, 1993) and Gibbs (1994), who regard the identification of metaphor as a matter of finding indirect meaning in lexical units. Although indirectness is a good starting point for finding metaphor in language, it is not a sufficient criterion – since it includes metonymy and excludes direct forms of metaphor.

Firstly, the criterion of indirectness is too extensive, because it includes another form of indirect language use, metonymy, which is a linguistically and conceptually distinct phenomenon. The Pragglejaz Group and Cameron have proposed that a necessary condition for the identification of metaphor is that some form of semantic transfer from the one sense to the other is involved, on the basis of some form of similarity or comparison (Pragglejaz Group, 2007; cf. Cameron, 2003). Thus, *reached* (*Darwin <u>reached</u> the theory of natural selection)* can be given a metaphorical analysis because it involves a contrast between intellectual success and physical ability, which may be bridged by constructing a similarity between the two. This is different from metonymy, where two senses may be contrasted but where the

contrast is bridged by contiguity instead of similarity. Thus, the term *English law* (*English law distinguishes between the offences of murder and manslaughter*) shows a contrast between abstract rules and regulations and the people that devise and handle them, or the physical volumes that contain them, causing a form of indirect meaning. This contrast is resolved by metonymic rather than metaphorical transfer, via the contiguous relationship between abstract rules and their handling, or documentation (cf. Steen, 2007).

Secondly, the criterion of indirectness is too restricted to capture all linguistic forms of metaphor. If metaphor is defined as a mapping across two conceptual domains, it is easy to show that such cross-domain mappings in thought may also be realized by direct language instead of indirect language.

(7) […] such ocean-going amphipods (a kind of 'shrimp') as Cystosoma, which also has enormously expanded eyes, <u>looking</u> <u>like</u> <u>headlamps</u>, compared with its bottom-dwelling relatives […]. (AMM-fragment02, emphasis mine, JBH)

This cross-domain mapping between animals' body parts and car parts is expressed directly: Readers need to build a mental representation of the text that includes both shrimps' eyes and cars' headlamps as part of the text, and in that, they are instructed by the use of the metaphor signal *looking like* (cf. Goatly, 1997 for an inventory of the various forms of metaphor). The particular type of metaphor present in (7) does not use language indirectly, as happens in *boundaries frozen by tradition* (see Chapter 1). However, if metaphor is defined as a cross-domain mapping, there is no reason to exclude this and other "direct" expressions of metaphor from the analysis (and identification). This is where the *MIPVU* version diverges from the path proposed by *MIP*: The Pragglejaz Group (2007, p. 32) excludes similes and other forms of direct language, since no different senses are evident, but concedes that these "may be constructed as metaphorical" at a "higher level of analysis", whereas *MIPVU* proposes capturing this level of analysis within the same procedure. This is possible when revising the criterion of indirectness in such a way that other forms of metaphor can also be accommodated. The key to this revision is to shift the criterion of indirectness from the use of linguistic signs to the use of conceptual structures (Steen 2007, p. 323; see also Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010, p.11).

MIPVU emphasizes that indirect conceptualization by metaphor causes some form of referential and sometimes even topical discontinuity or incongruity in discourse, independent of whether the indirect conceptualization is expressed in direct or indirect language. In any case, indirect conceptualization is given if an alien conceptual domain is present in the dominant conceptual domain of the discourse (or discourse segment). Consequently, an arising lack of conceptual coherence has to be

resolved by assuming that a mapping from the foreign source domain to the dominant target domain must be performed. This mapping may be triggered by indirect language use (*Darwin reached the theory of natural selection*; *boundaries frozen by tradition*) or by direct language (*eyes looking like headlamps; outline resembling that of an arab minaret*).

In addition to indirect and direct expressions of metaphor, another class of metaphors expresses cross-domain mappings implicitly. Here is an example from the British National Corpus:

> (8) Naturally, to embark on such a step is not necessarily to succeed immediately in realising it. (BNC-A9J, NEWS, emphasis mine, JBH)

Here *step* is related to metaphor, and *it* receives a code for implicit metaphor. This type of metaphor can be identified if the underlying definition of metaphor as a cross-domain mapping is adapted and the discourse-analytical notion of cohesive discourse is assumed. In discourse analysis (e.g., Kintsch, 1998), which identifies the conceptual structure underlying the language, syntactic dummy expressions (such as pronouns) are dealt with by linking them back to the concepts that they refer to. The proposition thus has to show the previous concept (antecedent, 'step') instead of the cohesive element (*it*): *Naturally, to embark on such a step is not necessarily to succeed immediately in realising [STEP]*. This makes the cohesive element in the current proposition metaphorical. Yet, importantly, the language in the surface text is *implicitly* metaphorical, since the discourse does not signal the need for nonliteral comparison, as is the case with indirect and direct metaphor (*Darwin reached the theory; eyes looking like headlamps)*. Instead, implicit metaphor results from an underlying cohesive link (grammatical and/or semantic) in the discourse which points to recoverable metaphorical material.

In *MIP*, the operational criterion for metaphor as indirectness by similarity works for indirectly used words. However, other forms of metaphor also operate on indirectness by similarity – yet these are indirect not at the level of word use, but at the level of the conceptual structure of discourse. These are also metaphors according to the definition of metaphor as cross-domain mapping, but either expressed directly or implicitly. They hence require an extension of *MIP* to be identified as linguistic expressions of metaphor: As with *MIP*, metaphor is thus understood in *MIPVU* as a cross-domain mapping, but indirectness by similarity is now pitched at the level of conceptual structure.

Unit of analysis. Like *MIP*, *MIPVU* treats metaphor at the level of lexical units, that is, words and word-like constructions such as phrasal verbs, polywords, and compounds. In order to consistently measure metaphor at one level of usage, lexical units need to be systematically and exhaustively examined for metaphorical use, and

annotated as such. All other manifestations of metaphor can consequently be left aside, at least for the moment. The main reason for choosing this unit of analysis is the relatively transparent relationship between words, concepts, and referents which is found in most analyses of metaphor in language and discourse.

Questions about the unit of analysis firstly concern the extent of units, with the unit of *word* opposed to larger units (such as phrase or sentence) and smaller units (such as morpheme or particle). They also concern the grammatical status of units, in the form of lemmas versus word classes (e.g., the lemma *parrot* can be treated as grammatically distinct depending on whether it is the noun *parrot* or the verb *to parrot*). A general decision thus has to be made about whether such units as *parrot* or *dog* are used metaphorically when transgressing word class boundaries – or not. Like *MIPVU*, lexical units are understood by word classes, not lemmas, in opposition to the Pragglejaz Group, who decided that "word class may be ignored in MIP" (2007, p. 28). The decision to analyze by word class was taken because in a discourse perspective, word classes have close connections with conceptual and referential classes such as entities, processes, and attributes. This means that with *MIPVU*, the noun *dog* is a lexical unit distinct from the verb *to dog*, because the noun links to a default animal referent and in that respect is different from the verb, which in turn links to a different default referent: a process that is some typical human action. Hence, with this crucial referential difference, the nominal usage is not a basic sense against which any contextual sense of the verb can be identified as metaphorical: The different grammatical usages correspond with distinct lexical units. With *MIPVU*, the verbs *to parrot* and *to dog* hence refer to processes, and therefore the decision whether they are related to metaphor or not depends on whether there is a contrast between some contextual and some more basic sense of the *verbs*.

Although at the level of the language system, the relation between the different lexical units is clearly metaphorical (specifically in terms of word formation), the verb is not metaphorical at the level of the use of the lexical unit in the discourse, where word classes are linked to particular kinds of referents. It might hence not be ruled out that the actual processing of lexical units that result from metaphorical word class derivation (such as *to dog* and *to parrot*) is metaphorical. However, since *MIPVU* operates on the contemporary word use in context, based in the lexicalization of meaningful referential units, it does not consider the results of metaphorical word formation processes. Since valid metaphor analyses need to treat the unit of analysis as a consistent parameter, in the present study, the basic unit of analysis is set at the level of lexical units, and does not transgress word classes.

Resources. The Pragglejaz Group (2007) points out that in the process of data collection, additional help can be recruited from a number of tools. These, however, require an additional number of decisions on how metaphor is identified in

language, specifically with regard to idioms (*bite off your tongue*), polywords (*of course*), and phrasal verbs (*turn on*). The issue of the unit of analysis, in particular with regard to the question of how to deal with word class boundaries, was already addressed in the last section. When examining the contextual and basic senses of lexical units, data collection can for example be standardized by reference to a publicly available description of all of these in one or more dictionaries (cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010, p. 16). This allows decisions to be based on an independently produced description of the language. It also means that annotations can be checked and analyses can be replicated. Another advantage is that tools can also be compared or combined, for example in the analysis of technical varieties. Disadvantages to using dictionaries lie, for example, in the way in which space restrictions inform sense descriptions, but these can be remedied (Steen, 2007).

In the following paragraphs, I will briefly explain how *MIPVU* used the corpus-based *Macmillan English Dictionary for Advanced Learners* as an explicit resource. Occasionally, under circumstances that will be described in the next two chapters, corpus annotation turned to a second opinion dictionary that is largely comparable to the Macmillan dictionary, *Longman Dictionary of Contemporary English* (Summers & Bullon, 2005). *MIPVU* contains explicit guidelines for using both dictionaries (but mostly Macmillan): Annotators look up senses of lexical units defined as word classes in the dictionary – and, as a rule, unless they are novel (which scarcely happens), they find these senses explicated there. After establishing the contextual sense, the annotator needs to look for a more basic sense for the same entry. Basic senses are typically the most concrete and human-oriented senses that can be distinguished – contrary to what is suggested by *MIP*, *MIPVU* does not include older senses (as listed in for instance the *Oxford English Dictionary [OED]*) in the procedure when determining basic senses. As these senses are largely absent from contemporary English dictionaries, they are normally not accessible as relevant senses to the contemporary user of English. Finally, the annotator can quite reliably measure whether contextual and basic senses are distinct enough, by assessing whether they appear as separate sense descriptions in the dictionary. These details, which correspond with steps two through three in *MIP*, will be explicitly formalized in the *MIPVU* procedure in the next chapter and then illustrated in Chapter 4.

A problem with the type of approach proposed by *MIP* and *MIPVU* is that it does not directly depict the rich reality of metaphor as a graded phenomenon. This problem may be alleviated, however, by taking into account that firstly, using nominal scales to measure reality does not equal its reification into static categories of all or nothing, since refinements are always possible in later stages of analyses; and secondly, if more fine-grained scales of measurement are favored, one is likely to encounter substantial problems in terms of precision and reliability. Thirdly, *MIPVU* added another category to metaphor identification, the so-called WIDLII,

"When In Doubt, Leave It In", indicating those cases that are borderline (cf. Scholfield, 1995). Incorporating WIDLII hence produced a three-category measurement of metaphor: clear metaphor-related words, metaphor-related words that are WIDLII, and words that are clearly not related to metaphor. In *MIPVU*, WIDLII was assigned to those data that were first analyzed independently by individual analysts and then made available for comments by the other analysts and judged to be problematic. WIDLII codes were only entered into the final annotation when they were not resolvable by subsequent group discussion. In all, annotators using *MIPVU* need to make a series of nominal decisions, beginning with whether or not to treat something as a lexical unit or not, and ending with judging a lexical unit as a metaphor, a borderline case, or a non-metaphor. In all this, the use of the Macmillan dictionary as the primary resource is an indispensable element to ensure rigor and precision in the procedure.

This overview has broached important issues of metaphor identification in language, which have found particular solutions in *MIPVU*. In part these were discussed with respect to the particularities of academic prose. The remainder of this section will be dedicated to discussing issues of metaphor identification in academic propose in some more detail. Goschler (2007) discussed a few of the specific problems that arise when trying to identify linguistic metaphor from the point of view of CMT. According to Goschler, the identification of word meanings is often problematic since "'truth' is not easily identified and the meaning of a scientific term is sometimes not obvious" (2007, p. 27). While I do not think it is necessary to ask questions about the "truth" of metaphorically used words in academic discourse for the purposes of linguistic metaphor identification, I do agree with Goschler about the decisive role that world and linguistic knowledge has in the identification of metaphor in academic prose.

Among her examples, Goschler discusses the case of the verb *behave* in a fragment from the scientific journal *Science*:

(9) The phospholipids form wormlike micelles in specific concentration ranges of mixed solvent systems, and under these conditions *they behave* like polymers for electrospinning. (Science, 2006, p. 299; cited in Goschler, 2007, p. 37; italics by Goschler)

Goschler explains that "[it] is possible to identify the word *behave* as a candidate for metaphor, because it is used together with polymers, which are not living beings and therefore cannot 'behave' in the concrete sense." However, she adds that it is difficult to describe the metaphor, "because the whole sentence is not easy to understand if one is not familiar with the scientific claims it relates to" (2007, p. 37). Goschler's example shows the basic problem that arises with the identification of

metaphor in academic prose: The analyst needs to have an understanding of both the contextual meaning and a possible more basic meaning of some lexical units – and often, both may not easily be established.

In the present example (9), according to the Macmillan Dictionary, *behave* has a typical scientific meaning in context ('if a chemical substance, metal etc behaves in a particular way, it always reacts in that way because of the laws of science'). The more basic meaning of *behave* is easy to establish since it is part of general discourse, and in contrast to the contextual meaning requires an animate agent. In the current case, the question is thus whether the subject of the sentence, *they*, which anaphorically refers back to *phospholipids*, has an animate referent or not.[12] Thus, the analyst needs to possess enough knowledge about *phospholipids* to determine whether *behave* is used metaphorically or not. It is relatively improbable that an analyst (or an average speaker of English) knows the specific meaning of the term (it is not featured in Macmillan or Longman). However, he or she may well infer (as may the ideal reader) that a *phospho**lipid*** is a particular type of *lipid,* a term that is in fact featured by Macmillan: 'one of a group of chemical compounds that do not dissolve in water. Lipids include oils and fats'. This sense description shows that *lipid* (and therefore, very probably, *phospholipid*) is inanimate. *Behave* in the *Science* text thus has a clearly identifiable meaning in Macmillan that can be compared with the more basic meaning 'to do things in a particular way' which indicates an action carried out by a human agent. In this particular case, identification is thus complicated, but not hindered, by the high degree of specialization of lexis in academic prose (cf. Eggins & Martin, 1997).

With regard to establishing the contextual and more basic meaning of lexical units, example (9), however, poses another identification problem, which concerns the meaning of the noun phrase *polymers for electrospinning*. Since the comparison maker *like* highlights some kind of similarity between *phospholipids* and *polymers for electrospinning*, the analyst needs to decide whether or not the two entities are similar in a metaphorical way (by conceptual similarity). In this case, it seems, common (linguistic and world) knowledge as represented by Macmillan is not sufficient for this operation: Without relatively advanced chemical knowledge about groups of molecules, the analyst cannot decide whether the elements of the noun phrase *polymers for electrospinning* are used metaphorically or not. While *polymer* appears in the dictionary ('a natural or artificially produced chemical substance consisting of large molecules made of many groups of smaller ones', MM), there is no entry for *electrospinning* in Macmillan or Longman. Although the OED, which

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[12] *Polymers*, while closer to *behave* in the sentence, is of secondary importance for deciding about metaphorical word use in this case. The principal criterion for deciding whether the verb is used in a metaphorical way is the verb meaning itself, which in its basic use requires an animate subject (and only secondarily requires an animate entity in object position headed by the comparison marker *like*).

captures also lexical items with more specialist meanings, features the meaning ('a technique for producing a fine mat of artificial fibre by extruding *an electrically charged spray of a polymer* through a nozzle and using electrostatic repulsion to control its pattern of deposition'; OED, emphasis mine, JBH), the description does not clarify (to the lay reader) whether the 'wormlike micelles' produced by the 'phospholipids' are figuratively similar to what goes on with polymers for electrospinning. Therefore, since an underlying conceptual similarity between both cannot be ruled out, applying *MIPVU*, this case hence has to receive the label WIDLII. Incorporating a borderline category thus presents a solution for dealing with the highly specialized meanings of specialized discourse that may exceed the lexical knowledge of the ideal reader/annotator, allowing the annotation to mark unclear cases that may require further analysis.

MIP, and *MIPVU*, can thus solve most, but very probably not all, problems associated with identifying metaphor in academic prose. However, the number of cases that needed to be excluded in the *VUAMC* is extremely small (below 0.1%), and the rate of borderline cases in academic prose was similar to the other registers (among all lexical units, academic prose had 1.0 % WIDLIIs, news 1.1%, fiction 0.9% and conversation 0.9%; cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010). There hence remains only a small group of borderline cases between metaphorical and non-metaphorical. The great advantage of applying one and the same procedure to four very different registers of English is that this facilitates a direct quantitative comparison of metaphorical word use across four language varieties (including the number of borderline or excluded cases): This means that a contrastive register profile of academic prose can be drawn. Moreover, *MIPVU,* presented as a manual in Chapter 3, does not only have a practical value (serving as a guideline for future studies), but its application also has a heuristic function, raising some specific issues that seem to be central to the identification of metaphorical language in academic prose (see Chapter 4).

In this section, I have shown which questions need to be answered when applying *MIP* to the identification of metaphor in natural (academic) discourse, and I have pointed out reasons why the *VU* Amsterdam Group have developed their own variant called *MIPVU* (cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010):

— *MIPVU* operationalizes metaphor as indirectness by conceptual similarity, or comparison. The Pragglejaz Group have pitched this operationalization at the level of language, testing whether lexical units are used indirectly. *MIPVU* has moved it to the level of conceptual structure, testing whether concepts are used indirectly, which allows the inclusion of other forms of expression of metaphor than indirect language use. In contrast to the Pragglejaz Group, *MIPVU* hence also includes direct expressions (other forms of metaphor such as simile, analogy, and so on) and

implicit expressions (by substitution and ellipsis); this will be detailed in the next chapter.

— Following the Pragglejaz Group, *MIPVU* is limited to the identification of metaphorical meaning to the contemporary language user, and as expressed in lexical units. This means that historical metaphor, or metaphor in morphology, syntax, and so on is not considered. In addition, the *MIPVU* definition of lexical units is less broad than in *MIP*, relying on the distinction between word classes in order to guarantee a consistent discourse perspective on the relation between words, concepts, and referents.

— *MIPVU* goes beyond the Pragglejaz Group's practice by standardizing the data collection process explicitly with reference to a particular resource, which is a dictionary. *MIPVU* comprises precise guidelines for making the various decisions that are needed in the identification of potential metaphor.

— Like the Pragglejaz Group, *MIPVU* approaches linguistic metaphor identification as yielding data about the semiotic structure of language in usage events; the focus on language means that *MIPVU* does not aim to specify the nature of underlying conceptual structures, while the focus on semiotic structure means that *MIPVU* does not make claims about cognitive processes and products.

—*MIPVU* is able to account for the special exigencies of metaphor identification in academic discourse, with (a) the adoption of an "ideal reader" corresponding with the (lexical) knowledge represented by the general purpose dictionaries and the standardized process relating to this resource, while (b) incorporating a borderline category (WIDLII). This practice allows retaining and signaling problematic cases in the analysis.

The present chapter has provided a thorough background for the linguistic analysis of metaphor in academic discourse. In the first section on "Written Academic Language Use" I conceptualized and operationalized notions such as *academic discourse* and *register*, providing a detailed overview of the state of the art in register studies of academic prose, discussing the linguistic features of academic discourse, and introducing Biber's and colleagues' account of comparative register studies. In the second section on "Metaphor in Academic Language Use", I introduced the study of linguistic forms of metaphor in academic discourse, describing evidence on metaphorical language use from a cross-register/cross-genre and from a quantitative perspective, as well as with regard to word class, metaphor types, and personification. In this section, I zoomed in on open questions about the linguistic forms of metaphor in academic prose (these will be tackled in the linguistic analyses of the present thesis). In the third section, the metaphor annotation procedure *MIPVU* was introduced, moving from general issues of metaphor identification towards an operational definition of metaphor (cf.

Pragglejaz Group, 2009), and addressing the specific issues that need to be dealt with when analyzing metaphor in academic discourse.

In the following two chapters, I will introduce the Metaphor identification procedure *MIPVU* in full technical detail. The subsequent empirical chapters will present the corpus-linguistic analysis (Chapter 5) and a comprehensive discussion of the results obtained in the light of the *Longman Grammar of Spoken and Written English* (*LGSWE*) (Chapter 6).

CHAPTER 3
MIPVU: A Manual for Identifying Metaphor-related words

This chapter presents the complete procedure for finding metaphor-related words which has been utilized in my research.[13] The style is in the form of a set of instructions. The reliability tests for this procedure are reported in Steen, Dorst, Herrmann, Krennmayr, and Pasma (2010), and quantitative empirical results of its application to our materials in Chapters 5 and 6. Qualitative discussions of methodological issues of application can be found in Chapter 4.

The present chapter is intended to be an independent presentation of the procedure as an autonomous tool. It may be used as a reference manual by anyone who aims to find metaphor-related words in usage. The term *metaphor-related words* is used to suggest that the tool aims to identify all words in discourse that can be taken to be lexical expressions of underlying cross-domain mappings.

3.1 The Basic Procedure

The goal of finding metaphor in discourse can be achieved in systematic and exhaustive fashion by adhering to the following set of guidelines.

1. Find metaphor-related words (MRWs) by examining the text on a word-by-word basis.
   $\Rightarrow$ For information about whether an expression counts as a word, consult Section 3.2.
2. When a word is used indirectly and that use may potentially be explained by some form of cross-domain mapping from a more basic meaning of that word, mark the word as metaphorically used (MRW).
   $\Rightarrow$ For information about indirect word use that is potentially explained by cross-domain mapping, consult Section 3.3.

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[13] A version of this chapter was published in Steen, Dorst, Herrmann, Krennmayr, and Pasma (2010). The present version deviates from it minimally, mostly in applying American English orthography and APA publication style, and where I slightly changed the text with regard to the unit of analysis.

3. When a word is used directly and its use may potentially be explained by some form of cross-domain mapping to a more basic referent or topic in the text, mark the word as direct metaphor (MRW, direct).

    ⇒ For more information about direct word use that is potentially explained by cross-domain mapping, consult Section 3.4.

4. When words are used for the purpose of lexico-grammatical substitution, such as third person personal pronouns, or when ellipsis occurs where words may be seen as missing, as in some forms of co-ordination, and when a direct or indirect meaning is conveyed by those substitutions or ellipses that may potentially be explained by some form of cross-domain mapping from a more basic meaning, referent, or topic, insert a code for implicit metaphor (MRW, implicit).

    ⇒ For more information about implicit meaning by substitution or ellipsis that is potentially explained by cross-domain mapping, consult Section 3.5.

5. When a word functions as a signal that a cross-domain mapping may be at play, mark it as a metaphor flag (MFlag).

    ⇒ For more information about signals of cross-domain mappings, consult Section 3.6.

6. When a word is a new-formation coined by the author, examine the distinct words that are its independent parts according to steps 2 through 5.

    ⇒ For more information about new-formations, consult Section 3.7.

The use of the phrase "potentially explained by a cross-domain mapping" is intentional. It should be read with an emphasis on "potentially". This links up with the tenuous connection between linguistic and conceptual metaphor identification discussed in Chapter 1.

As for the relation with *MIP* (Pragglejaz Group, 2007), Points 1 and 2 are essentially the same as *MIP*. Points 3 and 4 deal with two additions to *MIP* in the area of other forms of metaphor. Point 5 is a different kind of addition to *MIP* and includes the identification of signals of metaphor. And Point 6 takes one assumption of *MIP* to its linguistic conclusion by including instructions for handling new lexical units.

3.2 Deciding About Words: Lexical Units

The word is the unit of analysis which is examined for metaphorical use. This category includes other elements at lexeme level, such as polywords, compounds,

and phrasal verbs, which is why we[14] will call it *lexical unit*. There are other possibilities, such as the morpheme or the phrase, and these can account for additional metaphor in usage. However, we do not mark these other possibilities, because we can only do one thing at a time. Focusing on the lexical unit as the unit of analysis is already a most challenging and complex operation. It is motivated by the functional relation between words (i.e., lexical units), concepts and referents in discourse analysis, described in Chapter 1.

A systematic and explicit approach to the relevant unit of analysis is crucial for a consistent and correct quantitative analysis of the data. Lack of clear guidelines may introduce a substantial degree of error and therefore noise into the numbers and patterns obtained. It would undermine detailed quantitative comparison between distinct studies.

For theoretical reasons, we will use the notion of *lexical unit*, which can consist of several words if they are in the Macmillan dictionary as one entry. In adopting this terminology, we follow the Pragglejaz Group (2007). When you decide about the boundaries of lexical units, the following guidelines should be adopted.

3.2.1 General guideline. In our project, the data come from the British National Corpus, and we therefore follow most of BNC practice in deciding what counts as a lexical unit. In other projects with other materials, these guidelines may or may not have to be adjusted to the other source, as we shall show for Dutch in Chapter 7. In our research, the dependence on these materials means two things:

1. All words provided with an independent Part-Of-Speech (POS) tag in the corpus are taken as separate lexical units.

    For instance, prepositions are coded as PRP, nouns are coded as NN, and so on. A full list of tags is available from the BNC website: www.natcorp.ox.ac.uk.

2. All so-called polywords in the corpus are taken as single lexical units.

    There are a number of fixed multi-word expressions that are analyzed as one lexical unit in the BNC on the grounds that they are grammatical units which designate one specific referent in the discourse. Examples include *a good deal, by means of,* and *of course.* These multi-word expressions are called polywords. They have special tags and are available in a finite list from the BNC website: www.natcorp.ox.ac.uk. You should follow this practice and, in particular, not examine the parts of these polywords for potential metaphorical meaning.

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[14] In the present chapter, as well as in Chapter 4 and Chapter 7, I report collaborative work. Therefore, the style will be mainly first person plural.

3.2.2 Exceptions. There are three exceptions to our overall acceptance of BNC practice: phrasal verbs, some compounds, and some proper names.

Phrasal verbs are verbal expressions consisting of more than one word, such as *look up* or *turn on*. These are not taken as single lexical units in the BNC, but as independent verbs followed by autonomous adverbial particles. We will not follow this practice, for phrasal verbs function as linguistic units designating one action, process, state or relation in the referential dimension of the discourse. In that respect, they are similar to polywords.

You should therefore treat all phrasal verbs as single lexical units: Their individual parts do not require independent analysis for potential metaphorical meaning. The phrasal verb as a whole, however, can still be used metaphorically. For instance, setting up an organization is a metaphorical variant of setting up a roadblock. The classification of two or more words as part of one phrasal verb should be marked as such in the data.

The problem with phrasal verbs is their superficial resemblance to prepositional verbs (i.e. a frequent verb-preposition combination) and to verbs followed by free adverbs. The latter two cases should be analyzed as free combinations consisting of two independent lexical units, as opposed to phrasal verbs which should be taken as only one. Again, the motivation for this approach is the assumption of a functional and global correspondence between words, concepts, and referents.

One way to tell these three groups apart is by examining their POS (*part of speech*) tags in the BNC. Particles of phrasal verbs have received an AVP code, prepositions of prepositional verbs a PRP code, and freely occurring adverbs an AV0 code. These are classifications which have been made independently of any questions about metaphorical use; they are based on a general approach to data analysis, which is a bonus.

However, the matter is further complicated in three ways. Firstly, when we go to the dictionaries used in our research for examining contextual and basic meanings, it appears that they do not distinguish between phrasal verbs and prepositional verbs. They in fact call both types phrasal verbs. An example is *look at* in a sentence like "it was only when you looked at their faces that you saw the difference". According to Macmillan this is a phrasal verb, but the BNC code for *at* is PRP, indicating that it is a prepositional verb. We follow the BNC's decision, which means that you have to analyze *look* and *at* as two lexical units and independently examine their main senses in the dictionary to find their respective basic meanings; the contextual meaning of each of them in their combined use, even as a prepositional verb, however, will be found under the phrasal meaning of the combination.

Secondly, some of the verb+particle combinations marked as such in the BNC are in fact not conventionalized phrasal verbs. That is, they are not phrasal verbs according to the dictionary. An example is *look up* in a sentence like "she looked up

into the sky". Here *up* is coded as AVP in the BNC, suggesting that this is a proper phrasal verb. However, the Macmillan dictionary tells us that the contextual meaning – 'to direct your eyes towards someone or something so that you can see them' – is not one of the meanings of the phrasal verb (unlike, for instance 'to try to find a particular piece of information'). The contextual meaning, instead, is the result of a free combination of a verb plus an adverb. BNC has probably made a mistake here; the words consequently have to be analyzed as two separate lexical units.

Thirdly, there is the matter of complex phrasal verbs, such as *make up for* or *do away with*. These may be easily confused with combinations of simple phrasal verbs with a preposition (*make up + for* or *do away + with*). However, they are typically listed as complete, complex phrasal verbs in the Macmillan dictionary, as run-ons after the main verb, and they can be replaced by a synonym (*compensate* and *get rid of*). Because of this referential unity, we follow the dictionary for complex phrasal verbs and take the dictionary classification of these complex verbs as single units as our guideline.

Taking all of this into consideration, we have established the following rules for simple phrasal verbs (complex phrasal verbs being recognizable by the criteria above).

a.   If the POS tag is PRP then we are dealing with a prepositional verb → analyze the verb and the preposition separately (i.e. two lexical units).

b.   If the POS tag is AVP then check in the dictionary whether the combination of verb+particle has been listed as a phrasal verb meaning in the relevant contextual meaning.

  →   If this is the case, then we accept it is a phrasal verb and analyze the combination as one lexical unit;

  →   If this is not the case, then we do not take the combination to be a conventionalized phrasal verb and therefore we analyze the verb and the particle separately (i.e. two lexical units).

c.   If the POS tag is AV0 then we are dealing with a verb followed by a free adverb → analyze as two lexical units.

d.   If the POS tag is PRP/AVP then apply the tests below to determine whether we are dealing with a phrasal or a prepositional verb.

e.   If the BNC code is clearly wrong (supported by the above criteria or the tests below) then apply the proper analysis and add a comment in the materials stating "incorrect POS tag: PRP not AVP".

Tests for deciding between phrasal/prepositional verbs

In **prepositional** verbs:
- The preposition and following noun can be moved to the front of the sentence, which is not possible with phrasal verb particles (e.g. *Up into the sky she looked* but not **Up the information she looked*).
- An adverb can be inserted before the preposition (e.g. *She ran quickly down the hill* but not **She ran viciously down her best friends*).
- The preposition can be moved to the front of a *wh*-word (e.g. *Up which hill did he run*? but not **Up which bill did he run?)*.

In **phrasal** verbs:
- The adverbial particle can be placed before or after the noun phrase acting as object of the verb, which is not possible for the prepositional verbs (e.g. *She looked the information up* but not **She looked his face at*).
- If the noun phrase is replaced by a pronoun, the pronoun has to be placed in front of the particle (e.g. *The dentist took all my teeth out > The dentist took them out* but not *She went through the gate > * She went it through)*.

Compounds are single lexical units consisting of two distinct parts, which may cause orthographical problems. They can be spelled in three ways: as one word, as two hyphenated words, and as two separate words.

a. When a compound noun is spelled as one word, such as *underpass*, and can be found as such in the dictionary we treat it as one lexical unit designating one referent in the discourse.

b. When a compound noun is spelled as two hyphenated words and can be found as such in the dictionary, such as *pitter-patter*, we similarly treat it as one lexical unit. However, if we are dealing with a novel formation unknown to the dictionary, the compound noun is analyzed as two separate units, even though it may have one POS tag in the corpus. Our reason for this practice is that the language user is forced to parse the compound into its two component parts in order to establish the relation between the two related concepts and referents. This also applies to hyphenated compound nouns created through a productive morphological rule but that are not listed as a conventionalized compound in the dictionary (such as *under-five*).

c. In the BNC, compound nouns that have been spelled as two separate words are not taken as single lexical units, but analyzed as combinations of two independent words which each receive their own POS tags. When such compounds are conventionalized and, again, function as lexical units designating one referent in the discourse, we will not follow the BNC solution.

For then they are like polywords, and should be treated as single lexical units, whose parts do not require analysis for potential metaphorical meaning.

The Macmillan dictionary has a tell-tale signal for identifying conventionalized compounds that are spelled as two distinct words: When a fixed expression is taken to be a compound noun, there is primary stress on the

first word and secondary stress on the second word (e.g., ˈ*power* ˌ*plant*). In cases where the Macmillan dictionary treats a multi-word combination as having one meaning, but displays a reversed stress pattern (such as ˌ*nuclear* ˈ *power*), we do not treat the multi-word expression as a compound noun, and analyze it as consisting of two separate lexical units.

– Rules a and b also apply to compound adverbs and adjectives, such as *honey-hunting*. This example is a novel formation unknown to Macmillan. Therefore, following rule b, the adjective is analyzed as comprising two separate lexical units, even though BNC has given it one POS tag.

– Words may be spelled in more than one way, which may cause problems about the independent status of their components in some cases. An example is when the preposition *onto* is spelled as two words instead of one. When this happens, we will adhere to the spelling of the dictionary instead of the spelling of the document under analysis, because the dictionary is the more general reference work and related to accepted norms for language users. You should therefore analyze words according to their spelling in the dictionary, not according to their spelling and POS tagging in the corpus.

Proper names appear to form a special group in our analyses. There are several subclasses which we have encountered, which may not all technically qualify as genuine proper names. They will be discussed one by one. In general, however, proper names do not require any specific additional coding.

Our general strategy is to reduce the number of exceptions to POS tagging as provided by the BNC corpus. The solution to annotation problems proposed below is maximally simple: Every separate word will be treated as a separate lexical unit, **except for the bolded cases.**

a. Proper names: all parts of genuine proper names are to be treated in the way of regular POS tagging. That is, *Roy Wood* and *Madame Mattli* are coded as two separate words and taken as two lexical units. This can be extended to addresses, with house numbers as well as road names all being cut up into separate lexical units. As a result, *New York* (in *New York Herald Tribune*) is also two units.

b. Some proper names have been bestowed on public entities and may appear in the dictionary. If they do, they are to be treated as all other expressions in the dictionary: Thus, **Labour Party** becomes one lexical unit because it has the stress pattern of a compound.

    The same holds for some titles that appear in the dictionary, such as **Pulitzer Prize,** which is also treated as one lexical unit on the basis of the stress pattern.

    In our annotations, these expressions should be treated similar to phrasal verbs, compounds, and polywords and should therefore receive a code to indicate that the words form single lexical units.

    Green Paper and *White Paper*, by contrast, are to be treated as containing two lexical units, because they have rising stress (*Green* and *White* would always be marked as related to metaphor).

    The elements of names of countries (e.g. *United Kingdom*) and organizations (e.g. *United Nations*) that have rising stress in the dictionary should also be treated as separate units.

c. Other names and titles do not appear in the dictionary. They are also treated as composites of their independent words, both by the BNC and by us. This accounts for two lexical units in *Labour Law, Executive Committee, European Plan, Scarman Report,* and even more lexical units in *the Student Winter Games, the Henley Royal Regatta, the Criminal Law Revision Committee, House of Oliver,* and so on.

d. A separate problem is constituted by genuine titles, that is, titles of texts:
   – If titles are used as titles, that is, as headings of newspaper articles or chapters and sections of novels and academic writing, they need to be taken on a word-by-word basis. This is because they summarize or indicate content by means of words, concepts, and referents. They are regular cases, if linguistically sometimes odd.
   – If titles are mentioned, however, to refer to for example a text or a TV program, they function as names, like proper names. If they are in the dictionary, check their stress pattern; if they are not, use BNC Baby as a guide.

3.3 Indirect Use Potentially Explained by Cross-Domain Mapping

Indirect use of lexical units which may be explained by a cross-domain mapping is basically identified by means of *MIP*, with some adjustments. This means that the following guidelines should be adopted.

1. Identify the contextual meaning of the lexical unit.

⇒ For more information, see Section 3.3.1.

2. Check if there is a more basic meaning of the lexical unit. If there is, establish its identity.

⇒ For more information, consult Section 3.3.2.

3. Determine whether the more basic meaning of the lexical unit is sufficiently distinct from the contextual meaning.

⇒ For more information, see Section 3.3.3.

4. Examine whether the contextual meaning of the lexical unit can be related to the more basic meaning by some form of similarity.

⇒ For more information, consult Section 3.3.4.

If the results of instructions 2, 3, and 4 are positive, then a lexical unit should be marked as a metaphor-related word ("MRW"), which may be made more precise by adding the information that it is "indirect" (as opposed to "direct" or "implicit", see below).

3.3.1 Identifying contextual meanings. The contextual meaning of a lexical unit is the meaning it has in the situation in which it is used. It may be conventionalized and attested, and will then be found in a general users' dictionary; but it may also be novel, specialized, or highly specific, in which case it cannot be found in a general users' dictionary.

When you identify the contextual meaning of a lexical unit, several problems may arise.

1. When utterances are not finished, there is not enough contextual knowledge to determine

the precise intended meaning of a lexical unit in context. In such cases, it may be that the lexical unit has been used indirectly on the basis of a metaphorical mapping, but this is impossible to decide. In such cases, we will discard for metaphor analysis all relevant lexical units in aborted utterances.

An example is *Yeah I had somebody come round and* <u>*stuck*</u> *their* <u>*bloody*</u> *...* The lexical units in the incomplete utterance in question (beginning with *stuck*) that could or could not have been related to metaphor should be marked as "Discarded For Metaphor Analysis" (add code "DFMA" to each of them).

2. When there is not enough contextual knowledge to determine the precise intended

meaning of a lexical unit in context, it may be that it has been used indirectly on the basis of a metaphorical mapping, but this may be impossible to decide.

a. An example is the use of *up* to indicate movement towards, where it is possible that the target is either higher (not metaphorical) or not higher (metaphorical) than the speaker.

b. Another example is the use of idioms such as *gasp for breath* or *turn your shoulder*, approached as three lexical units, where it is possible that the designated action in fact takes place and thereby stands for the emotion (metonymy), or the designated action in fact does not take place so that the phrase is used metaphorically to indicate the concomitant emotion.

c. A third example involves anaphora which may be interpreted in more than one way, as in *all that* in the following example, where a possible metaphorical interpretation is applicable: *He said I come to sup be supervisor he said, I don't know, I don't wish to learn all that!*

In such cases of lack of situational knowledge but with a potential for metaphorical meaning, you have to treat the word as if it was used indirectly and metaphorically, on the basis of the general rule "When In Doubt, Leave It In" and add the special code WIDLII.

3. Specialist terminology may constitute a specific case of insufficient contextual knowledge to determine the precise intended meaning of a lexical unit in context. When there is not enough contextual knowledge to determine the specific technical and/or scientific meaning of a word in context, regular dictionaries cannot help. In such cases, it would of course be possible to use other, preferably specialized dictionaries to find out the specific contextual meaning of a term. However, in our project we assume that metaphor is "metaphor to the general language user": If we as general language users cannot establish the meaning of the lexical unit with the contemporary dictionaries alone but the lexical unit could be metaphorical on the basis of some contextual meaning projected from the basic—nontechnical—meaning, we also mark the word as metaphor-related based on WIDLII.

4. Sometimes the contextual meaning of a lexical unit may be taken as either metaphorical or as not metaphorical. This seems to be the case for many personifications, such as *furious debate* or *this essay thinks*. These examples may be analyzed as involving a metaphorical use of *furious* and *thinks*, respectively, but they may also be resolved by a metonymic interpretation of the other terms, i.e. *debate* and *essay*, in which case *furious* and *thinks* automatically turn non-metaphorical. In such cases, the possibility of the metaphorical interpretation should not be lost, and you should mark the relevant ambiguous words *furious* and *thinks* as metaphor-related words, and add a comment that this is due to a possible personification.

3.3.2 Deciding about more basic meanings. A more basic meaning of a lexical unit is defined as a more concrete, specific, and human-oriented sense in contemporary language use. Since these meanings are basic, they are always to be found in a general users' dictionary. A meaning cannot be more basic if it is not included in a contemporary users' dictionary.

From a linguistic point of view, a more basic meaning of a word is its historically older meaning. However, from a behavioral point of view, this definition may not be optimal. Most language users are not aware of the relative ages of the various meanings of most words in the contemporary language. This means that the linguistic notion of basic sense as the historically prior sense has little relevance to the behavioral, in particular cognitive notion of basic sense.

However, it is one of the fundamental claims of contemporary metaphor theory that most of the historically older meanings of words are also more concrete, specific, and human-oriented. This is explained by the cognitive-linguistic assumption of experientialism (Lakoff & Johnson, 1980). As a result, concrete meanings are typically also basic meanings from a historical perspective.

The still largely programmatic assumption of a connection between historically prior meanings and concrete, specific, and human-oriented meanings makes it possible for us to adopt one practical and consistent general starting point about basic meanings: They can be operationalized in terms of concrete, specific, and human-oriented meanings. This is our general definition for basic meanings.

As a result, we will not check the history of each lexical unit as an integral part of our procedure. This is a huge practical advantage, which is based in general cognitive linguistic practice. Diachronic considerations of basic meanings may only come in when specific problems arise.

When attempting to find basic meanings in the dictionary, the following guidelines should be adopted.

1. A more basic sense has to be present for the *relevant grammatical category of the word-form* as it is used in context. This is because a grammatical category in a text specifies a particular class of concept and referent, which may not be altered when looking for basic meanings, for otherwise the basis of comparison is shifted. When the dictionary shows that a word may be used in more than one grammatical category, you hence have to examine the various meanings of the word within its grammatical category.

   Contextual and basic meanings are therefore contrasted as two alternative uses for the same word form *in the particular grammatical role that it has in the text.* As a result,

   a. the contextual meaning of nouns, verbs, adjectives, adverbs, prepositions, and interjections cannot be compared with the meaning of other word

      classes for the same lemma (conversions); for instance, the meaning of *shift* as a noun should be analyzed irrespective of the meaning of *shift* as a verb;

b.   the contextual meaning of verbs used as linking verbs, primary verbs, modal verbs, verbs initiating complex verb constructions such as *start, stop, continue, quit, keep,* and so on, causative verbs (*have, get,* and so on), and full verbs cannot be compared with the meaning of the same verbs used in other roles;

c.   the contextual meaning of verbs used transitively can as a rule not be compared with the meaning of the same verbs used intransitively;

d.   the contextual meaning of nouns used to designate countable entities can as a rule not be compared with the meaning of the same nouns used to designate uncountable entities.

However, there are a number of complications:

2.   When a word may be used in more than one grammatical category, but its description in the dictionary is limited to one of those categories only, you inevitably have to compare the various meanings of the word in the other grammatical categories with reference to that one grammatical category. Example: the contextual and basic meanings of *suppression* have to be examined with reference to the description of *suppress.*

3.   When verbs are described under a single sense description in the dictionary as both Transitive and Intransitive, then you may compare these Transitive and Intransitive meanings with each other in order to determine whether the contextual meaning may be differentiated from a more basic meaning in the same sense description.

4.   Sometimes lexical units have an abstract contextual meaning that is general which has to be contrasted with a concrete meaning that is specialized, for instance because it is limited to a style (e.g. very [in]formal), a subject (business, computing, journalism, law, linguistics, medicine, science, and so on), or period (literary, old-fashioned). In that case, we abide by our general rule for finding basic senses and take the most concrete sense as basic, even if it is specialized. Example: the concrete medical sense of *palliate* is basic and the general abstract sense of *palliate* is therefore metaphorical.

5.   The reverse of [4] also applies: When a lexical unit with an abstract but specialized contextual meaning has to be contrasted with a concrete but general meaning, we also take the concrete sense as basic. Example: the abstract religious sense of *father, mother*, and so on is not basic, whereas the concrete general sense is. Therefore the religious senses are metaphorical.

6.   When the contextual meaning of a lexical unit is just as abstract/concrete as some of its alternative meanings, we have to check whether there is any indication of the (original) domain from which the word derives. For instance,

there are verbs such as *trot* and *roar* which may be applied with equal ease to a range of concrete entities, but the nonhuman, animal origin (basic sense) of the lexical units decides which applications are metaphorical and which are not.

7. However, other lexical units may have a less clear domain of origin, such as the verb *ride*. It is presented in the Macmillan dictionary as monosemous between animal and artefact. If we suspect that there is a problem with the dictionary description because of its function as an advanced learners' dictionary, we check the evidence in a second advanced learners' dictionary, Longman. For instance, the verb *to groom* does not have distinct senses for people and animals in Macmillan, but it does in Longman; as a result, we rely on Longman to conclude that the two senses are sufficiently distinct. By contrast, *transform* has one general sense in Macmillan, which is corroborated by the Longman dictionary.

3.3.3 Deciding about sufficient distinctness. Metaphorical meanings depend on a contrast between a contextual meaning and a more basic meaning. This suggests that the more basic meaning has to be sufficiently distinct from the contextual meaning for the latter to be seen as potentially participating in another semantic or conceptual domain. The following practical guideline should be followed:

1. When a lexical unit has more than one separate, numbered sense description within its grammatical category, these senses are regarded as sufficiently distinct.

2. When a lexical unit has only one numbered sense description within its grammatical category, this counts as the basic sense and any difference with the contextual sense of the item under investigation will count as sufficient distinctness.

3.3.4 Deciding about the role of similarity. When you have two sufficiently distinct meanings of a lexical unit and one seems more basic than the other, these senses are potentially metaphorically related to each other when they display some form of similarity. This typically happens because they capitalize on external or functional resemblances (attributes and relations) between the concepts they designate. It is immaterial whether these resemblances are highly schematic or fairly rich.

In deciding about a relation of similarity between the contextual and the basic sense of a lexical unit, the following practical guidelines should be followed:

1. When a lexical unit has a general and vague contextual sense which looks like a bleached, abstracted relation of a rather specific and concrete sense, you should mark the word as metaphorically used when the two senses are distinct enough and can be related via similarity. This is typically the case for senses that may be distinguished as concrete versus abstract. It should be noted that similarity is not the same as class-inclusion, as in the case of synecdoche. Thus, for *appeal* we have an abstract general sense and a more concrete but also specialized legal sense. If we decide that the latter is basic because it is more concrete, then the general sense of *appeal* is a case of generalization instead of similarity, and it can therefore be treated as a case of synecdoche instead of metaphor. This should be contrasted with a case like *palliate,* where we see both generalization and similarity based on metaphorical mapping from concrete (relieve physical pain) to abstract (relieve generally bad situations of their most serious aspects).

2. When a lexical unit has an abstract contextual sense and a sufficiently distinct, concrete more basic sense, but there does not seem to be a relation of similarity between the two even though there does seem to be *some* sort of relation, check the *Oxford English Dictionary* to deepen your understanding of the word. In such a case, the two senses may be historically related via a common source which may have disappeared from the language. Checking the *OED* may explain the strange relation between the current abstract and concrete senses and support the decision *not* to take the concrete sense as basic for the abstract sense, but instead to take both senses as equally basic because there is no transparent relation of similarity for the contemporary language user. We have seen this for a word like *order* ('arrangement' and 'bringing about of order by speech act').

3. When two senses appear to be metonymically related, this does not mean that you should not also consider the possibility that they are metaphorically related at the same time. Sense relations may have more than one motivation.

3.4 Direct Use Potentially Explained by Cross-Domain Mapping

Directly used lexical units that are related to metaphor are identified as follows:

1. Find local referent and topic shifts.
    ⇒ Good clues are provided by lexis which is "incongruous" (Cameron, 2003; Charteris-Black, 2004) with the rest of the text.
2. Test whether the incongruous lexical units are to be integrated within the overall referential and/or topical framework by means of some form of comparison.

⇒ Good clues are provided by lexis which flags the need for some form of similarity or projection (Goatly, 1997).

3. Test whether the comparison is nonliteral or cross-domain.

⇒ Cameron (2003, p. 74) suggests that we should include any comparison that is not obviously non-metaphorical, such as *the campsite was like a holiday village*. Consequently, whenever two concepts are compared and they can be constructed, in context, as somehow belonging to two distinct and contrasted domains, the comparison should be seen as expressing a cross-domain mapping. Cameron refers to these as two incongruous domains.

4. Test whether the comparison can be seen as some form of indirect discourse about the local or main referent or topic of the text.

⇒ A provisional sketch of a mapping between the incongruous material functioning as source domain on the one hand and elements from the co-text functioning as target domain on the other should be possible.

If the findings of tests 2, 3, and 4 are positive, then a word should be marked for direct metaphor ("MRW, direct").

3.5 Implicit Use Potentially Explained by Cross-domain Mapping

The previous forms of metaphor were explicit in that there is at least one word in the discourse which comes from another semantic or conceptual domain. Implicit metaphor is different and does not have words that clearly stand out as coming from an alien domain. It comes in two forms, implicit metaphor by substitution and implicit metaphor by ellipsis. Following Halliday and Hasan (1976), metaphor by substitution works through pro-forms such as pronouns, and metaphor by ellipsis works through non-existent words which may be inserted into grammatical gaps. Both types therefore do not exhibit ostensibly incongruous words, but still need to be analyzed as the linguistic expression of metaphor in natural discourse.

When a discourse uses lexical units for the purpose of substitution and thereby still conveys a direct or indirect meaning that may be explained by some form of cross-domain mapping from a more basic meaning, referent, or topic, insert a code for implicit metaphor ("implicit"). An example is: *Naturally, to embark on such a step is not necessarily to succeed immediately in realising it*. Here *step* is related to metaphor, and *it* is a substitution for the notion of "step" and hence receives a code for implicit metaphor ("MRW, impl").

When a text displays ellipsis and still conveys a direct or indirect meaning that may be explained by some form of cross-domain mapping from a more basic meaning or referent than the contextual meaning recoverable from the presumably

understood lexical units, insert a code for implicit metaphor ("implicit"). An example is *but he is,* which may be read as *but he is [an ignorant pig]*, when that expression is taken as a description of a male colleague discussed before. The verb *is* may be coded as a place filler by the code <MRW, impl>.

In general, for implicit metaphor, we need one linguistic element of cohesion (which means substitution or ellipsis, including what Halliday and Hasan call "reference") that is not necessarily metaphorical by itself but refers back to a previous word and concept that was metaphorically used. Potential elements of cohesion include third person pronouns, primary and modal verbs, and so on.

⇒ The first step in finding implicit metaphor will therefore be to decide whether a particular linguistic form from a list of potentially cohesive devices has in fact been used for cohesion as opposed to another function.

⇒ The second step is to decide whether the cohesion device is related to another word that was related to metaphor.

In principle it is possible for both demonstratives as well as general words such as *thing* and *stuff* to refer back to a metaphorically used expression. In that case, they are both indirectly metaphorical (because of their linguistic status) as well as implicitly metaphorical (because of their connection to a metaphorical concept in the text base). For this type of case we should add a code which combines "met" with "impl": "metimpl".

Finally, tag questions within the same utterance are not included in our view of cohesion. They are grammatical forms enabling a particular form of asking a question. There is no alternative where the pro-forms in the tag could be replaced by full NPs or VPs. This is why these are not part of cohesion. (However, when parts of utterances are repeated by subsequent speakers in order to ask or confirm or deny what the preceding speaker said, these are core cases of cohesion.)

3.6 Signals of Potential Cross-Domain Mappings

Lexical signals of cross-domain mappings are those words which alert the language user to the fact that some form of contrast or comparison is at play (cf. Goatly, 1997).

1. We focus on potential markers of simile and analogy and so on, such as *like, as, more, less, more/less ... than*, comparative case plus *than,* and so on. But we also include more substantial lexical markers such as *compare, comparison, comparative; same, similar; analogy, analogue;* and so on. Complex mental conception markers are also annotated as metaphor signals; they include *regard as, conceive of, see as; imagine, think, talk, behave as if* and so on; or simply *as if*. All of these lexical units are coded with "MFlag".

2. We exclude more general signals of all indirectness, such as *sort of, kind of*, and so on, since it is not always clear that they signal metaphoricity or other aspects of discourse. We have also excluded what Goatly (1997) calls topic domain signaling, such as <u>*intellectual* stagnation</u>, since its nature and demarcation were not clear from the beginning of the project.

3.7 New-Formations and Parts That may be Potentially Explained by Cross-Domain Mapping

We assume that new-formations, such as *honey-hunting* discussed above, have to be analyzed as if they were phrases consisting of more than one lexical unit: Each part of such new lexical units activates a concept and relates to a distinct referent in the discourse, which both have to be checked for metaphor. As a result, we sometimes have to mark parts of lexical units (morphemes) as indicating metaphorical meaning.

The guidelines for finding metaphor-related words in new-formations are a variant on the basic procedure for finding all metaphor-related lexical units described in Section 3.1.

1. Find metaphor-related words in new-formations by going through the text on a word-by-word basis and identifying all new-formations.
   ⇒ A new-formation is a complex lexical unit consisting of at least one independent lexical unit which, as a whole, is not defined in the dictionary.
   ⇒ A special group is formed by specialized technical and scientific terms which may be missing from the regular dictionary but may therefore be seen as new-formations for the general language user.
2. When a lexical unit in a new-formation is used indirectly and its meaning in the discourse may be explained by some form of cross-domain mapping, mark the word as related to metaphor (MRW, indirect).
   ⇒ If you are not sure about indirect word use that is explained by cross-domain mapping, go to Section 3.3.
3. When a lexical unit in a new-formation is used directly and its meaning may be explained by some form of cross-domain mapping, mark the word as direct metaphor (MRW, direct).
   ⇒ If you are not sure about direct use of lexical units that is explained by cross-domain mapping, go to Section 3.4.
4. When a lexical unit in a new-formation implicitly conveys a direct or indirect meaning that may be explained by some form of cross-domain mapping, insert a code for implicit metaphor ("implicit").

⇒ If you are not sure about implicit indirect meaning that is explained by cross-domain mapping, go to Section 3.5.

5. When a lexical unit in a new-formation functions as a signal that a cross-domain mapping may be at play, mark it as a metaphor flag ("MFlag").

⇒ If you are not sure about signals of cross-domain mappings, go to Section 3.6.

CHAPTER 4
Metaphor Identification in Academic Discourse

In linguistic work on metaphor in academic and education discourse, there has lately been an increase in research on metaphorically used lexical items (e.g., Darian, 2003; Cameron, 2003; Henderson, 1986; Hidalgo Downing & Kraljevic Mujic, 2009; Lindstromberg, 1991; Littlemore & Low, 2006; Low, 2008a, 2008b; Low et al., 2008; Semino, 2008; Skorczynska, 2010; Skorczynska & Deignan, 2006), covering a broad range of forms and functions of metaphor use. At the same time, research on academic language has thrived (cf. Biber, 2006b; Flowerdew, 2002; Flowerdew & Peacock, 2001; Hyland, 2006b, 2009; Paltridge, 2004), producing a detailed overview of the forms and functions of academic discourse. Together, both fields of study present a picture of metaphor in a discourse that is defined by significant specialization in terms of disciplines, subdisciplines, modes and genres (cf. Biber, 2006b, 2007; Halliday, 2004b), resulting in sociolinguistic variation. We will take this into account when now applying *MIPVU* to the identification of metaphor in academic prose.[15]

In connection with the identification of metaphor in academic discourse, there are three themes that merit separate attention here. The first concerns simile. The important role that has been assigned to analogy in science and education has led researchers to expect simile-like expressions to be pervasive in academic writing and speech (cf. Low, 2010). However, our own corpus-based research presented here suggests that this may not be the case (cf. Low, 2008b, 2010; Low et al., 2008). More research on similes in academic discourse is needed, especially within specific genres (such as textbooks) or disciplines (such as psychology). *MIPVU* offers a reliable and valid method for the identification of such cases of *direct metaphor*.

The second theme concerns personification. A particular type of this class of metaphor seems to be characteristic of academic texts and may be closely tied to text management (cf. Cameron, 2003; Low, 1999). This type occurs when a nonhuman entity (referring to some discourse entity, such as a text) is the subject with a verb that requires a human agent. An example is *argued* in *Woolf's report <u>argued</u> for an improvement in prison conditions* (example from Macmillan). *MIPVU* comprises a procedure for identifying such cases of personification in academic discourse.

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[15] A version of this chapter was published in Steen, Dorst, Herrmann, Krennmayr, and Pasma (2010). The present version deviates from it mostly in orthography, style, and some updated references.

The third theme has to do with expectations about specific conceptual metaphors. Research on metaphor in academic discourse based on the conceptual metaphor theory (CMT) holds that a number of specific conceptual metaphors underlie much of academic discourse, such as ARGUMENT IS WAR (Lakoff & Johnson, 1980; see Ritchie, 2003 for a critical discussion), ENCODING MEANING IN WRITTEN TEXT IS SPEAKING (Cameron, 2008), or DISCOURSE IS SPACE (Lakoff & Johnson, 1980). CMT holds that lexical items like *this, on, grounds, rests,* and *on* indicate mappings like DISCOURSE IS SPACE in utterances like <u>This</u> *view, as we shall see, has been attacked <u>on</u> the <u>grounds</u> that it <u>rests</u> <u>on</u> the false assumption that […]* (ECV-fragment05, emphasis mine, JBH). Below we will show how *MIPVU* can be applied to the linguistic identification of such lexical items, proposing that conceptual metaphor identification is a separate step in the process of metaphor analysis.

In the following sections we will present a number of cases, taken from different genres and fields of academic discourse. One fragment is from "The Development of Darwin's General Biological Theorizing", a paper published in the book *Evolution from Molecules to Men* (CMA-fragment01); one fragment from the textbook *Lectures on Electromagnetic Theory* (FEF-fragment02); and one fragment from the chapter "Bringing Fossils Back to Life" from the paleontology textbook *Fossils: The Key to the Past* (AMM-fragment01). Two smaller parts came from *The Mind at Work*, a textbook on ergonomics (CLP-fragment01), and from the monograph *Principles of Criminal Law* (ACJ-fragment01). In case an example stems from the texts used in the reliability texts (CMA, CLP, and FEF), coder agreement/ disagreement will be an additional source of information.

4.1 Unanimous Agreement

We will now turn to a number of illustrations of the unproblematic application of *MIPVU*. The first sentence stems from natural science.

   (7) <u>This</u> chapter <u>surveys</u> the <u>development</u> of his general biological theorizing <u>over</u> <u>that</u> remarkable early period. (CMA-fragment01, emphasis mine, JBH)

It is typical of the lexis in academic discourse. For one thing, all lexical items are rather abstract and formal. Many belong to word fields associated with academic discourse (*chapter, survey, development, biological*, *theorizing*) or have a general or bleached meaning, such as the adjective *general*, the demonstratives *this, that*, and the prepositions *of, over*. Furthermore, the example contains five cases of

conventional metaphor, which accords with the general trend. In the reliability test, the identification of metaphorically used words in this sentence was straightforward, with all metaphorically used items exhibiting unanimous metaphor identification.

The metaphor-related words include two demonstratives (*this, that*), which cater to referencing in writing, an issue we shall return to below. The verb *survey* manifests a typical metaphorical contrast between a concrete everyday sense and an abstract, formal, academic one. The identification of the contextual meaning of this lexical item yields '[FORMAL] to study something' (Macmillan's sense no. 4, or MM4). In the next step we identify the basic meaning as 'to examine an area of land in order to make a map of it' (MM3). Since the latter is distinct from, but can be understood in comparison with, the contextual sense, *survey* is a metaphorically used word.

There is a special feature of *survey* in this context. The tension between abstract and concrete is combined with a tension between non-human and human. That is, the contextual sense of *survey* has a selection restriction that requires a human agent in subject position, but this is violated by the appearance of a non-human agent. The dictionary provides an example included in the contextual sense (MM4): *Professor Arens has surveyed a wide range of tribal cultures*. It illustrates the semantic restriction of having to select a human agent for *survey* in the sense of 'to study something'. This selection restriction is violated in our example sentence, and can be treated as a case of personification.

Although personification of this kind seems to be rather typical of academic discourse, frequently being used for text management, there is a fine line between appropriate and inappropriate usage that cannot be transgressed without marking the language as stylistically deficient or conceptually unsound. Low (2005) shows that expressions like "this essay thinks" (which he relates to the conceptual mapping AN ESSAY IS A PERSON) are not accepted by experienced lecturers, while other cases, as we have seen, are perfectly acceptable. It should also be noted that the reported type of personification is closely tied to metonymy and is therefore substantially different from personifications like "each individual cell had to be *master of all trades"* (from an article in the popularized science journal *New Scientist,* identified by Low, 2005). The latter is a type of personification that seems to be used for distinct functions, such as explanation and entertainment (cf. Low, 2005).

The next lexical item identified as related to metaphor is *development*. In previous discussions among the analysts, it had been classified as a borderline case. The decision to regard the item as borderline was most likely prompted by the analysts' lexical knowledge about concrete instances of development, such as *the growth of a plant*. However, there is no such entry to be found in Macmillan. The dictionary rather lists a fairly universal meaning of development: 'change, growth, or improvement over a period of time' (MM1). The entry conflates the basic concrete meaning with more encompassing ('growth of a child as time passes, as it

changes and learns to do new things', MM1a) and more abstract ('improving the economy [...]', MM1b) meanings. What is more, even the contextual meaning is subsumed under the universal meaning of MM1. Given this strong general sense of *development*, the lexical item was later re-analyzed as a non-metaphorical item. At the time of the reliability testing, however, the discussion of *development* was still pending. All analysts indicated their awareness of this status by assigning borderline status.

The last metaphorical item included in this sentence is the preposition *over*. The contextual sense is 'during a period of time', which can be contrasted and metaphorically compared to 'above someone/something'. All coders agreed on this comparison. *Over* is thus a maximally straightforward instance of metaphor.

At this point, we can make the following observations about identifying metaphor in academic discourse. We observed that metaphor in academic writing often involves forms of personification (cf. Low, 1999). And, including rather than excluding borderline cases of metaphoricity is important for metaphor identification in academic registers, too. We will now turn to our treatment of a number of less clear cases.

4.2 Lack of Agreement

4.2.1 Metaphor identification and specialist terms: Metaphorical to whom?

Our reliability tests show that academic texts (together with news texts) have the highest rate of unanimously identified metaphors of the four registers (cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010). Most words related to metaphor found in our samples of academic discourse are straightforward cases of conventional metaphor. They are not ambiguous and they are a typical part of academic prose. But academic discourse also exhibits the highest proportion of coder disagreement. This seems to be related to one of the intrinsic qualities of many metaphors in academic discourse, their degree of specialization. There are a number of implications.

The British National Corpus reflects the high level of specialization of academic discourse by differentiating between four sub-registers: *humanities & arts, natural sciences, politics, law, & education,* and *social sciences*. The fragments representing academic discourse belong to distinct sub-registers, which have their own specialized vocabulary. This is one axis of specialization. In addition, Biber (2006b) also distinguishes between various "academic levels (lower division, upper division, graduate)" (2006, p. 21). This categorization relates to different audiences using words (especially technical terms) with distinct levels of expertise. This is another

axis of specialization. Both types of specialization may cause problems for reliable metaphor identification.

Each academic discipline has a specific technical language, which features many possible candidates for metaphorically related words. However, the detailed shades of meanings of technical languages are not part and parcel of the general reader's lexical knowledge, and correspondingly, cases of disagreement in the reliability test were often from technical vocabulary. The technical meanings of words like *scalar* (from *scalar function* in electromagnetics, FEF-fragment02) are not frequent enough to figure in Macmillan. This is a special methodological problem of academic discourse, which at first glance does not seem to be resolved by *MIPVU*'s practice of consulting a usage-based dictionary to support coder decisions. To correctly establish the contextual meaning for technical terms like *electrical charge* or *scalar function,* analysts would need to gather information from more encompassing dictionaries, such as the OED, or genuinely specialized dictionaries.

Our solution for dealing with cases like these was to adopt a general view on metaphor, which means that we assume a *general reader.* This reader's knowledge about the meaning of words is taken to correspond with the entries in the Macmillan dictionary, or, as a fallback position, Longman (Summers & Bullon, 2005). Decisions should therefore not be based on etymological principles (*charge*) or solely on specialized dictionaries (*scalar*). We thus decided to stick to our general identification procedure, and base our decisions primarily on Macmillan.

Since specialized terms do not appear in our dictionaries, and we deliberately did not include an additional step for assessing the specific contextual meaning of a lexical unit in the procedure, we cannot compare the exact contextual meaning to an assumed more basic meaning. However, just like the general language user, analysts do have intuitions about the approximate sense of a technical term, in particular about its abstractness and so on. Therefore, if the contextual sense of a specialized term is not in the dictionary, but there is a sense that fulfills our criteria of being basic, and that can be understood by comparison to the (assumed) contextual sense, we mark the word as a borderline case of metaphor (WIDLII) –"borderline" because we have not checked the contextual sense against a specialist dictionary.

4.2.2 Metaphor-related words and scientific models. In this section we will examine how our linguistic approach interacts with any knowledge we may have of the structure of underlying metaphorical scientific models. In particular, the question arises whether it can interfere with achieving unanimous agreement. One example of words that seem to indicate a scientific model is *(electrical) charge:*

(8) It means that neither the magnitude nor the position of the <u>charge</u> varies as a function of time. (FEF-fragment02, emphasis mine, JBH)

The contextual meaning is sense description 4 in Macmillan, 'the amount of electricity that something holds or carries', which is unproblematic. But when we have to identify the basic meaning of the word, it is difficult to make a decision. The summary for this entry looks like this:

1. amount of money to pay;
2. when sb [somebody, JBH] is accused;
3. an attack running fast;
4. amount of electricity;
5. amount of explosive;
6. sb you take care of;
7. ability to cause emotion.

Longman provides no further information. Candidates for a basic meaning are the bodily-related 'an attack by people or animals running very fast towards someone or something' (MM3) and the concrete 'an amount of the substance that makes a bomb explode' (MM5). By adding the label WIDLII to our judgment that this word is related to metaphor, we can signal borderline status. We thereby account for the possibility that the general reader might judge one of these senses basic.

The OED features the concrete, physical sense of 'a (material) load, burden, weight', which is now obsolete. It also provides us with the approximate date of the first usage of *load* in the electrical sense; this enables us to infer that, when the term was coined as part of a scientific model, the concrete, physical meaning was still part of the English lexicon. It is possible that today there is still available a model of electricity that works on the basis of an analogy between concrete material loads and less palpable amounts of electricity. This might even be explained in these terms to novices in the field. However, because the senses listed in Macmillan and Longman do not feature this obsolete basic meaning, we cannot mark the lexical item as a metaphorically used word based on an assumed comparison between the relevant concrete and abstract sense.

Another example of a technical term hinting at a scientific analogy is *natural selection*:

(9) For, by 1841 he had worked out not only his theory of the origin of species, *natural <u>selection</u>*, but also, it seems, his theory of generation (including heredity, variation and so on), pangenesis. (CMA-fragment01, emphasis mine, JBH)

Macmillan provides an entry for the phrase as a whole: 'the way in which living things continue to exist as a group or die, according to qualities they have or are able to develop'. However, as happens for all fixed phrases that are not compounds, we have to analyze *natural* and *selection* as independent lexical units. In the reliability test, one coder out of four decided that *selection* was used metaphorically. The basic meaning of *selection* is 'the process of choosing one person or thing from a group', with the examples in Macmillan and Longman suggesting a human agent. The other three analysts coded both elements of the phrase as non-metaphorically used. They apparently did not see that the basic meaning of *selection* includes a human agent, and can therefore be metaphorically compared to the contextual meaning. Our eventual decision is to mark the second component, *selection,* as a metaphorically used item. It is possible that individuals who are aware of Darwin's model might sooner note the metaphorical meaning, for Darwin deliberately compares human selection as practiced in plant growth to the genetic advantages of wild species (Young, 1988).

The following example concerns two related words from a social sciences fragment. The first metaphorically used word, *role*, stems from the title of the chapter (sentence 4 of the fragment):

(10) The human <u>role</u> as a system controller (CLP-fragment01, emphasis mine, JBH)

The second metaphorical item is *stage*. It appears several discourse units later, within the context of depicting the historical development of human system control:

(11) At this <u>stage</u> the typical machine operator manipulated machine controls on the basis of data presented on instruments. (CLP-fragment01, emphasis mine, JBH)

In the reliability test, *role* was a unanimous metaphorical item, whereas for *stage* two coders decided "related to metaphor" and two "not related to metaphor".

Let us first consider *role*. Both the contextual and the more basic meanings can be found in Macmillan, are sufficiently distinct, and can be related by comparison. The meaning in Macmillan closest to the contextual meaning is 'the purpose or influence of someone or something in a particular situation', while the basic meaning is 'the character played by a particular actor in a film, play etc: PART'. *Role* is thus a clear case of a metaphor-related word without major methodological complications.

Stage, however, is slightly more complex. At first glance, it seems that the contextual meaning ('a particular point in time during a process or set of events') is sufficiently distinct from the basic meaning 'the part of a theatre where the actors or

musicians perform'. However, the fact that two out of four coders did not identify a metaphorical usage hints at possible difficulties. With regard to the basic meaning, Steen, Biernacka et al., (2010), stress that 'part of a theatre' is derived from the historically prior, but now obsolete, sense of 'raised platform'. Contemporary speakers of English may make sense of metaphorical meanings such as the above through a 'spatial conceptualization of time'. Since this spatial conceptualization is achieved by a comparison with 'part of a theatre', which is the diachronic variant of 'raised platform', this would be a case of folk etymology.

It should be added here that besides the contextual meanings above, both *role* and *stage* have other conventionally metaphorical meanings within academic discourse (e.g. *developmental stage theory* in developmental psychology, or *role theory* in social psychology). In fact, a number of metaphorical terms seem to be semantically related to the concept of 'theatre' by indirect reference. To mention just a few examples from sociology, this group includes *dramaturgy, performance,* and *script* (cf. Goffman, 1959). And the scientific analogy underlying *developmental stage* seems to be based on a spatial concept which is related to 'raised platform' (cf. Case, 1992).

Our identification of the lexical items *charge*, *natural selection, stage,* and *role* as metaphor-related words in academic discourse shows that *MIPVU* offers specific solutions to different methodological issues. With *charge*, we have a highly conventionalized technical term whose original mapping is not metaphorical anymore, but for which new candidates for the basic meanings are possible (borderline case). *Natural selection* is a phrase of which the second component is metaphorically used due to the violation of a selection restriction, which coincides with Darwin's original analogy. And finally *role* and *stage* are used in general ways, which implies that scientific and folk models are in constant contact within academic discourse.

Our reliance on Macmillan (with the backup of Longman) as a resource for identifying the relevant contextual and basic senses offers an operational approach that can separate the contemporary from the diachronic perspective. When we consult the history of lexical senses listed by the OED, we only do so in order to clarify the nature of a particular problem (*charge, stage*). At the end of the day, all decisions about metaphor are based on the lexical entries in the contemporary corpus-based dictionaries. This systematic utilization of dictionaries facilitates the identification not only of metaphorically used words in general, but also of such words that are potentially related to scientific analogies.

4.2.3 Metaphor-related words and text management. Academic texts exhibit patterns of cohesion and co-reference (see Eggins & Martin, 1997; Halliday & Hasan, 1976) which are often provided by metaphorically used pronouns and determiners. Francis (1994) describes how nominal groups connect and organize

written discourse. Paying special attention to what she calls "metalinguistic" labels, she describes nominal groups that label the different stages of discourse as writers present their own and others' arguments. This category of labels includes nouns and adverbs such as *point, where* and *here*. These particular lexical items seem to convey comparisons between discursive meanings and spatial senses, thereby imparting structure to the abstract discourse. We will therefore first look at cases of metaphorical uses of demonstrative articles and pronouns and then scrutinize nouns and adverbs. These are quite often easy to identify as metaphorically used, but their very conventionality and one or two other factors may occasionally affect the achievement of unanimous agreement.

Demonstratives and pronouns are a crucial device for the construction of cohesion and co-reference (see Halliday & Hasan, 1976) in academic discourse. They effect a form of concretization, turning discursive topics into tangible objects. One example is the metaphorical use of the demonstrative and pronoun *this*. The basic sense of *thi*s is 'the one that is here'. It can be metaphorically contrasted with the contextual sense 'the one that is known', which is 'used when you are referring to a particular person, thing, fact etc that has just been mentioned, or when it is obvious which one you are referring to'. Consider the use of *this* in the following paragraph, which consists of two consecutive sentences, numbered separately:

(12) Fortunately, there is a single <u>antidote</u> effective against both these myths; and that is to start all over again with the most decisive source of Darwin's new identity […].

(13) <u>This</u> antidote is effective against the romantic-individualist myth, because, as a protégé of Lyell, the young Darwin of the Beagle is at once invested with all the intellectual and institutional context that that myth would suppress. (CMA-fragment01, emphasis mine, JBH)

The lexical item *this* in sentence (7) was a unanimously coded as a metaphorical item in the reliability test. Sentence (7) establishes co-reference with the preceding units of discourse contained in (6) by aligning *this antidote* with both the already mentioned lexical item *antidote* and the subsequent specification statement (beginning with the anaphoric implicit metaphor *that*). But, most importantly, in the metaphorical usage of the demonstrative *this* the abstract sense of *antidote* ('something that helps to improve the effects of something bad or negative', see above) is being referred to as if it was a concrete object: In the basic sense, *this* is 'used for referring to the thing that is nearest to you, especially when you are pointing to it'.

Here is another example of cohesion. The lexical item *this* in sentence (11) refers to the three preceding sentences (8 to 10), efficiently reducing all of the information into one pro-form.

(14) The business of designing machines, processes and systems can be pursued more or less independently of the properties of people.

(15) Nevertheless people are always involved, the designer himself is a human being and his product will shape the behaviour of many workers and other users.

(16) More fundamentally, the design activity will be meaningless unless it is directed towards serving some human need.

(17) In spite of all <u>this</u>, the design process itself is often thought about and executed without any formal considerations about people. (CLP-fragment01, emphasis mine, JBH)

In the reliability test, three analysts decided that *this* in sentence (11) was a metaphorically used word, while one did not. Given that the contextual use of the pronoun *this* is a clear case of metaphor for our procedure, this is an error that might be due to the high level of conventionalization of the lexical item in this kind of usage: The metaphorical use of the delexicalized items *this*, *that*, and the plural forms *these* and *those* can even be missed by trained analysts and are probably almost invisible to the untrained eye. *MIPVU* is thus an excellent tool for sharpening the analytical view of such constructions.

In Example (1) above, we are dealing with a slightly different metaphorical usage of the lexical item *this*. In <u>*this* chapter</u>, *this* abstractly "points" to what is currently relevant in the discourse (the contextual meaning in Longman being 'used to talk about the present situation'). This is another distinct sense that can be understood by comparison with the basic, deictic sense. It should be mentioned that there also is a metonymic dimension present here, for *this* also refers to the materialized text the reader is currently seeing, and, in a way, possibly touching with their hands (related to Longman's contextual meaning '*spoken*: used to talk about a thing or person that is near you, the thing you are holding, or the place where you are'). Yet, since metaphor and metonymy are not mutually exclusive, our identification of a metaphorically used word is not undermined by this finding.

Just as with the demonstratives, the following group of lexical items conveys comparisons between spatial senses and discursive meanings, for which some might wish to apply the cross-domain mapping DISCOURSE IS SPACE when they turn to conceptual analysis. The following examples are general devices for text management. Consider *viewpoint* in (12):

(18) From the narrow accountancy <u>viewpoint</u>, people are a cost and it is desirable to keep this cost as low as possible. (CLP-fragment01, emphasis mine, JBH)

In the reliability test, this lexical item was a straightforward, unanimously identified metaphor-related word. The contextual sense is an abstract 'way of considering something' (MM1). The basic meaning is clearly spatial: 'a place from which you can see or watch something' (MM2). Both meanings are thus sufficiently distinct from each other and can be metaphorically compared, even though it is clear that we need to include a touch of metonymy to get from the physical location to the concrete act of seeing for the basic sense.

It is interesting to examine whether the construction *point of view* behaves similarly.

> (19) Thus, as with biological theories, crime is seen as pathological (a disease), as something to be looked at from the medical <u>point of view</u>. (B17-fragment02, emphasis mine, JBH)

In contrast to *viewpoint*, *point of view* is monosemous in Macmillan. The contextual sense is abstract*:* 'a way of judging a situation based on a particular aspect'. However, based on the stress pattern, *point of view* is not one lexical unit, in the form of a compound, such as *stock market*. Instead, it is a fixed phrase, which needs to be analyzed as a collection of separate lexical units, following *MIPVU*'s general guideline for units of analysis (see Chapter 3). When all constituents of the phrase are analyzed as separate lexical items, both *point* and *view* are classified as metaphorical.

Yet another contextual sense of *point* that is typical of academic discourse is illustrated in the following fragment:

> (20) This brings the discussion to a crucial <u>point</u>: […]. (ACJ-fragment01, emphasis mine, JBH)

Here, the contextual meaning is 'a particular stage in a process' (MM3a), a subentry of 'a particular moment in time' (MM3). It is sufficiently distinct from and can be compared with the concrete spatial sense 'sharp end of something' (MM7). This is another metaphorical use of *point*, but for different reasons than the ones discussed above.

When we connect Francis (1994) to our metaphor identification research, we can assume that *viewpoint*, *point of view*, and *point* in the contexts above cater to lexical cohesion in labeling (meta-) linguistic acts. (12) and (13) thus label comments on the ways of considering or judging a subject, while (14) marks a stage in the discursive progress. The fact that these lexical items are indirectly used suggests that metaphorical word usage has a function for text management. The spatial basic senses seem to "ground" the abstract acts of judging/labeling and stage-marking.

A second type of "spatial" word is demonstrated by the contextual sense of *where*, which is used in a similar way as *here*. Both indicate an abstract situation in discourse:

> (21) The analysis draws throughout on the work done in the last decade by Gruber (1974), Herbert (1974, 1977), Ghiselin (1975), Ruse (1975a, b; 1979), Schweber (1977, 1980), Kottler (1978), Manier (1978), Sulloway (1979, 1982a, b), Kohn (1980), Ospovat (1981), and Sloan (1983a, b) and is derived from studies by the present writer (Hodge 1982, 1986; Hodge & Kohn, 1986) <u>where</u> full reference is made to the documentary sources and secondary literature. (CMA-fragment01, emphasis mine, JBH)

In the reliability test, analysts disagreed (three coders identified *where* as a metaphor-related word, one coder as a non-metaphor-related word). The contextual meaning of *where* in Macmillan is 'used for asking about or referring to a situation or a point in a process, discussion, story etc' (MM3), the basic sense is 'in or to what place' (MM1) or 'in or to a particular place' (MM2). We have thus a clear spatial basic meaning, contrasted with the abstract (discursive) situation. However, the fact that coders disagreed makes us conscious of the fact that written discourse is always tied to its material basis: the printed text on paper (or screens). We can speculate that the disagreeing analyst coded *where* as a non-metaphorical item for taking the given references as concrete objects (palpable texts), thus assuming that the contextual meaning was the basic meaning, and not identifying a contrast between the discourse sense and the concrete location.

The lexical item *here* can be found in sentences like the following one, stemming from a physics textbook:

> (22) We have used <u>here</u> a mathematical theorem stating that the line integral of a gradient depends only on the end-points and not on the connecting path. (FEF-fragment02, emphasis mine, JBH)

With the background knowledge that the sentence belongs to the genre *textbook*, we identify the contextual meaning as corresponding to 'at this point in a process, discussion, or series of events'. (MM3). It can be compared to the basic meaning 'in or to this place' (MM1). We are thus looking at another discernible metaphorical contrast between a discursive meaning and a spatial sense. However, when we know that the textbook comprises a series of *transcribed* lectures, we may have to adjust our decision about the contextual sense: The fragment belongs to a hybrid genre between the spoken and written modes of language, which makes it possible to consider the above sentence as *spoken* language. Thus, a non-metaphorical interpretation of the contextual meaning of *here* becomes possible, denoting the

actual location of speaker and audience. *MIPVU*'s solution for cases of lack of situational knowledge but with a potential for metaphorical meaning is to treat the word as if it was used indirectly and metaphorically. Thus, the possible spatial contextual sense does not rule out the metaphorical contextual meaning mentioned above, and the lexical item becomes a borderline case (WIDLII).

The metaphorical usage of the demonstratives, of the content words *viewpoint, point of view,* and *point*, as well as of *where* and *here* refers to abstract phenomena in and of discourse in a similar way as to concrete locations in space. We may therefore assume *some* lexical content for these otherwise "inherently unspecified (…) element[s]" (Francis, 1994, p. 83). Naturally, the analyses presented here aim to depict the identification of metaphorically used lexical items, and only secondarily to hint at the question whether and how a widely assumed conceptual mapping (DISCOURSE IS SPACE) manifests itself on the linguistic level. What has been found in this respect is that the linguistic identification of metaphorically used words does not conflict with the assumption of a systematic mapping between the domain DISCOURSE and the domain SPACE.

4.2.4 Metaphor-related words in extended contexts. In this section, we will identify a number of metaphorical word usages belonging to the same stretch of academic discourse. We will suggest that identifying metaphor-related words with *MIPVU* offers a useful vantage point for developing further ideas about the interaction between and the discourse functions of lexical units. We will examine indirect usage of the items *myth* and *antidote*, both found in CMA-fragment01, a biological text on Darwin's biography. In concert with that, we will identify a number of connected implicit metaphors, a rare phenomenon that *MIPVU* can help to detect (see Chapter 3). Below, the first examined metaphor- related word, *myth*, is found in sentence (19), with the preceding context in sentences (17) and (18) being vital for establishing the contextual meaning:

(23) The analysis draws throughout on the work done in the last decade by Gruber (1974), Herbert (1974, 1977), Ghiselin (1975), Ruse (1975a, b; 1979), Schweber (1977, 1980), Kottler (1978), Manier (1978), Sulloway (1979, 1982a, b), Kohn (1980), Ospovat (1981), and Sloan (1983a, b) and is derived from studies by the present writer (Hodge, 1982, 1986; Hodge & Kohn, 1986) where full reference is made to the documentary sources and secondary literature.

(24) Such a survey can serve more than mere biographical curiosity, and a final section will suggest how it may clarify some issues of current interest to historians, to philosophers and to biologists.

(25) It can also free us from many mistaken myths about Darwin himself.

This stretch belongs to the introductory part of the fragment, where the author first establishes the theoretical foundation for his argument (17), then goes on to underline the value of the analysis (18), which in sentence (19) culminates in ascribing to the survey a potential power to free *us* from *many mistaken myths* about Darwin. We will focus on the noun *myth*, which has the contextual sense 'something that people wrongly believe to be true'. The basic sense is 'an ancient traditional story about gods, heroes, and magic'. The basic sense is thus sufficiently distinct from and can be understood in comparison with the contextual meaning of 'wrong belief '; *myth* is a clear case of metaphor.

The metaphorical usage of *myth* is accompanied by at least two other rhetorical devices – alliteration (*many mistaken myths*) and pleonasm (the contextual meaning *myth* denotes 'something that people believe' with the additional property 'wrongly'; the adjective *mistaken* produces a pleonasm). The basic sense of *myth* may have been employed as an invitation to the reader to think of particular beliefs about Darwin and his life in terms of 'gods, heroes, and magic', with 'ancient' and 'traditional' being further aspects. A strategic choice of words is an option since irrational or even magical beliefs are not likely to be embraced by the intended academic audience of this text. Thus, we tentatively conclude that the usage of *myth* in the given context is very likely to have a deliberately persuasive function, inviting the reader to follow the author's argumentation and interpretation of the facts. This interpretation can be related to the identification of other metaphorically used items in the adjacent context.

In the five sentences below, which directly follow sentence (19), a series of interlinked implicit metaphors (see Chapter 3) can be spotted. These metaphors do not clearly stand out as coming from an alien domain, but still convey an indirect meaning that can potentially be explained by a figurative cross-domain mapping. In this case, implicit metaphor works by substitution of the metaphor-related words *myth* and *myths*:

(26) These myths mostly trace to his own misleading reminiscences later in life, and have been relentlessly reaffirmed since, at the 1959 centennial symposia for example and in the 1978 BBC-TV series on Darwin; but they are nonetheless discredited by the scholarly industry now grown up around the rich manuscript archive from Darwin's early years (Kohn, 1986).

(27) *One* is the romantic, really Wordsworthian, individualist myth so dear to the literary guardians of English national cultural stereotypes.

(28) It depicts the young Darwin as a lone, sporting gentleman, an amateur beetlecollector seeing nature as she really is by simply looking with the clear gaze of genius, unimpeded by any scientific training, theological prejudice, professional ambition and so on.

(29) Another is the Whiggish, anachronistic myth that Darwin's general biological thought consists of a molecule comprising just two atoms: the idea of evolution and the idea of natural selection.

(30) It depicts his early intellectual development as reducing to two moments of discovery, whereby he moves from having no coherent ideas to having just those ideas.

All instances highlighted with italics co-refer to the metaphorically used words *myths and myth*. The pronouns *they, it*, *one* and *another* are implicitly metaphorical by substitution. All of them substitute *myth(s)*, conveying an indirect metaphorical meaning, and therefore receive the label "implicit metaphor".

It might be surprising that coders did not spot the implicit metaphors in the reliability test, but it should be noted that implicit metaphor is so rare as well as hard to notice because of its implicit nature that coders who are not specifically looking for it may easily overlook it. Reporting this finding here should thus function as an additional motivation to spot implicit metaphorical meanings. Troubleshooting during the wrap-up phase of the annotation (see Chapter 9) has shown that *MIPVU* offers a rigorous instrument for the identification of implicit metaphor.

Subsequent to this extended co-referential structure relating to *myth*, sentence (25) contains *antidote,* an explicit, but indirect case of a metaphor-related word that may possibly exhibit a persuasive function as well. The noun here appears for the first time, thus in the sixth sentence after the introduction of *myth* (sentence 20 above). It is followed by another implicit metaphor, the pronoun *that*.

(31) Fortunately, there is a single antidote effective against both these myths; and that is to start all over again with the most decisive source of Darwin's new identity […]. (CMA-fragment01, emphasis mine, JBH)

The contextual sense of *antidote* is 'something that helps to improve the effects of something bad or negative'. It is sufficiently distinct from the basic sense, 'a substance that prevents a poison from having bad effects' and can be compared to it. Not surprisingly, it was a unanimously coded for metaphor in the reliability test.

The pronoun *that* in sentence (25) is an implicit metaphor by substitution. It substitutes the noun *antidote* that has been identified as metaphor-related before, and therefore receives the label implicit metaphor. When relating the meaning of *antidote* to our observations about the discourse function above, we note that here the author presents 'something that helps to improve the effects of something bad or negative' directly after a cluster of metaphorical items co-referring to *myth*. By implication, the views criticized as *myths* might not only appear as 'bad or negative', but bear further connotations related to the basic sense of antidote ('a substance that prevents a poison from having bad effects').

It should be briefly mentioned here that research on linguistic stance can be used as support for such an assumption: Charles (2003) examines the use of nouns for stance construction in thesis writing with regard to encapsulation by determiners, as is the case for *these myths* (20, 25) or *this antidote* (7) above, concluding that this use of nouns is an important resource for convincing argumentation and stance expression. Discussing this in more detail would go beyond the scope of this chapter, but it is clear that further analysis is needed to connect metaphorical word usage to the rich, rhetorically marked text structure and against the background of genre. This might deliver more definitive evidence for persuasive discourse function and stance construction. Such an analysis can rely on *MIPVU* as a reliable and accurate tool for detecting different types of metaphoricity, such as indirect and direct word usage and explicit and implicit metaphorical meaning.

The next and last example of this chapter displays both direct and possibly indirect word usage related to metaphor. The sentence stems from a chapter in *Fossils: The Key to the Past*, a textbook on paleontology. The chapter is entitled *Bringing Fossils Back to Life.*

> (32) Poplar leaves have an <u>elegant</u> outline <u>resembling that</u> of an <u>arab minaret</u>.
> (AMM-fragment01, emphasis mine, JBH)

The first lexical unit discussed here is *elegant,* with the contextual meaning of 'elegant places and things are attractive because they are beautiful in a simple way'. We might intuitively look for a more basic meaning related to human entities, and actually find 'an elegant person is attractive and graceful in their appearance and behaviour'. However, this sense is signaled as not being sufficiently distinct from the contextual sense by both Macmillan (where it is subordinate to our contextual meaning), and Longman (where *elegant* is actually monosemous: 'beautiful, attractive, or graceful'). Therefore, *elegant* is not related to metaphor.

In sentence (26), we identify a local referent shift, from *poplar leaves* to *arab minaret*. The lexical units *Arab* and *minaret* are incongruous with the overall topics of paleontology in general and *poplar leaves* in particular. However we see that the incongruous lexical units can be integrated within the overall referential framework by means of comparison, signaled by the verb *resemble* ('to be similar to someone or something, especially in appearance'), used in present participle form. In the next step, we see that the comparison is nonliteral or cross-domain, with the outline of the fossilized leaves belonging to the domain of plants and the outline of a minaret belonging to a highly salient object (minaret) from the distinct domain of (religious) architecture. The *[outline] of an arab minaret* thus indicates the source domain, compared to the target domain expression *outline of poplar leaves,* with *elegant* being a property of both. We therefore identify *resembling* as an MFlag and code the

entire collocation *that of an arab minaret* is as a direct metaphor, labeling the source domain of the provisionally sketched conceptual mapping as 'architecture'.

Direct use of lexical units related to metaphor may frequently be related to a didactic function in academic discourse, especially within the present genre, that of the textbook. In the above example the direct metaphor probably has the goal of facilitating visualization for the (novice) reader. In view of the need for further corpus-linguistic exploration of the distribution of similes and simile-like utterances in academic discourse (cf. Low in press), *MIPVU* also offers a reliable procedure for the identification of direct metaphors in discourse.

4.3 Conclusion

In this chapter, we have shown how *MIPVU* serves the identification of various cases of linguistic metaphor in academic discourse. Our primary goal was to run the procedure for a variety of case studies of academic discourse. We demonstrated how *MIPVU* accounts for the particularities of the register with the aim of providing researchers of metaphor in academic discourse with a reliable and fine-tuned tool.

One prominent feature that distinguishes academic discourse from the other registers at this level of analysis is the comparatively high proportion of cases of lack of unanimity in our reliability tests. In absolute terms, the instances of lack of agreement are still rather small in number, but in comparison with performance in news, fiction, and conversation, their relative frequency is striking. We interpret this finding as at least partly reflecting the specific nature of academic discourse, in particular the technical vocabulary of particular disciplines and the role that expertise might play in the usage of specific lexical items. In our group discussions, we observed that differences in prior knowledge and/or intuitions about contextual and basic meanings affected individual decisions. This eventually reinforced our policy of assuming a general reader, with the systematic utilization of a corpus-based learner's dictionary, as a norm. Recruiting specialized and diachronic dictionaries was not practicable for our particular goal, which after all is to produce annotations in a corpus of a reasonable size that is not limited to academic discourse. Other studies using *MIPVU* for metaphor identification in the academic register might, however, benefit from gathering information from more encompassing sources. Since highly conventionalized scientific terms are often metaphorical due to diachronic variation and change, including the etymological dimension might be one possible variation on *MIPVU*.

There is not one "academic discourse", but a number of specialized subfields with different metaphorical word usages. Within our research, we could account for this fact by employing the labels given by BNC, but not much more. Further

research is needed here to examine the specific metaphorical word usage in different subdomains of academic discourse. Similarly, only little work on the relation between academic discourse(s) and popular science has so far been based on word-by-word examinations of metaphor (e.g. Knudsen, 2003; Low, 2005; Semino, 2008; for a slightly different approach the work by Nerlich and colleagues [e.g. Larson, Nerlich, & Wallis, 2005; Nerlich & Halliday, 2007]).

Our range of examples includes straightforward identification of words related to metaphor on the one hand and cases that demand special methodological attention on the other. We have shown how *MIPVU* caters to specific and less frequent instances of metaphorical word usage in academic discourse, such as implicit meaning and direct metaphor. Cases can also be roughly related to discourse functions, with some technical terms indicating scientific models (*charge, natural selection, role, stage*), other lexical items possibly related to strategic word choice for persuasion (*myth*, *antidote*), and yet other words with spatial basic senses (*this, that*, *viewpoint, point of view, point, where, here*) serving the creation of textual cohesion. However, we are aware that only a full-fledged discourse-linguistic analysis can provide statistically grounded evidence on the discourse functions of metaphorically related words.

CHAPTER 5
A Distributional Profile of Metaphor in Academic Discourse

Academic prose is a written register, typically printed and produced off-line, without a shared immediate situation between writer and reader. As a rule, its audience is specialist, its dialect domain is global, and its main communicative purposes and contents are information, argumentation and explanation (cf. Biber et al., 1999, pp. 15-17).[16] According to Biber and colleagues, this situational profile accounts for much of the linguistic variation between academic prose and three other primary registers of English, news, fiction, and conversation. Among the typical linguistic features of academic prose are the frequent use of nouns, adjectives, and prepositions – as well as a comparatively infrequent use of verbs, pronouns, and adverbs (Biber, 1988; Biber et al., 1999).

The task of the present chapter is to add metaphor to this register profile of academic prose and to examine which place metaphor occupies in academic prose in relation to the other registers. Specifically, I will examine the distribution of metaphor across word class in four registers as well as the distribution of distinct types of metaphor use (direct, indirect, and implicit metaphor) across registers – with my focus being throughout on academic prose. Furthermore, a first attempt will be made to examine variation in metaphor distribution across different sub-registers of academic prose. Findings from Biber's multidimensional analysis of register (Biber, 1988) will be used for interpretation of the results.

The data were collected by an application of the annotation procedure *MIPVU* to four register samples from BNC Baby. The entire corpus amounts to approximately 187,000 words manually annotated for metaphor, with each register roughly making up one quarter. A comparative approach to metaphor in discourse was chosen since it enables quantitative analysis of the specific features of metaphor distribution in academic writing against the background of general patterns of sociolinguistic variation, where differences between registers are explained with regard to situational variation in mode, interactiveness, domain, communicative purpose, and topic (cf. Biber et al., 1999).

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[16] Other approaches conceive of *argumentation*, together with *narration*, *exposition* and *description* as *text types* which can serve to enlighten, persuade and instruct (cf. Steen, 2011b).

Several researchers have observed that metaphors may be associated with word class (e.g., Berber-Sardinha, 2008; Cameron, 2003; Goatly, 1997). Differences between registers in the distribution of metaphor may hence at least be partly attributable to their respective positions on various register dimensions in the sense of Biber (1988), which are heavily influenced by word class. Findings may be interpreted with reference to the main communicative purposes of the registers, such as pleasure reading for fiction, personal interaction for conversation, information and evaluation for news, and information, argumentation, and explanation for academic prose (cf. Biber 1988; Biber et al. 1999). Biber's *Dimension 1* is of particular interest, since it contrasts *involved* versus *informational production*, with conversation at the involved extreme, academic prose and news at the informational extreme, and fiction in between, and hence allows detailed predictions about metaphor use in the major word classes per register. Other dimensions that may exert an effect on the distribution and function of metaphor across word classes in the four registers are *explicit* versus *situation-dependent reference* (*Dimension 3*), which assigns a specific role to adverbs in the distinct registers, and *abstract* versus *non-abstract information* (*Dimension 5*), which predicts that conjunctions, but also abstract word use in general, are typical of academic prose. Findings will also be interpreted with reference to the contemporary framework of discourse-oriented metaphor studies described in Chapter 1, with metaphor in discourse as comprising lexico-grammatical forms, conceptual structures and communicative purposes. My main goal is however the description (and possibly the beginnings of an explanation) of the distributional role of metaphor in relation to word classes in academic prose as compared to news, fiction, and conversation.

The first analysis will enquire how metaphor is distributed across the four main registers of English. One question asked here is *whether the "plain style" associated with academic prose is in fact (largely) devoid of metaphors* (see Chapter 1). By examining the proportion of metaphorical word use in academic prose as compared with the other registers (for example the literary register of fiction), the study will give a new quantitative answer to the question whether the ideal of a plain, metaphor-less style that originated with Bacon and the scientists of the Royal Society in 17th Century England is alive in scientific writing today. Linked to this is the more general question *how metaphor is distributed across word classes in academic prose as compared to news, fiction, and conversation*. This part of the analysis will reveal important aspects of metaphor's role in the linguistic register profile of academic prose as opposed to those of the other three registers.

The second analysis will examine which role is played by the three distinct types of metaphor in discourse described in Chapter 2 (indirect, direct, and implicit metaphor). This analysis is motivated by the research question *how metaphor exhibits the three main metaphor types in academic prose as compared to news,*

fiction, and conversation. In the discussion of the quantitative findings I will focus on communicative functions of metaphor (see Chapter 1).

Lastly, I will look at the variability and specificity of academic discourse, with its heterogeneous array of disciplines and subdisciplines (e.g., Halliday, 2004b; Hyland, 2006a). While the "four registers described throughout the *LGSWE* are important benchmarks, spanning much of the range of register variation in English," there is a need for "[f]uture investigations of the sub-varieties within each register [which] will produce further important findings" (Biber et al., 1999, p. 17). I will ask *how metaphor type is distributed across four academic sub-registers.* This exploratory analysis of the academic corpus will divide academic prose into the sub-registers *humanities & arts, natural sciences, politics, law & education,* and *social sciences* (as pre-categorized by the British National Corpus [BNC]). Findings will be related again to the communicative functions of metaphor use proposed from within the contemporary metaphor framework.

5.1 Method

The present study was conducted with attention to a catalogue for good metaphor research practice proposed by the Pragglejaz Group (2007, p. 14). In this catalogue, eight issues are highlighted that should be addressed in any study applying *MIP*: *text details, listenership or readership assumed for the analysis, lexical unit decisions, resources used, coding decisions, analysis details, additional/subsequent analyses,* and *results of analyses*. In the following, in answer to the *MIP* catalogue, I will spell out details about the materials used, the resources applied and the analysis details, including an iterative discussion procedure.

Materials. The materials were taken from the four-million-word sample BNC Baby, itself excerpted from the 100-million-word British National Corpus. BNC Baby was chosen because it was developed to offer a set of language materials that were parallel with the data described in the *Longman Grammar of Spoken and Written English* (*LGSWE*) by Biber et al. (1999). This focus facilitates the description of metaphor in four registers that have been well studied from a lexico-grammatical point of view. The annotation of a selection of these files for the semantic component of metaphor is a novel contribution to linguistic research, and the final product of the annotated subcorpus has been published as a public resource (Steen et al., 2010b). The selection of the files was prepared with the help of Dr James Cummings from the Oxford Text Archive, who split the files up into separate fragments defined by the highest section division in the texts (such as chapter sections in fiction and academic writing, or separate newspaper articles).

Table 5.1

Sample Size per Register (Valid Units)

Register	Frequency	Percent
Academic prose	49,314	26.4
News	44,792	24.0
Conversation	47,934	25.7
Fiction	44,648	23.9
Total	186,688	100.0

The final corpus of text fragments comprises a total of 186,666 valid units of analysis (words) across the four registers academic prose, news, fiction, and conversation, with an average of approximately 47,000 words per register. The four registers were thus balanced in terms of sample sizes, each register making up roughly one fourth of the corpus (see Table 5.1). Representativeness of register samples was assured by random selection of fragments from the four corresponding BNC samples. A detailed description of the corpus can be found in Figure A1 (Appendix). Selected fragments were taken from the beginning, middle, and end of the complete BNC Baby files. A small number of files were discarded because their content was too difficult: It is impossible to identify metaphorical lexical units if the contextual meaning of a stretch of too many discourse units is unclear. Other files were discarded because they were too short and therefore too deviant from the average length of the excerpts. These criteria were clear from the start, but were applied intuitively, causing a lack of complete consistency; however, there seems no reason to believe that this had great effect on the findings.

A preliminary analysis of the corpus examined the distribution of the eight major word classes (adjectives, adverbs, conjunctions, determiners, nouns, prepositions, verbs, and a remainder category which includes pronouns, existential *there* and so on) across the four registers (reported in Steen et al., 2010a; Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010). For the word classes in question, it rendered largely the same results as Biber's analysis (1988, 1989), with nouns, prepositions, and adjectives more frequent in academic prose and news than in fiction and conversation, and adverbs, verbs, and the remainder being distributed in a contrary direction, with relatively lower counts among academic and news texts and relatively higher frequencies in fiction and especially in conversation. These findings are in line with what was predicted on the basis of Biber's first dimension, with a middle position of fiction between the academic prose and news on the informational end of the scale and conversation on the involved end. With regard to Biber's third dimension, no result was obtained that contradicted the global

prediction: Adverbs are less frequent in academic prose and in news than in fiction and especially in conversation. The results also show that the proportion of conjunctions does not vary as drastically among registers as the other word classes, but that their frequency is relatively higher in academic prose than in the other registers (Biber's fifth dimension).

In all, the preliminary analysis suggested that the sample for metaphor analysis extracted from BNC Baby is representative of the way in which these registers have been described in Biber (1988, 1989). The association between (clusters of) word classes and particular registers will hence be taken as a reflection of the typically involved or informational production of a specific register, as well as possibly of explicit or situation-dependent reference, and of non-abstract vs. abstract information. In the analyses presented in this chapter, these preliminary findings will be related to the distribution of metaphor across word classes and registers, with the goal of unfolding a complex picture of the lexico-grammatical properties of metaphor-related words in academic discourse.

Resources. *The Macmillan English Dictionary for Advanced Learners* (Rundell, 2002) was the main tool used for making decisions about lexical units, contextual meanings, basic meanings, and distinctness of contextual and basic meanings. The reasons for using this type of dictionary, and Macmillan in particular, are that it is recent and corpus-based (cf. Pragglejaz Group, 2007). As described in the instructions for the procedure (Chapter 3), a second dictionary was also used in order to have a second opinion about specific types of problems. This was the *Longman Dictionary of Contemporary English* (Summers & Bullon, 2005). An informal test at the beginning of the project, comparing the description and application of about 100 lexical units, showed that there was no essential or systematic difference between the two dictionaries. Macmillan was fixed as the first dictionary, to be supplemented by Longman only in cases of doubt. Oxford English Dictionary (OED) was also consulted at times, usually to achieve a deeper understanding of the semantic structure of a lexical unit. Only very seldom was the OED used to make a final decision.

Procedure. An explicit set of instructions was developed and fixed at the beginning of the research, with the resulting procedure reported as *MIPVU* in Chapter 3 (see also Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010). The starting point of this set was provided by *MIP*, the Metaphor identification procedure published by the Pragglejaz Group (2007), and this has remained the core of the *MIPVU* procedure. The main changes to *MIP* involved the following two features: (a) the detailed explication of many aspects of the decision-making process regarding lexical units and the identification of metaphorically used lexical units; (b)

the addition of new sections on other forms of metaphor (so-called direct and implicit metaphor, see Chapter 2), novel compounds, and signals for metaphor (MFlags). As the research went on, the instructions were selectively improved and refined, but the basic procedure has remained unchanged after revision since the first reliability test.

Reliability. Reliability tests were conducted throughout the entire period of annotation, to examine the extent of agreement between analysts when they had analyzed their materials independently of each other (before discussion). Reliability was good. Measured by Fleiss' kappa, the mean value was about 0.85. On average, the analysts achieved unanimous agreement before discussion for some 92 % of all cases (see Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010 for more details). Even though analyst bias was generally significant, this was alleviated by the overall protocol of analysis, which guaranteed a further increase of consistency against the background of the clear set of instructions (*MIPVU)*. The protocol is described next. The analysis of the reliability data was only concerned with one type of classification, related to metaphor vs. not related to metaphor. Other phenomena were examined for error margins by means of a different set of analyses (for details, see Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010)

Protocol. The set of instructions for annotation reported in Chapter 3 is the basis of the identification research, but it should be seen in the context of the overall approach to the materials. The texts were handled on the basis of the following protocol.

1. Excerpts were selected from the BNC Baby by the principal investigator and entered into an administrative database.
2. Ph.D. students selected the excerpts assigned to them and produced an individual annotation; Care was taken that all analysts saw materials from each register in order to attune them to differences between phenomena that had to be solved consistently with the same procedure.
3. The individual annotation had to be posted on an intranet website for comments by the other Ph.D. students.
4. The other Ph.D. students went through the work of their colleagues and posted comments and queries.
5. All Ph.D. researchers and the principal investigator had group meetings about the comments, referring to the details of the procedure and to previous decisions about specific cases, which had been recorded in a special lexical database; they made final verdicts about problematic cases, which were recorded.
6. The annotations in the individually analyzed files were subsequently corrected on the basis of the web version.

7. The final annotations were then stored in a separate folder.
8. Any decisions about problematic cases were recorded in a special lexical database, for future reference.

A slightly simplified example of a web version of annotation after discussion is presented in Figure 5.1. below.

All text in italics is from the BNC Baby text, with annotations added in angular brackets: The code "mrw" stands for *metaphor-related word*, which tags all forms of metaphor (indirect, direct, and implicit). Inserted in between the annotated BNC Baby fragment are queries posted by the individual analyst into the annotated document (here underlined); they alert the other Ph.D. students to potential problems and are meant to elicit discussion. Underneath the annotated text, there is space for new comments by the other analysts. They are numbered by utterance number and responses to comments can be added by other members of the group, with further indentation, another number, and signature (initial of analyst's name) being added. In this case, one comment can be seen, which uses "M" for metaphorical; the "Analyst In Charge" (AIC) positively responds to the comment.

As can be seen, this protocol reduces (significant) effects of individual analyst bias to virtually zero. That this it involves group dynamics at least to some extent is clear, too. But the basis of the identification procedure lies in the reliable individual case-by-case analyses anyway, as was shown by Fleiss' Kappa (see "Reliability" above). The protocol hence ensured an even more consistent application of the systematic and explicit set of instructions presented in Chapter 3 as *MIPVU*.

The essays in </mrw> *this* </mrw> *book do not amount* </mrw> *to* </mrw> *a programme: but they are intended to provide a springboard* </mrw> *for* <mrw type = "met" status = "UNCERTAIN" morph = "n" TEIform = "seg"> *one* </mrw>.
I think we should actually mark this deictic marker as well
3.2 *one*: I'm not sure, maybe only if the word it refers to is M; in this case it refers to programme, right? So not M because programme is not M? L
3.2.1 perhaps you are all right. not M. AIC

Figure 5.1. Extract from web discussion protocol. (AS6-fragment01).

Troubleshooting after completion.   In post-hoc troubleshooting, some systematic errors were detected and removed, and remaining margins of error were estimated (for a detailed report see Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010, Chapter 9). The upshot of this exercise is as follows:

1. For the prior identification of phrasal verbs, compounds, and polywords by BNC, a margin of error of 0.3% should be taken into account.
2. One percent of all lexical units in the conversations have been discarded for metaphor analysis on account of their lack of intelligibility in context.
3. For the class of lexical units flagging the presence of metaphor (MFlags), agreement was about 95%.
4. The error margin for classifying lexical units related to metaphor as direct expressions of metaphor was not separately examined since the behavior of these words is closely connected to the behavior of MFlags (see previous point).
5. The error margin for classifying lexical units related to metaphor as implicit expressions of metaphor was separately examined and led to a separate round in which we re-analyzed all potential cases in all of the data. We did so by checking all cases of a list of about 30 potentially cohesive words (the list included modal verbs, primary verbs, expressions such as *one, another,* and so on and cases amounted to 16% of all data). A test sample of over 2,000 words rendered a 100% agreement in the identification of potentially cohesive words for the written registers, while agreement about conversation was considerably lower. After a set of more explicit instructions was devised, a final sample of 1,000 words per register was checked for agreement which showed that reliability of identification of implicit metaphor is roughly equal to reliability for indirect metaphor.

Preparation of final database.   After troubleshooting was completed, and all annotated files had been corrected for errors, files were converted into an SPSS database, with technical assistance from Onno Huber of the ICT group in the Arts faculty at *VU* University, Amsterdam. Separated lexical units that needed to be treated as single units (compounds, phrasal verbs, and polywords) were merged into single cases. A small number (n=18) of conversion problems were detected upon visual inspection of the database, and corrected. These corrections, to the extent that they were needed, have also been fed back into the annotated BNC Baby files. In the following analyses, all DFMAs and genitive cases have been deselected. The total number of cases that remain in the SPSS database is 186,688 (see Table 5.1).

Statistical analysis.   The data reported in this chapter consist of frequency counts of lexical units related to metaphor in four registers and eight word classes. Moreover, if a word was classified as related to metaphor, it was further classified as

being indirectly, directly or implicitly related to metaphor. These frequency counts are summarized in the form of absolute and relative frequencies. To compare the frequencies of lexical units related to metaphor and examine register and word class interactions, log-linear and chi-square tests were performed). If a log-linear analysis detected a three-way interaction, subsequent chi-square tests were performed to determine the specific loci of the associations between variables. Standardized residuals were inspected in order to identify the cells that contributed to these significant chi-squares. All chi-squares reported were assessed in terms of effect size estimates (Cramer's V).

5.2 Analysis 1: Register, Word Class, and Metaphor

The first step in investigating the association between metaphor, register, and word class is to test whether they exhibit higher-order interaction effects besides the two-way interaction between word class and register. In order to examine this possibility, a three-way frequency analysis was performed to develop a log linear model of metaphor distribution across registers and main word classes. Factors were Relation to metaphor (yes, no), Register (academic, conversation, fiction, and news) and Word class (adjective, adverb, conjunction, determiner, noun, preposition, verb, remainder), with register and word class as predictors of metaphor distribution. There were 186,688 lexical units after clean-up which had been coded as either not related to metaphor (non-metaphor-related word, non-MRW) or related to metaphor (metaphor-related word, MRW): These classifications were a simplification of the original analysis, with all MFlags included into the category of non-MRW and all borderline cases included in the category of MRW (cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010). All component two-way contingency tables (metaphor by register per word class; metaphor by word class per register) showed expected frequencies in excess of five per cell so that a log linear analysis was allowed.

Stepwise selection by backward deletion of effects using SPSS16 produced a model that included all higher-order effects, with the three-way interaction between metaphor, register, and word class being the highest order effect. The model had a likelihood ratio of $\chi^2(0) = 0$, $p = 1$, indicating a perfect fit between observed frequencies and expected frequencies generated by the model. The highest-order three-way interaction between metaphor, register, and word class ($\chi^2(21) = 1694.044$, $p < 0.001$) is highly significant. For the raw frequencies see Table A2 in the Appendix.

Below, I will examine the differences in the distribution of metaphor-related words across the eight word classes and four registers. Standardized residuals, which

express the presence and magnitude of the deviation that each cell count has from an expected count, will be used to determine whether differences between the particular relative frequencies observed are statistically relevant (the null hypotheses being that metaphor is evenly distributed across word classes; and across registers). As large frequencies in corpora may often lead to significant results too easily, in the present analysis, α was set at the .01 level of confidence.[17] This was done in order to reduce the possibility of a Type I error. I will hence dismantle the three-way interaction in two steps, each step examining the distribution of MRWs across the corpus in one set of two-way interactions:

➢ In the first step, I will examine the two-way interactions between metaphor and word class for each of the four distinct registers separately;

➢ In the second step, I will scrutinize the two-way interactions of metaphor and register for each of the eight distinct word classes separately.

➢ In a general discussion (5.5), I will integrate the results of both comparative analyses in order to provide an overview of the particular role that metaphor plays in the lexico-grammatical profile of academic prose.

5.2.1 Step 1: Metaphor distribution across word classes per register. The analysis deals with the distribution of MRWs across word classes in each independent register. For each register sample (academic prose, news, fiction, and conversation), a separate two-way contingency table crossing the variables relation to metaphor (with the two categories MRW and non-MRW) with word class (with the eight categories adjective, adverb, determiner, noun, preposition, verb, rest, and conjunction) was constructed. No cells had an expected frequency lower than 5. For every register, the independent chi-square analysis showed a significant association between the two variables relation to metaphor and word class. Cramer's *V* measured the magnitude of association between the variables, or the effect size. A value of Cramer's *V* between 0.2 and 0.4 is conventionally described as "moderate association" (cf. Rea & Parker, 1992, p. 203). All tested associations had a "moderate" strength (min= .30 and max = .32).

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[17] The critical value for standardized residuals is 2.58 at the α=.01 level of significance.

Table 5.2

Percentages of Metaphor-related words Within Each Word Class in Each Register

Word class	Register				
	Academic	News	Fiction	Conversation	All registers
AJ	17.6%	21.0%	19.4%	13.3%	18.4%
AV	10.1%	11.0%	9.3%	7.5%	9.1%
CJ	1.4%	0.9%	1.0%	1.5%	1.2%
DT	8.1%	5.9%	7.6%	15.6%	8.9%
N	17.6%	13.2%	10.5%	8.3%	13.3%
PR	42.5%	38.1%	33.4%	33.8%	38.0%
V	27.7%	27.6%	15.9%	9.1%	18.7%
RE	2.6%	2.5%	0.9%	0.2%	1.1%
All word classes	18.5%	16.4%	11.9%	7.7%	13.6%

Note.   AJ=Adjectives;   AV=Adverbs;   CJ=Conjunctions;   DT=Determiners;   N=Nouns; PR=Prepositions; V=Verbs; RE=Remainder. Scores are percentages of number of occurrences of MRWs as opposed to non-MRWs. (The percentages of non-MRWs are omitted from the table in order to keep it concise.) For example, among the adjectives of academic prose, there are 17.6% MRWs (82.4% non-MRWs), among the adjectives of news, there are 21% MRWs (79% non-MRWs), and among adjectives across all registers, there are 18.4% MRWs (81.6% non-MRWs).

Table 5.2 shows that in the academic register 18.5% of the words are used metaphorically (for more details on frequencies of MRWs vs. non-MRWs, as well as the standardized residuals for MRWs/non-MRWs across the word classes in each of the four registers, see Tables A2 and A3 in the Appendix). However, the distribution of metaphor-related words differs considerably between the word classes (χ^2(7) =4879.221, p <.001; Cramer's V = .32). For instance, both prepositions (42.5%) and verbs (27.7%) are much more likely to be used metaphorically, whereas conjunctions (1.4%), the remainder (2.6%), and also determiners (8.1%), and adverbs (10.1%) are less likely to be metaphorical. At the same time, the percentages of metaphor-related adjectives and nouns (both 17.6%) are close to the total of 18.5%.

In news, 16.4% of the words are used metaphorically, thus slightly fewer than in academic prose. Again, the distribution of metaphor-related words differs considerably between the word classes (χ^2(7) =4178.537, p <.001; Cramer's V = .31). As in academic prose, prepositions (38.1%) and verbs (27.6%) are much more likely to be used metaphorically, but, in contrast to academic prose, also adjectives (21%). Meanwhile, conjunctions (0.9%), the remainder (2.5%), determiners (5.9%), adverbs (11%), and also nouns (13.2%), are less likely to be metaphorical.

In fiction, 11.9% of the words are used metaphorically, much fewer than in academic prose and news. Again, the distribution of metaphor-related words differs considerably between the word classes (χ^2(7) =3473.980, p <.001; Cramer's V = .30). As in academic prose, prepositions (33.4%), and verbs (15.9%), are much more likely to be used metaphorically, but also adjectives (19.4%), whereas remainder (0.9%), conjunctions (1%), determiners (7.6%), adverbs (9.3%), and also nouns (10.5%)[18], are less likely to be metaphorical.

Finally, in conversation, 7.7% of the words are used metaphorically, which is the smallest proportion of all registers. Again, the distribution of metaphor-related words differs considerably between the word classes (χ^2(7) = 4252.001, p <. 001; Cramer's V = .30). As in academic prose, prepositions (33.8%), and verbs (9.1%)[19], are more likely to be used metaphorically, but also determiners (15.6%) and adjectives (13.3%), whereas conjunctions (1.5%) and the remainder (0.2%) are less likely to be metaphorical. At the same time, the percentages of metaphor related nouns (8.3%) and adverbs (7.5%) are close to the total of 7.7%.

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[18] Although the percentages of metaphor-related adverbs and nouns are relatively close to the total of 11.9%, the respective standard deviations indicate significant variation (see Table A3 in the Appendix).

[19] Although the percentage of metaphor-related verbs is relatively close to the total of 7.7%, the standard deviation indicates significant variation (see Table A3).

Figure 5.2. Distribution of MRWs/non-MRWs across word classes, per register. (M = MRW; NM = Non-MRW. AJ=Adjectives; AV=Adverbs; CJ=Conjunctions; DT=Determiners; N=Nouns; PR=Prepositions; R=Remainder; V=Verbs). The areas of the rectangles per register are proportional to the counts of Table 5. For each register, the figure thus illustrates the relative contribution of word class (width) and relation to metaphor (height) to the total of words.

Figure 5.2 shows how metaphor distribution in academic prose varies across word classes, as it does in each of the three other registers.

➢   Academic prose, as the other three registers, has relatively more MRWs in prepositions and verbs when compared to the total proportion of MRWs – and fewer MRWs in the remainder and conjunctions.

➢   In academic prose and the two other written registers, metaphors are distributed in a relatively similar way, while conversation shows more divergences, notably in the higher proportion of MRWs among determiners. From the perspective of academic prose, news is most similar, especially taking into account the smaller difference in total counts of MRWs.

➢   However, academic prose differs from news (and fiction) in nouns and adjectives: Both fiction and news have relatively low MRW proportions of nouns, while in academic prose MRW noun counts do not deviate much from the total count of MRWs. In adjectives, both news and fiction (and in conversation), have relatively high MRW proportions, but again within academic prose, the observed MRW adjective counts are close to the within-register total of MRWs.

➢   Academic prose and conversation share relative average proportions of MRWs among nouns (where fiction and news have relatively few MRWs). However, it needs to be taken into account that the proportion that MRW nouns contribute to the sample of conversation (8.3%) is much lower than that of MRW nouns in academic texts (17.6%).

The above findings will be interpreted in more detail with regard to the particular functions of word classes across registers as described by Biber et al. (1999) and in relation to the three most relevant dimensions of Biber's MD analysis (1988, 1989) in the conclusion section below. Before I will come to that, in the following section, I will first examine the eight component two-way interactions of the variables relation to metaphor and register. This enables direct comparison of the distribution of metaphor across the four registers, in each word class. As in the previous section, I will scrutinize standardized residuals to identify the cells contributing to the significant chi-square tests and relate them to the relative frequencies.

5.2.2 Step 2: Metaphor distribution across registers per word class. This step deals with the distribution of MRWs across registers in each distinct word class. Per word class (adjective, adverb, conjunction, determiner, noun, preposition, verb, and remainder), a separate two-way contingency table crossing the variables of Relation to metaphor (with the two categories MRW and non-MRW) with Register (with the four categories academic prose, news texts, fiction texts, and conversation) was constructed. Seven of the eight chi-square analyses showed significant associations between the two variables of relation to metaphor and register (all p's < .001), even

though effect sizes were mostly relatively small (min = .05; max = .21).[20] No cells had an expected frequency lower than 5.

Table 5.2 above shows that among all adjectives, 18.4% of the words are used metaphorically (for the standardized residuals for MRWs/non-MRWs across the four registers in each of the eight word classes, see Table A4 in the Appendix). However, the distribution of metaphor-related words differs considerably between the registers $\chi^2(3)$ = 51.621, p < .001; Cramer's V = .06). This analysis shows that adjectives in both news (21%) and fiction (19.4%) are much more likely to be used metaphorically, whereas in conversation (13.3%) they are less likely to be metaphorical. At the same time, the percentage of metaphor related adjectives in academic prose (17.6%) is close to the word class total of 18.4%.

Among adverbs, 9.1% of the words are used metaphorically, thus much fewer than among the adjectives. Again, the distribution of metaphor-related words differs considerably between the registers ($\chi^2(3)$ = 26.399, p < .001; Cramer's V = .05). As among adjectives, adverbs in news (11%) are more likely to be used metaphorically, whereas adverbs in conversation (7.5%) are less likely to be metaphorical. At the same time, the percentages of metaphor related adverbs in academic prose (10.1%) and fiction (9.3%) are close to the word class total of 9.1%.

Among conjunctions, 1.2% of the words are used metaphorically, much fewer than in most other word classes. For conjunctions, no difference in metaphor distribution across registers was found (N=10,364; $\chi^2(3)$ = 4,639, p < .200; Cramer's V = . 02, p < .20). The percentages of metaphor-related conjunctions in academic prose (1.4%), news (0.9%), fiction (1%), as well as conversation (1.5%) were close to the total of 1.2%.

Among determiners, 8.9% of the words are used metaphorically. Again, the distribution of metaphor-related words differs considerably between the registers ($\chi^2(3)$ = 309,684, p < .001; Cramer's V = .12). Determiners are more likely to be used metaphorically in conversation (15.6%), whereas they are less likely to be metaphorical in fiction (7.6%) and news (5.9%). At the same time, the percentage of MRW determiners in academic prose (8.1%)[21] is close to the total of 8.9%.

Among nouns, 13.3% of the words are used metaphorically. Again, the distribution of metaphor-related words differs considerably between the registers ($\chi^2(3)$ = 398,794, p < .001; Cramer's V = .10). Nouns are more likely to be used metaphorically in academic prose (17.6%), whereas they are less likely to be

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[20] A reason for this may probably be the smaller sample sizes under examination. Since my main aim in this analysis is to explore any possible pattern, also interactions with small effect sizes are relevant.
[21] Although the percentage of metaphor-related determiners in academic prose and fiction is relatively close to the total of 8.9%, the standard deviation of fiction is significant, while that of academic prose is not (see Table A4 of the Appendix).

metaphorical in fiction (10.5%) and conversation (8.3%). At the same time, the percentage of MRW nouns in news (13.2%) is close to the total of 13.3%.

Among prepositions, 38% of the words are used metaphorically, which is the highest proportion of all word classes. Again, the distribution of metaphor-related words differs considerably between the registers ($\chi^2(3) = 113,769$, $p < .001$; Cramer's $V = .08$). Prepositions are more likely to be used metaphorically in academic prose (42.5%), whereas they are less likely to be metaphorical in fiction (33.4%) and conversation (33.8%). At the same time, the percentage of MRW prepositions in news (38.1%) is close to the total of 38%.

Among verbs, 18.7% of the words are used metaphorically, which is similar to adjectives. Again, the distribution of metaphor-related words differs considerably between the verbs ($\chi^2(3) = 1626,797$, $p < .001$; Cramer's $V = .21$). Unlike adjectives, verbs are more likely to be used metaphorically in academic prose (27.7%), as well as news (27.6%), whereas they are less likely to be metaphorical in fiction (15.9%) and conversation (9.1%). Especially the percentage of MRWs in conversation is far below the total of 18.7%.

Finally, among the remainder, 1.1% of the words are used metaphorically, which is the lowest proportion of all word classes (together with conjunctions). But in contrast to conjunctions, the distribution of metaphor-related words differs considerably between the registers ($\chi^2(3) = 296,950$, $p < .001$; Cramer's $V = .10$). Instances of the remainder are more likely to be used metaphorically in academic prose (2.6%) and news (2.5%), whereas they are less likely to be metaphorical in conversation (0.2%). At the same time, the percentage of MRW instances of the remainder in fiction (0.9%) is close to the total of 1.1%.

Figure 5.3 shows the relative contribution of each register to the total of words within the word classes and the relative distribution of metaphors and non-metaphors within each register.

Metaphor distribution varies across word classes in each of the four registers.

➢ Among prepositions and nouns, academic prose is the only register to exhibit a relatively high proportion of MRWs. In both word classes, the other registers have a proportion close to the total of MRWs per word class (news) or relatively low proportions (fiction and conversation). The most important difference between prepositions and nouns is however that MRWs proportions are much lower among nouns.

➢ Among verbs and the remainder, academic prose and the other informational register news both use relatively many metaphor-related words. By contrast, fiction and conversation use relatively fewer MRWs. The most important difference between verbs and the remainder at this level of analysis is however that MRWs proportions are very much lower among the remainder.
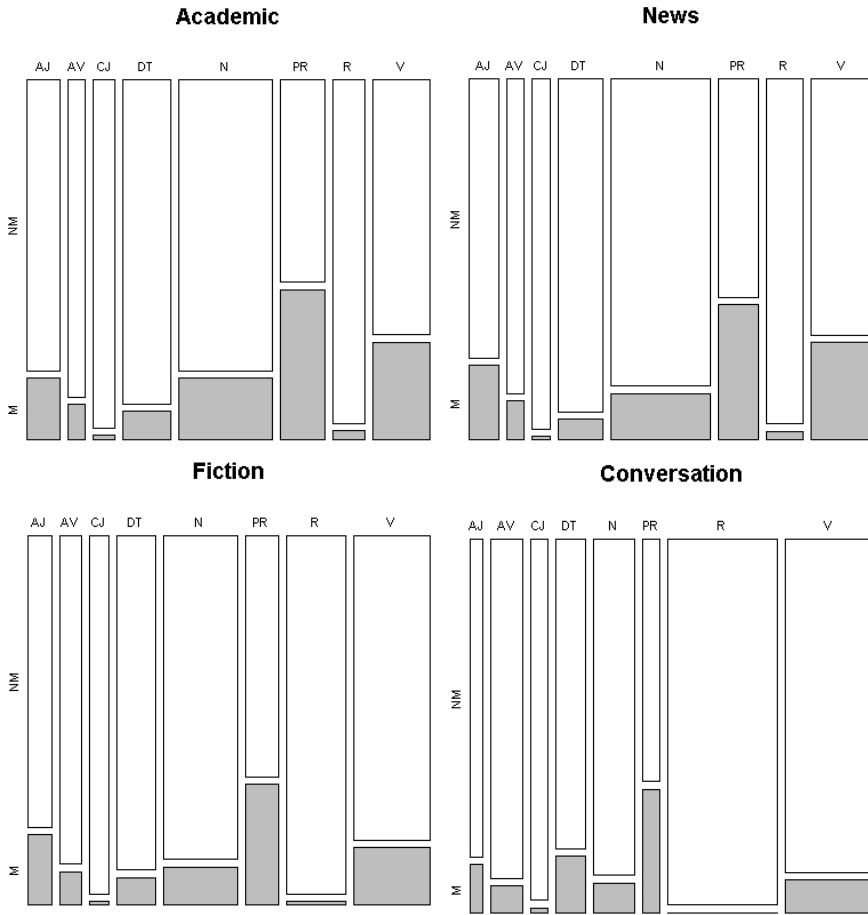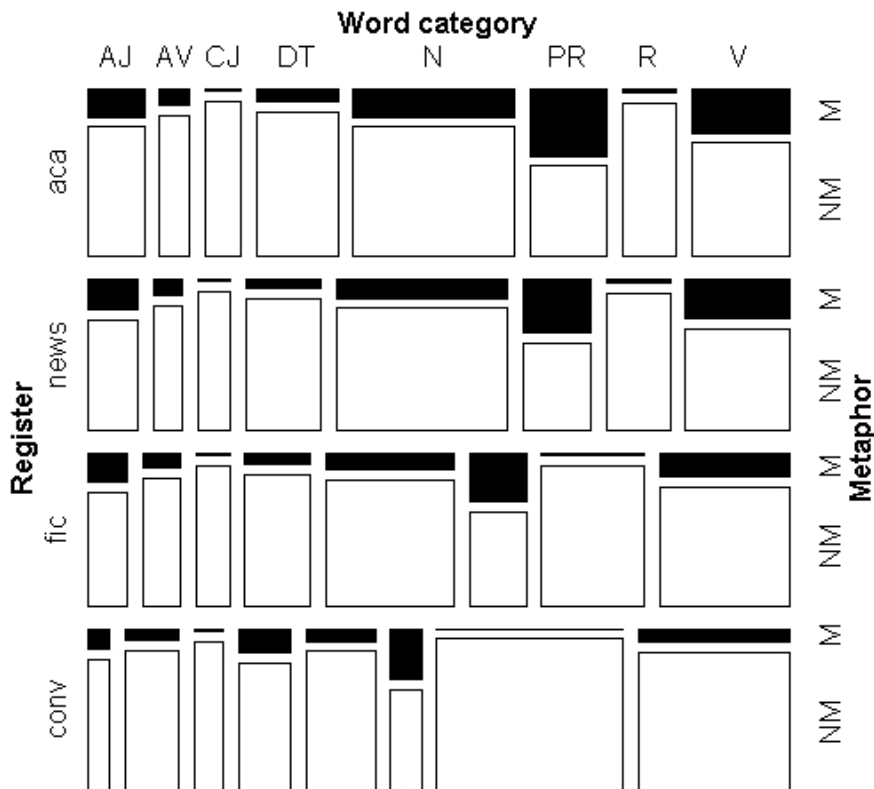
Figure 5.3. Distribution of MRWs/non-MRWs across registers, per word class. (M = MRW; NM = Non-MRW. AJ=Adjectives; AV=Adverbs; CJ=Conjunctions; DT=Determiners; N=Nouns; PR=Prepositions; R=Remainder; V=Verbs). The areas of the rectangles per register are proportional to the counts of Table 5, with width corresponding with number of lexical units per word class and height corresponding with number of MRWs /non-MRWs per register. The figure thus illustrates the three-way interaction between word class, register, and relation to metaphor.

➢ In adjectives and adverbs, academic prose shows MRW counts that vary insignificantly from the total counts of MRWs per word class. This is similar in fiction. Both word classes however show relatively higher MRW proportions in news, and relatively fewer in conversation. As far as academic prose is concerned, the observed difference between the two word classes is that adverbs comprise fewer MRWs than the adjectives. In determiners, the proportion of MRWs in academic prose again varies insignificantly from the total count of MRWs in the word class, much as in adjectives and adverbs. In opposition to these word classes, however, news and fiction have relatively lower proportions of MRW determiners, whereas conversation has a relatively higher proportion.

➢   Lastly, in conjunctions, very few MRWs are observed overall, and these are evenly distributed across all four registers. There is no association between register and metaphor in this word class.

In this analysis, academic prose is the only register to exhibit no proportion of MRWs that is significantly below the respective total count of MRWs in any of the word classes. This indicates a relatively stable proportion of metaphor-related words across all word classes in this register in direct cross-variety comparison. Academic prose is most clearly opposed to conversation, which shows a relatively higher proportion of MRWs just once (in determiners) and furthermore has relatively small frequencies of MRWs in all other word classes. News is most similar to academic prose, and fiction in between.

This cross-register distribution of metaphor is quite similar to the respective positions of academic prose and conversation on the extremes of the first dimension proposed by Biber's (1988, 1989) MD analysis, indicating involved and informational production, with news close to academic prose and fiction occupying a position in between the extremes. There is thus reason to interpret findings in terms of the first dimension, exploring metaphor use as one of the lexico-grammatical indicating either involved or informational production: Involved production, with its predominantly communicative purpose of personal interaction (conversation and the fictional conversations of novels), may rely much less on metaphor than informational production, with its general purposes of information, argumentation, and explanation (academic prose) and information and evaluation (news). The details of this possible association between frequent metaphor use and informational production will be explored in the following.

5.2.3 Discussion. The hierarchical log-linear tests confirmed that there is a three-way interaction between the variables register (academic prose, news, fiction and conversation), word class (adjectives, adverbs, determiners, nouns, prepositions, verbs, the remainder and conjunctions), and relation to metaphor (non-metaphor-related, metaphor-related word use). Breaking down this effect by analysis of two sets of component two-way interactions revealed relations between a) word class and metaphor *per register* and b) register and metaphor *per word class*. The next step in the present chapter is to merge the two sets of results to produce a full picture of metaphor use across word classes in academic prose, as compared to news, fiction, and conversation.

The first step (the analysis per individual register) showed a general distributional pattern of MRWs across word classes which is relatively constant across registers, with prepositions and verbs having the highest relative proportion of MRWs of all word classes in that order, while the remainder and conjunctions are virtually non-metaphorical. However, since there is a three-way interaction, four word classes diverge from the general pattern to different extents – nouns (both

fiction and news have relatively low MRW proportions of nouns, while in academic prose and conversation MRW counts are close to the within-register total of MRWs), adjectives (news, fiction, and conversation have relatively high MRW proportions, but in academic prose counts are close to the within-register total of MRWs), adverbs, and especially determiners (academic prose and the two other written registers have relatively low proportions, while conversation has a much higher proportion of MRWs). Step 1 thus suggested that in all registers, metaphor is comparatively strong in prepositions and verbs, and absent from conjunctions and the remainder, but that registers differ more in their proportionate use of MRW nouns, adjectives, adverbs and determiners.

The second step zoomed in on metaphor distribution across registers in each of the eight word classes and highlighted divergences in the relative proportions of MRWs across registers per word class. The general pattern was that academic prose was followed by (or identical with) news in terms of MRW frequency, but opposed to conversation (and, somewhat less pronouncedly, fiction). This pattern was found in prepositions and nouns, as well as in verbs and the remainder. However, since there is a three-way interaction, there were deviations from this general pattern – these occurred in adjectives and adverbs (in both of which MRW counts in academic prose and in fiction vary insignificantly from the total counts of MRWs per word class while news has a higher proportion), in determiners (where the proportion of MRWs varies insignificantly from the total count of MRWs per word class in academic prose, whereas news and fiction have relatively lower proportions of MRW determiners, and conversation has a relatively higher proportion), and in conjunctions, where all registers had similar proportions. Step 2 thus suggested that MRW use follows a clear cross-register pattern in four word classes (prepositions, nouns, verbs, and the remainder), but that the same clear pattern may not be found in adjectives, adverbs, determiners, and conjunctions.

In this analysis, academic prose is the only register to exhibit no proportion of MRWs that is significantly below the respective total count of MRWs in any of the word classes. This indicates a relatively stable proportion of metaphor-related words across all word classes in this register in direct cross-variety comparison. Academic prose is most clearly opposed to conversation, which shows a relatively higher proportion of MRWs just once (in determiners) and furthermore has relatively small frequencies of MRWs in all other word classes. News is most similar to academic prose, and fiction in between.

In the following discussion, both distributional patterns will be merged. For each word class, findings from the within-register comparisons will be mentioned first and then combined with findings from the respective cross-register comparison. Throughout I will refer to findings from Biber's MD analysis, specifically to Dimension 1, *involved* versus *informational production*. At selected points reference

will also be made to Dimension 3, *explicit* versus *situation-dependent reference*, and Dimension 5, *abstract* versus *non-abstract information.*

Prepositions. In the four within-register comparisons, prepositions are the most important word class in terms of MRW distribution. At least one third of all prepositions is related to metaphor in each register. The cross-register comparison of metaphor use for this word class, however, reveals some differences: Academic prose is the register that has the highest proportion of MRW prepositions, whereas news shows a proportion close to the total count of MRWs of prepositions, and conversations and fiction have relatively fewer MRWs. In the academic register, metaphor-related prepositions are thus quantitatively more important than metaphor-related use of other word classes and than metaphor-related use of prepositions in other registers.

The relatively high proportion of metaphor-related prepositions across the four registers can be explained with reference to prepositions not being used in their basic, spatial sense, but in abstract, metaphorical senses. An example is temporal use (*into this second half* from a sports broadcast – an extract from a soccer match, see Biber, 1988, p. 146) or as heads of other kinds of adverbials in non-spatial use (*on the grounds*, see example (1) below). As academic prose has a highly integrated and densely packed information structure which promotes the use of prepositions (cf. Biber, 1988, p.104), and since that information is typically more abstract than elsewhere (cf. Biber, 1988, p.112-3), metaphorical use of prepositions may be even more pronounced than in the other registers, serving "to integrate high amounts of information into a text" (1988, p. 104). For example, sentence (1) contains five metaphor-related prepositions:

(1) This view, as we shall see, has been attacked <u>on</u> the grounds that it rests <u>on</u> the false assumption that the distinction <u>between</u> adults and children is identical <u>with</u> the distinction <u>between</u> rational and non-rational beings. (ECV-fragment05, emphasis mine, JBH)

All five metaphorical uses of prepositions are non-spatial and highly conventional, with the contextual meanings being described in contemporary usage-based dictionaries such as Macmillan (Rundell, 2002).

As far as Biber's MD analysis is concerned, the observed pattern diverges slightly from what could be expected on the basis of what Biber found about the first dimension (involved versus informational production). Here, *both academic prose and news* are situated at the informational end of the scale, with high overall frequencies of prepositions. The fact that news has a somewhat lower proportion of metaphor-related prepositions than academic prose may be related to a higher number of non-metaphorical use of prepositions in news to indicate spatial positions,

directions and relations. Since metaphorical use of prepositions conveys meanings of prepositions that are abstract, the finding may also be connected to Dimension 5. On this scale, news genres show intermediate values, "due to the twin purposes of these genres: reportage of events involving concrete […] referents; and abstract discussion of the implications of those events in conceptual terms" (1988, p. 154), whereas academic prose is at the abstract extreme: as an "informational discourse that is abstract, technical, and formal" (1988, pp. 112).

Verbs. In the within-register comparisons, metaphorical verbs are overrepresented in every register when compared to other word classes. The cross-register comparison shows that academic and news texts both have relatively high numbers of metaphor-related verbs, while fiction and especially conversation have relatively lower ones. In the academic register (and in news) metaphor-related verbs are thus quantitatively more important than other word classes (except prepositions) within the academic register; metaphor-related verbs are also more quantitatively important in academic prose than in fiction and conversation.

The substantially higher proportion of MRW verbs in academic prose as an informational register is surprising, since verbs are overall less common here in comparison with fiction and especially conversation. The higher frequency of metaphor seems to be related to the abstract use of verbs in contexts other than bodily-related and concrete ones. For example, consider the underlined verbs in fragments (2) and (3):

(2) This view, as we shall see, has been attacked on the grounds that it rests on the false assumption that the distinction between adults and children is identical with the distinction between rational and non-rational beings. (ECV-fragment05, emphasis mine, JBH)

(3) If we agree that in that case women should be embraced by the liberty principle then so should children. (ECV-fragment05, emphasis mine, JBH)

Four of the five highlighted examples of metaphor-related verb use in (2) and (3) are lexical verbs (*see, attack, rest, embrace*); the modal verb *should* is an implicit metaphor. The first four examples all fall into the category indirect metaphor, where a contrast between the contextual sense in academic prose and a more basic, typically concrete or bodily-related sense in some other context, can be observed. By contrast, implicit metaphor depends on lexical cohesion in discourse and makes a connection with the metaphoricity of the previously used lexical item *embraced* by means of co-referential use of the modal verb. Four observations can be made about the lexical verbs: Firstly, all four lexical verbs have contextual senses that have to do with abstract argumentation and understanding. Secondly, all these metaphorical senses are conventional, as documented by sense descriptions in usage-based

dictionaries such as Macmillan and Longman. Thirdly, as far as basic senses are concerned, s*ee* has a basic sense that has to do with perception, *attack* is a (physical) activity verb, *rest* a verb of (concrete) existence and relationship, and *embrace* a (physical) activity verb (see Biber et al., 1999, pp. 361, for a semantic taxonomy of verbs). Lastly, *embrace* is used with an inanimate subject, which means that it is related to metaphor also because of a violation of a selection-restriction criterion that requires animate agents in subject position for that particular verb. Together with the use of the passive voice, it appears to fulfill an argumentative function, highlighting agency of the abstract *liberty principle*. The four observations together suggest that indirect, abstract, conventional metaphorical language use in verbs in academic prose draws on concrete and bodily-related basic senses of activity verbs to fulfill typical informational tasks.

At first glance, the distribution of metaphor-related verbs across registers seems to contradict the picture drawn by the first dimension of Biber's MD analysis, with conversation at the involved end and news and academic prose at the informational end of the scale, and fiction in between. However, the quantitative results showing a relative overuse of MRW verbs in the informational registers suggest that typical informational production is associated with a comparatively frequent use of verbs – when these are metaphor-related. Since the involved register conversation – and fiction (with its mixture of narrative and conversation passages) – have relatively lower proportions of MRW verbs, it may be suggested that verbs actually play some role in creating the "high informational density and exact informational content" (Biber, 1988, p. 107) that academic prose is known for – but again, only when related to metaphor. In verbs, metaphor-related lexical items show a pattern that reverses the typical ordering of registers on Biber's first dimension: A high frequency of non-MRW verbs belongs at the involved end, but a high frequency of MRW verbs belongs at the informational end.

Conjunctions and remainder. The two categories conjunctions and remainder are the word classes that have the lowest frequencies of metaphor in all four registers. In cross-register comparison of metaphor-related words among conjunctions, academic prose shows a percentage that is not significantly different from the total percentage of MRWs conjunctions. All other registers have similar proportions of conjunctions in relation to metaphor, which means that there is no significant variation in cross-register comparison. Conjunctions are thus not an important word class when it comes to their relation to metaphor in the academic register. This may be seen as a reflection of their predominantly grammatical functions. Conjunctions such as *and*, *but, which,* and *thus* simply have no basic sense that allows for a metaphorical comparison in contemporary English.

(4) It was argued in Chapter 2 that the criminal law ought to spread its net wider _where_ the potential harm is greater. (ACJ-fragment01, emphasis mine, JBH)

(5) She didn't say _where_ she works. (Macmillan, entry _where,_ emphasis mine, JBH)

In the case of _where_ it is easy to identify metaphorical word use in conjunctive use, such as in (4). In (4) and (5) we are dealing with a metaphorically used subordinating conjunction (tagged as conjunction by BNC) that connects two clauses. While usage in (5) is relatively clearly non-metaphor-related, in (4) metaphorical use is clear. In other cases, such as (6) it appears relatively hard to determine word class membership, but not metaphoricity:

(6) […] the number of examples _where_ the analysis has been pursued this far are limited. (AMM-fragment02, emphasis mine, JBH)

BNC assigned the hybrid tag "adverb-conjunction" to _where_ in (6), although it should be a relative adverb (_wh_-element). The metaphor-related use of _where_ (6) becomes clear in the context of spatial location such as in (7):

(7) All were spontaneous outbursts: none, contrary to some claims, were politically inspired or orchestrated (except in Northern Ireland _where_ urban problems existed on a grander, more devastating scale, and _where_ there was a unique heritage). (AS6-fragment01, emphasis mine, JBH)

In (7), the BNC tagged _where_ correctly as a relative adverb.[22]

In the _VU_ Amsterdam Metaphor Corpus, _where_ was identified as a potential metaphor across all affected word classes (conjunctions, interrogative and relative adverbs). The reason for this is that _where_ can be used metaphorically even as a conjunction, since a clear contrast between contextual and more basic sense may be identified _within that word class_. There are very few conjunctions that have a clear basic meaning, and _where_ is clearly the most frequent of these in our corpus.

Despite the low observed frequencies, the remainder category exhibits significant variation across the four registers: Academic prose shows a relatively high proportion of metaphors, as does news, while conversation has relatively fewer metaphors, and fiction is close to the total count of MRW instances of the

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[22] The tag assigned by BNC is "AVQ", a _wh_-adverb. The BNC User reference Guide explains: _"Where_ is like _when_ in that it can be a _wh_- adverb (AVQ) or a subordinating conjunction (CJS). However, with _where_ the CJS tag is much less likely." (Burnard, 2007, January).

remainder. In academic prose, the remainder may thus not be an important metaphor-related word class in direct comparison with other word classes, but in comparison with the other registers, it becomes clear that metaphorically used instances of the remainder do play a role in academic prose that is absent from fiction and conversation. This can be accounted for with reference to the notion of implicit metaphor, as we will now see.

Some of the smaller categories comprised by the remainder, such as pronouns and numerals (e.g., *one*) can be related to metaphor by implicit metaphor. This type of relation to metaphor depends on lexical cohesion in discourse and makes a connection with the metaphoricity of previously used lexical items in the text by means of co-referential use of pronouns and ellipsis. Fragments (8) and (9) provide examples of metaphorical use of pronouns. The pronoun *one* in (8) is related to metaphor by co-referential cohesion with the preceding metaphor-related noun *glimpse*; in (9), the personal pronoun *its* refers back to the noun phrase headed by the MRW *picture*.

(8) We can use the methods described above to elucidate some of these occupations, and get a <u>glimpse</u>, albeit an imperfect <u>one</u>, of the trilobite as it lived. (AMM-fragment02, emphasis mine, JBH)

(9) The <u>picture</u> painted by the Commission's report on inner London is as gruesome as any ever presented (and is itself revealing of common prejudices in <u>its</u> choice of indicators of deprivation). (AS6-fragment01, emphasis mine, JBH)

In (8), the use of *one* seems motivated by rhetorical purposes to give additional information on the nature of *glimpse* by means of an elliptic parenthetical element (cf. Biber et al., 1999, p. 137). Another kind of parenthetical element can be found in sentence (9), where the personal pronoun *its* embedded in the parenthesis co-refers to the metaphorically used antecedent *picture*. In both (8) and (9), pronouns are thus used for establishing endophoric reference within the same sentence. This may also entail that their reference is explicit – in opposition to many pro-forms in conversation, which "stand for unspecified nominal referents" (1999, p. 106) and which are as a rule specified through situation-dependent reference. While at this point it cannot be determined whether the given examples are really typical of academic prose, it may be hypothesized that co-reference-relations between metaphor-related nouns and pronouns (implicit metaphoricity) may be one tool for the establishment of explicit reference and coherence in academic prose and some sub-registers of news (e.g., press reviews). With regard to Biber's MD analysis, the proportions of metaphors observed among the remainder may thus be tentatively related to the third dimension (explicit versus situation-dependent reference), with academic prose at the explicit extreme and conversation at the situation-dependent

extreme, with fiction in-between. This interpretation will be followed up in the next chapter.

Adjectives. In the within-register comparisons, news, fiction, and conversations all show relatively high proportions of metaphor-related adjectives. In academic prose, however, the proportion of metaphor-related adjectives is close to the register total of MRWs. In the cross-register comparison of metaphors among adjectives, academic texts (together with fiction) display a proportion close to the total count of MRWs, while news uses relatively more metaphor-related adjectives, and conversation fewer. In the academic register, metaphor-related adjectives are thus quantitatively less important than metaphor-related prepositions and metaphor-related verbs when looking at word classes within the register by itself, and academic prose makes comparatively less use of metaphorically used adjectives than the other three registers.

Sentence (10) shows two instances of metaphor-related adjectives, both highly conventional ones.

(10) It was argued in Chapter 2 that the criminal law ought to spread its net wider where the potential harm is greater. (ACJ-fragment01, emphasis mine, JBH)

The contextual senses of *wide* and *great* in (10) are used for the description of abstract relations and extent, while their basic senses are descriptions of concrete extent and amount. The fact that they are both highly conventional may be typical of metaphor-related adjectives in academic prose: A relatively conventional repertoire of metaphor-related adjective types may be responsible for many instances of metaphor among the adjectives of academic prose, probably used to denote abstract size, extent, and quantity. Meanwhile, most adjectives in academic prose seem to have unequivocal non-metaphorical meanings (e.g., *electric, statistical, political*). The higher proportions of metaphor-related adjectives in news and fiction may be explained by communicative purpose: News transmits information, but also evaluation (see Biber et al., 1999, p.16), which may mean that metaphorical adjectives are used for evaluative purposes, as well as for aesthetic and attention-getting reasons (e.g., in news headlines); fiction may use metaphorical adjectives such as *bright, fair, narrow* for aesthetic and entertaining purposes to "evoke an atmosphere as well as to give a physical description" (Biber et al., 1999, p. 66). And, finally, conversation – and probably fictional conversation – may use metaphorical adjectives for aspects of involved communication (for example conventionally metaphorical emphatic adjectives such as *old*, *bloody*). By contrast, academic texts seem to use metaphor-related adjectives largely for informational purposes.

As far as the MD analysis is concerned, in adjectives, the cross-register pattern deviates slightly from what could be expected for adjectives on the basis of the first dimension, where news and academic prose both stood at the informational end of the scale. Biber's original analysis showed that adjectives are typical of both informational registers, used to "further elaborate nominal information […], since they pack information in relatively few words and structures" (1988, p. 105). The typical adjective in academic prose appears to be not related to metaphor.

Nouns. The within-register comparison shows that the proportion of metaphor-related nouns is close to the proportion of the total of metaphor-related words of academic prose. This is similar to what can be observed in conversation, while fiction and news have relatively fewer metaphor-related nouns than the respective proportions for their totals. In the cross-register comparison, however, academic prose has relatively more metaphor-related nouns, while conversation and fiction have relatively fewer, and news shows a proportion close to the total count. Thus, although the proportion of MRW nouns in within-register comparison is not among the relatively high ones within academic prose, cross-register comparison shows that academic prose uses many more metaphor-related nouns than the other registers, including news. When related to Biber's first dimension, news deviates from what could be predicted, since it uses fewer metaphor-related nouns than academic prose, but academic prose behaves as predicted.

This finding may be explained by the fact that academic prose exhibits more abstract nouns than the other registers, including news (see Biber, 1988, pp. 111-2; Biber et al., 1999) and that abstract nouns may often be metaphorical. This is Dimension 5. Metaphor-related nouns in academic prose seem to establish reference with abstract and often technical referents specified in the discourse (e.g., electrical *current*, *basis, structure*) and structure the discourse by means of frequent nominalizations (e.g., *attack, defense*), but also build up argumentation and make it persuasive (e.g., *attack, defense, view, point of view, antidote, asset*). As a rule, metaphorical use of nouns in academic prose may thus be highly conventional, with contextual meanings being described in contemporary usage-based dictionaries such as Macmillan (Rundell, 2002), or, depending on the referent, in more technical dictionaries by discipline. By contrast, nouns in non-metaphorical usage seem to be used most often in conversations, which are often concerned with concrete objects and persons (see Biber, 1988, pp. 151-4; also Biber et al., 1999, p. 266), as well as in fiction, which often describes persons and situations by means of establishing concrete (yet fictional) reference, but also in news, which reports all kinds of facts of the world, including concrete places, institutions, objects, and persons. In his discussion of Dimension 5 of the MD analysis (abstract versus non-abstract information), Biber states that the patient of a verb in abstract and technical discourse is "typically a non-animate referent and is often an abstract concept rather

than a concrete referent" (1988, p. 112). A high frequency of metaphor-related nouns may thus be indicative of Dimension 5.

Adverbs. In terms of the within-register comparison, adverbs have relatively fewer metaphor-related instances than many other word classes in academic prose. The same is true for adverbs in news and fiction, but conversation has a relatively high proportion of metaphor-related adverbs. The cross-register comparison shows that the number of metaphor-related adverbs in academic prose (as in fiction) is close to the total count of MRW adverbs, whereas it is higher in news, but much lower in conversation. Adverbs are thus among the quantitatively less important word classes for academic prose when it comes to metaphor.

The relatively unimportant proportion of metaphor in academic prose may be explained by the fact that many of the adverbs that are frequently used in academic prose, such as *more, only, quite, significantly, statistically,* and *very* (Biber et al., 1999, pp. 561-2), are not likely to be related to metaphor. One possibly frequent type of metaphorical adverb use in academic prose are place adverbs, which in metaphorical use denote intra-textual and intra-discursive reference (*here, above, below*). Other types may be adverbs of manner with a clearly human-related basic sense but with an inanimate entity in subject position of the clause (*intelligently*). Yet others may be degree adverbs (*lightly*) and stance adverbs (*heavily*) with concrete basic senses. As a rule, metaphorical adverbs in academic prose have conventional meanings, with the contextual meanings being described in contemporary usage-based dictionaries such as Macmillan.

With regard to place adverbs, metaphor studies have pointed out the existence of *discourse is space* –mappings, with spatial adverbs establishing discursive (co-)reference. For example, Fleischman (1991) argues that academic prose uses spatial adverbs such as *here, above,* and *below* "to orient addressees" within the discourse (1991, p. 305). This kind of metaphorical use of adverbs in academic prose may be tentatively related to the situation-dependent end of Biber's (1988, 1989) third dimension (explicit versus situation–dependent reference), where they "can be used for text-internal referents, but are much more commonly used for reference to places and times outside of the text itself" (Biber, 1988, p. 110). According to Biber, this kind of reference "crucially depend[s] on referential inferences by the addressee" (Biber, 1988, p. 110), but distinguishes here the *text-internal* referencing, which might be particularly common in academic prose, from the *text-external* referencing:

> [F]or text internal references (e.g., *see above; discussed later*) the addressee must infer where and when in the text *above* and *later* refer to, in the much more common text-external references, the addressee must identify the intended place and time referents in the actual physical context of the discourse. (Biber, 1988, p.110; emphasis mine, JBH)

On Dimension 3, metaphor-related situational adverbs such as *here, there,* and *below* thus appear among the features indicating situation-dependent reference. The frequent use of (metaphorical) place adverbs appears to contradict the generally explicit and highly elaborated reference of academic prose. Interestingly, a comment in Biber's (1988) discussion of Dimension 1 addresses this problem and subsumes *place adverbials* among the features that frequently occur together with the "typical" linguistic features of informational production:

> The co-occurrence of place adverbials with these other features [nouns, word length, prepositional phrases, etc., JBH] is surprising, but might be due to text internal deixis in highly informative texts (e.g., *It is shown here; It was shown above*). (Biber, 1988, p. 105)

We will return to the details of this issue in Chapter 6. As far as the MD analysis is concerned, the cross-register pattern of metaphor-related adverbs is overall relatively close to what could be expected for adverbs on the basis of the first dimension, where academic prose stood at the informational end of the scale. However, as pointed out in Biber's original discussion, place adverbs appear to play a special role, which may be related to their indication of the situation-dependent end of the third dimension.

Determiners. In the within-register comparison, the proportion of metaphor-related determiners is relatively low. The pattern is similar in news and fiction, but not in conversation, where determiners have a proportion of metaphor-related words that is relatively high. In the cross-register comparison*,* academic prose however shows a distribution of metaphor-related determiners that is close to the proportion in the total count, as compared to relatively lower proportions in both news and fiction, and a relatively higher proportion in conversation. In comparison with news, metaphor-related determiners hence play a more important role in academic prose. The pattern observed for metaphor-related determiners does thus not comply with the "typical order" of registers (with news and academic prose on one end, conversation at the other end, and fiction in between). In fact, in occupying a middle position, academic prose here is closer to conversation (which here occupies the positive extreme) than to news (which occupies the negative extreme, together with fiction).

(11) Henceforth <u>this</u> system provided the framework for his preoccupation with the problems of the extinction and origin of species. (BNC-CMA, ACA, emphasis mine, JBH)

(12) Children have served philosophy very well. <u>That</u> is the first thing which anyone surveying the literature would notice. (ECV-fragment05, emphasis mine, JBH)

In example (11), the demonstrative determiner *this* is related to metaphor since its basic meaning refers to spatial indicating, which is absent from the current context. It refers anaphorically to a particular system of thought discussed in the preceding sentence. In example (12), the demonstrative pronoun *that* establishes co-reference with the whole preceding proposition, it is metaphor-related because of its spatial basic meaning. All four demonstratives (*this, that, these, those*) have highly conventional metaphorical meanings, which are documented by usage-based dictionaries.

The function of demonstrative determiners and demonstrative pronouns appears to be the establishing of cohesion, as suggested by Biber in his examination of the features marking unplanned informational discourse: "It can only be suggested here that cohesion […] relies heavily on demonstratives" (1988, p. 114). Here, our findings about the relatively frequent MRWs among demonstrative determiners and pronouns in academic prose and conversation may support Biber's suggestion, especially regarding that both registers occupy a middle position on Biber's Dimension 6 (On-line Elaboration), while fiction and news, occupy low positions (cf. Biber, 1988, p. 155), which may be explained by their different informational structure (Biber, 1988, pp. 142-148). Metaphor-related demonstrative determiners and pronouns may thus be used in academic prose and conversation for relative similar purposes, establishing reference and guaranteeing coherence through the discourse. However, by contrast with the situational and unplanned discourse of conversations which appears to use many MRW demonstratives in "additional dependent clauses" (Biber 1988, p. 113), the densely integrated and exact prose of academic texts appears to need overall fewer metaphor-related use of demonstratives to guarantee for its mainly text-internal cohesion (Biber points out that in his study it is an open question whether reference is established text-internally or text-internally; cf. Biber, 1988, p. 114). Yet the number of MRW demonstratives is much higher in academic prose than in fiction and news, with their overall less integrated and precise informational structure (Biber, 1988, pp. 142-148). The middle position of academic prose can hence be explained with (MRW) demonstratives allowing establishing precise text-internal (co-)reference.

5.2.4 Conclusion analysis 1. This analysis of the three-way interaction has revealed that metaphorical language is not distributed equally across word classes and registers. The distribution of metaphors across registers seems by and large a reflection of functional characteristics of the registers, with the transmission of information, the establishing of explicit reference and the abstractness of

information being typical not only of academic prose in general, but seemingly also of its metaphors. The main pattern observed is that metaphor distribution across the register academic prose seems overall most similar to that of news, while most dissimilar to conversation, and slightly less dissimilar with fiction. This observation is based on the overall relative frequencies of metaphor-related words vs. non-metaphor-related words across all registers and word classes, but can also be inferred from many of the particular word classes, albeit to varying extents.

An important finding is that academic prose shows not only the highest relative proportion of metaphor averaged across registers and word classes, but that it also leads the rank order in cross-register comparison among prepositions, verbs, nouns and the remainder. Even though frequent use of verbs and remainder have been shown to indicate involved production, metaphor-related word use in all four word classes may be particularly associated with the informational end of the scale on Dimension 1: Metaphorical use of these word classes seems to play a particular role in catering to the needs of informational and argumentative production, among which seem to be the packaging of informational units (prepositions), the linking of clauses and phrases and the assignment of agency to inanimate referents (verbs), the establishing of reference to abstract concepts and the building up of argumentation (nouns), and the establishing of precise coherence relations in the text (possibly performed by pro-forms comprised by the remainder and demonstratives determiners and pronouns). That verbs and the remainder (pronouns) feature among the word classes that fulfill informational functions in metaphorical use is an interesting complication and probably among the most remarkable findings of this study.

Meanwhile, the role of metaphor-related adjectives, adverbs, and determiners cannot be related as directly to a position of academic prose at the informational extreme of this scale, with academic prose having proportions that are throughout lower than in other registers. There seem to be word-class-specific reasons. The role of metaphor-related adjectives in academic prose may be explained by the fact that many of these have unequivocal non-metaphorical meanings (*electric, statistical, political*). In academic prose, metaphor-related adjectives seem thus restricted to a relatively small range of adjectives to indicate abstract extent, quantity and number (*high, low* etc.). By contrast, news and fiction may use a wider range of metaphor-related adjectives (e.g., *bright, fair, narrow*), and have other communicative purposes, such as aesthetic pleasure or attention-getting (e.g. in news headlines). With regard to adverbs, a wide variety of technical and/or precise non-metaphorical adverbs (e.g., *significantly, statistically*, *only*) may be responsible for the slightly lower frequency in academic prose than in news. As for determiners, academic prose uses a slightly higher number of metaphor-related instances of *this, that, these,* and *those* than the other written registers, for the specification of referents and the establishing of (co-)reference. This proportion is however lower than that of

conversation, which may use the same words for slightly different purposes and with vaguer meanings than academic prose.

On another of Biber's dimensions, Dimension 3, where academic prose and particular sub-registers of news (e.g., press reviews) are situated toward the explicit reference end, while conversation is situated towards the situation-dependent extreme, and fiction again in-between, metaphor may play some role among adverbs of place. Adverbs of place may be used in academic prose often to establish situation-dependent, but intra-textual reference, while non-metaphor-related adverbs of place may be used for the establishing of situation-dependent, but extra-textual reference more often in conversation, fiction, and news (in that hypothetical order). This observation may be explained on the conceptual level by academic discourse needing to create some basis for rooting and organizing its abstract content. By contrast, two word classes where higher proportions of metaphor-related word use may be linked with a position on the explicit end of the third dimension are the remainder and determiners. In the remainder, metaphor-related instances such as pronouns may establish explicit co-reference with metaphorical antecedents in the academic text; among determiners, text-internal, explicit, reference may be established mostly by means of demonstrative determiners and pronouns that specify referents and establish precise links of reference across the highly integrated discourse.

Lastly, metaphor may also play a role on Dimension 5, where academic prose again is situated at one extreme, abstract information, while sub-registers of news range slightly above the mid-point of the scale (towards abstract information), and conversation and fiction are both located at the non-abstract end. Although the only parameter that could be directly tested for abstract production in the current analysis was the use of conjunctions in general (see preliminary analysis), it may be suggested that academic texts may use metaphor for dealing with "conceptual and abstract" (Biber 1988, p. 153) topics, specifically among nouns.

In sum, the analysis suggests that academic prose is overall in greater need of metaphorical word use to express its abstract, precise, and densely packed content than the other registers, especially in comparison with spoken (and fictional) conversation, which has more interactional than transactional features. Quantitative differences in metaphor use between academic prose and the other informational register, news, were found among four word classes with academic prose showing higher relative frequencies among nouns, prepositions and determiners, but lower ones among the adjectives. These differences may be explained by the generally less abstract and less technical content of news (more nouns referring to concrete entities, prepositions indicating spatial relations, less adjectives used in monosemous technical non-metaphorical meanings), and possibly a slightly less integrated and less explicit informational structure of news (fewer prepositions used for information packaging, fewer determiners used to specify and establish reference).

5.3 Analysis 2: Further Explorations

5.3.1 Register and metaphor type: Direct, indirect, and implicit metaphor. In this section I will explore the distribution of three main types of relation to metaphor across the four registers: indirect, direct, and implicit metaphor. While all three types of metaphor are based on the assumption of a potential cross-domain mapping between a contextual and a more basic domain, there are crucial difference in terms of (in)directness and implicitness of word use. Indirect metaphor is the prototypical type of metaphor with a word used indirectly to convey a meaning that is potentially related to some form of cross-domain mapping from a more basic meaning of that word (e.g., *Darwin reached the theory of natural selection*; *boundaries frozen by tradition*). By contrast, direct metaphors are normally identified when local referent and topic shifts are present, i.e., when lexis is "incongruous" with the rest of the text (Cameron, 2003; Charteris-Black, 2004) but can be integrated with the overall referential and or topical framework by means of some form of (cross-domain) comparison. An example is *The mind is like a computer,* with *computer* being a piece of incongruous lexis in the context of cognitive psychology that can however be successfully integrated by means of a nonliteral comparison between the two domains 'mind' and 'computer'. It conveys a conception of 'mind' as fast, operating on a binary code, complex, opaque etc. Direct metaphors are often signaled, they are typically used deliberately for particular communicative purposes (Steen, 2008, 2011a, in press). In the present example, the goal underlying a deliberate metaphor use may be to highlight the fast, complex and opaque mechanisms of the mind – for educational or general informational purposes. In other contexts, direct metaphor may have predominantly personal (expressive) or interpersonal (e.g., entertaining) functions, as in Woody Allen's remark *[Nature] is like an enormous restaurant* (see Chapter 1).

Implicit metaphor picks up potential cross-domain mappings established elsewhere in the text. Implicit metaphor works by lexico-grammatical substitution, either in the form of pronouns (or other pro-forms) or in the form of ellipsis and some form of coordination, where gaps on the text surface may be recovered by metaphor-related elements (cf. Halliday & Hasan, 1976). An example for implicit metaphor by substitution is: *Naturally, to embark on such as step is not necessarily to succeed immediately in realising it* (BNC-A9J, NEWS). Here *step* is indirectly related to metaphor, and *it* is a substitution for the notion of 'step' and hence is implicitly related to metaphor. Similarly, in the elliptic sentence *but he is* implicit metaphor is present where the noun phrase *[an ignorant pig]* is left out in the utterance describing a male colleague (*but he is [an ignorant pig]*). Here, the verb *is*

may be coded as implicit metaphor as a place filler. Generally, forms of implicit metaphor do not exhibit ostensibly incongruous words, but rely on "cohesion", which according to Biber et al. (1999, p. 42), is the "integration which is achieved between different parts of a text by various types of semantic and referential linkages". This includes *chains of reference*, whereby clauses are referentially linked by different kinds of expressions (such as pronouns, see also Biber et al., 1999, pp. 235-240; p. 266).

The goal of the present analysis is to examine which role the three distinct types of metaphor play in academic prose as opposed to the other registers. This analysis addresses the question *How is metaphor distributed across the main metaphor types (indirect, direct, implicit) in academic prose as compared to news, fiction, and conversation?* Subsequent discussion will be inspired by the research question: *Which discourse functions may be ascribed to the use of the distinct metaphor types in academic prose as compared to fiction, news, and conversation?* Findings on metaphor will hence be interpreted with reference to not only the main communicative purposes of the academic register, information, argumentation, and explanation (Biber et al., 1999), but also aspects that are more closely tied to lexico-grammar, such as abstraction of information and explicitness of reference (cf. Biber, 1988). Findings will also be related to the various discourse functions of metaphor that were reviewed in Chapter 1, such as theory-constitutive, pedagogical (Boyd) and ideational, interpersonal, textual (Goatly). In addition, Steen's (2008, 2011a, in press) model of metaphor use will be applied, specifically with regard to *deliberateness* as a particular communicative feature with a close relation to direct forms of metaphor. According to Steen, a direct metaphor is a deliberate metaphor, an "intentionally[23] constructed mapping across two semantic and conceptual domains", with the source domain concepts being hypothesized as "ineluctably present in the language user's discourse representation and attention" (in press, p. 11). The functions that can be ascribed to deliberate metaphor in Steen's model are quite diverse, but always need to be related to the "situated genre event within which a deliberate metaphor is used" (in press, p. 8). Deliberate (and hence direct) metaphor use may function to signal such diverse aspects of such a discourse event as its style, register, content, type, goal, and domain (in press, p. 8).

A two-way frequency table was constructed crossing the variable metaphor type (with the four categories indirect, direct, implicit, and non-MRW) with the variable register (with the four categories academic, news, fiction, and conversation). Non-metaphor was included to guarantee balanced measurement across registers (Analysis 1 showed that registers vary quite drastically in terms of the proportion of metaphor-related words. In a register low on metaphor, the use of a specific type of

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[23] The notions of *intentionality* and deliberateness in metaphor use have been discussed as controversial by Gibbs (2011a).

metaphor may hence be boosted disproportionately, and vice versa). No cells had an expected frequency lower than 5. In the current analysis, metaphor flags were included in the non-MRW category. A chi-square analysis showed that there is a significant association between the two variables of metaphor and register: $\chi^2(9) = 3.045$; $p < .0001$; Cramer's $V = .07$, $p < .001$.

Table 5.3 reports the relative frequencies of metaphor types across registers (for the standardized residuals see Table A5 of the Appendix). Its shows that "relation to metaphor" in all registers largely means "indirect metaphor": This type of MRW contributes by far the highest proportion to the total count of metaphor-related lexical units (13.3%), while both direct and implicit metaphors exhibit extremely low proportions (0.2% each). The high overall proportion of indirect metaphor in comparison with the other two types means that indirect metaphor is the prototypical case of metaphor-related language (cf. Steen, 2007), while direct (n=336) and implicit (n=291) metaphor make up just over 1% each of the total count of metaphor-related words of the corpus (N=25,444).

Table 5.3

Distribution of Main Metaphor Types Across Registers

Metaphor type	Register				
	Academic prose	News	Fiction	Con-versation	Total
	(N=49,314)	(N=44,792)	(N=44,648)	(N= 47,934)	(N=186,688)
Indirect	18.2%	16%	11.4%	7.6%	13.3%
Direct	0.1%	0.3%	0.4%	0.0%	0.2%
Implicit	0.2%	0.2%	0.1%	0.1%	0.2%
Non-met	81.5%	83.6%	88.1%	92.3%	86.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

The pattern obtained for the distribution of indirect metaphor is almost identical to the one drawn across registers in Analysis 1, grouping the informational registers, especially academic prose (18.2%), and news (16%) at the "metaphorical end" of a scale, and conversation (7.6%) at the "non-metaphorical end", with fiction (11.4%) slightly oriented towards a middle position. For direct metaphors, however, the pattern is different: There are relatively few direct metaphors in academic prose (0.1%; n=40), and in conversations (below 0.1%; n=19), while there are more in news (0.3%; n=112) and in fiction (0.4%; n=165). Here, academic prose behaves much more like conversations than like news, and fiction exhibits the highest proportion of direct metaphors, followed by news. The pattern exhibited by implicit metaphors is similar to that of indirect metaphors: Implicit metaphors are relatively frequent in academic prose (0.2%; n=121) and relatively infrequent in conversations (0.1%; n=31), whereas fiction (0.1%; n=54) and also news (0.2%; n=85) have proportions that do not deviate significantly from the statistically expected counts (for the standardized residuals, see Table A5 of the Appendix). In all, the analysis shows that despite their being fairly small categories, direct and implicit metaphor each exert their own role in the make-up of the metaphorical register profiles that emerge in this analysis. As far as academic prose is concerned, the result obtained for direct metaphors is surprising and needs to be interpreted.

Direct metaphors frequently comprise a (lexical) signal for comparison and directly express the source domains in the discourse, such as in the two following examples from the academic corpus:

(13) […] Cystosoma, which also has enormously expanded eyes, looking like headlamps, compared with its bottom-dwelling relatives […].

(14) Poplar leaves have an elegant outline resembling that of an arab minaret (AMM-fragment02, emphasis mine, JBH)

The low frequency of direct metaphor in academic prose (low both in comparison with the other registers and in absolute terms) may be largely explained by the stylistic convention which generally prescribes a plain, exact, and "non-figurative" style for academic writing (cf. Giles, 2008, pp. 15; see also Semino, 2008). Specifically, the reason why direct metaphor is so scarcely used in spite of is logical soundness and its conceptual power (e.g., Dunbar, 2001; Giles, 2008; Gentner, 1982; Gentner & Jeziorski, 1993; Low, 2010) may be a particular communicative feature: deliberateness. Forms of direct metaphor are likely to be (or appear) deliberately used, suggesting a form of language processing that involves the on-line comparison of domains (cf. Steen, 2008, 2010, 2011a), which thus highlights the fact that alien source domains are used for thinking about particular target domains, creating overtly figurative discourse. This latter fact may be one reason for the overt absence of direct metaphor in printed academic prose.

Furthermore, there may even be a relation between direct metaphor and unconventional (or novel) metaphorical word use, with non-conventionalized figurative language use as another deviation from the ideal of "plain style". According to Gentner and Bowdle (Bowdle & Gentner, 2005; Gentner & Bowdle, 2008), there is a relation between conventionality of metaphorical terms and the syntactic form in which they are uttered, with conventional metaphors often associated with indirect forms (*A is B*) and novel metaphors often associated with direct forms (*A is like B*). Indeed, in the two examples of direct metaphor use above, *looking like headlamps* and *resembling that of an arab minaret*, the nouns related to the respective source domains (vehicles), do not have conventional metaphorical senses in usage-based dictionaries such as Macmillan or Longman. The main reason why non-conventional metaphor use (and thus many direct metaphors) is largely absent from much written academic texts may have to do with its higher degree of ambiguity (cf. Gentner, 1982). More ambiguous metaphorical terms may cause doubts in readers about which aspects of the source term (vehicle) ought to be transferred to the target term, and therefore eventually conflict with the explicitness of most academic prose. Direct metaphor use thus may be associated with both deliberate and unconventional metaphor use, which seems to reinforce why it be avoided in many instances of academic prose from the perspective of a plain, explicit style. In terms of cross-register distribution, the pattern obtained for direct metaphor thus seems to correspond with popular views about metaphor: Direct metaphor appears to be typical of the rich and deliberately polyvalent prose of literary texts, and of news, where it may be used for catchy headlines and evaluative take-home messages in news, but is largely absent from the exact and precise prose of academic texts.

The relatively low overall frequency of implicit metaphor is somewhat surprising as well (0.2%; n=291). Given that textual and grammatical cohesion, prerequisites for implicit metaphor, are common across all four registers, and given that academic prose and news specifically abound in metaphors, comparatively speaking, it would follow that there should be a substantial number of implicit metaphors in these registers. In cross-register comparison, academic prose uses indeed relatively more implicit metaphors (0.2%; n=121) than the other registers. Here are two examples:

(15) If we agree that in that case women should be <u>embraced</u> by the liberty principle then so <u>should</u> children. (ECV-fragment05, emphasis mine, JBH)
(16) This <u>view</u>, as we shall see, has been attacked on the grounds that <u>it</u> rests on the false assumption that the distinction between adults and children is identical with the distinction between rational and non-rational beings. (ECV-fragment05, emphasis mine, JBH)

In sentence (15), the modal verb *should* refers back to the MRW verb *embraced*, and in sentence (16) the personal pronoun refers back to the MRW noun *view*. In both examples, co-reference is established within the sentence.

The finding that academic prose shows a higher proportion of implicit metaphor is clearly related to its high general proportion of metaphor-related words, but this seems to be just one half of the story. The other half of the story may be explained by the particular co-reference structure exhibited by academic prose. Differences between academic prose and news may lie in that news may constitute endophoric reference more often by lexical variation, and less often by means of substitution and ellipsis, as may be more often done in academic prose. This assumption is supported by Biber et al., who show that news has a higher number of synonyms among anaphoric expressions than academic prose (1999, p. 237), as may be illustrated by an excerpt from a news text in which the referent *Kylie Minogue* is anaphorically expressed by *The Aussie singer* in a subsequent sentence, and the referent *Madonna* of one sentence is co-referred to by *American superstar* in another (1999, p. 238). This way of co-referencing by synonyms produces "a more varied and informative text" (1999, p. 239), probably with a higher degree of entertainment than the maximally exact and densely packed prose of academic texts. Meanwhile, in fiction, the lower proportion of implicit metaphor observed may be explained with regard to its lower overall frequency of indirect metaphor, but also by the fact that its main means of anaphoric expression is pronouns (see Biber et al., 1999, p. 237), which are used to co-refer to referents across sentences (e.g., *the father – he – who, the father – he* in an excerpt from fiction, see Biber et al., 1999, p.238), while in conversation, a combination of the overall low count of instances of indirect metaphor and a less elaborate intra-textual co-referencing that relies even more heavily on pronouns (cf. Biber et al., 1999, p. 237) may account for the low frequency of implicit metaphors (a typical co-reference chain across sentences and clauses is established by *they – they their – their - they're,* reported by Biber et al., 1999, p. 237). In all, the higher frequency of implicit metaphor in academic prose seems to be related to its higher general proportion of indirectly used metaphor-related words, but also to its particular co-reference structure, which needs to integrate long and densely integrated sentences within the discourse.

The analysis of metaphor types across registers has shown that indirect metaphor accounts for almost 99% of all instances of metaphor in academic prose. By contrast, direct metaphor and implicit metaphor are not used as often. Indirect metaphors in academic prose – and the implicit metaphors that typically depend on them – are almost without exception examples of highly conventional metaphorical word use, while direct metaphors may be less conventional more often. This fact, before the background of academic prose having fewer direct metaphors than the other written registers, may explain that academic prose is typically approached as "non-metaphorical" in popular opinion.

The three-way interaction between register, word class, and metaphor examined above suggested that indirect conventional metaphorical word use in academic prose may be related to informational production, as well as possibly to explicit reference and abstract information. All this suggests that it is indirect metaphor, not direct metaphor, which is indispensable for informational, abstract, and situation-independent academic discourse. The higher frequency of implicit metaphor in academic prose seems to be directly related to the higher general proportion of indirectly used metaphor-related words in academic prose, as well to its particular co-reference structure, which integrates long and densely integrated sentences by way of establishing explicit reference with antecedent MRWs (Dimension 3).

Meanwhile, it cannot be ruled out that direct forms of metaphor can still play an important function, for example for educational and heuristic purposes, and future research should be able to reveal whether and in in which types of discourse these metaphors are actually used. Factors to be taken into account in this type of study are text genre (e.g., textbooks vs. scientific articles); mode of communication (spoken, written, multimodal); idiosyncratic differences between writers-speakers; communicative goal and audience (e.g. explaining well established theory to novices vs. proposing new theories to experts); and topic, discipline, and academic field. A first attempt of this kind of study will be made in the next subsection.

5.3.2 Metaphor type and sub-register. The main analyses above were conducted at a high level of generality, backgrounding variability across disciplines and genres within "academic discourse" (Biber et al., 1999). However, at the end of the day, it should not be ignored that the fragments representing academic discourse belong to distinct fields and subfields. The divergent contents pursued within these domains of discourse are reflected in specialized linguistic registers (see Halliday, 2004b; Hyland, 2006a). Therefore, the following analysis will approach academic discourse from a vantage point of specialization, rather than generalization. The British National Corpus accounts for the specialization within academic discourse by differentiating between four sub-registers: humanities & arts, natural sciences, politics, law, education, and social sciences. These sub-registers will be examined in the present analysis (see Table 5.4).

Table 5.4

Distribution of Lexical Units Across Academic Sub-Registers

Count	Academic sub-register				
	Humaniti es & arts	Natural science	Politics, law & education	Social science	Total
Lexical units	16,431	6,554	9,934	16,395	49,314
Percent	33.3%	13.3%	20.1%	33.2%	100.0%
No. of fragments	5	2	3	6	16

Table 5.4 shows details of the academic sample, which consists of four samples from the sub-registers humanities & arts (16,431 valid units), natural science (6,554 valid units), politics, law & education (9,934 valid units), and social science (16,395 valid units), totaling 49,314 valid units (words). The academic sample comprises 16 text fragments with an average of 3,082 words per fragment. For an overview of the particular details of the text fragments, see Figure A1 (Appendix). Given the relatively small sample size and the rather unequal sampling in terms of number of fragments per sub-register, the following analysis of variation of metaphor type across the four academic sub-registers has a rather exploratory character.[24]

A two-way frequency table was constructed crossing the variable metaphor type (with the four categories indirect; direct; implicit; non-MRW) with the variable sub-register (with the four categories humanities & arts; politics, law, & education; natural sciences; social sciences). In the current analysis, metaphor flags are included with the non-MRW category (see Analysis 5.3).

A chi-square analysis shows that there is a significant association between the two variables of metaphor type and sub-register: $\chi^2(12) = 56.383$, $p < .0001$; Cramer's $V = .02$, $p < .001$.

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[24] The text fragments were randomly selected under the criterion to be representative on the level of register, which means that at the time of corpus compilation we did not cater to equal balancing across the four academic sub-registers. As a result, sub-registers are fairly unevenly spread in terms of sample sizes. However, the fact that the criterion of random selection of samples was observed means that no *a priori* assumptions were made about the distribution of sub-registers in the actual population, which is an asset. Furthermore, the chi-square analysis itself is able to compensate for varying sample sizes and numbers. For these reasons, I decided to report on the interaction of metaphor type and sub-register, albeit within the framing of an exploratory study.

Table 5.5

Distribution of Metaphor Types Across Academic Sub-Registers

Metaphor type	Sub-register				Total
	Humanities & arts	Natural science	Politics, law & education	Social science	
Indirect	18.3% (3,005)	16.6% (1,087)	17.9% (1,789)	18.8% (3,089)	18.2% (8,961)
Direct	0.1% (21)	0.2% (12)	0% (0)	0% (7)	0.1% (40)
Implicit	0.4% (59)	0.3% (17)	0.2% (22)	0.1% (23)	0.2% (121)
Non-MRW	81.2%	83%	81.9%	81%	81.5%
Total	100% (16,431)	100% (6,554)	100% (9,934)	100% (16,395)	100% (49,314)

Note. Raw frequencies in brackets.

Not surprisingly, Table 5.5 shows that of the metaphor types, all four sub-registers mainly rely on indirect metaphor. Direct metaphor makes up 18.2% of all lexical units (N=49,314) within academic prose, ranging from 16.6% in natural science to 18.8% in social science. Meanwhile, direct and implicit metaphors are scarce: Direct metaphors have a relative frequency of 0.1% (n=40), while implicit metaphors have a total percentage of 0.2% (n=121) – all three types are however distributed unequally across sub-registers. This is indicated by the significant chi-square test.

The results show that indirect metaphors are relatively frequent in social science, but relatively less frequent in natural science. The sub-registers humanities & arts and politics, law & education are close to the proportion of the total count (18.2%). Although relatively similar to humanities & arts and politics, law & education, the number of indirect MRWs in social sciences is significantly higher, as is indicated by the standardized residuals (see Table A6). By contrast, the number of indirect MRWs of natural science is significantly lower. Direct metaphor roughly divides sub-registers in pairs, by higher frequency and lower frequency: Politics, law & education (0.0%) and social sciences (0.0%) have lower frequencies (however, standardized residuals indicate that only the count obtained for politics, law & education is significantly lower than average, whereas social science is insignificantly removed from average, see Table A6), while humanities & arts (0.1%) and natural sciences (0.2%) show comparatively higher frequencies (both of

which are significantly deviant from a chance result, as indicated by the standardized residuals).

Implicit metaphor has relatively more instances in humanities & arts (0.4%), but relatively fewer in social sciences (0.1%). Inspection of standardized residuals (see Table A6) shows that observed counts do not deviate from the statistically expected counts in the two other sub-registers, natural sciences (0.3%) and politics, law & education (0.2%). These findings will now be interpreted by sub-register /academic domain, starting with the humanities and arts.

The domain humanities/arts features a combination of relative average proportion of indirect metaphors and a higher proportion of implicit metaphors, which may be explained by its highly abstract topics in the realms of culture and art, philosophy and history (as reflected in titles such as "'Her Dress Hangs here': De-frocking the Kahlo Cult" [A6U, an article from the history of art], *The Philosopher's Child* [ECV, a book on feminist philosophy], or *White Mythologies: Writing History and the West* [CTY, a book on the philosophy of history]; for the full list of fragments, see the Appendix, Figure A1). The abstract and informational nature of much humanities discourse does not only mean that many topics and subjects require indirect metaphorical referencing (the ideational and theory-constitutive functions described by Boyd and Goatly, see Chapter 1), but that the discourse itself requires structuring by metaphorically used words across the word classes, which thus perform a textual function (e.g., prepositions and verbs such as *based* and *on* in *The attacks are <u>based on</u> empirical observation* to link phrases and clauses, and spatial adverbs such as *here* and *below* to establish intra-textual reference, and pronouns that co-refer to MRWs, such as *it* in *This <u>view</u>, as we shall see, has been attacked on the grounds that <u>it</u> rests on the false assumption*). Furthermore, another way of explaining the higher proportion of implicit metaphors with regard to a textual function may be that humanities/arts texts have longer, and probably even more densely integrated, sentences than the other sub-registers. In order to examine the variation of sentence length across sub-registers (for a discussion of sentence length variation across registers, see Tavecchio, 2010, pp. 394), a two-way contingency table was constructed crossing the variable sub-register (with four levels: hum, nat, pol, soc) with sentence length (with four levels: very short [1-10 words], short [11-20 words], medium [21-30 words], long [31 and more words]). A chi-square analysis shows that there is a significant association between the two variables: $\chi^2(9) = 1790.523$, $p < 0.001$; Cramer's $V = 0.10$, $p < 0.001$. No cells had an expected frequency lower than 5. For the raw frequencies and standardized residuals, see Table A7 in the Appendix.

Table 5.6 shows that humanities & arts indeed have relatively few sentences that are very short, short, and of medium length, whereas more than half of all sentences have 31 or more words (56.3%). By contrast, the other sub-registers have proportions of long sentences that lie clearly below 50 % (natural science has 37.1%

long sentences; law, politics & education has 46.5%; social science has 41.6%). The higher frequency of long sentences in humanities/arts may thus help to explain its higher proportion of implicit metaphors, with implicit metaphors probably catering to a higher need for establishing coherence in long sentences.[25]

As far as direct metaphors in humanities and arts are concerned, the comparatively high proportion may be related to an academic style that is somewhat richer on imagery. Direct metaphors as a rule highlight figurative comparisons, which makes them often appear more "metaphorical" than indirect or implicit metaphors. They may also comprise metaphorical terms that are more ambiguous in meaning. For both reasons, they may be used for rhetorical, for pedagogical (Goatly's interpersonal function, see Chapter 1), but also for aesthetic purposes. In sentence (17), which comes from paper on the history of art (subject Frida Kahlo), reference is made to a particular definition of art by the surrealist artist Breton, who described art as *ribbon round a bomb*. Sentence (18) compares Frida Kahlo's body and appearance directly to *the canvas* and *art*, respectively.

Table 5.6
Percentages of Sentence Length Across Academic Sub-Registers

Sentence length	Sub-register				Total
	Humanities & arts	Natural science	Politics, law & education	Social science	
Very short: 1 to 10 words	4.0%	9.4%	4.0%	2.7%	4.3%
Short: 11 to 20 words	15.4%	26.4%	19.2%	18.8%	18.8%
Medium: 21 to 30 words	24.3%	27.1%	30.3%	36.9%	30.1%
Long: 31 and more words	56.3%	37.1%	46.5%	41.6%	46.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

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[25] This assumption can be corroborated by the observation that the sub-register that has the lowest relative frequency of implicit metaphor – social science – has also the second lowest number of long sentences. The sub-register with the lowest relative number of long sentences, natural science, however, has a count of implicit metaphors that does not deviate significantly from expected counts and thus does *not* show relative underrepresentation. This may be explained by genre or by the heterogenic character of the two fragments, one being a transcribed lecture, one a historiographical text.

(17) More problematic is the way in which such a dislocation has led to the acceptance of her 'Mexicanness' as mere decoration of the essentially feminist themes of her work, thereby defusing a substantial part of the art described by Breton <u>as</u> a <u>'ribbon round a bomb'</u>.

(18) It is her body <u>as</u> the <u>canvas</u>, her appearance <u>as</u> <u>art</u>. (A6U-fragment02, emphasis mine, JBH)

Both examples suggest that the writer uses direct metaphor to convey a relatively rich and atmospheric meaning. This may be due to idiosyncratic style, but could possibly be attributed to a particular academic writing style in the discipline at that time (beginning 1990s). Another, different, example of a direct metaphor comes from an historical text (19). It conveys a meaning that is less ambiguous than (17) and (18) and seems to pursue an educational/expository goal, directly comparing soldiers to "shields" in battle.

(19) Their [the soldiers', JBH] value in battle, as <u>shields</u> behind which the knights could shelter before they launched their charge, ensured their continued employment by those who could afford them — notably Henry II of England. (EA7-fragment03, emphasis mine, JBH)

There may thus be divergent communicative goals of direct metaphors (in the humanities), with some catering more to aesthetic objectives (17 and 18) and others more to pedagogical or evaluative (interpersonal) ones (19). This of course is a tentative suggestion which needs to be investigated across the various fields of the humanities and eventually other sub-registers.

In social science, which has a relatively high proportion of indirect metaphor, a relatively low proportion of direct metaphor, and a proportion of implicit metaphors that is close to the total count, the high proportion of indirect metaphor is not surprising, given the usually abstract subjects of social sciences (the theory-constitutive/ideational establishing of reference with social actions, facts, and structures) and the need for metaphorical textual structuring of the abstract discourse by means of prepositions, verbs, and adverbs (see above). Furthermore, social science, with an important tradition of "socially responsible" and intervening science, may sometimes tie observations to programmatic claims and the relatively overt evaluation of social facts and structures (interpersonal function). For example, consider sentences (20) and (21):

(20) The essays in <u>this</u> <u>book</u> do not <u>amount</u> <u>to</u> a programme: but they are intended to provide a <u>springboard</u> for one. (AS6-fragment01, emphasis mine, JBH)

(21) The aim is to analyse a problem which economic <u>growth</u> alone has <u>failed</u> to <u>cure</u> — and to consider possible new <u>forms</u> of public action. (AS6-fragment01, emphasis mine, JBH)

These two consecutive sentences, which are the opening sentences of the introductory chapter, show relatively overt evaluation of problems, their origins and possible solutions, both by means of non-metaphor-related words (e.g., the negatively connoted noun *problem*) and of metaphor-related word (e.g., the positively connoted noun *springboard*) with the contextual meaning of 'something that helps you to become successful' (MM). It may be speculated that indirect metaphors in this sub-register relatively often exhibit persuasive and evaluative functions.

Natural sciences seem the "least indirect" sub-register, with a relatively low proportion of indirect metaphors and a relatively high proportion of direct metaphors (the proportion of implicit metaphors is close to the total proportion). The comparatively lower frequency of indirect metaphor (and the highest proportion of non-MRWs of all sub-registers) may be motivated by the more exact and explicit style of natural sciences (which could be seen in the direct tradition once established by Bacon, Hobbes, and Locke, who aspired to a "plain style", absent of "inexact" metaphor, cf. Giles, 2008, pp. 15). At the same time, the significantly higher use of simile and other forms of direct metaphor may seem irregular, at least if relating it to overt evaluation and persuasion. However, direct metaphor seems to comply very well with the academic ideals of precision and logic, since it normally has a positive logical truth value and a high degree of explicitness (cf. Low, 2010). The comparatively high frequency of direct metaphors in natural sciences may thus be related to this feature. Moreover, the pedagogical function of direct forms of metaphor is well attested, and may be ultimately responsible for the observed results. This impression is reinforced when we take into account that the natural science sample is constituted by fragments from text books, textual genres with a clear educational purpose (*Bringing Fossils Back to Life*, a chapter from the book *Fossils: The Key to the Past* and a chapter from *Lectures on Electromagnetic Theory*, see Figure A1 in the Appendix). Further analysis is needed to validate and test these ideas about metaphor types in natural sciences.

The sub-register "politics, law, and education" is largely an "average" sub-register, with average incidences of indirect metaphor, an average distribution of implicit forms of metaphor and an average occurrence of non-metaphorical words. However, there is one exception: direct metaphor. In contrast to the other sub-registers, this form of metaphor does not occur at all. The sub-register is composed

by three fragments, one from the domain of law, one from educational psychology, and one from educational policy. All three excerpts are taken from chapters of books, one from legal studies, one from education, and one from a volume on educational policies. One way of making sense of the results obtained for the politics, law and education sub-register is to relate it to social science, which is most similar to it, in terms of metaphor distribution, and in terms of topics and aspects of disciplinary communication. This is suggested also by the meta-data in BNC, which assigns the label "social sciences" to all three fragments (see Figure A1 in the Appendix). More research is needed to investigate differences in metaphor type distribution between particular sub-registers of academic prose falling into the fields of educational psychology, politics, and law, probably with a differently structured corpus.

In sum, the exploration of metaphor types across sub-registers has raised a number of questions that may inform future research. It suggests that certain features of academic sub-registers, such as subject matter, stylistic conventions, and typical communicative goals are likely to influence the distribution of metaphor types across academic fields and disciplines. All sub-registers rely largely on indirect metaphor, but implicit and direct metaphor vary across sub-registers, with natural sciences and humanities & arts showing a higher proportion of direct metaphors than the other two sub-registers, but probably for divergent reasons; while natural sciences may use direct metaphors for pedagogical reasons, humanities & arts may also apply them to create aesthetically rich prose. It also seems that deliberate use of metaphor (both in direct and indirect metaphors) may have different goals in the distinct sub-registers, such as evaluation in social sciences, humanities & arts, aesthetic and pleasure in humanities & arts, and education in natural sciences, but also in humanities & arts. Further research, both qualitative and quantitative, is needed to test and possibly modify these tentative hypotheses. Lastly, the use of implicit metaphor varies again across sub-registers, its relatively high frequency in humanities and arts being possibly related to a higher degree of textual integration in this sub-register. In all, further research is needed to disentangle the effect that topic, stylistic convention, and communicative goal may have on the proportion of indirect metaphor and the proportion of implicit and direct metaphor.

5.3.3 Conclusion Analysis 2. Academic prose shows overall an unexpectedly low proportion of direct metaphors, both in absolute frequencies and in comparison with the other registers. This seems to be related to stylistic conventions in academic prose. Meanwhile, the proportion of implicit metaphors is overall low, but comparatively higher in academic prose than in the other registers, especially in conversation. It seems to be directly related to the higher general proportion of indirectly used metaphor-related words in academic prose, as well to its particular

co-reference structure, which integrates long and densely integrated sentences by way of establishing explicit reference with antecedent metaphor-related words.

The explanation for the relatively low proportion of direct metaphor in academic prose is that direct metaphor syntactically and semantically invites the construction of a figurative comparison between domains (cf. Steen, in press) – this type of metaphorical word use often seems to be deliberate on the part of the writer, and that it is probably often interpreted as intended figurative word use on part of the reader. While this kind of communication may be sought (and found) in the classroom, the lab, or some textbooks and popular science, it might be avoided in many written sub-registers and disciplines of academic prose.

This hypothesis was explored in a preliminary investigation of the distribution of metaphor types across sub-registers of academic prose. The results indeed provide some reason to assume that there are differences in the way that sub-registers apply the types of metaphor, especially direct and indirect ones, and that these differences seem to be quantitative as well as qualitative, specifically in differences in communicative functions. It was proposed that differences in metaphor type use could be related to content, but also stylistic traditions, and that these in turn regulate the communicative functions of metaphor use. More research is needed to test the validity of this hypothesis.

5.4 Discussion and Conclusions

The first crucial finding of this chapter is that the four registers can be situated on a general rank order of metaphoricity, in terms of relative frequencies of metaphor-related words: Academic prose has the highest proportion of words related to metaphor (18.5%), followed by news (16.4%), while fiction occupies a middle position (11.9%), and conversations have the lowest overall proportion of MRWs (7.7%). The phenomenon of (conceptual) indirectness by similarity called metaphor occurs thus substantially often across registers, but it is especially frequent in academic prose (and somewhat less frequent in the second informational register, news). This finding shares overall similarity with the register's position on Biber's (1988) involved/informational dimension (Dimension 1). Specifically, a register's situation at the informational end of the scale seems to correlate with a higher proportion of MRWs (academic and news texts), while a situation at the involved end may correlate with a relatively low proportion of MRWs (conversations), and a situation in the middle part of Biber's scale seems to correlate with a mean proportion MRWs (fiction). The careful production of the registers associated with informational exposition, with their focus on conveying densely packed and highly precise information (cf. Biber & Conrad, 2003, p. 186), may increase the overall

number of metaphorical use of the relevant word classes; in accordance with their particular situational features and communicate purposes. By contrast, the on-line communication of the register associated with involved production (conversation) is normally produced under real-time constraints and reflects interactiveness and high personal and situational involvement (Biber & Conrad, 2003, p. 186), which seems to exhibit less reliance on metaphorical language. As a prototypical informational register that is simultaneously shaped by high abstract information (Biber's Dimension 5, abstract versus non-abstract information) and a high degree of explicit, elaborated reference (Biber's Dimension 3, explicit versus situation-dependent reference), academic prose appears to use metaphor for producing an informationally densely packed, abstract, and textually highly elaborated discourse.

With regard to a more detailed analysis, taking into account differences in metaphor proportions across registers in the individual word classes, an important finding is that academic prose leads the rank order in cross-register comparison among prepositions and nouns, but also verbs and the remainder. These four word classes are where metaphor-related word use reflects most clearly "a familiar order, with conversation at one extreme and academic prose at the other" (Biber et al., 1999, p. 578). Metaphorical use of these word classes may thus play a particular role in catering to the needs of informational and argumentative production, including the functions of "prototypical" word classes in informational production, the packaging and linking of informational units in phrases of prepositions, and the establishing of reference to abstract concepts and the building up of argumentation of nouns. What is more, word classes whose frequent occurrence is typically associated with involved production, seem to "turn informational" in metaphorical use: Metaphor-related verbs cater to the linking of phrases and clauses and the assignment of agency to inanimate referents, and metaphorical pro-forms of the remainder seem to be involved in the establishing of precise coherence relations in the text. Metaphorical use of these four word classes is distributed "from left to right".

Meanwhile, the distribution of metaphor-related adjectives, adverbs, and determiners does not display the same familiar order in every detail. Among each of these word classes, some other register has at least a slightly higher proportion of MRWs than academic prose, although academic prose has an average relative frequency in each of them. Metaphorical adjectives in academic prose may be largely restricted to adjectives that indicate abstract extent, quantity and number (*high, low, wide* etc.), whereas most other (and thus non-metaphorical) adjectives could have unequivocal non-metaphorical meanings (*electric, statistical, political*) in academic prose. The distinct distribution of metaphor among this word class in the other registers indicates that news and fiction may use metaphor-related adjectives also for other purposes and with other communicative goals, such as

aesthetic pleasure, the conveyance of subjective world-views, or the grabbing of attention (e.g., in news headlines).

As for adverbs, the relatively lower proportion of metaphor in academic prose can probably be related to frequent use of non-metaphorical adverbs with precise and often technical meanings (e.g., *significantly, statistically*, *only*). Meanwhile, metaphor-related adverbs in academic prose appear to be mainly place adverbs (e.g., *here, where, above*). With regard to determiners, we saw that metaphor-related instances of *this, that, these,* and *those* are slightly more frequent in academic prose than in the other written registers, whereas less frequent than in conversation. Metaphorical determiners seem to cater for the specification of referents and the establishing of (co-)reference text-internally in academic texts, whereas in conversation, these lemmas may have vaguer meanings used for slightly different purposes, such as the establishing of text-external reference.

The analysis of metaphor in the distinct word classes also suggested that metaphor may play some role among the linguistic features associated with the explicit end of Dimension 3. Word classes where higher proportions of metaphor-related word use may be linked with a position on the explicit end of the third dimension are the remainder and determiners. In the remainder, metaphor-related instances such as pronouns may establish explicit co-reference with metaphorical antecedents in the academic text; among determiners, text-internal, explicit, reference can be established through specification and the creating of coherence on different levels of the text (clause, sentence, paragraph levels). On the third dimension, a third word class seems to play a special role, adverbs of place. They appear to be used in academic prose often to establish situation-dependent, but text-internal (or discourse-internal) reference, with addressees being forced to make substantial inferences. This observation may be explained on the conceptual level by academic discourse needing to create some basis for rooting and organizing its abstract content.

The analysis also suggested a role of metaphor on Dimension 5, where academic prose can again be found at the scale's extreme, abstract information, whereas news appears slightly above the mid-point (towards abstract information), and conversation and fiction are both located at the non-abstract end. Although only one of the features of Biber's original analysis could be tested (use of conjunctions in general; see preliminary analysis), it appears that academic texts may use metaphor – and specifically nouns - generally for dealing with "conceptual and abstract" (Biber, 1988, p. 153) topics.

In all, it seems that the two informational registers, but academic prose in particular, depend on metaphorical mappings to fulfill the functional tasks associated with this kind of register: transmitting abstract, specific, densely packed, and mostly informational content. This is in contrast to the involved production of conversation, including fictional conversation in novels, which has more

interactional than transactional features. The analysis put an emphasis on elucidating possible differences in metaphor use between academic prose and news, and indeed found quantitative discrepancies in nouns, prepositions, adjectives and determiners: Higher relative frequencies were found in academic texts among nouns, prepositions and determiners, whereas adjectives were less frequently related to metaphor. Differences were related to content; academic prose may use more metaphors in these word classes because of its more frequent abstract referents, its overall more technical character, and possibly, a slightly more integrated and explicit informational structure.

In addition to the quantitative differences there may also be more qualitative ones, which in turn may result from a slightly different array of communicative functions of news, with more interactive, entertaining and attention-raising purposes, and different stylistic conventions (as compared to the more strictly informational and argumentative goals of academic writing). These different communicative goals and characteristics of news may allow for a more open and deliberate exploitation of the metaphorical potential of language in news than in academic prose (cf. Krennmayr, 2011). A similar story may hold true for fiction, which may deliberately exploit metaphors to convey particular insights about emotive or sensory perceptions or to raise consciousness about the materiality of language use (cf. Dorst, 2011a), while conversation (and maybe fictional conversation passages) seems to use metaphor-related words mainly to create vague, imprecise meanings that allow for ongoing interaction (cf. Kaal, 2012).

This cross-register profile of metaphor use is elaborated by the findings obtained for metaphor type distribution across registers. Metaphors across registers seem mostly indirectly used, with direct metaphors being quite uncommon in academic prose, especially in comparison with news and fiction. The proportion of implicit metaphors is overall low as well, but comparatively higher in academic prose, and seems to be directly related to the higher general proportion of indirectly used metaphor-related words in academic prose, as well to its particular co-reference structure, which integrates long and densely integrated sentences by way of establishing explicit reference with antecedent metaphor-related words. The overall scarcity of direct metaphors, finally, may be explained by stylistic conventions of academic prose; deliberate and unconstrained figurative language use with its conceptual richness and ambiguity may be seen as compromising the objective and precise transmission of information. A tentative analysis of metaphor distribution across sub-registers suggested that natural sciences may be more inclined to direct metaphor (and hence deliberate) use than other disciplines. It was tentatively proposed that differences in metaphor type use could be related to stylistic traditions in the disciplines, which in turn regulate the communicative functions of metaphor use. More research is needed to test the validity of this hypothesis.

This quantitative comparative analysis of metaphor has provided the first quantitative profile of metaphor use in academic prose. It suggested that this highly informational and formal register relies more extensively on metaphor than news, fiction, and conversation, but that metaphor frequency varies across word classes. One finding was that among the most powerfully metaphorical word classes range verbs and pronouns, which have been traditionally associated with involved production. The analysis has revealed that about 99 % of all metaphors in academic prose are indirect, which means that direct metaphors, despite their prominent role in the literature on analogy in science, are in fact largely absent from academic prose. The very final conclusion of this chapter is hence that metaphorical language use should be reckoned with in any linguistic description (and explanation) of academic discourse that aspires to account for "the full picture".

CHAPTER 6
Metaphor and Word Class in Academic Prose: Detailed Interpretation

> Every time we write or speak, we are faced with a myriad of choices: not only choices in what we say but in how we say it. (Biber et al., 1999, p. 4)

Much of the cognitive-scientific literature on metaphor has focused on the great potential of metaphor to remodel and shape scientific thought. Along the lines of Arbib & Hesse (1986, p. 156), who propose that "scientific revolutions are, in fact, metaphoric revolutions", metaphor is seen quite globally as an engine for the re-modeling of thought and, more implicitly, for the introduction of new specialized terms and expressions in language. However, so far, no neat analysis has been provided of the (lexico-)grammatical patterns of everyday metaphorical academic language, and their functions in discourse. The previous corpus-linguistic chapter has already started to fill this gap, putting its focus on the identification of linguistic patterns of metaphor distribution across the eight word classes in academic prose as compared to the other three registers and their interpretation in terms of Biber's Dimensions. It presented a *macroscopic* analysis, which aims to "identify the underlying textual dimensions in a set of texts, enabling an overall account of the similarities and differences among particular texts and genres" (Biber, 1988, p. 62).

The present chapter, by contrast, homes in on a finer-tuned linguistic analysis, which can be called *microscopic*. It aims to pinpoint the "exact communicative functions of individual linguistic features", thus interpreting the textual dimension "in functional terms" (Biber, 1988, p. 62). This means that the analysis moves in closer to the particular linguistic elements and their communicative functions. The present chapter will hence carry out two connected exercises: Firstly, it will flesh out the quantitative analysis provided in Chapter 5 by examining more concrete examples of metaphor use per word class; secondly, it will provide a deeper understanding of how metaphor in academic discourse interacts with relevant lexico-grammatical features, such as word classes, and their lexical and semantic characteristics (cf. Biber et al., 1999, p. 5), and, finally, the functions ascribed to these in discourse (cf. Biber et al., 1999, pp. 41). In this exercise, the main resource will be the *Longman Grammar of Spoken and Written English* (Biber et al., 1999).

Aspects of such discourse functions were already addressed in Chapter 4, which presented an application of the *MIPVU* procedure to academic discourse. In the section on "Metaphor-related words and scientific models", noun phrases such as

electrical <u>charge</u>, natural <u>selection</u>, and *developmental <u>stage</u>* were identified as referring to scientific models. In the section on "metaphor and text management", demonstratives such as *this* appeared as crucial devices for the construction of cohesion and co-reference, just like such nouns as *viewpoint, point of view,* and *point*, the *wh*-element *where*, and the adverb *here*. In the section on "metaphor-related words in extended contexts" I addressed the phenomenon of implicit metaphor which extends indirect reference to adjacent clauses, sentences, and paragraphs by means of pronouns (*one, it,* and *another*). In the same section, the noun *myth* appeared to have a deliberately persuasive function in the context of a review of Charles Darwin's work.

The following analyses of metaphor-related lexical units will examine in more detail which "exact communicative functions of individual linguistic features" can be identified in lexical items that are related to metaphor, but they also discuss in how far this kind of functional approach is useful for the current purpose, the analysis of the interaction between word class and relation to metaphor in academic prose. Before the analyses can start, crucial terms used by the *LGSWE* will be introduced, such as g*rammatical feature, lexical* and *functional words, word class,* and, finally, the six *communicative functions.*

The term *linguistic* – or *grammatical* – *feature* is a general "cover for anything that recurs in texts that can be given a linguistic description" (Biber et al., 1999, p. 5). Features include

> [...] word classes such as 'noun' and 'preposition'; structural patterns such as subject-verb-object; phrasal and clausal categories, such as verb phrases and adverbial clauses of time; and other structural distinctions, such as progressive aspect or indefiniteness. Morphological, lexical and semantically oriented categories are also included, as are quantitatively defined features such as type-token ratio. (1999, p. 5)

Of these features, the current chapter highlights one "core grammatical category" (1999, p. 36) – word class. Word class is one of the "categories and terms that are familiar and unobjectionable to the widest range of grammar users" (1999, p. 7), which is reflected by the fact that during the creation of the *Longman Corpus of Spoken and Written English (LCSWE)* automatic tagging of word classes operated at a high level of accuracy, with 90-95 % of all words correctly identified by the software (cf. 1999, p. 36). There are two main word classes that divide words by their main functions and grammatical behavior: *lexical words* and *function words* (cf. 1999, p. 55).[26] The *LGSWE*'s definition of lexical words is:

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[26]There is a third class, *inserts,* which is however more peripheral.

> Lexical words are the main carriers of meaning in the text. […] Lexical words are numerous and are members of open classes. […] they can be heads of phrases. […] There are four main classes of lexical words: nouns, verbs, adjectives, and adverbs. (Biber et al., 1999, p. 55)

And that of function words is:

> Function words often have a wide range of meanings and serve two major roles: indicating relationships between lexical words or larger units, or indicating the way in which a lexical word or larger unit needs to be interpreted. Function words are members of closed systems. (1999, p. 55)

Typical function words are determiners, pronouns, numerals, prepositions, auxiliaries, modals, adverbial particles and conjunctions (cf. 1999, p. 69). In opposition to the lexical words, which vary greatly in frequency and are bound to the topic of the text, function words "are frequent and tend to occur in any text." (1999, p. 55).

The *LGSWE* characterizes grammatical units – and thus word classes – in four main ways: in terms of (internal) structure (e.g., morphology); syntactic role (i.e. their role in building up larger units); meaning; and finally, in terms of distribution and discourse function (i.e. by selection and use patterns, especially in different registers) (cf. Biber et al., 1999, pp. 50-1). In this thesis, the operational definition of *word class* has been taken from the *LGSWE*.

(1) A word class is a grammatical feature that recurs in natural text;
(2) Word class membership is "characterized by a combination of morphological, syntactic, and semantic features" (Biber et al., 1999, p. 62) and similarity between the members (1999, p. 59);
(3) According to their main functions and their grammatical behavior, word classes can be grouped into two main categories
(4) Lexical words: nouns, verbs, adjectives, and adverbs;
(5) Function words: determiners, pronouns, numeral, prepositions, auxiliaries, modals, adverbial particles, and conjunctions;
(6) Word classes are "characterized with respect to their distribution", i.e. "by patterns of selection and use" (1999, p. 51);
(7) Word classes can be characterized "in terms of discourse function" (1999, p. 51).

The solution for dealing with fuzzy word class membership proposed by the *LGSWE* is "to look for similarities in terms of more-or-less rather than either-or" (Biber et al., 1999, p. 59). The *LGSWE* proposes an essential linkage between grammatical

features and communicative functions in discourse. With their emphasis on the functional interpretation of quantitative findings (1999, p. 41), Biber et al.'s account draws on systemic functional grammar (e.g., Halliday, 2004a) and the descriptive approach to English grammar by Quirk, Greenbaum, Leech, & Svartvik (1985).

In this chapter, *functions* are understood with regard to the six major functions, or "tasks", performed by linguistic features in discourse as distinguished by Biber et al. (1999, pp. 41): ideational, textual, personal, interpersonal, contextual, and aesthetic tasks.[27]

– The *ideational* tasks of linguistic structures are about "identify[ing] referents or […] convey[ing] propositional information about those referents" (Biber et al., 1999, p. 41; cf. Biber, 1988, p. 34; see also Halliday, 1978). This function has long been regarded as the primary function of language. It concerns structures at different degrees of complexity. For example, simple declarative clauses have a "basic ideational function, presenting a proposition about some referent(s)" (Biber et al., 1999, p. 41), while other, more complex constructions such as relative clauses and some types of prepositional phrases also perform crucial ideational tasks "by specifying and elaborating the identity of the referents" (Biber et al., 1999, p. 41).

– The *textual* tasks of linguistic structures consist in "marking informational structure and marking cohesion" (Biber et al., 1999, p. 42). *Information structure* refers to the way in which referential information is packaged or presented within clauses and the way in which clauses are packaged or presented within texts. *Cohesion*, on the other hand, "refers to the integration which is achieved between different parts of a text by various types of semantic and referential linkages" (Biber et al., 1999, p. 42). Cohesive linguistic features are for example displayed by proper nouns, pronouns, synonyms, and repeated noun phrases, but also demonstratives and lexical substitution (see also Biber, 1988, p. 34; Halliday & Hasan, 1976).

– The *personal* functions are exhibited by linguistic features that express the individual "attitudes, thoughts, and feelings of the speaker" (Biber et al., 1999, p. 42) or writer. For example, stance adverbs (*unfortunately, hopefully*) often have the task of presenting the personal attitudes of the speaker/writer "towards some proposition" (Biber et al., 1999, p. 42). Biber et al. claim that personal functions are more common in many spoken registers, but they are also typical of written registers such as personal letters and newspaper editorials.

– The *interpersonal* tasks vary from the personal tasks "in that they depend on and determine some aspect of the relationship between participants" (Biber et

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[27] This notion of *communicative function* is different from Steen's (2008, 2011a, 2011b) use of the term. In Steen's model, communicative function is generally opposed to *conceptual structure* and *linguistic form* in a three-dimensional space for symbolic analysis of language.

al., 1999, p. 42). This function has been ascribed to typical aspects of spoken and written conversation, where relationship is a crucial aspect of the interactive communication (for example expressed by interrogative and imperative clauses, as well as the choice of different address terms, such as first name and surname in English). These may, however, be found in academic prose as well. Although academic genres, such as research articles, are typically considered to be "factual and impersonal, their only purpose being to report and draw references from a series of events" (Hunston, 1994, p. 192), it has been shown that academic prose displays personal and interpersonal functions, using language "to acknowledge, construct and negotiate social relations" (Hyland, 2004b, p. 13). This, for example, happens by means of different types of lexis, including adjectives, adverbs, verbs, and nouns (e.g., Charles, 2003), but also by grammatical and paralinguistic markers (e.g., Biber, 2006a, 2006b; Hunston & Thompson, 2000). In contrast to other registers, however, evaluation and persuasion in academic prose "must be highly implicit and will, in fact, avoid the attitudinal language normally associated with interpersonal meaning" (Hunston, 1994, p.193; see also Halliday, 2004a).

- The *contextual* function of linguistic features is to refer to "some aspect of the situation shared by speaker and listeners" (Biber et al., 1999, p. 42). In this function, reference can be established to concrete and abstract contexts, such as physical or spatial (*here, there, the book on the table*), as well as temporal (*yesterday, last year*) or "imaginatively or emotively evoked situation[s] (e.g. when a joke begins with *there was this guy*)" (Biber et al., 1999, p. 43).

- The *aesthetic* function of linguistic features is related to particular stylistic conventions: "[G]rammatical forms are selected according to conventions of 'good style' or 'proper grammar'." (Biber et al., 1999, p. 43). Biber et al. give the example of "varied vocabulary, using synonyms instead of repetition, and the avoidance of dispreferred structures such as 'dangling' participles and non-standard forms" (Biber et al., 1999, p. 43).

In the present chapter I will start out from the quantitative findings of the previous chapter, attempting to answer to the following question:

> How do typical metaphor-related manifestations of each individual word class behave in academic prose? What are their typical lexico-grammatical features and which of the proposed functions do they seem to perform?

The microscopic analysis of metaphor use within word classes of this chapter will be structured in the following way: Beginning with the word classes that are most heavily metaphor-related in academic prose (prepositions and verbs) we will move

on to in-between cases (nouns, adjectives, determiners, adverbs) and end with the two word classes with very low distributions of metaphor-related words (remainder, conjunctions). For each word class, I will do the following:

(1) A summary of the quantitative analysis will provide the background for the ensuing exploration of lexico-grammatical and semantic features and discourse functions of metaphorical word use per word class in academic prose.
(2) To explore the quantitative analysis in terms of grammatical knowledge of word classes, I will review the relevant lexico-grammatical features and functions associated with the particular word class in the *LGSWE*, and discuss their relation to metaphor on the basis of natural language data obtained mainly from the *LCSWE* and the *VUAMC*. Depending on the characteristics of the particular word classes, and the role that metaphor may play, this step will focus either more on the syntactic or semantic features of the word class – or both.
(3) To complement the review of the *LGSWE*, I will report and discuss the ten most common metaphor-related types per word class in the academic register (as compared to the other registers) of the *VUAMC*.
(4) Finally, I will relate findings to the current account of cognitively-informed metaphor studies.

In this way, I will approach metaphor as constrained by word class and see whether the detailed knowledge available for word classes in the *LGSWE* reveals new perspectives onto metaphor in academic prose. Conversely, approaching members of particular word classes as potentially related to metaphor may shed new light on the lexico-grammatical, formal, dimension of academic discourse. Lastly, metaphor will be systematically addressed as a type of conceptual structure with two contrasting, but similar, senses that may be related to cross-domain mappings. Through this, the analysis may be able to provide more insight into the "joints" of discourse – where symbolic structure transforms into the communicative functions of words.

6.1 Prepositions

Prepositions have the highest proportion of metaphor of all word classes in each of the four registers. They play a conspicuously crucial role in academic texts, which have the highest proportion of prepositions in all registers: News texts show a proportion that is close to the total count of metaphors (among prepositions) across registers, and conversation and fiction have significantly fewer instances. In the previous chapter, these results were tentatively related to an integrative function of

metaphor-related prepositions, catering to "high informational density and exact informational content" (Biber, 1988, p. 107). How does this relate to metaphor: Do metaphor-related prepositions in academic prose behave differently than non-metaphor-related prepositions? What are their typical lexico-grammatical and semantic features and what functions do they perform?

According to the *LGSWE*, prepositions are "mortar which binds [the main building blocks of] texts together" (1999, p. 55). They have a prominent textual function, packaging information by connecting linguistic structures. Many prepositions with this textual "binding" function in academic prose are not used in their spatial basic senses but in their metaphorical senses. This is (implicitly) noted by the *LGSWE* when it discusses postmodifying prepositional phrases beginning with *in:* According to the grammar these phrases "represent a number of meanings ranging from physical location to various logical relations" (1999, p. 636). Among the listed examples for *in* denoting "logical relations" is:

(1) a resulting decrease [in breeding performance] (ACAD, 636; prepositional phrase in [square brackets], emphasis mine, JBH)

This use of *in* is related to metaphor in that it is distinct from a more basic sense of the preposition as in *the mess [in his bedroom]* (CONV, 636), an example given of the "physical location" meaning in the *LGSWE*. The difference between the sense of *in* referring to a "logical relation" and the sense referring to "physical location" noted by the *LGSWE* can thus be explained by relation to metaphor. At the same time, there is a clear connection between the textual function of prepositions and the fact that academic prose is particularly rich in metaphor-related prepositions: As academic prose has particularly many of one of the main "building blocks" of texts, noun phrases, much "mortar" (prepositions) may be needed to provide textual cohesion as a "device which connects noun phrases with other structures" (1999, p. 74). However, attributing metaphor-related use of prepositions too exclusively to a textual function may be too restrictive and other functions will be considered below.

In terms of lexico-grammar, prepositions (as heads of prepositional phrases) can be used in a number of syntactic roles in sentences (1999, pp. 104), for example as heads of postmodifiers and as heads of prepositional phrases that function as adverbials on clause level. They can also be used as heads of complements of adjectives; and as constituents of prepositional verbs, heading a prepositional phrase that functions as an adverbial. The following discussion will focus on metaphor-related prepositions in terms of their lexico-grammatical forms and communicative functions (underlying conceptual structures will be given less attention). Consider the use of prepositional phrases in example 2:

(2) Mortality [*among* stocks *of* eggs stored outdoors in the ground] averaged 70%; eggs collected the following spring from a large number [*of* natural habitats] [*in* the central part [*of* the province]] [28] suffered a 46% reduction [*in* viability] which could only be attributed to this exposure [*to* cold].[29] (ACAD, 607, emphasis mine, JBH)

Example (2) shows prepositional phrases as postmodifiers and complements of nouns. In such phrases, the metaphor-related prepositions such as *among, in, to,* and *between* perform the textual function of providing links within and to noun phrases. Yet they simultaneously perform the ideational function of "specifying and elaborating the identity of the referents in a construction" (Biber et al., p. 41). The (slight) ideational function of *among* (2), for example, lies in the fact that it specifies the referent of the uncountable noun *mortality*. The metaphorical sense of *among* relates to generally 'saying what happens within a particular group of people' (MM). This sense can be metaphorically related to the more basic spatial meaning 'in the middle of other people or things' (MM). In other words, the metaphor-related sense of *among* specifies the group of entities to which the abstract concept *mortality* is applicable – in terms of spatial neighborhood. A cross-domain mapping underlying this use of *among* may thus be MEMBERSHIP OF AN ABSTRACT GROUP IS LOCATION.

(3) The plant is equally susceptible [to drought] during this period. (ACAD, 105, emphasis mine, JBH)

In example (3) the prepositional phrase headed by the (metaphor-related) preposition is the complement of an adjective, which "serve[s] to complete the meaning of the adjective" (Biber et al., 1999, p. 101). In the case of *susceptible* (3), the adjective's meaning ('easily influenced or affected by something') is completed by an indication of who/what is the affecter, which is done by means of the prepositional phrase headed by *to*. In terms of *MIPVU* its contextual meaning is 'used for saying who or what is affected by a situation' (MM), which can be compared with the more basic 'used for saying in which direction someone or something is facing or pointing' (MM). In terms of conceptual mapping being "easily influenced/affected by something" is thus similar to "movement to(wards) (potential) endpoints of approach" (cf. Lindstromberg, 2010, p. 237), or "direction is indication of the affecter" (*susceptible*). Prepositions in this kind of phrase not only perform a textual

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[28][in the central part …] is a prepositional phrase that can either be categorized as a postmodifier of the head *habitats* or as an adverbial on clause level. Biber et al. (1999, p. 607) treat it as a postmodifier; see also Biber et al. (1999, p. 104) for the fuzzy boundaries between the two roles.

[29]Prepositions at the start of postmodifiers are marked in *italics*, while relation to metaphor is signaled by *underlined italics*.

function of opening complementary phrases required by adjectives bound to prepositions (*susceptible to*), but also perform an ideational function, indicating abstract relations between referents. The two examples (2 and 3) hence show that prepositions (as heads of postmodifying prepositional phrases and complementing nouns and adjectives) are not restricted to textual functions in academic prose, but participate (however slightly) in the ideational tasks (performed by the noun and adjective phrases).

Textual and ideational functions can also be established in prepositions that work as heads of adverbials on the clause level:

(4) This view, as we shall see, has been attacked [[on the grounds [that…]]. (ECV-fragment05, emphasis mine, JBH)

However, with many of these prepositional phrases being (semi-)fixed collocations, such as [*on the grounds*], which Macmillan lists as a connected phrase under the entry for the noun *ground* (MM3), the ideational specification function of the respective MRW prepositions seems backgrounded for the sake of the meaning of the whole phrase. This appears to be the main difference from the prepositions-as-heads-of-postmodifiers / complement-of-nouns-and-adjectives group (ex. [1], [3]). Prepositions as constituents of prepositional verbs (and of prepositional objects) "face[…] in two directions, both to the verb and the object" (1999, p. 129).[30] This is why prepositions are addressed by the *LGSWE* both as parts of prepositional verbs and as parts of prepositional objects (Biber et al., 1999, p. 129). This appears to be another reason for why academic prose uses a high number of MRW prepositions: Since "[v]erbs in academic prose are often associated with a following abstract complement" (Biber et al., 1999, p. 380), prepositions that introduce these abstract complements are bound to be abstract as well. When such prepositions have a more basic spatial meaning, they are used metaphorically.

(5) Partly to redress the balance and partly because *talking* [*about* 'children'] covers such a wide range of potential images, I shall try to *keep* [*before* my mind an ordinary 10-year-old of our society]. (ECV-fragment05 emphasis mine, JBH)

(6) It is surprising that the Commission has failed to recognise that if uncorroborated confessions are to be admitted in court then their accuracy *must be* [*above* suspicion]. (BNC-HAJ, ACA, emphasis mine, JBH)

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[30]Biber et al. discuss two competing structural analyses of prepositional verbs, a) as a simple lexical verb followed by a prepositional phrase functioning as an adverbial; b) as a verb plus preposition as a single unit (1999, p. 414). I treat prepositional verbs according to analysis a). For the distinction between prepositional and phrasal verbs and their annotation in both BNC and the *VUAMC*, see Chapter 3.

Similar to the other prepositional constructions, prepositions following lexical verbs have a textual function, but also clearly perform an ideational task in being "relational marker[s], which sometimes make[…] the meaning relationship more explicit" (1999, p. 130). Some prepositions in prepositional verbs, however, not only make meaning relationships "more explicit", but establish the meaning relations in a more substantial way (e.g., in (6), *above* establishes the relation between 'accuracy [of uncorroborated confessions]', and 'suspicion'). The fact that metaphor-related prepositions play a vital role in establishing meaning relations becomes even more obvious when replacing *above* by a different, but also metaphor-related preposition:

(7) *"[…] then their accuracy *must be* [_below_ suspicion]". (invented example, JBH)

Inserting *below,* the antonym of *above*, drastically changes the proposition underlying the clause by establishing a different semantic relation between the arguments *accuracy* and *suspicion.*

Another example is *on* in (8):

(8) The police force face the virtually impossible task of _keeping_ the lid [_on_ the explosive mixture of ingredients [that the dynamics of British society have assembled in the inner city]]. (AS6-fragment01, emphasis mine, JBH)

In this scenario, the metaphor-related preposition _on_ plays a substantial role in establishing the relation between the predicate *keep* and the prepositional object, which becomes obvious when replacing _on_ by the opposite metaphor-related preposition _off._

(9) *"[…] _keeping_ the lid [_off_ the explosive mixture of ingredients […]."[31] (invented example, JBH)

In terms of contextual functions, metaphor-related prepositions seem to be involved in orienting readers and writers in some kind of shared context, referring to "some aspect of the situation shared by speaker and listeners" (Biber et al., 1999, p. 42). This may in particular be the case in circumstance adverbials that "describe the circumstances or conditions of an action or state" (Biber et al., 1999, p. 131), such as [_in the remainder_] (10).

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[31]Note that * *Keeping the lid off* is not idiomatically used in contexts such as the social science text. In concrete contexts, for example beer-brewing, *keep the lid off* is however idiomatic: *It's still a good idea to keep the lid off during the boil, especially if you upgrade to partial mashes or all-grain brewing* (ArcaneXor, 2009, December 1,highlighting mine, JBH).

(10) [*In* the remainder [*of* this chapter]] I will explore […]. (BNC-A0K, ACA, emphasis and brackets mine, JBH)

Here, the MRW *in* heading the circumstance adverbial appears to be used for quasi-spatial indication of intra-textual reference in academic prose. Although this may actually be treated as a borderline case between a contextual function and textual function (since the adverbial creates textual coherence), the text itself (with its levels of spatial and content orientation) becomes a context shared by writer and reader.

But how about (inter)personal functions? After all, academic prose has a high overall number of prepositional phrases used as stance adverbials – after single adverbs, they are the second most common form (Biber et al. 1999, p. 862; page references here and below to Biber et al., 1999), and are also more frequent in academic prose than in news and fiction (cf. 1999, p. 859). Stance adverbials "typically express the attitude of the speaker/writer toward the form or content of the message" (1999, p. 131). In academic prose, these are by and large conventional adverbial phrases with more or less subtle (inter-)personal functions, for "qualify[ing] claims" (1999, p. 864), limiting the "generality of the proposition" (*in general, on the whole,* 1999, p. 864) or "explicitly stating that the author's viewpoint is being presented" (*in my view* (1999, p. 864), *from our perspective*, 1999, p. 860). Do the MRW prepositions in constructions such as *in my view* hence exert interpersonal functions? Apparently they do not, or not alone: Although relation to metaphor can be identified for *in* separately, and a composite more basic phrase meaning can be established that refers to 'a location that something can be used in', its interpersonal function cannot be attributed to *in* independently of the other constituents.

However, different prepositions appear to exert ideational functions to different extents, and this seems to extend to (inter-)personal functions. It appears that the degree of independence of meaning of a preposition in a certain context is crucial here. Some (MRW) prepositions, such as *above/below* in (6/7) or *off/on* in (8/9), seem to have a greater independence in terms of meaning in comparison with others such as *in* in *decrease in breeding performance* (1). This appears to be connected to the fact that in (6/7) and (8/9), prepositions are used as "free prepositions" (1999, p. 74). A free preposition such as *on* in *keeping the lid on* are "not dependent upon any specific words in the context" (1999, p. 74). It is semantically less closely tied to the co-text than "bound prepositions" such as *to* in the complements of nouns and adjectives in [*exposure to*] (2) and [*susceptible to*] (3), where "the choice of the preposition depends upon some other word (often the preceding verb)" (1999, p. 74). However, even though cases such as *on/off* have a relatively independent meaning and can be assigned some role in exerting ideational and interpersonal functions, they are still relational elements by nature. The functional analysis of

metaphor on the basis of *MIP*(*VU*) hence does well in examining the meaning of the surrounding elements.

Overall, the specifically high number of MRW prepositions in the academic register could be explained by prepositions catering to the greater need of elements that establish links in academic prose, both on syntactic and semantic levels, with prepositions not used in their spatial, but in their "logical" metaphorical senses. In addition to the relatively obvious textual function, metaphor-related prepositions also exert ideational functions, specifically where they complete the meaning of nouns and adjectives (*difference between*; *susceptible to*) and where they work as relational elements between verbs and their objects (e.g., *keep the lid on the explosive mixture*; *must be above suspicion*). The review also suggested that metaphor-related prepositions may exert a contextual function, catering to intra-textual reference (e.g., in the circumstance adverbial *in the remainder of this chapter*). I furthermore discussed whether metaphor-related prepositions (stance adverbials such as *in fact*; prepositional phrases following verbs such *keeping the lid on the explosive mixture; accuracy must be above suspicion*) may play a role in (inter-)personal tasks. I argued that while MRW prepositions are often indispensable for the meaning of larger units (phrases, clauses), when the level of analysis is set at word level, prepositions do not seem to exert (inter) personal functions alone.

Turning back to the *VUAMC* and the results from Chapter 5, the most frequently metaphor-related lexical types of prepositions will now be compared with the other registers. This serves to explore the relation between metaphor and word class even further, zooming in on the lemmas that occur most frequently in relation to metaphor.

Table 6.1 shows the ten most common metaphor-related prepositions of academic prose. These ten types comprise altogether N=2,809 tokens (cases) in academic prose, of which n=2,430 are related to metaphor, which is 87%. There is thus a clear contrast between the non-metaphorical and the metaphorical use of these prepositions. The metaphorical instances of the ten types (n=2,430) account for 88% of the total count of metaphor-related prepositions of academic prose (N=2,750; see Table A2 in the Appendix). This can be explained by the limited lexical variation among prepositions as a closed class (cf. Biber et al., 1999). Another way of addressing lexical variation is by means of the type-token ratio (TTR). This ratio divides the number of types (*in, to, with*, etc.) by the number of tokens (the occurrences of these types in the corpus), multiplied by 100.

Table 6.1

Top Ten Metaphor-Related Prepositions in Academic Prose

Lemma	Academic prose			News			Fiction			Conversation		
	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total
In	169	902	1,071	255	538	793	261	303	564	261	143	404
To	39	388	427	98	288	386	172	216	388	136	116	252
With	47	293	340	69	228	297	142	220	362	92	86	178
On	37	255	292	74	206	280	115	113	228	77	164	241
From	34	189	223	79	127	206	87	78	165	34	19	53
At	37	130	167	97	117	214	118	126	244	81	81	162
About	1	83	84	1	56	57	1	81	82	0	85	85
Into	7	74	81	13	53	66	58	38	96	19	14	33
Between	4	69	73	4	30	34	9	12	21	4	8	12
Through	4	47	51	9	25	34	27	17	44	15	2	17
Total	379	2,430	2,809	699	1,668	2,367	990	1,204	2,194	719	718	1,437

Thus, the total number of different preposition types that occur in relation to metaphor in academic prose (N=46) is divided by the total number of MRW prepositions in academic prose (N=2,750, see Table A2 in the Appendix) and then multiplied by 100: 46/2750*100= 1.67. This is a very low score, as will become clearer when comparing TTRs across word classes. Lexical variation is hence very small among the MRW prepositions of academic prose. When examining the content of the ten most common MRW prepositions, there are no surprises – all types have clearly spatial basic meanings, indicating position, direction, location, and origin. In comparison with academic prose, all other registers show fewer tokens in terms of total counts, and in terms of metaphor-related counts. News is quantitatively most similar to academic prose, with a slightly lower overall count and 70 % of the tokens related to metaphor. Fiction has a lower overall token count than news (N=2,194), and of this only 55 % are related to metaphor (n=1,204), while conversation has the fewest tokens overall (N=1,437), with only half of these related to metaphor (n=718). Vice versa, the proportion of non-metaphorical instances is highest in conversation and lowest in academic prose.

These differences between the registers suggest that news, but especially fiction and conversation, use the most frequent metaphor-related prepositions of academic prose more often for the indication of concrete locations, positions, and directions. To give an example, the preposition *in* has clearly more metaphorical instances than non-metaphorical ones in academic prose, with 84 % of the tokens related to metaphor (n=902 out of N=1,071). However, in conversation, this proportion is much lower – with 35 % metaphor-related tokens (n=143 out of N=404). There are thus many more non-metaphor-related occurrences of *in* in conversation than metaphorical ones, and in their basic senses necessarily used for the indication of spatial relations. Similarly, in fiction, 54 % of all occurrences (n=303 out of N=564) of *in* are related to metaphor, roughly as many metaphorical tokens as non-metaphorical ones (n=261). And in news, 68 % of the tokens are related to metaphor (n=538 out of N=793), a proportion that is still substantially lower than that of academic prose. Most other prepositions in Table 6.1 show a similar distribution of MRWs and non-MRWs across the four registers.

We thus see that the most common MRW prepositions of academic prose are common in the other registers as well, especially in news. However, the crucial difference is that in academic prose, they are by far more often related to metaphor, while the other registers use the same forms much more often in their spatial meanings. This finding corroborates the assumption that academic prose uses prepositions in their 'logical' senses for linking the abstract and highly specific prose of academic discourse, while in the other registers, they are more often used to indicate actual spatial relations.

With regard to news, the other "informational" register, the most important question is why news does not display as many metaphor-related prepositions as

academic prose, especially since it actually uses slightly more nouns than academic prose (see Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010; Steen et al., 2010a; see also Biber, 1988; Biber et al., 1999). One reason for this is that academic prose has a higher proportion of abstract nouns than news (see Chapter 5 and Section 6.4 below), and that these require prepositional phrases headed by prepositions with equally non-concrete – and thus often metaphorical – meanings. Another, related, explanation for the higher count of MRW prepositions in academic prose is that academic prose packs its referential information even more densely than news (cf. 1999, p. 578; p. 607) – the *LGSWE* reports that academic prose uses a higher frequency of a particularly dense type of postmodification, the "complex postmodifier complex", which consists mostly of series of (nested) prepositional phrases (1999, pp. 641-2). The prepositions in head position in these postmodifiers are often related to metaphor:

> (11) […] ideas emerging [*from* disciplines devoted [*to* the study [*of* language and learning]]]   (ACAD, 641, emphasis and brackets mine, JBH)

By contrast, news relies more often on simple prepositional phrases as postmodifiers (cf. 1999, p. 606; p. 642), as well as on premodifiers (1999, pp. 579) that often feature nouns as premodifying elements (1999, p. 589). Both types of modification are shorter, less densely integrated and thus feature fewer prepositions. Moreover, in news, they appear to be more often headed by non-metaphorical prepositions used to indicate actual location and direction, such as in *their first trip* to *Scotland* (NEWS, 637). In all, comparing the two informational registers, the overall slightly more abstract and slightly more densely integrated content of academic prose appears to account mainly for the higher proportion of MRW prepositions in academic prose. The higher frequency of complex (post)modification in academic prose with its greater need for abstract prepositions in head position is opposed to fewer postmodifiers in noun phrases in news, which in turn requires fewer (metaphor-related) prepositions for textual and ideational linking.

The following list of bullets will summarize the findings of this section, with a reevaluation of the conclusions made in Chapter 5, a review of the formal and functional characteristics of MRW prepositions, a summary of the characteristics of the top ten MRW prepositions in academic prose as opposed to the other registers, and a final statement about the cross-domain mappings underlying MRW prepositions in academic prose.

➢ Chapter 5 suggested that metaphorical use of prepositions in academic prose may be relatively straightforwardly related to informational production. The present section presented some support for this, in particular with regard to a general "linking" function: In the highly integrated, informationally dense and

exact prose of academic discourse, metaphorical prepositions seem indispensable for the linking structures.

➢ This seems to apply especially to textual functions, by "indicating relationships between lexical words or larger units" (1999, p. 55). But metaphorical prepositions also link structures ideationally, "by specifying and elaborating the identity of the referents" (1999, p. 41), as well as contextually, by referring to "some aspect of the situation shared by speaker and listeners." (1999, p. 42). Lastly, in addition, they participate in communicating the (inter-)personal level of discourse, participating in "indicating the way in which a lexical word or larger unit is to be interpreted" (1999, p. 55). This function, however, seems to be largely performed by the whole phrase and clause units – and hence not by the prepositions alone. Metaphorical prepositions are hence true relational elements, both in terms of syntax and semantics.

➢ Comparison of the ten most common metaphor-related prepositions showed much more metaphor-related than non-metaphor-related tokens in academic prose in comparison with news (as well as with fiction and conversation). On the basis of the small range of possible types, this was related to a more frequent use of prepositions in the other registers for the non-metaphorical indication of concrete locations, positions, and directions. Thus, in addition to using more MRW prepositions for integrating information, academic prose seems to refer to physical space (and entities) less often than news and the other registers. Overall, (MRW) prepositions as a functional word class draw on a restricted range of lexical types, which are very frequently used.

➢ Computation of the TTR confirmed this observation for the whole sample of MRW prepositions. Metaphorical use of prepositions is hence very common, but at the same time very inconspicuous, repeating the same constructions over and over for the indication of relations between elements.

➢ The informal analysis of cross-domain mappings underlying metaphorical word use suggested that (at the most general level) MRW prepositions prose may be related to the DISCOURSE IS SPACE mapping. The mapping matches the textual function of catering to discourse coherence. However, related to the ideational function, more specific source domains may be POSITION, DIRECTION, LOCATION, and ORIGIN, which are mapped onto particular target domains, such as MEMBERSHIP OF AN ABSTRACT GROUP IS LOCATION (*among*), or INDICATION OF THE AFFECTER IS DIRECTION (*susceptible*).

6.2 Verbs

The macroscopic analysis in the previous chapter showed that verbs have the second highest proportion of metaphor in each of the registers. Metaphorically used verbs are most common in academic prose and news texts. In Chapter 5, this was hence tentatively related to informational production, whereas a higher frequency of non-metaphorical verbs seemed to indicate involved production. With this quite surprising result, it is important to ask why metaphorical verbs play such an important role in academic prose, which is after all marked by a heavily nominal style. How do metaphor-related verbs behave in academic prose? What are their typical lexico-grammatical and semantic features and what functions do they perform?

Although verbs can be related to metaphor as auxiliaries or modals, the previous chapter has shown that this phenomenon is relatively uncommon in all four registers. Therefore, the present section puts a clear emphasis on a discussion on the characteristics of verbs as lexical verbs. In terms of syntactic characteristics, lexical verbs, as heads of verb phrases, are crucial devices that "serve as the centre of clauses" (Biber et al., 1999, p. 63), typically denoting "an action (*drive, run, shout,* etc.) or a state (*know, seem, resemble,* etc.)" (1999, p. 120). The semantic classification of verbs in the *LGSWE* (1999, pp. 360-372) groups lexical verbs into seven main semantic domains: (1) activity verbs (*go, buy, give*); (2) communication verbs (*say, tell, write*), which are a subclass of activity verbs; (3) mental verbs (*think, see, discover*); (4) verbs of facilitation or causation (*cause, enable, require*); (5) verbs of occurrence (*become, change, happen, develop, grow*); (6) verbs of existence and relationship (*be, seem, exist, contain, include*); and (7) aspectual verbs (*change, become, develop*).

Naturally, categorization of lexemes into semantic domains becomes tricky when lexical units exhibit polysemy (many of the verbs could go into more than one category, see Biber et al., 1999, p. 361), and many of these cases of verbal polysemy seem to involve conventional metaphor. The following discussion of metaphorical word use will use classification by the *LGSWE* – which means that, as a rule, verbs will be categorized by what Biber et al. call their "core meanings". A *core meaning* is defined as "the meaning that speakers tend to think of first" (1999, p. 361). This is the classification criterion of "thinking of first". However, in the *LGSWE*, this criterion is at times overruled by another one, called the "most typical use" of a verb (1999, p. 361). One example is *start*, where "most speakers tend initially to think of […] physical activities" (1999, p. 361; e.g., *It must have been fifteen minutes before he got it started* [FICT, 361]). However, according to the *LGSWE*, verbs like *start* are commonly used in a different, aspectual, meaning, concerned with the progress of some other action (*Her car started to overheat*). Therefore, following the second

criterion, verbs that are "typically used" in some meaning are listed according to that meaning (e.g., *start* is listed by LGSW as an aspectual, not an activity verb). This is a classification problem resulting from two divergent criteria. However, it seems to be alleviated when resorting to the concept of *salience* in the sense of Giora (1997, 2003), since ultimately, both criteria proposed by the *LGSWE*, the "thinking of first" and the "most typical use" appear to match what is understood as a word's most salient meaning:

> The most conventional, popular, frequent, familiar, or predictable, or […] most probable interpretation is the most salient meaning of a specific word or sentence *in a specific context*. (Giora, 1997, p. 186, emphasis mine, JBH)

Overall, Biber et al.'s semantic classification hence appears to classify verbs by their most salient meanings in some context. In Giora's definition of salience, the phrase "in a specific context" is thus crucial, with salience being defined as a context-sensitive feature that will change across situations of usage. Salience reconciles the two criteria proposed by the *LGSWE*. In the *LGSWE*, metaphor-related verbs that occur frequently in academic prose are largely semantically categorized by what *MIPVU* defines as their *contextual sense*, since in the context of academic prose, this sense is most salient. This is the "most typical" (conventional, popular, frequent, familiar, or predictable) sense, and at the same time the sense that people will "think of first" in this particular context (for a discussion of metaphorical word meanings and salience, cf. Giora 1997). For example, consider the verb form *risen* in *sale room estimates of her work have <u>risen</u> from $40,000 to over $1 million* (A6U-fragment02, emphasis mine, JBH). In the *LGSWE*, the contextual sense of *rise* ('to increase in size, amount, quality, or strength', MM) falls into the category "verbs of single occurrence". These verbs report events that occur apart from any volitional activity, e.g., *become, change, increase,* and *occur* (Biber et al., 1999, p. 364). By contrast, the basic sense ('to move upward or to a higher position', MM), falls into the category "activity verbs", which express volitional activities, but also non-volitional actions, events, or static relations (e.g., *bring, carry, come, run;* cf. Biber et al. 1999, pp. 361-2). In the specific context of a text describing the economic value of Frida Kahlo's art, it is thus not the activity verb sense, but the verb of single occurrence sense that is more salient, the abstract contextual meaning of *increase* being very likely the "most conventional, popular, frequent, or predictable" interpretation. Under normal circumstances, in this particular context, people will think of this sense first.

Let us also consider a second example: *see*. The verb is used non-metaphorically in *It turns out that our animal was able to see in almost every direction — upwards, downwards, sideways and forwards* (AMM-fragment02). The basic sense of *see* is 'to notice someone or something using your eyes' (MM), and in

the given context (a text on paleontology), this meaning of *see* is also the contextual meaning. The *LGWSE* categorizes this use of *see* as a *verb of perception*, subcategorized under mental verbs (Biber et al., 1999, p. 362). Within the given context, the basic sense identified by *MIPVU* is thus very likely to be the most salient sense of *see*. Readers would thus "think first" of the sense 'using your eyes', because this sense is "the most typical" sense in a textual paragraph dealing with the detailed reconstruction of extinct animals. In a different context, the non-metaphorical use of *see* can, however, be contrasted with an abstract, metaphor-related use: *Darwin <u>sees</u> pangenesis as an evening up, on both sides, of all the powers of the sexual and asexual parts of any organism*. (CMA-fragment01, emphasis mine, JBH). In this particular context (a text on the development of Darwin's theories), *see* has an abstract contextual meaning ('to consider someone or something in a particular way', MM), and is thus used metaphorically according to *MIPVU*. This metaphorical sense is another "most salient meaning"– but only in this particular context. By contrast to the paleontologist text, readers are here very likely to "think of" the metaphorical sense first. In sum, it appears that Giora's salience is able to reconcile *LGSWE*'s two criteria for semantic verb classification and hence allows us to classify both the contextual and basic meanings.

As a rule, in academic prose, the contextual senses of MRW verbs appear to be salient, not the basic senses. One exception to this assumed rule may be deliberate metaphor use, where the basic meaning becomes salient. Consider the MRW *reanimate,* which appears in the first sentence of the paleontology text: *... some of the ways in which palaeontologists determine the way fossil animals lived are described, <u>reanimating</u> the dead fragments to build up a living creature (AMM-fragment02, emphasis mine, JBH)*. This sentence follows the title of the text, which features a similar metaphorical verb, the phrasal verb *bring back*: <u>*Bringing fossils back* </u>*to life*. In this specific context, triggered by co-textual priming in the title, a more basic sense of *reanimate* is likely to be salient ('to restore to life: revive'; Merriam-Webster Online Medical). Strictly speaking, this is a case of revitalization, since *reanimate* is monosemous in LM ('formal to give new strength to someone or something or the energy to start again'; the verb does not feature in MM). While the actual frequency of instances of deliberate metaphor use in verbs of academic prose is an empirical question, it appears that overall, in conventional academic prose, contextual senses of MRW verbs are likely to be more salient than the more basic senses (e.g., *rise* and *see*). Giora's definition of salience can reconcile both criteria used by the *LGSWE* for the semantic categorization of verbs, with "context" explaining effects on readers' interpretation in terms of frequency and register, as well as in terms of more local textual priming. In the following, we will use the semantic verb categories proposed by the *LGSWE* to determine and compare the semantic category of verbs, in terms of contextual senses and basic senses.

In academic prose, according to the *LGSWE*, the task of most verbs is linking a noun phrase to another kind of phrase, reporting "relations among entities – both concrete and abstract – using simple statements of existence/relationship or occurrence" (1999, p. 372). By contrast, in conversations and fiction the prototypical task of verbs is specifying particular actions, "talking about what people have done, what they think or feel, or what they said" (1999, p. 371). In academic prose, thus, many lexical verbs essentially function as existence verbs, describing static situations and relationships between mostly abstract entities, despite their "core meaning" in other registers (1999, p. 379). As a result, the majority of metaphor-related verbs in academic prose appear to exert textual and basic ideational functions (catering to the linking of noun phrases, indicating basic existence and causation). Here are several examples from distinct semantic classes.

In sentences (12) and (13), the metaphor-related verbs *follow* and *make* have meanings that have to do with 'facilitation and causation', indicating "that some person or inanimate entity brings about a new state of affairs" (1999, p. 363).

(12) I shall suggest that this does not <u>follow</u> because rationality is […]. (ECV-fragment05, emphasis mine, JBH)

(13) Social [science], [religion], and the [arts], <u>make</u> contributions. (ACAD, 379, emphasis mine, JBH)

Follow in (12) is used as a *causative verb* with the contextual meaning of 'if something follows, it must be true because of something else that is true' (MM). In its basic sense, *follow* is however an activity verb (it is categorized as such also in its academic usage in the *LGSWE*, 1999, p. 367). Since 'following', the action denoted by the basic sense, can only be performed by animate agents, the word use in context involves personification as well. *Make* in (13) is used as a *verb of facilitation*, "for showing that someone performs the action referred to by the noun" (MM). In this respect, *make* has only minimal lexical content, its main tasks being to link the elements of the clause and to express a basic ideational relation of assigning agency to the abstract subjects of the clause (social science etc.). Its basic sense, however, is concrete and bodily-related ('to create or produce something by working'), with an animate entity in subject position. The *LGSWE* acknowledges the relation between what we have called basic and contextual senses in the following way: "[S]everal of these activity verbs [e.g., *make, give, lead, produce*, JBH] commonly have a causative or facilitative sense when used with inanimate subjects in academic prose" (1999, p. 380).

A similar relation between physical senses in other contexts and abstract senses in academic prose is shown by the verbs *embrace* in sentence (14), *take* in (15), *rest* in (16), and *have* in (17):

(14) If we agree that in that case women should be <u>embraced</u> by the liberty principle then so should children. (B17-fragment02¸ emphasis mine, JBH)

(15) Testing usually <u>takes</u> the following three steps <…>. (ACAD, 379, emphasis mine, JBH)

(16) […] that it <u>rests</u> on the false assumption that the distinction between adults and children is […].   (B17-fragment02, emphasis mine, JBH)

(17) […] delinquent boys were twice as likely to <u>have</u> a mesomorphic build, a chunky, muscular physique, compared with non-delinquent boys. (B17-fragment02, emphasis mine, JBH)

These verbs are all classified as *verbs of existence and relationship*. Such verbs report "a state that exists between entities" (1999, p. 364). *Rest* and *have* are verbs of existence and relationship not only in metaphorical use, but also in their basic senses; however, in their basic senses, they have clear spatial meanings, for instance *rest*: 'to put something somewhere for support, especially a part of your body' (MM). In contrast, the basic senses of *embraced* and *take* belong not among the verbs of existence and relationship, but among the activity verbs, with a bodily-related and emotional meaning for *embraced* ('to put your arms around someone in order to show love or friendship', MM) and a bodily-related meaning for *take* ('to reach out and get something, especially with your hand', MM). *MIPVU* can explain the contrast between an abstract sense (as a verb of existence) in academic prose and some other, typically concrete and bodily-related, sense (often as activity verb) in a different context.

   Another semantic verb type that is relatively abstract is *verbs of simple occurrence*. According to Biber et al., these verbs "primarily report events (typically physical events) that occur apart from any volitional activity" (1999, p. 364). Among the examples given in the *LGSWE* are *become, change, happen, develop, grow* – of which *grow* can be related to metaphor in academic contexts such as (18), with a bodily or organism-related basic sense that is a verb of simple occurrence as well:

(18) […] something which helps to explain why partisan strife continued to <u>grow</u> in intensity after 1689. (BNC, HY9, ACA, emphasis mine, JBH)

Grow in example (18) shows a contrast between abstract and more concrete meaning within the category "verbs of simple occurrence" itself. This is different from *risen* in the Frida Kahlo text above (*sale room estimates of her work have <u>risen</u>), which* in its basic sense is an activity verb. In example (18) *MIPVU* thus identifies relation to metaphor on the basis of two related senses from the same semantic category.

   In all, the frequent use of metaphor-related senses of verbs of the abstract semantic classes (verbs of facilitation, causation, existence, and occurrence) appears

to explain the important role of metaphorical verbs in the nominal style of academic prose. But how about such metaphor-related verbs that are categorized as activity, communication, and mental verbs in the *LGSWE*?   First, *activity verbs* primarily "denote actions and events that could be associated with choice, and so take a subject with the semantic role of agent" (1999, p. 361). To give an impression of activity verbs in academic prose, consider the three activity verbs (*used, found, exerted*) that appear in the following extract of academic prose from the *LGSWE*:

> (19) […] an empirical approach was *used* to investigate the effect of various weather factors on grasshoppers.[…] While it was <u>found</u> that the early stage was extremely vulnerable to adverse weather conditions, the major influence […] appeared to be *exerted* upon egg production […]. (ACAD, 372, emphasis mine, JBH)

While *used* and *exerted* are not related to metaphor according to *MIPVU*, <u>*found*</u> is, based on a contrast between the contextual meaning of 'to discover or learn something by study, tests, sums etc' (LM5) and the more basic meaning of 'to discover, see, or get something that you have been searching for' (LM1), which involves a bodily activity and concrete object. The metaphor-related verb *find* has the ideational function of indicating a typical scientific/scholarly activity, which is often highly abstract. In conceptual terms, a mapping between 'learning' on the one hand and 'seeing/getting' on the other could be assumed. Both senses of the verb are hence activity verbs, but contrast in the type of activity (largely, abstract vs. concrete).

Secondly, *attack* (20)*, talking* (21), and *indicate* (22), are all three instances of *communication verbs*, which "can be considered a special subcategory of activity verbs that involve communication activities" (1999, p. 362), such as speaking and writing.

> (20) This view, as we shall see, has been <u>attacked</u> on the grounds […]. (B17-fragment02, emphasis mine, JBH)
> (21) Partly to redress the balance and partly because <u>talking</u> about 'children' covers such a wide range of potential images […]. (B17-fragment02, emphasis mine, JBH)
> (22) She is the child of this paper unless I <u>indicate</u> otherwise. (B17-fragment02, emphasis mine, JBH)

The three communication verbs have, however, quite different basic senses. *Attack* has a basic meaning as a physical activity; *talking*, whose contextual sense in (21) refers to 'writing', has a basic sense as a communication verb involving the physical act of talking; and the basic sense of *indicate* falls into a different kind of

communication verb category: By contrast to *talking*, its basic sense is that of a gestural communication verb, involving deixis. These three verbs converge in having predominantly ideational functions, establishing reference with particular abstract communicative activities. In terms of conceptual relation to metaphor they also have in common activities of the (human) body as a – broadly conceived – source domain. At the same time, there are more differences between the three verbs. Firstly, the mappings that the metaphors reveal on the conceptual level are very different. In (20) the basic meaning is a brutal, physical action with a hostile goal, indicating a mapping between 'argument' and 'physical fight' (or 'war'). In (21), the contrast between written contextual meaning and spoken basic meaning indicates a mapping between 'writing' and 'speaking'. In (22), the mapping is between 'written' and 'gestural' communication. Secondly, the verbs differ in the extent to which they perform interpersonal functions: *Attack* (20) has a meaning that may be perceived as "stronger" than a paraphrase such as *criticize*. As a result, it may be chosen by writers for argumentative and/or persuasive motives in particular contexts. Meanwhile, in the case of *talking* (21) an interpersonal task is less salient. However, the choice of *talking* conveys a more casual situation than would the choice of *writing*.[32] It is more neutral than *arguing*. And in (22), with *indicate*, the writer chose a neutral verb with a relatively neutral meaning which may in the context of (22) be associated with "objectivity", possibly because of the simple bodily meaning resonating in the contextual meaning. In all, metaphor-related communication verbs as a rule have predominantly ideational functions, referring to particular abstract communicative activities. In addition, some verbs appear to perform interpersonal functions more clearly than others (*attack* vs. *talking*). A general source domain underlying the use of MRW communication verbs is 'activities of the (human) body', which, however, includes such distinct mappings as ARGUMENT IS (PHYSICAL) FIGHT (OR WAR), WRITING IS SPEAKING, and WRITING IS GESTURING.

Thirdly, let us take a look at the so-called *mental verbs*, which "denote a wide range of activities and states experienced by humans; they do not involve physical action and do not necessarily entail volition" (Biber et al., 1999, p. 362). Note that in the *LGSWE*, they include cognitive (*think*) and emotional (*love, want*) meanings, and even perception (*see, feel, taste*) and "the receipt of communication (e.g., *read, hear*)" (1999, p. 362).

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[32] In the current context *talking* has a greater extension than *writing* (covering acts of talking as well as of writing) – therefore *writing* is no exact paraphrase of *talking* (for an examination of the language indicating a WRITING IS SPEAKING mapping in elementary educational discourse see Cameron, 2008).

(23) This view, as we shall <u>see</u>, has been attacked on the grounds [...]. (ECV-fragment05, emphasis mine, JBH)

See in (23) is a mental verb in its contextual meaning as well as in its basic meaning; however, in the contextual sense it relates chiefly to intellectual understanding, while in its basic meaning it denotes sensory perception. The metaphor-related verbs *see* in the sense of learning/knowing has an ideational function, denoting a mental activity that is typical of scientific and academic discourse. The use of s*ee* also has a textual function, being embedded in the appositive clause *as we shall see*, which points forward within the text and serves to guide the reader to link the current discourse unit to later discourse units. The metaphorical use of *see* could also be ascribed some interpersonal task (together with the usage of the personal pronoun *we*, which addresses the reader directly and serves to create a "togetherness" between reader and writer), suggesting that what is being claimed is as evident "as through visual observation". However, since *see* is highly conventionally used for this purpose (cf. *As we saw in Chapter 2, the reasons for the war were complex*, MM) the interpersonal function does not seem to be foregrounded here.

Verbs in academic prose have a relatively high degree of abstraction (cf. Biber et al., 1999, p. 372). This can now (at least in part) be explained by the relatively high proportion of metaphors among the verbs. In line with Biber et al., the above examples suggest that in many of these instances verb meanings do not carry much content besides the indication of existence, agency, and logical relations, especially in the case of verbs of facilitation/causation, existence, and occurrence. However, it was suggested that metaphorical verbs of academic prose, at least in some cases, also exhibit personal and interpersonal functions. For example, an author may prefer *attack* before the more neutral *criticize* to (unconsciously) add a (negative) evaluative tone to the exposition. Similarly, in (14) *embraced* may have been preferred to *include* since it adds a (positive) evaluative tone and thus an (inter-)personal function to the proposition, with positive associations such as those of 'hugging' (corresponding on the conceptual level roughly with a mapping between the 'liberty principle' and an 'affectionate person'). Metaphor-related verbs may thus be used in personal and interpersonal ways in academic prose, possibly relatively independent of semantic classification in the sense of the *LGSWE*.

Since academic discourse has predominant informational, argumentative, and explanatory goals (cf. Biber et al., 1999; Chapter 2 of this thesis), interpersonal functions are probably mostly combined with argumentative and explanatory purposes. Specifically the communicative goals of textbooks, the transmission of knowledge (e.g., Myers, 1992), and the acculturation of future professionals into the epistemology of the discipline (e.g., Richardson, 2004), may be generally associated with interpersonal/ideational functions, which can be exerted in a conventional and indirect way by metaphorical verbs.

A last aspect of this review of metaphorical verb use in academic prose will now highlight a slightly different, but apparently typical, type of relation to metaphor in verbs in academic prose: the violation of the selection-restriction criteria of the verb. In sentence (24) the inanimate agents *social science*, *religion*, and the *arts* appear in the subject position of *make* – this is opposed to the animate agency of the pronoun *she* in (25).

(24) Social [science], [religion], and the [arts], <u>make</u> contributions. (ACAD, 379, emphasis and brackets mine, JBH)

(25) She *makes* all her own clothes. (Macmillan, entry *make* [verb], emphasis mine, JBH)

The phenomenon present in (24), which has traditionally been called personification in stylistics and metaphor studies (cf. Dorst, 2011b; Low, 1999), is also recognized by the *LGSWE*: Biber et al. (1999, p. 379) report that academic prose shows an exceptional tendency to use abstract rather than concrete and animate subjects with verbs that normally entail human subjects (activity, communication, and mental verbs). It is hence different from MRW verbs in which animate entities are in subject position, such as *see* in *This view, as we shall <u>see</u>*.

According to the *LGSWE*, personification is also present in news, but less pronounced, while conversation and fiction mostly use these verbs with human subjects. In academic prose, over 60% of all causative, occurrence, and existence verbs occur with inanimate subjects, as well as over 30% of all activity verbs, 20% of all communication verbs, and 10% of all mental verbs (Biber et al., 1999, p. 378). Examples listed by Biber et al. include the potentially metaphorical verbs *apply, make, provide* and *take* (with basic meanings as activity verbs)*, suggest, explain* (communication verbs), and *mean* (mental verbs). The more frequent use of personification may thus be one area in which a difference between academic prose and news in terms of metaphor-related verb use can be perceived (cf. Master, 1991, for a study of active verbs with inanimate subjects in scientific prose that exert the predominant functions of indicating "causation and explaining").

In all, in academic prose, two basic types of relation to metaphor in verbs can be identified. Firstly, there is the typical indirect language use with a contrast between the contextual and basic, often bodily-related, meaning of the verb itself (see Chapter 3). Secondly, a specific case of this appeared as potential personification of inanimate and often abstract entities, with an inanimate and/or abstract entity in subject position instead of the prototypical human one, and with abstract entities instead of concrete ones in object position. The contextual meanings of both types are generally used to denote existence, relations, and occurrence, causation, or mental and communicative activities (both are present in *make* in *[Social science], [religion], and the [arts], <u>make</u> contributions*). The two types differ, however, in

terms of more basic meanings: While the first one typically captures verbs that have a more basic sense relating to some physical activity, and can thus be related to metaphor independently of the entity in subject position (*as we shall see)*, the second type has potentially a much broader scope of basic meanings. For personification a verb is required that normally requires an animate, typically human, entity in subject position, but the meaning of the verb itself can be relatively abstract in the more basic sense (e.g., *suggest*). On the basis of this examination the following summary from the *LGSWE* can thus be directly related to metaphor:

> [Academic prose] usually reports relations among entities – both concrete and abstract – using simple statements of existence/relationship or occurrence. Academic prose reports relatively few physical, mental, or communication activities – and when such activities are reported, they are often attributed to some inanimate entity as subject of the verb. (Biber et al., 1999, p. 372)

Let us now turn to the most frequent metaphor-related verbs across all four registers, since this list can show which lexical verbs are among the top ten. Table 6.2 shows the ten most common metaphor-related verbs of academic prose. These ten types comprise altogether N=927 tokens in academic prose, of which n=525 are related to metaphor, which is 57%. This means that the proportion of metaphorical use of these verbs is only slightly higher than that of non-metaphorical use. However, limiting the analysis to lexical verbs by excluding *have* (which contains a great deal of auxiliary forms which are seldom related to metaphor), we get a relation of n=405 metaphor-related cases to N=466 in total, which is 87%, a very clear contrast in favor of metaphor.

Table 6.2
Top Ten Metaphor-Related Verbs in Academic Prose

Lemma	Academic prose			News			Fiction			Conversation		
	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total
Have	341	120	461	418	125	543	692	116	808	795	150	945
Make	5	98	103	10	69	79	13	72	85	22	37	59
Take	3	73	76	6	46	52	34	65	99	40	38	78
See	25	48	73	17	22	39	98	31	129	130	58	188
Give	5	40	45	9	66	75	10	40	50	31	31	62
Find	7	39	46	10	32	42	27	15	42	12	7	19
Show	5	34	39	4	15	19	8	7	15	11	–	11
Produce	5	26	31	11	4	15	–	2	2	1	–	1
Follow	–	25	25	1	14	15	7	6	13	–	2	2
Come	6	22	28	7	50	57	61	32	93	75	17	92
Total	402	525	927	493	443	936	950	386	1336	1117	340	1457

A first insight gained from Table 6.2 is that apart from *have*, the top ten types indeed include lexical verbs only. The metaphorical instances of the ten verb types (n=525) account for 23% of all metaphor-related verbs of academic prose (N=2,255; see Chapter 5). Variation of lexical types is hence far greater among MRW verbs

than among MRW prepositions. This can be explained by the fact that verbs are a lexical word class with more variation in types across different text. Computation of the TTR (including *have*) resulted in the following value: (611/2255)*100= 27.1, which is much higher than the TTR value obtained for MRW prepositions (1.67). It hence confirms that lexical variation is much greater among the MRW verbs of academic prose in comparison with MRW prepositions.

Most verbs in Table 6.2 have conventional metaphorical meanings that are probably mostly used in academic prose as verbs of existence/relationship (e.g., *have, take, give*), causation (e.g., *follow, produce, make, give*), and occurrence (*show, find, come*), while only one is a mental verb (*see*). By contrast, their basic meanings are mostly relatively clearly as activity verbs, and hence spatial and/or bodily-related (*show, make, give, take, find, follow, come). Have, see* and *produce* are somewhat different from the rest; *have* is not a lexical, but a primary verb and denotes in the basic meaning the existence of a relationship between concrete entities (cf. Biber et al., 1999, p. 364);[33] the basic meaning of *produce* is more abstract and seems to straddle between an activity verb and a verb of facilitation and causation (cf. Biber et al., 1999, p. 363); and the basic meaning of *see* denotes a perceptive activity, and it therefore is a mental verb in the sense of Biber et al. (1999, p. 362). In all, the source domains associated with the most frequent metaphorically used verbs in academic texts all seem to be related to the (human) body, specifically, in its capacity to create, handle, move and perceive. The general source domain of the assumed conceptual mappings is thus the (human) body, or taking into account personification, human capacities in general.

A comparison with the other registers shows that news has an almost identical total token count for these ten verbs as academic prose, fiction a higher one, and conversation the highest count. This can be related to the higher general frequency of verbs in the latter two registers. The proportion of metaphors among the top ten verbs of academic prose corresponds with the general trend observed across registers in metaphor-related verbs, with highest counts in academic prose, slightly lower counts in news (where n=318 of the N=393 tokens are metaphor-related, which is 81% excluding the primary verb *have*) and clearly lower counts in fiction (n=270 out of N=393 are MRWs, which is 51% excluding *have*) and in conversation (n=190 out of N=512 are MRWs, amounting to 37% excluding *have*). This suggests that news – and especially fiction and conversation – uses the most frequent metaphor-related types of academic prose generally more often for the non-metaphorical indication of spatial and/or bodily-related activities and to express relationships between concrete entities. This is interesting since it suggests that

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[33] In the *VUAMC*, *have* includes full verb use as well as auxiliary uses, which are much less likely to be related to metaphor (for lack of basic meanings in auxiliary and modal use). For this reason, *have* comprises a great deal of non-metaphorical uses.

many of the ten types are frequent in all four registers, but that differences lie in the distribution of metaphor: Generally, academic prose prefers metaphorical use, while non-metaphorical use is more common in the other registers, especially in fiction and conversation.

The reduced semantic content of many metaphorically used verbs has, however, also been noticed for elementary educational discourse (Cameron, 2003, pp. 94-5). Cameron noticed that the "delexicalized nature of many verb metaphors [e.g., the verb *go*, JBH] is somewhat counter-intuitive, as it may be expected that metaphors would make use of more schematic lexis in order to have rich and striking domain transfer". The use of widely "delexicalized" metaphorical verbs is thus not entirely singular to academic prose (as was also shown by the within-register comparisons in the previous chapter, where MRW verbs ranked relatively high in each register), but there are two important differences with other registers. Firstly, in terms of sheer frequencies, academic prose uses many more verbs in metaphorical use than fiction and conversation. Secondly, academic prose appears to use metaphorical verbs in a particular way. This way has been noticed by the *LGSWE* – with metaphorical verbs used as verbs of existence and occurrence, indicating abstract relationships and causation/facilitation. Meanwhile, metaphorical delexicalized verbs of conversation (and probably fiction) refer to "many types of dynamic actions" (Cameron, 2003, p. 95) and overall have other, probably vaguer meanings (note also that the "multi-purpose" verb *go* which was identified as a highly frequent in Cameron (2003) does not feature among the top ten MRWs in academic prose).

Among the most frequent metaphor-related verb types of academic prose, the (primary) verb *have* plays a special role, being the most frequent type (in both metaphorical/non-metaphorical use) not only in academic prose, but also in the other registers. It is also noticeable that metaphorical instances of *have* are roughly equal in the written registers, whereas conversation uses a somewhat higher frequency of the relatively bleached metaphorical senses of *have*. This slightly higher number in conversation, however, needs to be put into perspective when one considers that conversation has about twice as many occurrences of *have* than academic and news texts. As a lexical item that covers many senses both in non-metaphorical and metaphorical use it appears to be a welcome choice for speakers under the real-time constraints of involved production. Overall, in Table 6.2 academic prose has more metaphorical instances per lexical item, which can be largely explained by the corpus-linguistic result that showed that the two informational registers are richer on metaphor-related verbs than conversation and fiction. One genuine exception to that general trend in verbs (and Table 6.2) is *see*, where academic prose has a lower count among both metaphorical *and* non-metaphorical instances, which could be explained by the frequent use of *see* in conversation for interpersonal means, managing both attention and opinion (– *See? I told you*). As for the other lexical verb types, the fact that verbs such as *follow, show* and especially *produce* appear

less frequently in the other registers, both in metaphorical and non-metaphorical use, may be related to a relatively high degree of variation in use of lexical verb types across registers: Verbs that appear often in academic prose might not appear as frequently in the other registers.

The high percentage of metaphor among the lexical verbs observed especially in academic and news texts may thus be explained as follows: Metaphor here largely resides in lexical verbs, not in other verb types (including forms of *have*). Verbs in academic prose may (a) often be used as verbs of existence and occurrence, indicating abstract relationships and causation/facilitation, and (b) often exhibit inanimate entities in subject position. Inspection of the top ten types of academic prose suggests that this may largely apply to news as well, but with slightly lower use of metaphorical instances of these particular types (apart from *have*, which is more frequently used in relation to metaphor). Meanwhile, fiction and especially conversation appear to rely mainly on frequent metaphorical use of *have* and also *go* (in Cameron, 2003, *go* is the verb most frequently used metaphorically – as a kind of multi-purpose verb, it is metaphorically used to refer to many different types of dynamic actions, 2003, p. 95). In these registers, verbs are generally used to indicate "actions, processes, or states" and "the relationship between participants in an action, process, or state" (Biber et al., 1999, p. 63). Since these are often actual, physical actions and activities, verbs are used relatively more often here non-metaphorically, in their more basic, physical senses.

The following list will summarize the findings of this section, with a reevaluation of the conclusions of Chapter 5, a summary of functional characteristics of the linguistic forms of MRW verbs in academic prose, a summary of findings on the top ten MRW verbs in academic prose as opposed to the other registers, and a final summary of what could be found out about underlying cross-domain mappings.

➢ The present analysis presented some support for the global hypotheses from Chapter 5, which assumed that the frequent metaphorical use of verbs in academic prose may be related to informational production, while the frequent non-metaphorical use in conversation (and, somewhat less, fiction) may be related to involved production. A question asked at the beginning of this chapter was how the important role of metaphorical verbs could be reconciled with the typical heavily nominal style of academic prose. The answer holds that metaphorical verb use in academic prose typically exerts textual and ideational functions.

➢ The *LGSWE* shows that MRW verbs generally express simple existence, occurrence, and relationships (not actions, as in the other registers) in academic prose; regardless of whether they also exhibit personification/inanimate agency or not (see also Dorgeloh & Wanner, 2009; Low, 1999; Master, 1991). This is an interesting result which can be related to a predominant textual function and a basic ideational function of verbs in informational production. However, some

metaphorical verbs may also exert personal and interpersonal functions. Metaphor-related use of verbs may hence be an important rhetorical tool in academic prose since it offers means to convey evaluative meanings in an indirect way (e.g., *attack*, *embrace*) that does not violate the maxims of fact-oriented and impersonal style of academic prose (cf., e.g., Hunston, 1994; Hyland, 2004b).

➢ The examination of the top ten verbs also indicated that the most frequent MRW verbs are likely to express existence, occurrence, and relationships. By contrast, the other registers, and most extremely conversation, frequently use some of the same lexical types non-metaphorically (for the indication of spatial and/or bodily-related activities and to express relationships between concrete entities). However, it was found that this is different with *have*, which occurs most often in metaphorical use in conversation, with the relatively bleached meanings of *have* in conversation possibly used in many different senses. It was also suggested that there may be more lexical variation among metaphor-related (lexical) verbs across registers.

➢ The metaphorical instances of the ten verb types indicated an expected higher lexical variation than among MRW prepositions (this was extended to the whole sample of MRW verbs by the TTR). Verbs as a lexical word class include many more types than the closed class prepositions. The review of the *LGSWE*, as well as the quantitative examination of verb lemmas, suggested, however, that the potential offered by the open-ended list of types of a lexical word class is not fully exploited by academic prose with its apparently quite conventional metaphorical verb use.

➢ The source domains inferred for the most frequent metaphorically used verbs in academic texts seem as a rule related to the (human) body, specifically in its capacity to create, handle, move and perceive. The general source domain of the assumed conceptual mappings thus seems to be the (human) body – or, when taking into account personification as well, human capacities in general.

6.3 Adjectives

Both the within-register and the cross-register comparisons showed a proportion for metaphor-related adjectives in academic prose that did not deviate significantly from the total count of MRWs in academic prose and within the word class. In the previous chapter, these results were tentatively related to metaphor-related adjectives playing a role in "further elaborat[ing] nominal information" (Biber, 1988, p. 105). How do metaphor-related adjectives behave in academic prose? What

are their typical lexical, grammatical, and semantic features and what functions do they perform?

According to the *LGSWE*, adjectives are most frequent in the written registers, especially in academic prose, where they are commonly used to modify nouns, "adding to the informational density of expository registers" (1999, p. 504). With regard to syntactic roles, Biber et al. (1999, p. 505) differentiate between attributive and predicative adjectives. Attributive adjectives are normally constituents of the noun phrase, modifying nominal expressions, such as the MRWs *wide* in *a wide range of potential images* (ECV-fragment05), and *underlying* in *The method concerns itself [...] with what the underlying unit actually is* (BNC-AC9, ACA). Predicative adjectives characterize a noun phrase as a separate clause element, either as complements of a copular verb, such as the MRW *weaker* in *The tendencies are not significant and get weaker when data are corrected* (ACAD, 105), or following a direct object, such as the MRW *harder* which follows *it* in *Pragmatism makes it somewhat harder to predict what courts will do* (ACAD, 515). As these examples show, adjectives can be related to metaphor in both syntactic roles.

In semantic terms, the *LGSWE* groups attributive adjectives into two main semantic classes: descriptors and classifiers.

–   Descriptors are "prototypical adjectives denoting such features as color, size, and weight, chronology and age, emotion, and a wide range of other characteristics" (1999, p.508). Semantic subdomains are color (*black, dark*), size/quantity/extent (*big, deep, heavy*), time (*daily, new, recent*), evaluative/emotive (*bad, beautiful, poor*) and miscellaneous descriptive (*appropriate, cold, complex, dead, free, hot, open, strong*). (1999, pp. 508)
–   The primary function of classifiers is to "delimit or restrict a noun's referent by placing it in a category in relation to other referents" (1999, p. 508). Classifiers can be grouped into subclasses, including relational (*additional, final, similar*), affiliative (*English, American*), and a miscellaneous topical class (*chemical, medical, political, phonetic*). (1999, p. 509)

Biber et al. report (1999, p. 511) that academic prose shows an "extreme reliance on classifiers", which corresponds with its communicative needs; the primary function of classifiers is to delimit or restrict a noun's reference (cf. 1999, p. 506). The other registers, especially fiction and conversation, exhibit fewer classifiers. In contrast, descriptors are most common in fiction.

Classifying adjectives such as *identical, rational, non-rational, empirical, first, potential, ordinary* are hence typical instances of adjective use in academic prose. However, they appear to be used non-metaphorically:

(26) This view, as we shall see, has been attacked on the grounds that it rests on the *false* assumption that the distinction between adults and children is *identical* with the distinction between *rational* and *non-rational* beings.

(27) The attacks are based on *empirical* observation; most women and *older* children are actually quite as *rational* as most men while some men are actually less *rational*.

(28) I shall suggest that this does not follow because rationality is not in fact the grounds for the distinction in the *first* place.

(29) Partly to redress the balance and partly because talking about 'children' covers such a <u>wide</u> range of *potential* images, I shall try to keep before my mind an *ordinary* 10-year-old of our society. (ECV-fragment05, emphasis mine, JBH)

By contrast, descriptors such as *wide, underlying, weaker*, and *harder* (see above) seem to be more likely to be related to metaphor in this register. Because their basic senses designate attributes of concrete entities, it may be even postulated that descriptors may constitute the bulk of metaphorical tokens in academic prose. The *LGWSE* reports that descriptive adjectives such as *wide, long, great, high, low, large* are among the most common attributive adjectives in academic texts (see Biber et al., 1999, pp. 512-3), while *clear* belongs among the most common predicative adjectives of academic prose (1999, p. 517). All these lexical types are potentially related to metaphor since they have a conventional abstract sense in academic prose and a more basic one in other contexts.

Furthermore, it may be noted that many of these adjectives form contrasting pairs frequently found in academic prose. The following pairs are candidates for exhibiting a relation to metaphor: *large/small*[34]; *low/high; long/short; young/old;* (cf. the list of common attributive adjectives that form contrasting pairs in academic prose in Biber et al., 1999, p. 515). Another semantically contrasting pair that seems relatively typical of academic prose is *strong/weak*. Both antonyms are conventionally related to metaphor in sentences such as the following:

(30) The tendencies are not *significant* and get <u>weaker</u> when data are corrected for guessing. (ACAD, 105, emphasis mine, JBH)

(31) The reason for the <u>stronger</u> association in the younger men is not clear. (BNC- FT3, ACA, emphasis mine, JBH)

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[34] The abstract use of *small* is mostly not related to metaphor. MM1 and LM1 both conflate amount and number: *small number* is then a literal phrase. *Small* is then not-metaphorical even if "small number" means little importance.

In terms of semantic classes, metaphor-related adjectives in academic prose appear to be mainly descriptors (*wide, high, low*), but not classifiers, which are mainly used to restrict a noun's reference (*identical, rational, empirical*). Metaphor-related adjectives occur in contrasting pairs relatively often (*high/low*). MRW adjectives seem to be employed by academic prose mostly for the purposes of denoting abstract size, amount, and extent. This ideational function can be detected in our examples *wide*, *underlying*, *harder*, *weaker*, and *stronger* (see above). But do adjectives in academic prose also exert (inter-)personal functions?

In their overview of semantic types of adjectives across registers, Biber et al. note a surprisingly high proportion of evaluative attributive adjectives in academic prose. They report that *good, important, special,* and *right* are particularly productive (1999, p. 514). This finding suggests that academic prose is not devoid of evaluative tones when it comes to adjectives, which in turn implies that some of the potentially metaphor-related adjectives, for example the descriptors *full, new, small, high, low* may be used for the purpose of evaluation and thus exhibit (inter-)personal functions. Consider the metaphorical use of *low* in the following two fragments:

(32) […] that the consequences included a pervasive sense of neglect and decay, a decline in community spirit, a <u>low</u> standard of neighbourhood facilities, and an increase in crime and vandalism […]. (AS6-fragment01, emphasis mine, JBH)

(33) […] hypertensive patients with high renin profiles, […] who were found to be at higher risk of coronary heart disease than those with <u>low</u> renin[35] profiles. (BNC-CRM, ACA, emphasis mine, JBH**)**

In both sentences *low* performs a descriptive, and thus ideational function, but in (32), it also seems to carry an evaluative tone, which seems to be largely absent from (33). In (32) *low* is used in the sense of 'about the quality or standard of something', with quality and *standard* by definition resting on subjective judgment, while in (33) *low* has a more objective, quantitative meaning, denoting a small amount or level (cf. MM). This example shows that depending on the context, metaphor-related descriptors such as *low* can have an (inter-)personal function in academic prose.

Biber et al. also observe that, generally, "different denotations" of adjectives such as *old* and *poor* have different functions, for example "descriptive" and "emotive" ones:

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[35]Renin is "a proteolytic enzyme of the blood that is produced and secreted by the juxtaglomerular cells of the kidney and hydrolyzes angiotensinogen to angiotensin I". (MWM)

> [V]ery common adjectives designate a range of meanings. For example, in some expressions *old* is descriptive, denoting age (*an old radio, old newspapers*); in others it denotes affect (*poor old Rusty, good old genetics*). Similarly *poor* has two principal uses: emotive (*the poor devil, You poor bunny!*) and descriptive (*a poor country, in poor health*). Even the descriptive uses of *poor* carry different denotations, such as 'lacking adequate financial resources' and 'not good'. (1999, p. 509, Italics in original)

This description can be seen as an explanation of the relations between the metaphorical and basic senses of *old* and *poor*, with metaphor accounting for the contrast between the "descriptive" (basic) and "emotive" (metaphorical) meaning of an adjective. Although the obvious emotive senses of *old* and *poor* are probably largely absent from academic prose, this example seems to pinpoint how metaphorical use of adjectives changes their discourse functions. The *LGSWE* also proposes a cross-register relation:

> [T]he characteristic uses of a given adjective often differ across registers. For example, in academic prose *poor* is generally descriptive, whereas in fiction it is commonly emotive. (1999, p. 509, Italics in original).

This suggests that the basic meaning of *poor* (or some other "descriptive" meaning) is used more often in academic prose than in fiction. This relation may be reversed for such adjectives where fiction seems to deal more often with the concrete, basic sense of an adjective, and where academic prose uses abstract metaphorical senses, for example in the adjectives *high* and *low*. If this is the case, academic prose could apply proportionally more metaphor-related senses of *high* and *low* for ideational or discrete interpersonal purposes (indicating abstract size/number/extent, subtly evaluating quality), while fiction in turn may utilize proportionally more instances of the basic, non-metaphor-related meanings, presumably for the description of concrete situations and entities.

In sum, descriptors *(wide, low, high,* etc.) may be more likely to be related to metaphor than classifiers (e.g., *identical, rational,* and *empirical),* since they have clearly identifiable more basic meanings. Since classifiers are especially frequent in academic prose (Biber et al., 1999), this may explain the quantitative results from Chapter 5. Metaphor-related adjectives in academic prose mostly exert ideational functions, describing abstract numbers / amounts / degrees / extents (e.g., <u>wide range</u>), but also (inter)personal functions in evaluating situations or entities (<u>low standards</u>).

Table 6.3
Top Ten Metaphor-Related Adjectives in Academic Prose[35]

Lemma	Academic prose			News			Fiction			Conversation		
	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total
Large	20	35	55	4	–	4	15	1	16	10	6	16
High	8	28	36	1	4	5	7	10	17	6	23	29
Serious	6	25	31	–	–	–	6	2	8	2	4	6
Great	8	22	30	–	4	4	9	8	17	11	19	30
Wide	3	21	24	–	2	2	7	–	7	–	5	5
Clear	–	19	19	2	2	4	2	9	11	2	10	12
Direct	3	16	19	–	–	–	–	5	5	1	5	6
Full	1	13	14	6	8	14	2	5	7	2	15	17
Strong	1	10	11	–	2	2	4	6	10	–	10	10
Poor	7	9	16	–	2	2	2	5	7	–	1	1
Total	57	198	255	13	24	37	54	51	105	34	98	132

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[36]Table 6.3 excludes the lemmas *current* and *new* for two distinct reasons. *Current* was inserted due to a coding error by BNC, coded as adjective in a fragment on electromagnetics (FEF-fragment03), where it was used as a noun and a nominal pre-modifier (*current density*). *New* was excluded because of inconsistent coding (at a fairly late stage of the annotation project it was decided that the adjective *new* in abstract use – as opposed to people or things – is related to metaphor. However, cases of abstract usage of *new* coded before that point kept

By and large, metaphor-related adjectives fulfill these functions by referring indirectly to characteristics of physical entities and situations, and thus, much like verbs, are means to convey these messages without violating the stylistic conventions of academic prose.

Turning back to the *VUAMC* and the results from Chapter 5, the most frequently metaphor-related lexical types of adjectives will now be compared with the other registers. We will also have the opportunity to examine semantic class (classifiers/descriptors) among the most frequently used lemmas.

Table 6.3 shows the ten most common metaphor-related adjectives of academic prose. These ten types comprise altogether N=255 tokens in academic prose, of which n=198 are related to metaphor, which is 78%. There is thus a clear contrast between the non-metaphorical and metaphorical use of these adjectives.

The metaphorical instances of the ten types (n=198) account for 24% of all metaphor-related adjectives of academic prose (N=818; see Chapter 5).This is similar to the proportion of verbs (23%). Academic prose thus appears to apply a relatively varied vocabulary among verbs and adjectives. However, the TTR of MRW adjectives in academic prose shows a relatively high value: (352/818)*100= 43. There are thus relatively more types accounting for the total MRW count in adjectives than there are in verbs (which had a TTR of 27.1). However, adjectives overall have a much lower frequency than verbs. This means that in raw counts, there are still more MRW verb types than MRW adjective types, but also that there is less repetition among the MRW adjective types.

An examination of the semantic types of the ten most common metaphor-related adjectives shows that almost all of the most frequent metaphor-related adjectives of academic prose are indeed descriptors. They have more basic meanings denoting physical and other characteristics ascribed to concrete and animate entities, such as color/appearance (*clear*), size, extension, constitution, and connectivity (*large, high, great, wide, full, strong, direct*), and emotion/character (*serious*) and other characteristics (*poor*). Two adjectives (*full* and *direct*) are, however, borderline cases that may be used either as descriptors or as classifiers, depending on the discourse (for a discussion of adjectives than can perform both functions; see Biber et al., 1999, p. 509). Cross-domain mappings may thus be constructed between the target "abstract characteristics ascribed to abstract situations, concepts, and states" and the source "physical other characteristics that are ascribed to concrete and animate entities".

In comparison with academic prose, all other registers, especially news, show fewer tokens in terms of total counts and in terms of metaphor-related counts of the ten most common MRW adjectives in academic prose. These observations suggest

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their original, non-metaphorical code). The analysis in Chapter 5 was left in its original state since a test revealed that a change of codes does not alter the statistical results significantly.

that news and fiction (and slightly less, conversation) use the ten most frequent metaphor-related types of academic prose more often for physical or human-related description than academic prose. The fact that so few of the top ten MRWs of academic prose appear also in news (the total token count in news is N=37, opposed to the N=255 tokens of academic prose), while news has a higher overall proportion of MRW adjectives (21% of all adjectives) than academic prose (17.6% of all adjectives) may eventually be related to news having the greatest variety of adjectives of all registers (cf. Biber et al., 1999). Interestingly, the top ten metaphorical adjectives of academic prose also appear to quite some extent in conversation, which, however, is likely to use the particular tokens in slightly distinct senses. Conversation mainly shows metaphor-related usage of *high*, *great, full*, and *strong*, possibly in senses largely absent from academic prose, relating to emotions and other more "involved" referents. For example, *strong* in *You've got to be <u>strong</u> and not let their remarks bother you* (MM) has the metaphorical sense 'someone who is strong has confidence, determination, and emotional strength'. By contrast, academic prose uses the same lemmas in other senses, possibly relating to size, extent, and quantity in a relatively stringent, technical way. For example, *strong* in *the <u>stronger</u> association in the younger men* (Example 31) has a rather exact meaning, relating to statistical measurement. In all, the observation that "the characteristic uses of a given adjective often differ across registers" (1999, p. 509) appears to include specific differences between metaphorically used adjectives in conversation and academic prose: Denoting clearly defined characteristics (of measurement) in academic prose the same lemmas may refer to less clearly defined characteristics of people, their relations, and evaluations in conversation.

The top ten metaphor-related adjectives of academic prose are descriptors, almost without exception (*full* and *direct* are borderline cases that may be used either as descriptors or as classifiers, depending on the discourse; for a discussion of adjectives than can perform both functions, see Biber et al., 1999, p. 509). Descriptors may be more likely to be related to metaphor since they have clearly identifiable more basic meanings. More specifically, the finding may be explained by the fact that descriptive adjectives (e.g., *high, serious, clear*), as "prototypical adjectives" (1999, p. 508), are prime candidates for metaphors, with concrete and tactile basic meanings. By contrast, classifiers, which mainly serve to "delimit or restrict a noun's referent by placing it in relation to other referents" (1999, p. 508) may be much less likely to be used widely in relation to metaphor. My study suggests that in academic prose, metaphorical adjectives typically have a contextual meaning that allows denoting abstract size, quantity, extent, but possibly also to express evaluation, in a relatively subtle way. In that, they perform ideational, but also (inter-)personal functions. Adjectives perform textual functions in that they allow packaging of great amounts of information into phrases, but this is a function

that can be exhibited by any (attributive) adjective and thus does not seem to be typical of metaphorical adjectives in any particular way.

The following list of bullets will summarize the findings of this section, with a reevaluation of the conclusions made in Chapter 5, a summary of functional and formal characteristics of MRW adjectives in academic prose, report findings on the top ten MRW adjectives in academic prose as compared to the other registers, and a final remark on underlying cross-domain mappings.

➤ Chapter 5 suggested that metaphor-related adjectives (which did not deviate significantly from average MRW counts within the academic register and across registers) play a role in elaborating nominal information (cf. Biber, 1988). However, most adjectives in academic prose seemed to have unequivocal non-metaphorical meanings (e.g., *electric, statistical, political*). The present analysis presented further support for these hypotheses.

➤ Review of the *LGSWE* suggested that metaphorical use of adjectives is restricted to the semantic class of descriptors. The relatively high frequency of classifying adjectives, which are more unlikely to be related to metaphor, may be the main explanation of why MRW adjectives are comparatively infrequent in academic prose when compared with other word classes and registers.

➤ In terms of discourse functions, metaphor-related adjectives from the top ten are mainly used to denote abstract size, extent, and quantity: They exert ideational, but also inter-personal functions, with indirect and conceivably rather subtle tones of evaluation, which seem to accord with the stylistic conventions of academic prose. The textual function of adjectives (the packaging of information) in academic prose is performed by (attributive) adjectives regardless of whether the lexical unit is related to metaphor.

➤ Inspection of the ten most common MRW adjectives of academic prose shows that in comparison with academic prose, especially news and fiction seem to use these types more often non-metaphorically for the description of physical and other characteristics ascribed to concrete and animate entities. Furthermore, news seems to use an altogether different range of (metaphor-) related adjectives than academic prose, which may be explained by the fact that according to the *LGSWE* news has the greatest variety of adjectives of all registers. Interestingly, the top ten metaphorical adjectives of academic prose also appear to some extent in conversation, albeit with a difference in meaning. In conversation the same lemmas probably have vaguer meanings relating to emotions and subjective description, whereas in academic prose they appear to have more exact meanings, denoting for example abstract size and quantity.

➤ The ten most common adjective types account for a similar proportion of all metaphor-related adjectives of academic prose as in verbs, but with a much higher TTR value. The overall relatively few MRW adjectives are thus spread across comparatively more types than the overall much more frequent MRW verbs.

➤   Metaphoricity of most adjectives in academic prose seems to be based on a cross-domain mapping between source domains of 'physical and other characteristics ascribed to concrete and animate entities' and target domains of 'abstract size, quantity, extent, and (subtle) evaluation of abstract situations, concepts, and states'. This suggests that on the conceptual level, adjectives are more varied than verbs (which generally appear to be linked to the source domain 'bodily actions') as well.

6.4 Nouns

In within-register comparison, academic prose showed a proportion of metaphor-related nouns that did not significantly deviate from the total proportion of MRWs in this register. In cross-register comparison, however, academic prose showed a higher proportion of metaphor-related nouns than all other registers. In the previous chapter, these results were tentatively related to a function of metaphor-related nouns marking "high informational density and exact informational content" (Biber, 1988, p. 107), as well as to possibly marking "informational discourse that is abstract, technical, and formal" (Biber, 1988, pp. 112-3). Since a high frequency of nouns is generally indicative of informational production, but metaphor-related nouns are more frequent in academic prose than in news, the difference between academic prose and news is of specific interest. How do metaphor-related nouns behave in academic prose? What are their typical lexico-grammatical and semantic features and what functions do they perform?

According to Biber et al. (1999, p. 232), nouns are the main means of referential specification: They "specify who and what the text is about". Reference can be specific (1999, pp. 260), classifying (1999, pp. 145), or generic (1999, pp. 265). Biber et al. state that in English in general, nouns "commonly refer to concrete entities" (e.g. *book, girl*), but may also denote qualities and states (e.g., *freedom, friendship*) (1999, p. 63). Since academic texts are characterized by a high number of complex nominal elements (1999, p. 231), and "[h]ead nouns followed by complements are typically abstract nouns derived from verbs or adjectives" (Biber et al., 1999, p. 97),[37] it may be assumed that academic prose exhibits a high number of abstract nouns. Given that the presence of metaphor is often associated with abstract word meanings, a substantial number of the abstract nouns in academic prose may be related to metaphor.

As for types of nouns, common nouns (*cow, milk, education*) are distinguished from proper nouns *(Nancy, Australia, the National Australia Bank),* and

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[37] For example, *she refuses to* […] => *her refusal to* […] (Biber et al. 1999, p. 97).

furthermore, for common nouns, a distinction is made between *countable* and *uncountable nouns* (Biber et al., 1999). Countable nouns establish reference to discrete concrete objects and entities (*businessman, boat*), but also to abstractions (*thing, event, contribution, result*) (1999, p. 242). Biber et al. reflect on the fact that countable nouns help to construct concepts in discourse; the example is the abstract (and metaphorical) use of *thing* in conversation:

> [C]ountability is not a simple reflection of things observed in the external world. For example, even a countable noun such as *thing* is used not only with reference to discrete concrete objects, but also to abstractions which do not so obviously or naturally come as distinct entities; see the use of these *things* in the following example:
> *I have just got it confirmed, but these* <u>things</u> *take time. (CONV)* (Biber et al., 1999, p. 242, underlining mine, JBH)

Examples of similar countable nouns that are more typical of academic prose are *attack*, *range* and *image* in (34) and (35):

(34) The <u>attacks</u> are based on [...].
(35) [...] wide <u>range</u> of potential <u>images</u> [...]. (ECV-fragment05, emphasis mine, JBH)

Thing, attacks, range and *images* are all used with reference to abstract concepts in discourse. Since these words are used metaphorically, this word use is indirect and exploits some similarity between the contextual meaning and some more basic meaning of the respective nouns in other contexts. This could be called an ideational function in the sense of the *LGSWE*. In addition to an ideational function, nouns such as *attack* may perform textual functions in the sense of the *LGSWE*. Textual functions consist in labeling discourse and through this establishing textual cohesion with the preceding sentence *(This view [...] has been attacked on the grounds that [...]. The attacks are based on [...])*. This function has been documented in the literature (e.g., Francis, 1994). Uncountable nouns, which are more common in academic prose than in the other registers, usually denote substances (*air, ice*), emotional or other states (*love, receivership*), qualities (*importance*), events (*arrival, flooding*), relations (*contact*), and abstract concepts (*feedback, news, theory, time*) (1999, p. 243). Uncountable nouns may often be related to metaphor, as for example in a sentence from an article in a psychology journal (36):

(36) Nineteen <u>flooding</u> sessions were used wherein the patient was instructed to imagine the traumatic events for approximately 40 minutes. (Saigh, Yule, & Inamdar, 1996, emphasis mine, JBH)

Flooding here denotes an 'exposure therapy in which there is prolonged confrontation with an anxiety-provoking stimulus' (Merriam-Webster Online Medical Dictionary). The more basic sense of *flooding* (which is uncountable as well) is 'a situation in which water from a river or from rain covers large areas of land' (MM). Common nouns can be related to metaphor both as countables (e.g., *thing, attack, image*) and uncountables (e.g., *flooding*). By contrast, proper nouns are mostly "arbitrary designations which have no lexical meaning" (1999, p. 245) and are hence largely non-metaphorical. They can be assumed to be specifically frequent in news to report facts of the world, including specific persons, places, and companies. A sample analysis of *VUAMC* confirmed this: Of the N=3,488 proper nouns occurring in the two informational registers, 70% appear in news (n=2,429), and only 30 % (n=1,059) in academic prose. As suspected, the proportion of MRWs among the proper nouns is negligible (a total of N=11 lexical units among the two registers; see Table B1 in the Appendix). The uneven distribution of proper nouns hence seems to contribute to the quantitative difference in metaphorical noun use between academic prose and news. Proper nouns, as a largely non-metaphorical noun type, are much more frequent in news, whereas common nouns, which are more likely to be related to metaphor, are more frequent in academic prose.

Returning to common nouns, Biber et al. distinguish between four semantic types: quantifying, collective, unit, and species nouns. Quantifying nouns grammatically behave like ordinary countable nouns and are used to refer to quantities of both masses and entities (1999, p. 252). They are followed by *of*-phrases which specify the type of matter or phenomenon referred to. Biber et al. (1999, pp. 252) point out that concrete nouns denoting types of container (*packet of biscuits*), shape (*heap of ashes*) or standardized measures (*1 ton of aluminum*) can be used "more generally, and metaphorically" (1999, p. 252) as quantifying nouns (*packets of data, heaps of common sense, tons of songs*). Cases of quantifying nouns identified as MRWs are the countable nouns *range* in (37) and *packets* in (38):

(37) […] talking about *'children'* covers such *a* wide range of potential *images* […]. (ECV-fragment05, emphasis mine, JBH)
(38) *Packets of data* are multiplexed together. (ACAD, 252, italics in original, underlining mine, JBH)

Collective nouns (1999, p. 247) refer to groups of single entities, e.g., *army, audience, board, staff, team*. They have an ideational function that consists in shaping the identity of referents. Interestingly, Biber et al. explicitly discuss the role of metaphor (1999, pp. 249), specifically in reference to metaphorical use of nouns in fiction, where metaphorically used collective nouns are "particularly common" (e.g., *group of men* vs. *bunch of men* vs. *swarm of men* and similarly *flock of*

messages vs. <u>*herd*</u> *of station wagons,* vs. <u>*shoal*</u> *of white faces,* all examples from fiction; 1999, p. 249). In collective nouns, according to the *LGSWE*, "[t]he choice of collocation may be used to suggest how a group of entities is viewed" (1999, p. 249). The fact that the *LGSWE* emphasizes that metaphorical noun use exerts a function in the conceptualization of groups and entities suggests that relation to metaphor in collective nouns has an ideational function, with metaphor essentially working as a tool for shaping reality. Along the same lines, it suggests that a particular perspective is conveyed by the writer/speaker (personal function), and that this is imposed on the addressee (interpersonal function). Casual observation suggests that, in academic prose, metaphor-related collective nouns have a more pronounced ideational function, but a more backgrounded (inter-)personal function. Consider the use of the metaphor-related noun *team:*

(39) All was linked to the sense of a new departure, a "new style", a "new regime in politics" and a new <u>team</u> at the helm: as well as a new leader, the party had by the middle of 1912 a new Chief Whip, Party Chairman, party treasurer, principal agent, press adviser, and an almost entirely new <u>team</u> of Whips and organizers. (EW1-fragment01, emphasis mine, JBH)

Here metaphoricity is based on a contrast between the human sense relating to 'work' ('a group of people who have been chosen to work together to do a particular job', LM) and a more basic sense relating to farm animals ('two or more animals that are used to pull a vehicle', LM). Another possible basic sense suggested by the dictionary is a sports sense ('a group of people who play a game or sport together against another group', LM).[38] By comparison with one of these more basic senses the politicians are conceptualized as one united, and closely collaborating, group.

Unit nouns are in a way the opposite of collective nouns:"[R]ather than providing a collective reference for separate entities, they make it possible to split up an undifferentiated mass and refer to separate instances of a phenomenon" (1999, p. 250). Examples are *a* <u>*bit*</u> *of television* (CONV), *a* <u>*slice*</u> *of soft white bread* (FICT), *two* <u>*pieces*</u> *of advice* (NEWS, 250-2). Biber et al. observe that many uncountable nouns can combine with a great variety of unit nouns. Unit nouns thus have an ideational function since "[b]y the choice of unit noun, it is possible to bring out different aspects of the entity (size, shape, etc.)" (1999, p. 251).

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[38] Longman was chosen as the resource since it offers three distinct senses for *team*, whereas Macmillan conflates the work and the sports sense.

(40) Unfortunately, this *evidence* has tended to be fragmentary, a *collection* of separate, discrete *pieces* of *information* lacking a synthesizing *theory* to provide *cohesion* and predictive *power*. (CLW-fragment01, emphasis mine, JBH)

Again, as with collective nouns, the ideational function of metaphor here seems to consist in lending a particular structure to the target domain, with for example the contextual sense of *pieces* (40) referring to units of the abstract concept 'information', and the basic sense to 'physical entities'. With its foregrounded objectivity and factualness, academic prose is not likely to use metaphor-related unit nouns in a blatantly evaluative or even expressive manner. Rather, it may be suspected that metaphor-related unit nouns have a predominant ideational purpose, and a backgrounded interpersonal one, such as *pieces* in (40).

Species nouns are found in patterns that superficially resemble those of quantifying nouns. However, they do not refer to the amount, but to the type of entity or mass expressed by the following *of* phrase (1999, p. 255). Common examples are *class, kind, make, sort, species, type;* for example *types* in *There are two types of bond energy* (ACAD) (1999, p. 255). In academic prose, species nouns are more common than in the other three registers. Biber et al. (1999, p. 256) interpret this finding with "classification [being] an important aspect of academic procedure and discourse". In (41), *species* is related to metaphor because it does not refer to the biological group 'whose members all have similar general features and are able to produce young plants or animals together' (MM).

(41) They were a species of organizational rhetoric (now menaced by public access to the monopoly of enforcement), embodying compromise between conflicting values and recognition of the vagaries of the environment to be controlled. (BNC-FA1, ACA, emphasis mine, JBH)

Consider the metaphor-related nouns *way* in (42), *part* in (43) and *field* in (44):

(42) A particular difficulty about task synthesis is that there is no easy *way of* confirming completeness. (CLP-fragment01, emphasis mine, JBH)

(43) So, although it is possible to conceive of any event as an incarnation of the totality, insofar as it must itself make up a *part of* that totality in its determination, [...], it still remains unproven that an overall entity, 'History', can be said to exist at all. (CTY-fragment03, emphasis mine, JBH)

(44) Enlargement shows a section through the lenses to show the direction of the *field of* view. (AMM-fragment02, emphasis mine, JBH)

In all examples, the metaphorical species nouns classify the type of entity or mass expressed by the following *of* phrase, shaping the identity of referents. This way of referencing is very precise – rather than allowing for polyvalence and uncontrolled inferences, it delimits nominal reference to a specifically defined minimum. Metaphorical species nouns, despite their often underspecified meanings when viewed in isolation (e.g., *way, part*), can thus be seen as tools for the creation of more differentiated technical prose. This range of ideational functions of metaphor-related nouns is somewhat more fine-tuned and local than may have been expected beforehand.

In all, with respect to metaphor, the *LGSWE* observes that quantifying, collective, unit and species nouns are often fairly general in meaning (cf. 1999, p. 248, 250), and thus conventionally combine with a wide range of possible collocates (e.g., *Packets of data are multiplexed together*, ACAD, 252). In the collocations of academic prose, however, reference seems to be typically narrowed down in a precise manner. For present purposes, it is interesting that many of these senses are related to metaphor, and that the *LGSWE* also mentions this fact, for example in quantifying and collective nouns.

Depending on their function, the same metaphor-related noun types can, however, also be used as simple countable nouns with metaphorical use as in (45) – (47):

(45) This takes three main <u>forms</u>: checklists, routines and knowledge-texts. (CLP-fragment01, emphasis mine, JBH)

(46) The terminology in this <u>field</u> is not standardised. (CLP-fragment01, emphasis mine, JBH)

(47) We can now make the link between this <u>model</u> of adolescent development and subject choice in schools. (CLW-fragment01, emphasis mine, JBH)

Here, the three nouns require specification themselves, or function as anaphoric devices for co-referencing. In (45) *forms* is premodified by the adjective *main,* while in (46) *field* and in (47) *model* are used anaphorically, and refer back to a proposition in some preceding sentence, respectively.

The *LGSWE* notes frequent metaphorical use of "place head nouns" of relative clauses with *where* in academic prose, being "typically used to mark logical rather than physical locations" (1999, p. 626), in contrast to the other three registers. Among their examples are the place head nouns *situation, points,* and *area* (1999, p. 626):

(48) Farmers were slow to see management as an <u>area</u> where training could help (ACAD, 626, emphasis mine, JBH)

Area "has a literal meaning referring to a physical location but is often used to refer to a knowledge domain" (1999, p. 626). Another head noun mentioned is *way* (1999, p. 629), which occurs in academic prose often together with *in which* (*The <u>way</u> in which this happens gives important information on the inner organization*, ACAD, 629). As with the place nouns and MRW *where*, the following MRW preposition is coherent with the spatial source domain of the head noun.

The *LGSWE* reports that nouns account for approximately 30 % of all premodifiers in academic prose and for even 40 % of those of news (1999, p. 589). Therefore, a substantial number of metaphor-related nouns in academic prose may be used as premodifiers of other noun phrases, as exemplified in (49) and (50).

> (49) Section 210.2 of the <u>Model</u> Penal Code includes within murder those reckless killings which manifest 'extreme indifference to the value of human life'. (ACJ-fragment01, emphasis mine, JBH)
>
> (50) We may, in fact, reinterpret any of the diagrams of Figs (2.25)-(2.31) by assuming that the whole space is filled with a material of conductivity [formula] and the <u>field</u> <u>lines</u> are now the <u>lines</u> of <u>current</u> <u>flow</u> as well. (FEF-fragment03, emphasis mine, JBH)

In (49) *Model* premodifies *Penal Code*, and in (50) *field* premodifies *lines* and *current* premodifies *flow*. This observation is relevant since it opposes traditional ideas about nominal metaphor in the literature, where typical metaphorical nouns appear in the form of *x is a block of ice, jail, shark,* or *gorilla.*[39] By contrast, metaphorical nouns used as pre-modifiers appear to have a more backgrounded metaphoricity, and, at least in these examples, are part of the highly technical vocabulary of academic prose. The phenomenon of noun + noun sequences has been picked up by the *LGSWE* as a particular phenomenon that goes against the typical register tendencies in terms of communicative functions.

When considering the following characterization of noun+noun sequences with regard to metaphor, it may appear that metaphorical pre-modifiers are specifically hard to understand.

> [N]oun + noun sequences represent two opposite extremes of communicative priorities. On the one hand, they bring about an extremely dense packaging of referential information; on the other hand, they result in an extreme reliance on implicit meaning, requiring addressees to infer the intended logical relationship between the modifying noun and head noun. (1999, p. 590)

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[39] *Sally is a block of ice; My job is a jail; My lawyer is a shark; Sam is a gorilla* (see for example, Glucksberg & Keysar, 1990; Bowdle & Gentner, 2005).

Model Penal Code, field lines and *current flow* indeed show that further context would be needed to identify the precise meaning relationship between the two terms. The fact that the pre-modifiers are related to metaphor may further complicate the disambiguation, at least for the non-initiate of the respective fields (law and electromagnetics, respectively). Pre-modification by metaphorical nouns was pointed out also for elementary educational discourse by Cameron (2003, p. 90), describing such items as *butterfly clips, lollipop trees* as results of "condensation of a comparison into a pre-modified noun phrase". Without (situational) context, it is hard to understand what these noun+noun sequences refer to, and disambiguation becomes challenging for outsiders of elementary school discourse as well.

In terms of discourse functions, the review of the *LGSWE* suggested that many metaphor-related nouns in academic prose may be often used as unit, species, quantifying, and collective nouns. In their respective ideational functions, nouns "make it possible to split up an undifferentiated mass and refer to separate instances of a phenomenon" (Biber et al., 1999, p. 250); "bring out different aspects of the entity" (1999, p. 251); "refer to quantities of both masses and entities" (1999, p. 252); "provid[e] a collective reference for separate entities" (1999, p. 250). The fact that in all these ideational functions, metaphor-related nouns help to shape the identity of referents may largely be explained by the systematicity of cross-domain mappings underlying the metaphorical word use (in the sense of Lakoff & Johnson, 1980), roughly speaking with source domains (e.g., space) allowing to transfer structure onto abstract target domains (e.g., information) as in the example of *packets* of *data*.

Metaphor-related nouns in academic prose seem to exert textual functions as well, allowing for anaphoric cross-reference in texts (*this point of view*) or establishment of reference to the text world itself (*point* may be used in expressions such as *at this point*, which refers to the ongoing discourse itself). Skirl (2007) analyzed a number of metaphorical expressions that work as textual anaphors in fiction texts. He proposes that metaphorical anaphors such as *the lump of clay* in the below example from Jelinek's novel make a "contribution to referential continuity" (2007, p. 116), with the "metaphorical descriptive content add[ing] specifying information" (2007, p. 115).

> Erika, the meadow flower. That's how she got her name: erica. Her pregnant mother had visions of *something timid and tender*. Then, upon seeing the lump of clay that shot out of her body, she promptly began to mold it relentlessly in order to keep it pure and fine. (Jelinek, *The Piano Teacher*, p. 23; cited in Skirl, 2007, p. 115, emphasis mine, JBH)

In Skirl's example, the direct antecedent is *something timid and tender*, and the metaphorical anaphor is *lump of clay*. This combination of novel metaphor and expressive evaluation appears to be largely absent from academic prose. However, as far as the anaphoric co-reference structure is concerned, a similar phenomenon may be encountered in academic prose – and related to what Francis (1994) describes as nominal groups that connect and organize written discourse. For example, <u>view</u> in (52) is an anaphor to the gist of (51), which is a particular philosophical perspective taken on children ("children cannot be denied autonomy").

(51) The recognition that children can not [sic] simply be written off in the rationality stakes and can not [sic] therefore be denied autonomy on this account has led some writers to conclude that they can not [sic], therefore, be denied it on any account.

(52) We should notice that this <u>view</u> is not just a flight of fancy from the loony left, the pederast lobby or children themselves. (ECV-fragment05, emphasis mine, JBH)

The metaphor-related noun *view* thus labels a stage of discourse as the writer presents his/her own and others' arguments.

Metaphor-related nouns in academic prose may also exert (inter-)personal functions: One relatively clear example is *erosion* in (53).

(53) But, without other changes, the result is likely to be a 'society of barricaded self-defence, and a steady <u>erosion</u> of civil liberties'. (AS6-fragment01, emphasis mine, JBH)

Here, the metaphor-related noun *erosion* means 'the gradual reduction or destruction of something important', a meaning which contrasts with the more basic meaning 'the process by which the surface of land or rock is gradually damaged by water, wind etc and begins to disappear' (MM). The choice to use *erosion* in (53) reflects a conventional way of expression in a particular field of academic discourse, which however implies a relatively strong sense of evaluation on part of the author (reflected in the dictionary by 'of something important').

Lastly, I will briefly mention metaphor-related nouns that are used in so-called direct metaphors. Such metaphors occur in contexts in which both source and target of the metaphorical comparison are mentioned as distinct referential domains in the text, often accompanied by a lexical marker of comparison. While direct metaphor use is not restricted to nouns, noun phrases do seem to play an important role, since they establish reference to one or both terms of the comparison. For example, in (54) [*as if*] works as a metaphor flag; the noun phrase [*the structure of the fossil*] is the

target term of the comparison, and the noun phrase [*a piece of engineering*] is the source term.

(54) The second method tries to analyse [the structure of the *fossil*] almost <u>as if</u> it were [a <u>piece</u> of <u>engineering</u>].

(55) If the *fossil* is constructed in a certain <u>way</u>, then there are only a limited number of *'<u>jobs</u>'* that the structure could perform. (AMM-fragment02, emphasis mine, JBH)

In the second sentence (55), '*jobs'* is another metaphor-related noun, with a basic meaning that is conceptually coherent with that of *piece of engineering*. The scare quotes may be seen as signaling the figurativeness of the expression. Together with the direct metaphor in the first sentence, it could be argued that this metaphor-related noun is a case of deliberate metaphor use (Steen, 2008, 2011a, in press), which may be recognized as such by an addressee, and may cater to explanatory and didactic purposes (note that the above example stems from a textbook, and is thus aimed at a learners' audience). In other contexts, deliberate metaphors may have personal and interpersonal functions, such as in the example of direct speech quoted in an article about Frida Kahlo:

(56) There is, however, an inevitable logic to the appropriation of her meticulously constructed image, a process which the artist was mocking as early as 1933: ' … some of the gringa women are imitating me and trying to dress 'a la Mexicana', but [the poor souls] only <u>look like</u> [<u>cabbages</u>] and to tell you the naked truth they look absolutely impossible.' (A6U-fragment02, brackets and emphasis mine, JBH).

Here, the artist expresses how she perceives North-American and Western-European women who dress in a traditional Mexican way, comparing the appearance of [*the poor souls*] directly with that of *cabbages*. This comparison (together with other lexical cues) creates a depreciating evaluation of this appearance, with *cabbage* traditionally not considered a particularly aesthetic and valuable vegetable.

Another, slightly different type of direct metaphor use involving MRW nouns is direct metaphor use indicated by adjectives, such as *metaphorical* in the next example:

(57) Interwoven with these images are subtler references to the <u>metaphorical borderlines</u> which separate Latin American culture from that of Europe and North America. (A6U-fragment02, emphasis mine, JBH)

In (57), *metaphorical* works as an Mflag, and the directly used *borderlines* is the source term of the direct metaphor ('a border between two countries', LM). The target term is not mentioned explicitly in the text, but implicitly ('the point at which one quality, situation, emotion etc ends and another begins,' LM). Although direct metaphors generally occur infrequently in our corpus – specifically in academic prose (Chapter 5) – they may play a particular role in the discourse, probably because of their signaled status.

After this review of lexico-grammatical features and communicative functions of metaphor-related nouns in academic prose, we now turn to a list of the ten most common metaphor-related nouns in academic prose to get an impression of which types are used frequently in academic prose, and how these types behave in the other registers. The total count of metaphor-related nouns is N=2,750 (see Chapter 5).

Table 6.4 shows a clear contrast between the non-metaphorical and metaphorical use of these nouns in academic prose, with n=325 out of N=357 tokens related to metaphor (91 %). There is thus a strong preference for metaphor-related use. These common metaphor-related instances of nouns (n=325) account for 12% of all metaphorical nouns in academic prose (N=2,750). This is much lower than the respective proportion of prepositions, and relatively much lower than that of verbs and adjectives. This, however, has to be seen against the background of the high overall frequency of MRW nouns in academic prose: The TTR ((689/2750)*100 = 25.1) shows that lexical variation among MRW nouns is slightly lower than among MRW verbs (TTR=27.1), and much lower than among MRW adjectives (TTR=43.0). There are many more different types of metaphorical nouns (N=689) than in any other word class, including adjectives (N=351), adverbs (N=89), and even verbs (N=611), yet MRW noun types are more often repeated than in the other word classes. This is probably due to the preference in academic prose for repetition of technical terms as opposed to elegant variation, which is more characteristic of for instance fiction.

Table 6.4
Top Ten Metaphor-Related Nouns in Academic Prose

Lemma	Academic prose			News			Fiction			Conversation		
	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total
Way	–	51	51	3	42	45	14	32	46	18	34	52
Field	3	42	45	5	4	9	6	1	7	–	–	–
Form	1	41	42	3	11	14	–	4	4	1	2	3
Force	2	34	36	–	5	5	1	–	1	–	–	–
Part	14	33	47	10	16	26	4	5	9	–	–	–
Level	3	26	29	–	11	11	1	1	2	–	–	–
Point	4	26	30	–	23	23	–	14	14	7	9	16
Model	3	24	27	1	2	3	2	18	20	–	–	–
Section	1	24	25	–	7	7	–	–	–	–	–	–
Stage	1	24	25	6	3	9	–	2	2	1	4	5
Total	32	325	357	28	124	152	28	77	105	27	49	76

When examining the content of the ten most common metaphorical nouns, most nouns (probably with the exception of *force*) are quite general in metaphorical meaning. They can be used as species (or unit) nouns, in collocation with the preposition *of* for the specification and classification of referents, but also as

premodifying nouns or simple countable nouns. Apart from *force*, all top ten MRW nouns in academic prose (*way*, *field, form, part, level, point, model, section,* and *stage)* have some spatial basic sense. However, many of the basic senses reflect some level of abstraction (e.g., *form, part, level, model, section, force*). A provisional sketch of the source domains underlying metaphor-related use of the basic senses of *stage, way, field,* and *point,* may infer a general source domain of space. For *form, part, level, model, section* this may be a (differentiated) 'spatial object'. The object is either partitioned (*part, level, section*), or formed (*form*), or a copy of a bigger object itself (*model*). For *force*, a general source domain may be constructed that is 'physical' or 'physical world'. These domains may function as sources for establishing and shaping reference to differentiated concepts and relations within academic discourse.

In comparison with academic prose, all other registers show fewer tokens in terms of total counts among the ten types, and in terms of metaphor-related types. News has the second most tokens, but much lower frequencies; 82% of the ten types (n=152) are related to metaphor in news. Fiction has an overall lower token count than news (N=105), and of this roughly three quarters are related to metaphor, while conversation has the fewest tokens overall (N=76), with slightly below two thirds of these related to metaphor. Generally, the most common MRW nouns in academic prose are thus less often related to metaphor in the other registers, specifically in conversation, which indicates that concrete reference is more often established by these nouns in the other registers. In terms of content, it is noticeable that a substantial number of the ten types is not featured by fiction and especially conversation (in conversation, six types *field, force, part, level, model* and *section* do not appear at all; and fiction does not list *section*, while *force, level* and *stage* are very infrequent), and that news features markedly fewer instances of *field, force, model, section*, and *stage*.

The overall lack of general overlap between the top ten metaphor-related nouns in academic prose and the other registers can at least be explained by the high variability of nouns as a lexical word class, with nouns probably reflecting particular topics that are typical of some specific discipline. For example, *field* in academic prose may be used as *electrical field,* while *model* may be related to the modeling of phenomena that escape direct manipulation (*model* of adolescent development) or to outstanding examples (*Model* Penal Code). As was mentioned above, both *field* and *model* are infrequent or even absent from the other registers. By contrast, there are two types that have relatively constant counts across all registers, *way* and *point*. They thus seem to belong to a general register-independent vocabulary, however with some distributional differences between registers sketched out even by this small study: Overall counts are relatively similar, but academic prose has no non-metaphorical instances (n=0) and the highest number of metaphorical instances (n=51) of *way*, while news (n=3 MRWs/n=42 non-MRWs), fiction (n=14

MRWs/n=32 non-MRWs) and conversation (n=18 MRWs/n=34 non-MRWs) in this order have growing counts of non-metaphorical instances and declining metaphorical ones. This observation can be explained by a relatively frequent metaphor-related use of *way* (as a species noun or head noun of a relative clause construction) in all registers, but a comparatively more frequent use of the basic meaning in the context of concrete location especially in fiction and conversation. This situation is similar for *point*, which is used most often in relation to metaphor in academic prose, and least often in conversation, which may have to do with its ideational/textual function of shaping and structuring abstract discourse, but also with the fact that aesthetic conventions may prevent casual conversation to use *point* very often for this goal.

In the following, I will summarize the findings of this section, with a reevaluation of the conclusions of Chapter 5, a summary of formal and functional characteristics of MRW nouns in academic prose, a summary of findings on the top ten MRW nouns in academic prose in comparison with the other registers, and a final remark on underlying cross-domain mappings.

➢ The present analysis presented some support for the global hypotheses from Chapter 5, which assumed that metaphorical use of nouns in academic prose may be relatively straightforwardly related to informational production, as well as to abstract information, with predominant ideational and textual functions: MRW nouns serve to establish exact, often formal and technical meanings (cf. Eggins & Martin, 1997), but also to package abstract content in a very condensed, nominalized, way (cf. Halliday, 2004b).

➢ In terms of communicative functions, many metaphor-related nouns (as unit, collective, quantifying, and species nouns) shape the identity of referents in a very specific and precise way, using the semantic structure of the source domain for ideational tasks in the target domain. This range of ideational functions is somewhat more fine-tuned and local than may have been expected beforehand. Another observation was that an important function of nouns is textual, the organization of arguments and the establishing and continuation of textual cohesion. Metaphorical use of nouns in academic prose seems also related to (inter)personal functions for argumentation, persuasion, and explication.

➢ Metaphor-related nouns may also play a particular role in academic discourse when used in direct metaphors (*almost as if it were a piece of engineering*), in that they may be interpreted as deliberate metaphor use (Steen, 2008, 2011a, in press). Although the direct forms of metaphor in our corpus occur actually very infrequently, particularly in academic prose (Chapter 5), they may have a particular function for exposition and education, because of their signaled status.

➢ Chapter 5 suggested that in opposition to academic prose, nouns in non-metaphorical usage may be used most often in conversations, which are often

concerned with concrete objects and persons (e.g., see Biber et al., 1999, p. 266), as well as in fiction, which often describes persons and situations by means of establishing concrete (yet fictional) reference. These assumptions could be largely supported. The examination of the top ten metaphor-related nouns suggested that the most common MRW nouns in academic prose are indeed less often related to metaphor in the other registers, specifically in conversation. In terms of content, it is however noticeable that a substantial number of the ten types is not featured in fiction and especially conversation, while in news markedly fewer instances occur of *field, force, model, section*, and *stage*. The overall lack of general overlap between the top ten metaphor-related nouns in academic prose and the other registers can at least be explained by the high variability of nouns as a lexical word class, with nouns probably reflecting particular topics that are typical of specific disciplines. By contrast, two types have relatively constant counts across all registers, *way* and *point*. They thus seem to belong to a general register-independent vocabulary, with a relatively frequent metaphor-related use of *way* (as a species noun or head noun of a relative clause construction) in all registers, but a comparatively more frequent use of the basic meaning in the context of concrete location especially in fiction and conversation.

➢ The TTR analysis showed that there is more lexical variation among MRW nouns than among MRWs of the closed class prepositions, but less variation than among MRW adjectives, and slightly less than among MRW verbs. In MRW nouns, there is hence more repetition than among any other lexical word class. One explanation is that the same lexical types are used in quite distinct ways (e.g., *form* as a species noun to narrow down reference and as a common countable noun).

➢ In terms of cross-domain mappings, a provisional sketch of the source domains underlying metaphor-related use of the basic senses of the ten most common lexical types of academic prose may infer the general source domain 'physical world', including 'space', and 'spatial object'. These source domains may be mapped onto the differentiated referential structure of academic discourse.

6.5 Adverbs

Metaphor-related adverbs show a significantly lower frequency than may be expected in the within-register comparison of academic prose, but in the cross-register comparison, the proportion in academic prose did not vary significantly from the average. In the previous chapter, these results were tentatively related to a main function of metaphor-related adverbs catering to "text-internal deixis" (Biber,

1988, p. 105) as place adverbs (*here, above, below*), possibly in terms of an underlying discourse-is-space mapping (Fleischman, 1991). Other possible semantic types of adverbs used metaphorically were adverbs of manner with a clearly human-related basic sense but with an inanimate entity in subject position of the clause (*intelligently*), as well as degree adverbs (*lightly*) and stance adverbs (*heavily*) with concrete basic senses.

Although metaphor-related adverbs do not seem to belong among the prototypical features of informational production, the tasks they fulfill seem to be important for academic prose. Biber (1988, p. 105) subsumes "place adverbials" among the features that frequently occur together with the "typical" linguistic features of informational production. How do metaphor-related adverbs behave in academic prose? What are their typical lexico-grammatical and semantic features and what functions do they perform?

Adverbs can be used as modifiers (most commonly of adjectives and other adverbs) and as adverbials on clause level (1999, p. 538). Biber and colleagues (1999, pp. 552) distinguish seven semantic categories for adverbs: place, time, manner, degree, additive/restrictive adverbs, stance adverbs, and linking adverbs. Many instances of these seem to be related to metaphor. Emphasizing metaphorical word use among adverbs, the *LGSWE* remarks that

> […] many adverbs have meanings that vary with context of use. […] some adverbs have both literal and more metaphorical meanings. […]. The adverb *far* has a literal meaning with distance (*too far up the road*), a metaphorical meaning with time (*so far, with Christmas not that far off*), and a third meaning of intensification (*a far better atmosphere, far more numerous*). (1994, p. 552, Italics in original)

To *MIPVU*, both the temporal and the intensifying meaning are related to metaphor, on the basis of the contrast between basic meaning and the contextual meanings, respectively. Adverbs of place, such as the instances of Biber et al.'s *far,* are generally likely candidates for relation to metaphor with their basic meanings relating to position, direction, or distance (cf. Biber et al., 1999, p. 552, e.g., *here, there, backward*). These contrast with metaphorical meanings in contexts such as academic prose, which commonly deals with abstract and logical relations. Consider also the use of *here* in sentence (59), which follows (58) in the original:

(58) One school was so impressed by the children's positive reactions [that they completely revamped the science work in the first two years to include more social and human applications of science].

(59) The survey of children's attitudes helped <u>here</u>: research such as Ormerod 's (1971; Ormerod and Duckworth , 1975) had shown that girls were

interested in the social implications of science, but did not tell teachers what the desirable teaching approach might be in practice. (CLW-fragment01, emphasis mine, JBH)

The adverb *here* in (59) co-refers to the *that*-clause in sentence (58). *Here* is related to metaphor because of a contrast between the contextual meaning 'at this point in a process, discussion, or series of events' (MM) and the more basic meaning of 'in or to this place', with place as a concrete location (MM). The metaphor-related adverb thus serves to establish "text-internal deixis" (Biber, 1988, p. 105), prompting the reader to "identify the intended place and time referents in the actual physical context of the discourse" (Biber, 1988, p. 110). Such occurrences of *here* may be broadly related to the textual function proposed by Biber et al., since they seem to serve to establish what is quite generally called *cohesion* in the grammar: "the integration which is achieved between different parts of a text by various types of semantic and referential linkages" (Biber, 1988, p. 42). However, since they appear to create a context shared by the participants of the discourse, and to this end require inferences by the addressees, they may be attributed the contextual function as described by the *LGSWE*. The same holds for the adverbial *[so] far* used in academic prose, which indicates a point in the process of writing, respectively reading:

(60) We have *so far* talked about positive and negative charges, about point charges, and distributed charge. (FEF-fragment03, emphasis mine, JBH)

Adverbs of place are thus used to structure the text, and to orient readers, with recourse to a mapping from the concrete domain of space onto the abstract domain of discourse (see also Fleischman, 1991). They may hence be assigned a predominantly contextual function in the sense of Biber et al. (but also a textual one, depending on how far the latter is stretched).

A special case of place adverbs is the relative adverb *where*. As a relative adverb *where* 'refer[s] back to a noun and introduc[es] a relative clause' (MM); it can also 'introduc[e] a clause that is subject, object, or complement of another clause': *Stratford is where Shakespeare was born* (MM). *Where* is generally very common in each of the four registers (e.g., see Biber et al., 1999, p. 625). However, the *LGSWE* observes the following cross-register distribution of non-metaphor-related versus metaphor-related *where* as a relative adverb:

> [T]he registers use different head nouns with relative clauses of this type. In conversation, fiction, and news, these head nouns typically refer to physical locations:
>
> that place [*where* they had the used goods sale] (CONV) (1999, p. 626, numbering, emphasis, and brackets mine, JBH)

As was seen in the discussion of metaphorical nouns in academic prose, in contrast, relative clauses with *where* in academic prose are typically used to mark logical rather than physical relations:

(61) the kind of situation [<u>where</u> this type of work is helpful] (ACAD)
(62) another case [<u>where</u> the initial and final values of p and T are the same] (ACAD)
(63) the points [<u>where</u> further inquiry needs to be made] (ACAD)
   (1999, p. 626; numbering, brackets, and emphasis mine, JBH)

Since metaphor-related use of *where* is more closely related to the directly preceding text, a textual function in the sense of Biber et al. can be more straightforwardly inferred.

Other possible cases of metaphor-related use are adverbs of manner (e.g., *quietly, terribly*; 1999, pp. 553-4), with the basic meaning expressing information about how a physical action is performed. Many of these are potentially related to metaphor with an inanimate agent in subject position of the clause if the typical agent of the basic sense is animate, or even human.

(64) Imagine an operating system that is suitable for everything from photo copiers to games consoles to video-graphics work to transaction processing. It is completely parallel and can <u>intelligently</u> farm bits of itself and applications across multiple processors, or alternatively sit on just one. (BNC-CR3, ACA, emphasis mine, JBH)[40]

The adverb *intelligently*, for example, is derived from the adjective *intelligent*, which in the dictionary has the basic sense 'able to think, understand, and learn' (MM) and a conventionally metaphorical sense that is applicable to the context of computing in (64): 'intelligent software is able to react and deal with changes or different situations in a way that is similar to human intelligence' (MM).

Similarly, degree adverbs, which describe the extent to which a characteristic holds, may also be related to metaphor in academic prose (e.g., *deeply*, *completely*;

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[40] In the *VUAMC*, no cases of metaphorical use of *intelligently* were observed, and only two occurrences of non-metaphor-related use.

1999, pp. 554). One example is *far more numerous* from the *LGSWE* citation above. Another is a metaphorical use of *far* that was not mentioned by Biber et al.:

> (65) Does the 'grievous bodily harm' rule extend the definition of murder *too far*? (ACJ-fragment01, emphasis mine, JBH)

In this fragment from a textbook on criminal law, *far* together with the degree complement *too* works as a degree modifier that also conveys possible attitudes towards the proposition (the use is non-committal because it is formulated as a question). In the subsequent sentence of the fragment, one possible answer to the question posed by (65) is given:

> (66) If the point of distinguishing murder from manslaughter is to mark out the most heinous group of killings for the extra stigma of a murder conviction, it can be argued that the 'grievous bodily harm' rule draws the line *too low*. (ACJ-fragment01, emphasis mine, JBH)

Sentence (66) contains another degree adverb, *low*, which is metaphor-related as well, and in a similar way (again modified by the degree complement *too*). The main difference between *extend too far* and *draw too low* in terms of metaphorical mappings is that in (65) the source domain is horizontal extension (with a too great distance from some assumed central area suggested to be problematic), while in (66) the source domain is vertical extension (with a too great downward distance indicated to be problematic as well). Both cases describe the degree to which a definition is (should be) extended, but through this also express attitudes towards the definition of murder with respect to manslaughter. Both degree adverbs could hence be categorized as stance adverbs as well.

Stance adverbs are generally "surprisingly common in academic prose" (1999, p. 859). Epistemic stance adverbs convey certainty or doubt, comment on the reality or actuality of a proposition, relate a proposition to some evidence, show the limitations of a proposition, and/or hedge statements (e.g., the metaphor-related stance adverbs *apparently*, *roughly* (1999, p. 557).

> (67) It may be roughly divided into two parts: magnetostatics and the rest. (FEF-fragment03, emphasis mine, JBH)

In this sentence, which refers to the classification of steady electrical currents, *roughly* is related to metaphor because of a contrast between the contextual sense which refers to the way in which classification ignores more subtle differences and a physical more basic sense ('in a way that is not gentle' / 'in a way that is not neat or exact', MM). Epistemic stance adverbs are also called *hedges* and are often

associated with precision of exposition in academic prose, where the ambit of propositions is generally delineated in an explicit way. Attitude stance adverbs "tell a speaker's or writer's attitude towards a proposition" (1999, p. 558). Examples are the above discussed uses of *too far* and *too low*. The last type of stance adverbs are style stance adverbs, which comment on the "manner of conveying the message" (1999, p. 857, e.g., *frankly*). By definition, stance adverbs are related to an (inter-)personal function, expressing the writer's attitude, and inducing a similar one in the intended audience. However, since in academic prose many stance adverbs are epistemic stance adverbs and these mainly serve to delimit the assumed validity of some proposition, they have less of an interpersonal function, but more of an ideational function, conveying a message about the truth-value of the proposition itself (*roughly*).

By contrast to the types of adverbs discussed so far, it is unlikely that many time adverbs, as well as additive/restrictive adverbs (*also, only*), and linking (*first, secondly, namely* etc.) adverbs are related to metaphor – for lack of related more basic meanings. Academic prose exhibits a higher frequency of linking adverbs than the other registers, reflecting an emphasis on conveying logical coherence and the building of arguments (cf. Biber et al., 1999, p. 767). Since these adverbs are seldom related to metaphor (again for lack of a more basic sense), this appears to be one important reason for the comparatively low proportion of MRWs among the adverbs. Another reason for this may be that the above types of adverbs also include many instances that cannot be related to metaphor, e.g., *more, only, quite, significantly, statistically,* and *very* (Biber et al., 1999, pp. 561-2).

After this review of lexico-grammatical features and communicative functions of metaphor-related adverbs in academic prose, the ten most common metaphor-related adverbs of academic prose will now be examined to get an impression which types are used frequently in academic prose, and how these types behave in the other registers. Specifically, their examination might shed at least some light on the question what role spatial adverbs play among the metaphor-related adverbs in academic prose.

Table 6.5 shows that in academic prose, the ten types comprise N=182 tokens (cases), of which n=122 are related to metaphor (67 %). The contrast between metaphorical and non-metaphorical tokens is thus clear. These metaphor-related tokens (n=122) account for almost half of the total of metaphor-related adverbs of academic prose (N=252), which suggests a rather restricted range of adverb types related to metaphor in academic prose. However, the TTR is relatively high: 89/252*100=35.3. This means that lexical variation among the MRW adverbs of academic prose is higher than among verbs (TTR=27.1) and nouns (TTR=25.1), but not adjectives (TTR=43.0).

Table 6.5
Top Ten Metaphor-Related Adverbs in Academic Prose

Lemma	Academic prose			News			Fiction			Conversation		
	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total
Here	3	23	26	16	7	23	46	3	49	104	1	105
Far	2	18	20	2	16	18	6	13	19	2	6	8
Where	8	18	26	25	3	28	32	1	33	74	4	78
Further/far	1	14	15	2	4	6	3	1	4	3	3	6
Above	–	9	9	–	1	1	1	–	1	1	1	2
Over	–	9	9	1	9	10	12	8	20	5	9	14
Then	41	9	50	43	2	45	103	1	104	174	16	190
Under	–	8	8	–	4	4	–	1	1	–	2	2
About	3	7	10	1	20	21	1	14	15	4	48	52
Directly	2	7	9	1	2	3	–	1	1	–	–	–
Total	60	122	182	91	68	159	204	43	247	367	90	457

The reason why there is more lexical variation among MRW adverbs appears to be that the tokens are spread wider across the range of the (altogether relatively few) types. Almost half of all MRWs are already captured among the top ten, but the remaining half may be comprised by a wide range of other adverbs, such as

intelligently, which appear in a more scattered way, possibly corresponding with content and audience of the particular texts. While the first group may predominantly exert textual functions, the last group may exert interpersonal functions much more often, tailored to the specific rhetorical needs of the particular text.

In terms of semantic type, *here*, *where* and possibly *above* may be categorized as situational place adverbs and it is noticeable that nine out of the ten adverbs have a spatial basic meaning (except for *then*). In terms of semantic domain, they seem to cover manner (e.g., *directly*) and degree (e.g., *far*, *over, above, under,* and *about*), and possibly stance (e.g., *far*). These ten adverbs make up roughly half of all MRW adverbs in academic prose. As far as the other registers are concerned, fiction (N=247) and especially conversation (N=457) feature higher overall token counts than academic prose. This observation accords with the fact that conversation and fiction have overall more adverbs than academic prose and news. However, this trend is largely reversed for the proportion of metaphors – here academic prose leads, followed by news (43% of the counted total related to metaphor), conversation (20%), and lastly fiction (17%). This suggests that the other registers, especially fiction and conversation, use a different range of lexical types in relation to metaphor, while news (as the other informational register) shows more lexical overlap. Fiction and conversation have similar counts among metaphor-related adverbs that are higher than those of academic prose (see Chapter 5).

The examination of the top ten metaphor-related adverbs of academic prose captured half of the tokens that make up metaphorical adverbs use in academic prose, almost all of which have a spatial basic meaning. Other kinds of mappings may underlie these distinct lexical types of adverbs (e.g., *roughly,* which has a basic sense that refers to manner of movement/activity) in academic prose, and should be subject to further research.

In the following, I will summarize the findings of this section, with a reevaluation of the conclusions of Chapter 5, a report of the formal and functional characteristics of MRW adverbs in academic prose, a summary of findings on the top ten MRW adverbs in academic prose as opposed to the other registers, and a final remark on underlying cross-domain mappings.

➢ Chapter 5 suggested that metaphor-related adverbs cater to text-internal deixis (as place adverbs), and that adverbs used as stance adverbials (such as *heavily*) perform (inter-)personal functions. This assumption was supported.

➢ Analysis of examples suggested that adverbs with a spatial basic sense may be used to structure the text and to orient readers (*We have so far talked about*…; *The survey of children's attitudes helped here*), but also as stance adverbials, catering to what could be called (inter-)personal functions (*extend the definition of murder too far*?). It was also mentioned, however, that epistemic stance adverbs (*roughly*) appear to exert a predominantly ideational function. The

relatively low number of MRW adverbs found in academic prose in cross-register comparison was tentatively related to the high proportion of linking adverbs among academic texts reported by the *LGSWE* (which are hardly ever related to metaphor).

➢ The top-ten metaphor-related adverbs account for roughly fifty percent of all MRW adverbs in academic prose. This group of types appears to exert textual, contextual, and even interpersonal functions, but the other half may be a miscellaneous collection of adverbs with other spatial senses (e.g. *intelligently, roughly*), and fewer tokens each, possibly used for ideational and also (inter-)personal means.

➢ The TTR indicated a medium degree of lexical variation – higher than that of verbs, nouns and especially prepositions, and lower only than that of adjectives. There are thus overall not many MRW adverbs, but these appear to be spread across a relatively great number of lexical types.

➢ In terms of cross-domain mappings, reference seems to be often established with recourse to a mapping from the concrete domain of space onto the abstract domain of discourse. Other kinds of mappings underlying distinct lexical types of adverbs are quite feasible (e.g., *roughly,* which has a basic sense that refers to an irregular manner of movement, but also *intelligently*, with corresponds with a mapping between a person and some inanimate entity), and should be the subject of further research. Hence, the idea that relation to metaphor among adverbs has a strong foundation in spatial basic terms, but is also potentially open to metaphor use with very distinct basic senses, can be extended in terms of conceptual structures.

6.6 Determiners

In within-register comparison, metaphor-related determiners have a proportion in academic prose that does not vary significantly from the total proportion of MRWs in the register. Cross-register comparison shows that academic prose has a proportion of metaphor-related determiners that is close to the total proportion of MRWs in this word class as well. By contrast, the other informational register, news, has a significantly lower proportion, similar to fiction, while conversation shows the highest relative frequency of all registers. In the previous chapter, these results were tentatively related to the function of establishing exact text-internal reference in academic prose, catering to a particular, anaphoric, type of informational cohesion (cf. Biber, 1988, p. 114). How do metaphor-related determiners behave in academic prose? What are their typical lexical, grammatical, and semantic features and what functions do they perform?

It should be noted that in the present study, the categorization of word classes subsumes all types of demonstratives under the class determiners[41], thus also demonstrative pronouns such as *this*. Determiners are a functional word class used to narrow down the reference of nouns (see Biber et al., 1999, p. 258). Of all types of determiners, it is the demonstrative determiners (*this, that, these, those*) that are frequently related to metaphor, but not the definite and indefinite articles (e.g., *the, a*), since they have purely grammatical functions. Similarly, possessive determiners (e.g., *my, your*) and the quantifiers (e.g., *some*, *many*) are only occasionally related to metaphor in the form of implicit metaphor by ellipsis or substitution. The fact that the *VUAMC* worked with a broad class of determiners (including articles) was the reason why in the preliminary study (cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010; Steen et al., 2010a) this word class appeared most commonly in academic and news texts – these informational registers feature many more noun phrases than conversation and fiction, and they require some kind of determiner. The distributional profile of function word classes in Biber et al. (1999, p. 92) shows a similarly high, count for determiners in academic prose and news.

Biber et al. distinguish between *distant* (*that, those*) and *proximate* (*this, these*) demonstrative determiners, with proximate demonstratives being more commonly used in academic prose and news than in fiction and conversation, signaling immediate reference to the neighboring text by establishing anaphoric (and cataphoric) reference (1999, pp. 272). Consider *this*:

(68) This view, as we shall see, has been attacked on the grounds […]. (ECV-fragment05, emphasis mine, JBH)

Here, the concrete, deictic basic meaning ('the one that is here', MM1) can be compared and contrasted with the abstract discourse meaning ('used when you are a particular person, thing, fact, etc. that has just been mentioned, or when it is obvious which one you are referring to', MM3). While the noun *view* is used to label a preceding discourse section, *this* is used to delimit its reference to exactly the one that 'has just been mentioned'. The function is thus to serve to establish exact and specific reference – an ideational function combined with a textual one.

For practical reasons, the present analysis subsumes different kinds of demonstratives under determiners. An example of a metaphorically used demonstrative pronoun[42] is:

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[41]In the *VUAMC*, possessive determiners were included with the remainder. They are, however, highlighted in the fragment for illustrative reasons.

[42]A frequency count of the lemma *this* (N=819), rendered AV n=2, DT n=817, remainder n=0. A frequency count for the lemma *that* (N=2,451) rendered AV n=28, DT n=1,150, CJ n=1,273.

(69) I shall suggest that <u>this</u> does not follow because rationality is not in fact the grounds for the distinction in the first place. (ECV-fragment05, emphasis mine, JBH)

The distinction between proximate and distant demonstrative is also valid for demonstrative pronouns: As in (69), demonstrative pronouns in academic prose are largely used for establishing precise immediate textual reference (1999, p. 238) – again a textual function. The difference between the two types of demonstratives is that demonstrative pronouns work as placeholders which establish co-reference with noun phrases or clauses (or objects and entities in situational contexts), while determiners mark a noun (object, entity) as known and specify it in terms of textual reference (or spatial situation relative to the speaker). Metaphor-related determiners hence seem to exert a textual, but also ideational function, catering to discourse coherence but also to the exact specification of referents (cf. 1999, pp. 238; pp. 272-4; pp. 284).

In the following, I will examine the distribution of the most common metaphor related determiners of academic prose across registers. The ten most common metaphor-related determiners of academic prose are listed in Table 6.6. Metaphor-related tokens make up 12 % of the N=4,376 tokens, which is a relatively low proportion, but largely due to the definite article *the*. Excluding *the*, which is related to metaphor only once (by mistake),[43] the metaphorical tokens account for 73 % of the n=745 tokens. This is a clear contrast between the non-metaphorical and the metaphorical use of these tokens in academic prose (when excluding the frequent *the*). The total count of MRW determiners in academic prose in Table 6.6 differs only by one token from the total count of MRW determiners of the whole register (N=544), which means that lexical variation among metaphor-related determiners is extremely restricted. The TTR ((10/544)*100=1.84) is indeed very low, with few lexical types very frequently repeated.

The four types *this, these, that,* and *those* (which add up to n=534) make up 98% of all MRW determiners of academic prose. The proximate forms (*this, those*) are much more frequent in academic prose than the distance forms (*that, those*), and account for almost 80 % of all MRW determiners in academic prose. Note that this includes all types of demonstratives, thus determiners as well as pronouns.

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[43] The erroneously coded *the* was included in the sentence *It is through her emergence as a cult painter of *<u>the</u> feminist movement of the 1970s that her current reputation has evolved.* (A6U-fragment02)

Table 6.6
Top Ten Metaphor-Related Determiners in Academic Prose

Lemma	Academic prose			News			Fiction			Conversation		
	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total
This	2	312	314	5	164	169	17	128	145	74	97	171
These	5	114	119	1	46	47	6	23	29	10	33	43
That	32	64	96	16	86	102	28	193	221	200	494	694
Those	10	44	54	5	31	36	2	25	27	5	23	28
Half	4	5	9	6	2	8	7	8	15	24	5	29
Any	64	1	65	41	--	41	53	--	53	43	--	43
Each	36	1	37	14	--	14	13	--	13	7	--	7
Little	12	1	13	8	1	9	5	1	6	1	--	1
Same	37	1	38	22	2	24	17	--	17	18	--	18
The	3,630	1	3,631	3,011	1	3,012	2,485	--	2,485	1217	--	1,217
Total	3,832	544	4,376	3,129	333	3,462	2,633	378	3,011	1,599	652	2,251
Total excluding the	202	543	745	118	332	450	148	378	526	382	652	1,034

Comparison with the other registers (excluding *the*) shows that news includes fewer determiners on this list than academic prose, but is proportionally similar (74% of the tokens related to metaphor), much like fiction (72% metaphorical use). Conversation has a much higher overall count, and also the highest count of metaphor-related determiners of all registers, but with a slightly lower proportion than academic prose (63% metaphorical use). This is interesting and needs further exploration.

Table 6.6 shows that conversation uses a much greater number of singular distant forms (*that*) and fewer proximate forms (*this, these*) than academic prose. While both registers apply MRW demonstratives commonly to allow for cohesion and co-reference in the discourse, the forms used in conversation appear to display comparatively vaguer reference, since in its "heavily situation-dependent" (1999, p. 238) discourse, "it can be less specific and rely on implicit rather than explicit links and references" (1999, p. 284). Especially the distant forms (*that, those*) may in this context be convenient, since they have a "usually fairly vague" reference which "fits in with the use of other vague expressions in conversation" (Biber et al., 1999, p. 350; see also Kaal, 2012). Hence, in terms of reference established by demonstratives, it appears that academic prose and conversation generally differ in the degree of precision. On the one hand, conversation uses many demonstrative pronouns to establish "implicit rather than explicit links and references" (cf. Biber et al., 1999, p. 238), which allows for ongoing discourse with a minimum of effort (cf. Biber et al., 1999, pp. 1044-5). On the other hand, academic prose uses demonstratives to provide a "precise form of reference" (Biber et al., 1999, p. 238), establishing co-reference with the "immediately preceding text" (Biber et al., 1999, p. 274). Consider the following example from conversation, where abstract extra-situational reference is established by means of the pseudo-deictic metaphor-related demonstratives *this* and *that*.

(70) A: Sue and I go to this café, I told you, at Newtown, didn't I?
(71) [question by B, further description of the café by A]
(72) B: Oh that one.   (CONV, 233, emphasis mine, JBH)

This example suggests that in contrast with academic prose, conversation uses metaphorical demonstratives (in this case, determiners) to allow for rather vague referencing. In (70) the proximate demonstrative *this* establishes reference with some café that may have been mentioned at some prior point (but not necessarily within the same conversation). The café appears to be physically distant from the speakers and, in spite of the proximate form, is referred to in a rather unspecific way, with specification provided in (71). In (72), a second demonstrative (*that*) co-refers to the same café that was just introduced, now in the distant form – apparently marking the absence of a shared spatial and temporal situation. Both *this* and *that* thus establish relatively vague reference, whose uncertainty is "cleared up in the course of the exchange" (Biber et al., 1999, p. 350). Both *this* and *that* allow the chunking of informational units under real-time constraints (cf. Chafe, 1994).

Another, and compatible, explanation for the quantitative difference in proximate and distant forms is their relation to the management of proximity (cf. Kaal, 2012, pp. 142-146), which relates to language users' respective spatial

positions to the messages and each other. In her explanation, Kaal suggest that the distant form *that* appears to "create[...] distance between proximate language users in spoken texts" and the proximate form *this* appears to "create[...] nearness between distant language users in written texts" (2012, p. 145). With regard to the example above, the use of the proximate form in (70) thus appears to bring the distant referent closer to the interlocutors. And, in (72), the distant form may have been chosen "because speakers are already relatively close to each other and need to create distance to structure information" (Kaal, 2012, p.145).

Thus, as proposed in Chapter 5, the main difference between academic writing and conversation with regard to demonstratives may be the degree of precision of reference suggested, with carefully crafted academic prose using determiners to guarantee the highest level of explicit (co-)reference and coherence throughout exposition and argumentation. Related to this difference may be the degree of situational proximity between language users, with a low degree of proximity in academic prose bridged by a frequent use of proximate forms. Ultimately, this may also bring out the "reader-in-the-text", as proposed by Kaal (2012) and Thompson (2001).

In academic prose, metaphor-related determiners exert a textual as well as an ideational and possibly a contextual function. Differences to conversation may be related to the distinct communicative goals of the two registers, and to production circumstances. Ultimately, in academic prose, the relatively frequent use of metaphorical demonstratives may indicate that these words, with their shades of spatial meanings, are a way to "bind" the abstract discourse (quite "tightly") "together" with recourse to the spatial domain. A similar tendency of discourse-space mappings was suggested to underlie metaphorical use of prepositions and place adverbs. Further qualitative and quantitative analysis is needed to validate this analysis.

In the following, the findings of this section will be summarized, with a reevaluation of the conclusions of Chapter 5, a summary of formal and functional characteristics of MRW determiners in academic prose, a report on the findings on the top ten MRW determiners in academic prose as compared to the other registers, and a final summary of what could be found out about underlying cross-domain mappings.

➢ Chapter 5 suggested that metaphorical demonstratives in academic prose (with an average proportion as compared to other word classes within academic prose, but a higher proportion in academic prose than in fiction and news, and, remarkably, a lower one than in conversation) have the function of establishing precise anaphoric reference in academic prose, catering to informational density and exactness, as well as to text-internal reference. This interpretation was supported by the present chapter.

➢ The quantitative difference between academic prose and conversation may be explained by the different referential and situational characteristics of the registers – with regard to their respective degrees of referential "vagueness", and also situational "proximity". Academic prose uses more proximate MRW demonstratives, which make it possible to create explicit and precise (co-)reference structures within the text (Biber et al., 1999). This possibly also corresponds with academic prose's need to bridge the situational distance created by the lack of interaction and shared immediate direct situation (Biber et al., 1999; Kaal, 2012). By contrast, conversation uses more distant demonstratives, with may be explained in terms of their higher degree of vagueness (Biber et al., 1999), allowing the establishment of coherence and the chunking of informational units under real-time constraints, but also with their low degree of situational proximity creating distance needed in the interactive discourse of shared direct situations (cf. Kaal, 2012). In terms of Biber et al. (1999), MRW demonstratives in academic prose hence appear to perform typically textual, but also ideational (and contextual) functions.

➢ Examination of the commonly occurring types of academic prose showed that the four types *this, these, that,* and *those* account for almost all instances of metaphorical determiners of academic prose.

➢ The TTR confirmed very low lexical variation. Metaphoricity among determiners is thus largely restricted to these four types.

➢ In terms of cross-domain mappings, the relatively frequent use of metaphorical demonstrative determiners and pronouns in academic prose may indicate that those words, with their shades of spatial meanings, are a way to "bind" the abstract discourse "together" by recourse to the spatial domain: A somewhat similar tendency was suggested for prepositions, spatial adverbs, and some nouns.

6.7 Conjunctions

The two remaining categories of word classes, conjunctions and the remainder, have very low relative frequencies of metaphor in all four registers. The cross-register comparison of MRWs in conjunctions shows that there is no significant variation of MRWs across registers. How do metaphor-related conjunctions behave in academic prose? What are their typical lexical, grammatical, and semantic features and what functions do they perform?

Conjunctions are a functional word class used for linking clauses and phrases, and as coordinators (*and, or, but*) and subordinators (*that, as, while*) have a predominant syntactic function (see Biber et al., 1999, pp. 79-88). Although some

conjunctions are identical in form (homonymous) with other word classes (e.g., the preposition or adverb *after*) in their conjunctive use, they are normally not related to metaphor, due to the lack of a more basic meaning *within the word class*. The form identity is the reason why a few cases of relation to metaphor were recorded, especially in academic prose. Most of these are thus errors, either on the part of the BNC POS-tagging or on the part of the *VUAMC* annotation. One exception is *where*, which was already discussed in Chapter 5 (see section on *Conjunctions and the remainder*). As a subordinating conjunction, *where* introduces dependent clauses, both in non-metaphorical use such as in *She didn't say where she works* (MM, entry *where*) and in metaphorical use, such as in […] *criminal law ought to spread its net wider* <u>*where*</u> *the potential harm is greater* (ACJ-fragment01). The *LGSWE* suggests that *where* in metaphorical use has a textual function, at the same time exploiting the contrast between the spatial basic meaning and the linking ("logical") meaning in abstract contexts. As discussed above (in the section on adverbs), *where* can be also be used as a relative adverb with more basic senses of within this word class. Despite problems in classification, *where* is (to our knowledge) the only conjunction that does exhibit a contrast between contextual senses and a basic, spatial sense. Most cases of MRW *where* tagged as conjunction appear in academic prose (n=28), followed by news (n=7), and fiction (n=1), whereas conversation features none. By contrast, most cases of non-metaphorical conjunctive use of *where* were identified in fiction (n=16), followed by news (n=14), academic prose (n=12), and finally, conversation (n=7). This distribution appears to reflect a higher frequency of abstract referents in academic prose (and, to some extent, news) on the one hand, and a more frequent occurrence of spatial referents in fiction, conversation, and interestingly, also news on the other (see Table B2 in the Appendix; see also discussion of *where* above).

The following list will summarize the findings of this section, with a reevaluation of the conclusions of Chapter 5, and a summary of what was found out for the metaphorical conjunction *where*.

➢ Chapter 5 did not identify a significant statistical difference between registers in terms of frequency of MRWs: Conjunctions are largely non-metaphor-related.
➢ Inspection of the five lexical types of conjunctions that include tokens that were coded as MRWs in academic prose revealed that most cases are errors, due to form identity with the word classes prepositions and adverbs. However, there seems to be one exception*, where.* This lexeme seems to work as a subordinator with a more basic spatial meaning and thus was correctly identified as related to metaphor in conjunctive use. Most metaphorical occurrences of *where* were counted in academic prose (followed by news), probably related to the more abstract content and dense information structure. The function performed by

where could be termed textual, since, as a subordinating conjunction, it introduces dependent clauses.

6.8 Remainder

Although the observed counts of MRW within the remainder are rather small, this category is interesting in cross register comparison: The statistical analysis showed significant variation of metaphor use between registers, with academic prose (and news) having higher relative frequencies. In the previous chapter, these results were tentatively related to "highly explicit, context-independent reference" (Biber, 1988, p. 110).

Casual inspection suggested that these metaphor-related lexical items were mainly pro-forms such as pronouns, related to metaphor by ellipsis and substitution. In the current chapter, we can examine the remainder category in more detail, checking whether this assumption was reasonable. Which instances of the remainder are related to metaphor? How do metaphor-related instances of the remainder behave in academic prose? What are their typical lexico-grammatical and semantic features and what functions do they perform?

Since negations, possessives, numbers, and existential *there* are normally not related to metaphor, potential relation to metaphor within the remainder category resides in pronouns and unclassified elements. Pronouns are the more important group since they can be related to metaphor in their function as implicit metaphors (referring back to a previously used metaphor, see Chapters 2, 3, and 5). The total count of MRWs of remainder of academic prose is N=117 (see Chapter 5). The table captures all instances of the remainder in academic prose, including the metaphor-related ones. The metaphor-related tokens (n=117) make up 5.2 % of all instances of the remainder in academic prose (N=2,245). The TTR is (9/117)*100 = 7.7. This value is higher than that of prepositions (1.67) and determiners (1.84), but its interpretation has to take into consideration that the remainder, as a "bin" category, by definition includes very diverse lexical types, many of which are not repeated very often in absolute terms. More than half of the types listed can be broadly categorized as pro-forms (*it, they, we, next, one, two*) and thus are likely candidates for implicit metaphor. Exceptions are *under-fives* and *to*, which were errors, whereas *next* is a borderline category.

Table 6.7
Nine Metaphor-Related Types of Remainder in Academic prose

Lemma	Academic prose			News			Fiction			Conversation		
	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total	Non-MRW	MRW	Total
It	486	49	535	480	42	522	560	15	575	1458	13	1471
They	401	37	438	425	30	455	430	22	452	746	4	750
Under-fives	–	11	11	–	1	1	–	–	–	–	–	–
To	872	5	877	803	10	813	732	2	734	623	–	623
We	195	5	200	240	–	240	236	–	236	606	–	606
Next	4	4	8	8	22	30	7	12	19	12	14	26
One	123	4	127	102	1	103	132	2	134	293	1	294
Naught	–	1	1	–	–	–	–	–	–	–	–	–
Two	47	1	48	56	–	56	68	–	68	147	–	147
Total	2128	117	2245	2114	106	222	2165	53	2218	3885	32	3917

All eight instances of *next* were identified as ordinal numbers by the BNC POS-tagger. This reflects the fact that *next* is a borderline case regarding word class

membership somewhere between adverb, adjective and determiner. According to the *LGSWE*, *next* is a "semi-determiner" (1999, pp. 280) – an adjective with "no descriptive meaning" that works as a determiner / ordinal number, "specifying items in terms of order" (1999, p. 281). To *MIPVU*, however, it is related to metaphor because of a contrast between the basic meaning 'used for referring to the place that is closest to where you are' (MM) and a contextual meaning that refers to 'the time, event, action, person, etc. that comes after this one or after another one'(MM). An example of the metaphor-related use of *next* is given in (73), where *next* has a meaning that relates to logical order.

(73) […] Sartre arrives at what he calls 'the real problem of History', that is how there can be totalization without a totalizer, only at the very end of Volume I. It is not until the <u>next</u> volume, however, that he intends to show how […]. (CTY-fragment03, emphasis mine, JBH)

In all, the analysis of the MRW lexical types of the remainder shows that pronouns are the most important group among the remainder in academic prose. The pro-forms (*it, they, we* etc.) make up n=97 cases out of the total N=117 MRWs of academic prose. In terms of cross-register comparison, the nine reported types cover a great deal of the tokens in the other three registers as well: Table 6.7 accounts for almost 90 % of all metaphor-related instances of news (n=106 out of the total N=118, see Chapter 5), as well as for a major part of the metaphor-related remainder of fiction (n=53 of the N=69 instances) and of conversation (n=32 of the total N=35). In terms of relation to metaphor, news is very similar to academic prose, with a relatively small proportion (4.8%). Meanwhile, this proportion is even smaller in fiction (2.4%), and smallest in conversation (only 0.8%).

Extract (74) contains a metaphor-related instance of the pronoun *it*, which refers cohesively to the metaphor-related noun *view*.

(74) This <u>view</u>, as we shall see, has been attacked $_1$[on the grounds $_2$[that <u>it</u> rests on the false assumption $_3$[that the distinction between adults and children is identical with the distinction between rational and non-rational beings$_1$]$_2$]$_3$]. (ECV-fragment05, emphasis and brackets mine, JBH)

View is here related to metaphor because of a contrast and similarity between the contextual sense and a more basic sense that refers to the sense of sight (and place)[44]. The mapping that is set up by *view* and taken up by *it* is thus (roughly)

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[44]The basic meaning of *view* seems to include an element of location/place – firstly, *view* presupposes a particular place from which you see something ('the ability to see something

between the domain 'sight/location' as the source and 'opinion/belief' as the target. In (74), the main clause *This view has been attacked* is extended by an adverbial – the prepositional phrase ($_1$) *on the grounds*. This prepositional phrase in turn has a *that*-clause as a complement (($_2$) *that it rests …*) which itself functions as a matrix clause with a ($_3$) *that*-clause as a complement of *assumption*. The subject of the first *that*-clause is the metaphor-related pronoun *it* and is identical with the object of the main clause. Sentence (74) thus has a highly integrated information structure, something which is typical of the informational registers (cf. Biber, 1988) and which seems to require such intermediate cohesive devices as *it* for establishing "highly explicit, context-independent [co-]reference" (Biber, 1988, p. 110). With regard to metaphor, pro-forms such as *it* can be taken to extend the conceptual cross-domain mappings established by indirectly used lexical items such as *view* across phrase and clause boundaries.

In all, the frequency analysis can largely be mapped onto the picture that was obtained for implicit metaphor in Chapter 5, with most instances of metaphor found in academic prose, followed by news, and then fiction, and with much fewer instances in conversation. On the basis of these results, the comparatively higher frequency of the remainder category in academic prose appears to be a direct function of implicit metaphor.

In the following, I will summarize the findings of this section, with a reevaluation of the conclusions of Chapter 5, a summary of formal and functional characteristics of MRWs falling into the remainder category in academic prose as compared to the other registers, a summary of findings on the top ten MRWs in academic prose, and a final report on underlying cross-domain mappings.

➢ The detailed analysis of the remainder category supports the interpretation put forward in Chapter 5. The variation in metaphor distribution across registers in the remainder seems to largely map onto the variation in implicit metaphor use across registers, with a higher frequency in the informational registers, and the lowest one in conversation.

➢ Metaphorical instances of the remainder (pro-forms) seem to perform textual tasks as cohesion markers that refer back to metaphor-related nouns. In that capacity they make up part of the linguistic features typical of informational production and allow for the establishing of maximally precise (co-) reference.

➢ Metaphor-related instances of the remainder are indeed to a large extent pro-forms. A few other forms were also identified – these were borderline cases (*next*), tagging errors (*to*), and new-formations (*under-fives*).

from a particular place'); secondly, *view* may stand metonymically for the 'area or place that can be seen' (MM). In this respect, metaphorical coherence may be established with the basic senses of the other MRWs in the sentence, *on, grounds, rest*, and even *attack* (attacking can be directed towards some location).

➢ The TTR was higher than that of prepositions and determiners, but the diverse lexical types of this "rest" category repeated are in fact not repeated very often.

➢ It may be argued that in contrast to non-metaphorical pro-forms, they extend conceptual cross-domain mappings across phrase and clause boundaries.

6.9 Summary and Discussion

In the following, I will briefly summarize and discuss the results in two ways, firstly by summarizing the findings on lexical variation within the distinct word classes when related to metaphor, and secondly by addressing the five communicative functions proposed by the *LGSWE* as a heuristic for discussion of the particular word classes. In order to summarize the findings in terms of types and tokens of the metaphor-related instances per word class in academic prose, Table 6.8 depicts the word classes ordered by type frequency. In terms of lexical variation measured in TTR, we can discern four groups. Firstly, there are MRW nouns (TTR=25) and MRW verbs (TTR=27), which have quite similar TTR values. Secondly, there are the adjectives (TTR=43) and adverbs (TTR=35) which are overall much less frequent than nouns and verbs, but have comparatively many types. Thirdly, there are two functional word classes, MRW prepositions and MRW determiners, which exhibit a substantial contrast between type and token counts, and therefore have both a very low TTR value of under 2 (note however, that MRW prepositions not only have a much higher overall frequency than MRW determiners but that they also come in more different lexical types). And lastly, there is the functional word class remainder, which includes very few MRWs (TTR=8). It is of no surprise that the remainder, being comprised of very diverse lexical units falling into different grammatical classes, has a TTR that is not as low as that of determiners and prepositions. However, the overall count of MRWs among the remainder is very low, which means that variation is spread across very few cases.

Table 6.8
Types and Tokens of all MRWs per Word Class

Word class	Types	Tokens	TTR
Nouns	689	2750	25.1
Verbs	611	2255	27.1
Adjectives	351	818	42.9
Adverbs	89	252	35.3
Prepositions	46	2345	1.7
Determiners	10	544	1.8
Remainder	9	117	7.7

In all, the metaphor-related instances of the lexical word classes are – as a rule – spread among many more different lexical types than the MRWs of the functional word classes. Hence, lexical variation in MRWs reflects by and large the pattern of lexical and functional word classes generally, with lexical word classes that have a great number of types and are open to new formations, and functional word classes that are restricted to a closed number of types. However, it may be suggested that academic prose exploits only a relatively small degree of the potential of lexical word classes. Repetition of a formal and technical vocabulary (cf. Biber, 1988; Eggins & Martin, 1997; Hyland, 2006b), together with stylistic restrictions (cf. Giles, 2008; Hyland, 2004; Hunston, 1994), appears to delimit metaphor use in academic prose to conventional and backgrounded language. Metaphorical language thus seems to be largely an inconspicuous part of a highly conventional and normally well-defined lexical repertoire of academic prose.[45] This assumption was tentatively supported by counting the top-ten metaphor-related types per word class, which featured MRW verbs such as *make, take,* and *have,* adjectives such as *wide* and *low,* nouns such as *field, form,* and adverbs such as *here, above,* and *where.* At the same time, it appears that metaphor-related lexical items that are new-formations (such as the psychological term *flooding* once must have been) need to be carefully introduced and accepted by the discourse community before acquiring a proper, well-defined meaning in discourse (see Chapter 2 for a discussion of theory-

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[45] There is, however, a tradition of academic prose that embraces openly creative and vague metaphorical language, for example, deconstructivists such as Derrida. The type of academic prose described in this thesis, however, appears to be largely oriented towards the maxims of exactness and plainness inherited from the scientific revolution (see Chapter 2).

constitutive metaphors; see also Semino, 2008, who discusses the introduction of a newly coined metaphor-related term in a scientific paper). As far as distinctions between word classes are concerned, it may be that nouns, as the major carriers of meaning, are more "open" to metaphorical new-formations or less conventional usage than other lexical word classes, establishing reference with new theories before other word classes "catch up" or are highlighted as figurative word use for educational or epistemic reasons. This hypothesis, however, needs to be subjected to further empirical analysis.

In this chapter, I used the six discourse functions proposed by Biber et al. as a heuristic to pinpoint behavior of metaphor in the eight specific word classes. Table 6.9 is a summary of this exercise. From the above review of the *LGSWE* it could be inferred that metaphor-related nouns, verbs, and adjectives typically perform ideational functions, establishing and shaping reference, and that some metaphor-related adverbs appear to perform very specific ideational tasks (epistemic stance adverbs). Reference is established by these word classes with the various (abstract) concepts, relations, and situations that are discussed in academic discourse, and this is done in rather exact ways.

Table 6.9

Communicative Functions Attributed to MRWs per Word Class

	Function			
Word class	Ideational	(Inter-)personal	Textual	Contextual
Nouns	Typical	Possible	Possible	Possible
Verbs	Typical	Possible	Typical	No
Adjectives	Typical	Possible	Typical [46]	No
Adverbs	Typical	Typical	possible	Typical
Prepositions	Typical	Possible [47]	Typical	Possible
Determiners	Possible	No	Typical	Possible
Pronouns	No	No	Typical	No
Conjunctions	Possible?	No	Typical	No

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[46] Independently of relation to metaphor.
[47] Within larger units (phrases and clauses).

The fifth word class that may be assigned typical ideational functions in metaphor-related use is often considered a functional word class – prepositions, which, in prepositional phrases can be used to specify and elaborate the identity of referents. (Demonstrative) determiners may be assigned an ideational function, since they delimit the reference indicated by the respective noun as well. There was only one true metaphor-related conjunction, *where,* which is a special case that even seems to involve a slight content-related, and thus ideational, aspect.

All lexical word classes also occurred with (inter)personal functions, for argumentation, for persuasion, the signaling of stance, and for pedagogical tasks. While prepositions as heads of prepositional phrases functioning as adverbials and as complements of lexical words may be involved in these functions as well, all other functional word classes seem to be devoid of (inter)personal functions. Furthermore, all lexical word classes seem to be able to perform certain textual functions in metaphorical use, most of which may be directly explained with their metaphorical nature (mapping properties and structure from a more basic domain onto the highly abstract and "logical" target domain, which could be roughly dubbed "textual cohesion" or "abstract discourse"). Textual functions were however even more typically performed by MRWs of the functional word classes, with MRW pronouns as the most extreme case catering solely to the establishment of metaphorical coherence. When contextual functions are seen as intra-textual and intra-discursive deixis, these appear to be performed by four word classes: firstly, by two lexical word classes, of which adverbs (*here, above* etc.) seemed the more typical ones, whereas nouns appear to be less typical (*point*); and secondly, by the two functional word classes determiners (*this* *attack*, *this* chapter) and prepositions (*in the remainder of*).

Table 6.9 excludes the aesthetic functions proposed by Biber et al. It may be assumed that – as a tendency – in the fragments of published academic texts, the stylistic conventions of academic prose were considered – thus, generally, we may propose that aesthetic functions of the recorded academic language largely comply with the rules of objective and elaborated style. In terms of relation to metaphor, however, it may be that indirect metaphorical language use of especially lexical words is a welcome and possibly important tool for exerting interpersonal functions, since it complies with the particular stylistic and communicative conventions of academic prose that highlight "the factual, impersonal and objective" (cf. Hunston, 1994; Hyland, 2004b). In other words, as typical academic lexis, metaphorically used words that appear to exert interpersonal functions (e.g., nouns such as *balance*, verbs such as *attack*, or adjectives such as *low*) comply with stylistic conventions of academic prose, and therefore do not contradict the "objective" and informational nature of much academic discourse, "avoid[ing] the attitudinal language normally associated with interpersonal meaning" (Hunston, 1994, p.193). In academic prose, texts are normally edited multiple times, and in this process, writers have ample

opportunity to apply stylistic conventions. This may often mean that imprecise or too colorful language, which may include metaphor, is deleted from the texts. Consider for example the APA style manual:

> [Linguistic devices] that attract attention to words, sounds, or other embellishments instead of to ideas are inappropriate in scientific writing. Avoid heavy alliteration, rhyming, poetic expression, and clichés. Use metaphors sparingly; although they can help simplify complicated ideas, metaphors can be distracting. […] Use figurative expressions with restraint and colorful expressions with care; these expressions can sound strained or forced. (American Psychological Association, 2010, p. 70)

If linguistic devices that attract attention to words instead of ideas are generally avoided in academic prose, the aesthetic functions of metaphor may thus be overall exerted within relatively confined margins.

The clearest distinction between the lexical and functional word classes was observable for (inter)personal functions, with MRWs of the functional word classes largely devoid of evaluative tones, but MRWs of all lexical word classes bearing a potential of conveying a particular personal perspective and revealing the intent to induce this perspective to the addressees of academic prose. Ideational tasks meanwhile appeared to be performed by all word classes to some degree, save the pronouns in the remainder. Contextual functions in academic prose were not always identified straightforwardly, which was probably mainly due to the fuzzy definition of this function by the *LGSWE* (contextual functions are defined as establishing reference to some kind of context or situation, whether concrete or abstract, such as a joke beginning with *there was this guy*). They were identified in lexical as well as in functional word classes. Textual functions were most typically performed by functional word classes, but the lexical word classes, too, appeared to perform certain textual functions in metaphorical use. Lastly, aesthetic functions appear to be performed by metaphorical word use of all word classes. In one sense, this is a trivial finding, since all fragments, as academic publications, were heavily edited, which made sure that "conventions of 'good style' or 'proper grammar'" (Biber et al., 1999, p. 43) are observed in the first place. However, looking at the data from this angle, it can be seen how metaphorical word use (by potentially exploiting cross-domain mappings) may be an important tool that allows the conveying interpersonal and personal perspectives in a backgrounded way in academic prose.

6.10 Conclusions

This chapter has dealt with the choices that writers make in terms of vocabulary and grammar in metaphorical word use in academic prose. A great number of cases of natural language use were discussed across the eight word classes of English, and all instances could be related to one or more of the particular communicative functions proposed by the *LGSWE*. I have given answers to the question of how typical metaphor-related manifestations of each individual word class behave in academic prose – which their typical lexico-grammatical and semantic features are, as well as what functions they seem to perform, both typically and less typically. I found that relation to metaphor can largely explain *how* the particular (ideational, textual, interpersonal, personal, contextual, and aesthetic) functions are performed by natural language use in published academic texts – by means of some cross-domain mapping, which typically have more basic source domains and more abstract target domains.

First of all, most assumptions made from an analytical distance of the macroscopic quantitative chapter actually hold true in the microscopic view. The informational production of academic prose (Biber's first dimension) uses nouns and prepositions, but also verbs, in metaphorical use for predominantly ideational and textual tasks, establishing and refining reference in highly elaborated texts, giving a register-constrained "clue about what we do" (Romaine, 2000, p.21), and densely packaging information in complex constructions (Biber et al., 1999). Metaphor appears here as a tool that helps (a) forging semantic links between lexical units (Halliday & Hasan, 1976) and (b) packaging information in the typically nominal style (Halliday, 2004b; Hyland, 2006b) of academic prose. Metaphor plays thus an indispensable part in the formal (cf. Eggins & Martin, 1997; Hyland, 2006b), specialized, and technical prose (cf. Biber et al., 1999) of academic texts. Connected to this are the explicit reference (Biber's third dimension) and abstract content (Biber's fifth dimension) of academic prose: The finely-tuned reference structures of academic prose are to a great deal facilitated by metaphorically used adverbs, determiners, nouns, and prepositions, while the abstract content of academic prose appears to be intrinsically linked to metaphor as a conceptual tool that allows mappings between abstract and more familiar domains. The lexically more restricted functional word classes (conjunctions, determiners, pronouns, and prepositions) appear to rely on space-discourse mappings (an exception being pronouns related to implicit metaphor that work differently), whereas the lexically open word classes nouns, verbs, adjectives and adverbs show more variability in source domains, ranging from space and objects (*point, here, widely, low*) to bodily- and perception-related domains (*make, see, clear*) to more culturally-based (*flooding, field, poor, stage*) and abstract source domains (*produce, force*). In this respect, also the

impersonal style of academic prose (Biber et al., 1999; Hyland, 2006) can be in part accounted for by relation to metaphor: What Dorgeloh and Wanner (2009) identify as formulaic constructions involving an inanimate entity in subject position of active verbs (*This paper argues/This fact suggests*; see also Biber et al., 1999; Master, 1991) is personification, and thus a mapping between some inanimate entity and a person (cf. Low, 1999, 2008b).

Secondly, the macroscopic structure of the findings could be fleshed out by discussing examples grouped in terms of the information given by the *LGSWE*. One important heuristic tool here was the catalogue of communicative functions proposed by the grammar. Applying the functions to examples of academic text played out well, by and large. It showed that in academic prose, textual functions can be performed by metaphor-related instances of all word classes – academic prose uses not only metaphorical instances of the functional words, but also of the lexical word classes, especially nouns and verbs, as well as adverbs, for guaranteeing cohesion and coherence within and across its abstract and long sentences (cf. Biber et al., 1999; Halliday & Hasan, 1976). That this may be a particular characteristic of academic prose, and somewhat less, of news, was already suggested by Chapter 5. Using the *LGSWE* as a heuristic tool also suggested that lexical words, but not the bulk of functional words, can perform interpersonal and personal functions in academic prose. The persuasive and attitudinal functions of certain word classes in academic prose (e.g., adverbs, adjectives) that were noted (as surprising) by the *LGSWE*, and could be extended to metaphor-related instances of all lexical word classes. This finding is in line with research on academic discourse on the distribution and function of hedges and other linguistic structures that perform interpersonal tasks (e.g., Biber, 2006b; Charles, 2003; Del Lungo Camiciotti & Tognini-Bonelli, 2004; Hunston & Thompson, 2000; Hyland, 2004b), as well as with discourse-analytically oriented research on academic discourse (e.g., Charteris-Black, 2004; Goatly, 2007; Hellsten, 2008; Nerlich & James, 2009; Semino, 2008; Wallis & Nerlich, 2005), and research on the rhetoric of science (e.g., Fahnestock, 1999; Gilbert & Mulkay, 1984; Halliday & Martin, 1993). With regard to the contextual functions, seen as intra-textual and intra-discursive deixis (cf. Biber et al., 1999), these appear to be performed by adverbs of place (e.g., *here, above*), nouns (e.g., *point*), determiners (*this attack*, *this chapter*) and prepositions (*in the remainder of*). Among this list, adverbs of place comprise probably the most typical instances of metaphor used to orient readers with recourse to a mapping from the concrete domain of space onto the abstract domain of discourse (see also Fleischman, 1991; Lakoff & Johnson, 1980). As far as aesthetic functions are concerned, a particular form is performed by metaphor-related word use in concert with personal and interpersonal functions: Metaphorical instances of (mostly) the lexical word classes convey evaluative meanings in an indirect way (e.g., *attack*, *embrace*) that do not violate the maxims of fact-oriented and impersonal style of

academic prose (e.g., Hunston, 1994; Hyland, 2004b). A different situation is likely to apply to fiction and especially news – both registers have very different stylistic conventions than academic prose, and in opposition to academic prose, have clear entertainment functions, which allows them to feature a more varied, and more openly creative, use of lexico-grammatical forms of metaphor (e.g., novel metaphors such as *lump of clay* in fiction [cf. Skirl, 2007, p. 115] or novel metaphor-related compounds such as *state-masonry* in *The masses are being engaged in the craft of state-masonry* [fragment A9J, cited in Krennmayr, 2011, p. 68]). While metaphorical language use in academic prose can have interpersonal functions as well, a particular type of metaphor-related compound formation with interpersonal function appears to be more typical of news (see also De Knop, 1987, whose analysis of a corpus of German news headlines found three interacting parameters, *metaphoricity*, a *headline function*, and the *process of compounding*).

Meanwhile, lexical variation in conversation is low, including lexical units related to metaphor (cf. Kaal, 2012). This can be explained by the multimodally rich nature of conversation as the "canonical encounter" (Clark, 1973, pp. 34-5) of human communication, which exploits situated context for reference and hence does not need to express everything by means of the linguistic mode. With regard to the linguistic mode, however, the situational setting of conversation may generally result in a high extent of repetition of "multi-purpose" words with "multiple uses but minimal meaning" (Cameron, 2003, p. 72) among which demonstratives (*that*), nouns (*thing*), and verbs (*have*; *go*). It was also suggested that while metaphor use in the lexical word classes is largely an integral part of a register-dependent vocabulary, general overlap across registers consists in such lexical words as *way, point,* and *have*. At the same time, function words such as *in, on, this* and *that,* coincide to a greater extent across registers in terms of forms, but some of these appear to be used with different meanings in distinct registers (e.g., demonstratives in academic prose vs. conversation).

Lastly, the present chapter has shown that examining relation to metaphor is a powerful tool for the lexico-grammatical analysis of academic texts. The detailed analysis of metaphor in academic prose has proposed that relation to metaphor can not only be identified across all main word classes, but that within these word classes, metaphor occupies specific niches (e.g., in descriptive adjectives such as *wide, long, weak* as opposed to classifying adjectives, such as *additional, English,* and *chemical,* which appear to be hardly related to metaphor among the most common types) and performs particular functions (e.g., among the lexical word classes, it exerts the ideational tasks of stating what a text is about, but also performs the less objective (inter)personal task of conveying particular attitudes, and even textual jobs in linking units and making the text coherent).

Metaphorical language use is thus a highly differentiated phenomenon that cannot be readily reduced to one or few typical structures, least functions. It may be

true that "scientific revolutions are, in fact, metaphoric revolutions" (Arbib & Hesse, 1986, p. 156), with metaphor fueling the re-modeling of thought and the coinage of new technical language. However, the functional examination of the lexico-grammatical features of metaphorical language use in academic discourse reveals that metaphor is not just "revolutionary" in the sense of Arbib and Hesse, but that it is in fact mostly "bourgeois" and staid, providing the stylistically restricted language of academic prose with the possibility to communicate abstract and complex content, as well as attitude and persuasion.

CHAPTER 7
Testing the Influence of Expertise on Metaphor Processing

The last two chapters suggested that many instances of metaphor in natural academic discourse are conventional, if not inconspicuous from a reader's perspective. This seems to be compatible with a recent approach to metaphor processing that suggests that most metaphor in language may not be "processed metaphorically, that is, by a cross-domain mapping involving some form of comparison" (Steen, 2008, p. 214). Although this position goes against some well-established assumptions about the nature and processing of metaphor in cognitive linguistics (cf. Gibbs, 1994; Lakoff & Johnson, 1980; Kövecses, 2002), it can be supported by psycholinguistic evidence on metaphor processing, especially by the career of metaphor approach (cf. Bowdle & Gentner, 2005; Gentner & Bowdle, 2001), which proposes that there are two modes of metaphorical language processing, comparison and categorization, and suggests that these are determined by two properties of metaphorical language, grammatical form and metaphor conventionality (cf. Bowdle & Gentner 2005; Gentner & Bowdle, 2001). The career of metaphor approach hence offers a framework for addressing the problem of some metaphorical language not being processed metaphorically, by turning our attention to the factors of grammatical form and conventionality of metaphors. In the present study, the theory will be applied to a specific domain of discourse, psychology. From among the vast number of academic disciplines, psychology was chosen mainly because metaphor use in modern psychology has been well documented (e.g., Cooke & Bartha, 1992; Corts & Pollio, 1999; Draaisma, 2000; Gentner & Grudin, 1985; Hoffmann, 1980, 1985; Leary, 1990b), and because "expert" groups can be acquired relatively easily, in contrast to some other disciplines. The literature suggests that metaphor plays a vital role in the various subfields of psychology, and that this includes specialized metaphors particular to the discipline as a whole. At the same time, from a theoretical point of view, the experiment would have been possible with basically any other academic discipline.

Applying the career of metaphor theory from a discourse-linguistic perspective, my assumption is that conventionality is not a fixed characteristic of metaphor-related words, but that it can vary, depending on the domain of discourse. In other words, the basic supposition is that some metaphors are conventional within some particular domain (psychology), but not outside of it. The simple question that follows from this is whether experience (for example in psychology) may predict the

processing of metaphors conventionally used within that discipline. In this chapter, I will thus examine whether metaphor processing within a specialist discourse community such as psychology is affected by the language user's degree of expertise.

The two studies that will be presented in this chapter are embedded in the same integrated framework as the rest of this dissertation (see Chapter 1). In contrast with the preceding chapters, however, we will here focus on the behavioral dimension and zoom in on the role that expert knowledge may play in the processing of technical figurative expressions. In doing so, we will build upon cognitive psychological research on expertise (cf. Chi, Glaser, & Farr, 1988; Sternberg & Ben-Zeev, 2001; Sternberg & Frensch, 1992), analogical mental models (cf. Gentner, 1983; Gentner & Wolff, 2000), and analogical processes of problem solving (see overview in Bowdle & Gentner, 2005, p. 198).

The interaction between expertise and figurative language and thought has been addressed by only a small number of articles (most of which appeared in a special issue of *Metaphor and Symbol* on expertise and metaphor (cf. Hoffman, 1992; Honeck & Temple, 1992), and no study has so far experimentally examined metaphor comprehension as dependent on expertise in a scientific/technical domain. Most relevant for the current study is the work by Cooke and Bartha (1992) who compared metaphor production in experienced and inexperienced scholars of psychology. They showed that the expert group (graduate students and Ph.D.s), when asked to explain a set of hypothetical experimental findings, produced more psychological (and more novel) metaphors than the novice group (undergraduate students), while both groups used everyday metaphors to the same extent. Experts also used metaphors covering a wider range of psychological phenomena. This finding can be interpreted in such a way that an expert, when describing discipline-related topics, automatically produces more theory-constitutive metaphors (Boyd, 1993; Semino, 2008) than a novice – since theory-constitutive metaphorical language is part of both the active and the passive genre knowledge that an expert acquires in their formal training. More evidence for the use of metaphor and its connection with expertise in the domain of natural psychological discourse (however, on the symbolic level of analysis) is given by Beger (forthcoming), who identified linguistic metaphors in interlocutors' utterances to infer conceptual metaphors of love and anger. She suggests that the conceptual metaphors for 'love' and 'anger' used by experts (counselors and psychology professors) differ from one used by laypersons. It thus appears that the lay public has a different conceptualization of basic psychological concepts than expert groups. Other relevant findings on metaphor and expertise come from the domain of human-computer interaction (for a short review see Hsu, 2006); studies in this field examine the effects of metaphorical elements embedded in hypermedia and computer systems on learning the systems. The basic assumption here is compatible with Lakoff and

Johnson's (1980) basic claim of lending structure to abstract or unknown target domains and thereby highlighting some features of the target, while hiding others: Metaphors "not only bring about knowledge transfer but also help draw a person's attention to certain important elements of the target domain" (Hsu, 2006, p. 774). However, there is debate about the extent to which metaphors have a beneficial effect on learners in this context (cf. Hsu, 2006, p. 772); Some studies indicate that the positive effect of metaphors holds mainly for complex-learning or problem-solving situations (knowledge elaboration and transfer tasks) and not as much for retention or rote learning (cf. Hsu, 2006, p. 772; p. 783). This suggests that in knowledge elaboration, metaphorical mappings from more familiar (lay) domains (e.g. mailing system of the post office) to technical (expert) domains (e.g., data transmission processes of the Internet, see Hsu, 2006, p. 777) put heavy workload on novices, but eventually facilitate the elaboration of more expert mental models. In terms of my hypothesis, it may be assumed that novices engage in comparison between the two domains first and then abstract a schema which is integrated with the more expert mental model. Similarly, examining *conceptual change* of mental models, Gentner and Gentner (1983) explored the influence of participants' figurative mental models on problem solving in electric circuits. In a first experiment, they found that participants' preexisting mental models influenced their ability to solve various circuit problems. In a second experiment, they taught three different models to groups of participants and compared their subsequent patterns of inference. They found that teaching one model (the "moving-crowd" model) resulted in better performance in solving problems that were structurally related the two other models (two distinct "water" models). The authors suggest that this was because participants had a wrong or partial prior knowledge of source domain of the two latter models (water). Honeck and Tempel (1992) sketched out a theoretical model which addresses general factors involved with the examination of the relation between metaphor and expertise: problem, expertise, social situation, and task. They also propose the "cognitive discovery hypothesis", which holds that "people […] are more likely to use novel metaphor when they encounter unfamiliar problems" (1992, p. 238). Specifically with regard to novices they "expect that when faced with challenges, neophytes would use many novel metaphors" (1992, p. 239). The literature on knowledge change generally implies that knowledge, including technical knowledge, is at least partially acquired by means of on-line figurative processing (see Gentner & Wolf, 2000, for an overview).

Despite these explorations of expertise as a factor involved in metaphor use in language and thought, so far no behavioral evidence has been produced of the effect that expertise has on the processing of scientific/technical linguistic metaphor. Since expertise is likely to play a role in receptive linguistic metaphor processing, and since processing in turn may be affected by domain of discourse, the time seems ripe

for an exploration of the linkage between metaphor processing and disciplinary expertise on experimental grounds.

The remainder of this chapter is structured in the following way. Firstly, the theoretical framework will be laid out; first (7.1.1) with regard to metaphor processing, in particular, to the career of metaphor account, and secondly, an overview of relevant expertise research will be given (7.1.2). Subsequently, the hypothesis stated above will be transformed into a research question and predictions (7.1.3) for the two experiments that are presented in sections 7.2 and 7.3. The chapter will be completed by a general discussion (section 7.4).

7.1 Metaphor Processing and Expertise

7.1.1 Metaphor processing. In contemporary psycholinguistic metaphor research, views have quite drastically diverged about the question of processing strategies applied to metaphorical language (for an overview see e.g., Bowdle & Gentner, 2005; Steen, 2007). The career of metaphor theory can bridge some of the theoretical and methodological gaps between different schools of thought, proposing a unifying account of the processing of literal and metaphorical language. The positions of the career of metaphor theory will be briefly outlined in reference to main theoretical strands relevant for psycholinguistic metaphor research. The two main schools are *categorization theories* and *comparison theories*.

Categorization theories (Glucksberg & Haught, 2006; Glucksberg & Keysar, 1990, 1993) assume that two distinct concepts are related by class-inclusion, such as is the case in *Time is a river*. It is assumed that the base concept of the statement, *river*, generates an *ad hoc metaphorical category* (e.g., 'anything that flows forward') of which river itself represents a prototypical member. When the superordinate metaphorical category has been abstracted from the base concept, the target concept, *time*, is understood as its member (see Gentner & Bowdle, 2001). Target and base are thus understood independently, at different levels of abstraction, with the target ('time') being subordinate to the category abstracted from the base ('anything that flows forward').

By contrast, comparison theories (Johnson & Malgady, 1980; Miller, 1993; Ortony, 1979; Tversky, 1977) hold that expressions like *Time is a river* are understood as comparison statements, relying on some kind of similarity between the two involved concepts and a mapping process between the two (although it has been heavily discussed whether the involved similarities may be pre-existent, and whether there is systematic asymmetry in the mapping, all comparison theories share some account of similarity and mapping). Another name for comparison theories is "feature matching theories" (see Bowdle & Gentner, 2005, p. 194), since it is

assumed that the mapping functions by way of a feature matching process, with the interlocutor searching for shared features of the target (*time*) and the base term (*river*), e.g., 'moving constantly'. Comparison theories assume that target and base term are understood at roughly the same level of abstraction.

The label comparison theories can furthermore be used to group the considerable body of research that approaches metaphor as a form of analogy (for an overview, see Gentner, Bowdle, Wolff, & Boronat, 2001). Of these analogy approaches, Gentner's (e.g., Gentner, 1983; Gentner & Bowdle, 2008) structure-mapping theory is one of the most systematically formulated and extensively studied ones. It holds that metaphors establish links between conceptual systems in "target" and "base" domains, in which relational correspondences are emphasized over correspondences between object attributes (see also Gentner & Bowdle, 2001). It argues that metaphor interpretation involves two stages, namely structural alignment and inference projection.

One particular variant of the comparison/analogy approach is the conceptual metaphor theory (CMT; e.g., Gibbs, 1994; Kövecses, 2002; Lakoff & Johnson, 1980; for more recent versions see Lakoff & Johnson, 1999, 2003; see Chapter 1). Its main distinction from the psycholinguistic theories of metaphor representation and processing is that it proposes extensive culturally and cognitively entrenched cross-domain mappings, which are assumed to be stored in long-term memory and automatically accessed when reasoning with concepts from the target domain (see a discussion in Bowdle & Gentner, 2005, p. 212). The CMT may be subsumed under the analogical approach to metaphor processing in that it stresses links between conceptual systems in target and base (here called *source*) domains, in which relational correspondences are emphasized over correspondences between object attributes. However, it is still an open question whether – or when – extensive cross-domain mappings such as LOVE IS A JOURNEY have psychological reality (e.g., Boroditsky, 2000; Murphy, 1996, 1997). Studies in the tradition of (the classical version of the) CMT have furthermore been criticized for their sort of evidence and methodology (almost solely top-down linguistic analysis, often with problematic metaphor identification and no experimental manipulation) and the theory's lack of detail, which makes it hard to test as a psychological model (for a recent overview of criticisms, but also supporting evidence and new theoretical perspectives on CMT, see Gibbs, 2011b; for a critical reply see Steen, 2011c).

In contrast to these two kinds of approaches, which each defend a single processing strategy only (categorization and comparison, respectively), the career of metaphor theory is more flexible. It unifies the Class Inclusion and Comparison approaches, proposing that mode of processing may vary depending on the level of conventionality of the cross-domain mapping and on the linguistic form. The career of metaphor theory thus combines an adjusted version of "metaphor as a class-

inclusion statement" of categorization theories with the structure-mapping version of comparison theories.

There is adequate experimental evidence to support the career of metaphor. It does not negate the possible existence of global cross-domain mappings of any sort, discussing extended "conventional systems" of target-base mappings, such as space-time mappings (Bowdle & Gentner, 2005; see also Boroditsky, 2000; Gibbs, 2011b). It also offers a psychologically sound explanation of the historical formation and possible situational activation of assumed extensive conceptual mappings – by on-line comparison between two domain-specific concepts. There are three particularly important tenets of the career of metaphor theory that are relevant for the current study:

(1) The career of metaphor approach suggests two general modes of processing for literal as well as for metaphorical language: categorization and comparison. This is important since through this, metaphorical and literal language and thought can be described with the same unified model. The career of metaphor thus rejects such (psycho-)linguistic traditions that treat metaphorical language as deviant and therefore model metaphor processing as requiring special mechanisms (Grice, 1975; Searle, 1993). Bowdle and Gentner (2005, p. 199) stress that metaphors are not "a special class of language or thought", but are processed by the same mechanisms that are used to understand literal analogies (*comparison*) and literal categorization statements (*categorization*). Both modes of (metaphor) processing "rel[y] on the same basic mechanisms […] structural alignment and inference projection" (2005, p. 199).

Bowdle and Gentner suggest that the primary distinction between comparison (metaphorical processing) and categorization (literal processing) is seen in "the kind and degree of inference projection". Although comparison processing entails the projection of inferences, "the inference process is highly selective; only those properties connected to the aligned system are likely to be considered for projection. By contrast, categorization involves complete inheritance: Every property true to the base should be projected to the target." (2005, p. 199). Thus, for example, if the utterance *Socrates was a midwife* (see Bowdle & Gentner, 2005, p. 196) is understood by means of comparison, the process of alignment and selective inference projection can be described by Gentner's (1983) structure mapping theory as follows:

First, the identical predicates in the target and base (the relations *helps* and *produce)* are matched, and the arguments of these predicates are placed in correspondence by parallel connectivity: *midwife --> Socrates, mother --> student,* and *child->idea.* Next, these local matches are coalesced into a global system of matches that is maximally consistent. Finally, predicates that are unique to the base but connected to the aligned structure (i.e., those predicates

specifying the gradual development of the child within the mother) are carried over to the target. Thus, the metaphor could be interpreted as meaning something like, "Socrates did not simply teach his students new ideas but rather helped them realize ideas that had been developing within them along. (Bowdle & Gentner, 2005, p. 196)

By contrast, understanding a metaphorical utterance by means of a categorization process presupposes an established secondary metaphorical meaning of the term.[48] One such example is *blueprint* in *A gene is a blueprint* (see Bowdle & Gentner, 2005, p.199). The word *blueprint* has a domain-general secondary sense ('something resembling a blueprint (as in serving as a model or providing guidance); *especially*: a detailed plan or program of action', MW) which calls up the respective domain-general category. In this case, the interlocutor aligns *gene* and *blueprint*, but upon accessing the metaphorical category 'blueprint' maps all properties stored in the category (BLUEPRINT) to the target term (GENE). According to Bowdle and Gentner (2005) complete inheritance of inferences of metaphorical categorization is based on a *vertical alignment* of representations on distinct levels of abstraction (concept A [GENE] as a member of category B [BLUEPRINT]), while the selective inheritance of inferences during comparison is based on *horizontal alignment* of representations on roughly the same level of abstraction (concept A and concept B).

(2) The second key hypothesis of the career of metaphor paradigm assumes that manner of metaphor processing is also affected by conventionality. A conventionalized metaphor, as a rule, is understood by a *categorization* process, while a novel metaphor still needs on-line *comparison* to guarantee successful interpretation. Categorization is possible as a processing strategy when the base term of a conventional metaphor (e.g., *blueprint* in *A gene is a blueprint*) has a domain-general meaning ('everything that provides a plan', MW) that corresponds with a domain-general metaphorical category (BLUEPRINT$_{general}$). However, as long as the metaphor is not *dead* (which means that the domain-specific term is either obsolete or detached from the domain-general one), there is still a second, potentially domain-specific literal sense ('a photographic print in white on a bright blue ground or blue on a white ground used especially for copying maps, mechanical drawings, and architects' plans', MW) and its corresponding concept (BLUEPRINT$_{domain-specific}$). "At this point, the base term will be polysemous, having both a domain-specific meaning and a related domain-

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[48] The Merriam-Webster Online Dictionary of English (MW; Merriam-Webster, 2012b) lists two senses: the more basic sense (1) 'a person who assists women in childbirth', and the domain-general metaphorical sense (2) 'one that helps to produce or bring forth something'.

general meaning" (Gentner & Bowdle, 2001, p. 228). The availability of an abstract meaning that calls up an abstract domain-general category (polysemy) opens up the possibility of categorization as a processing strategy. Thus, somebody who encounters a statement containing a conventionally metaphorical word (*blueprint*) in an everyday context (e.g., a newspaper article on genetics) can directly categorize the contextually adequate concept (GENE) under the domain-general category (BLUEPRINT$_{general}$). On the other hand, in novel metaphors (e.g., *Science is a glacier*), the base term has not yet acquired an abstract secondary sense and is not linked to a domain-general abstract category. It has its domain-specific sense only ('a very large mass of ice that moves very slowly'), and is linked to a domain-specific concept (GLACIER). The lack of polysemy of a base term thus restricts available processing strategies to *comparison*, where a contextual word meaning has to be inferred on the basis of a cross-domain mapping (alignment and inference projection) between two distinct representations of domain-specific concepts (SCIENCE – GLACIER). According to Bowdle and Gentner, as a result of this mapping, the "common relational structure that forms the basis of the metaphor's interpretation will increase in relative salience" (2005, p. 198). In the case of *Science is a glacier*, predicates of this structure may be 'large' and 'progressing slowly' (further predicates could be 'objective', 'rational', or 'unemotional', given the salient feature 'cold' of glacier). From here, the further career of a metaphor depends on whether a mapping involving the base term and the same basic interpretation is repeated or not:

> The highlighted system may in turn give rise to an abstract metaphoric category of which the target and base can be seen as instances. This is akin to the induction of domain-general problem schemas during the course of analogical problem-solving […]. In this view, metaphoric categories are created as a byproduct of the comparison process and may be stored separately from the original target and base concepts. (Gentner & Bowdle, 2001, p. 228)

Thus, if a comparison process is repeated often enough, a "common metaphoric category" (2001, p. 198) will be formed from the highlighted system shared by the two concepts, which eventually may result in a secondary abstract domain-general metaphorical word sense, and polysemy. Suggesting that processing, as a rule, follows a natural tendency of choosing the less costly strategy (Bowdle & Gentner, 2005, p. 199), the authors propose that the preferred mode of processing for conventional metaphors is categorization, and that only novel metaphors, where categorization is by definition not possible (in absence of a category named by the base term), are normally processed by

comparison. This is important since the theory does not automatically take conventional metaphors to be automatically understood by means of categorization, but assumes that conventional metaphors can indeed be understood by comparison, should the interlocutor wish or need to do so. For example, in the case of *A gene is a blueprint*, someone thinking about a gene ('a specific sequence of nucleotides in DNA or RNA that is located usually on a chromosome and that is the functional unit of inheritance controlling the transmission and expression of one or more traits by specifying the structure of a particular polypeptide and especially a protein or controlling the function of other genetic material'; MW) in terms of a 'blueprint', might access the domain-specific meaning of blueprint ('a photographic print of a plan […] on special blue paper') corresponding with a domain-specific concept of BLUEPRINT and align it with the concept GENE. Both concepts being domain-specific, they contain relatively many predicates, and the common relational structure (e.g., something along the lines of 'providing information for construction and operation') is extracted by a selective mapping of predicates (e.g., mapping of 'information', 'pattern', or 'special', but not of 'blue' or 'paper'). However, with comparison being representationally (and possibly communicatively) not necessary most of the time, the normal mode of conventional metaphor processing is assumed to be the less costly categorization (Bowdle & Gentner, 2005, p. 199).

(3) The third tenet of the career of metaphor theory concerns an interaction between conventionality and another predictor of processing strategy, grammatical form. The career of metaphor approach has paid special attention to the forms *simile* (A is like B) or nominal *metaphor* (A is B). The observation that similes have the same grammatical form as literal comparison statements (*apples are like pears*) while nominal metaphors have the same grammatical form as literal categorization statements (*pepper is a spice)* gave rise to Bowdle and Gentner's so-called "grammatical concordance principle". From here, the authors derive the basic assumption that "form follows function" (2005, p. 200), which essentially means that the grammatical form of a metaphorical statement is related to an interlocutor's mode of processing. Thus, when an interlocutor produces or receives a metaphor in the form *A is B*, and the metaphor is already conventionalized, the default processing mode is categorization, for this is the "function" that the categorization form invites. But when an interlocutor produces or receives a metaphor in simile form (*A is like B*), the comparison particle *like* is the linguistic form that normally invites the above described comparison process. In Bowdle and Gentner (2005) experimental evidence is reported that support these ideas.

In all, the career of metaphor theory holds that the processing strategy (comparison or categorization) by which a metaphorical utterance is understood depends both on its conceptual conventionality and on its grammatical form (simile or metaphor). It also holds that the interaction between grammatical form and conceptual conventionality is such that novel metaphors are processed more easily in the comparison form and (also when grammatically presented as categorization statements) take longer to interpret than conventional statements, while conventional metaphors are processed more easily in the metaphor form, in which they are also processed faster. Conventional metaphors are generally processed faster than novel metaphors, which indicates that they are normally processed by means of categorization. All these findings together suggest that the metaphor from (*A is B*) indeed corresponds with a vertical, less costly alignment (categorization) for such metaphors that have already been conventionalized, while the simile form (*A is like B*) corresponds with a horizontal, more costly, alignment (comparison) for novel metaphors and a re-vitalized conventional metaphors.

While previous studies have examined the interaction between the two factors metaphor conventionality and grammatical form as predictors of metaphor processing (rating patterns), the present study will add a third factor: expertise. In order to add expertise as a factor, metaphor processing will be examined within *one specific domain of discourse*, psychology. Here, conventional metaphors are thus seen as part of the specialized domain's technical vocabulary, and as a rule conventionalized within the discipline, but not outside of it. The hypothesis is that conventional technical metaphorical expressions may be stored in experts' long-term memory as stable abstract schemas (see Gentner & Bowdle, 2005), establishing reference with specialized theories and concepts in particular disciplines. This idea is supported by the research on scientific mental models (e.g., Gentner, 1982; Gentner & Gentner, 1983; Gentner & Grudin, 1985), which proposes that expert representations of a discipline's topics and theories may be partially structured by conventionalized figurative analogies. Our hypothesis is that in opposition to experts, novices do not possess stable abstract schemas of these conventional technical metaphors.

One example of a conventionally metaphorical technical term of psychology is *flooding* such as in

(1) Imaginal <u>flooding</u> of traumatized children and adolescents; Nineteen <u>flooding</u> sessions were used wherein the patient was instructed to imagine the traumatic events for approximately 40 minutes. (Saigh, Yule, & Inamdar, 1996, emphasis mine, JBH)

The dictionaries[49] show that in general discourse, the noun refers only to water from a river or rain (2), whereas in the technical discourse of psychology, the noun only refers to a particular form of therapy (3).

(2) flooding
a situation in which water from a river or from rain covers large areas of land (MM)[50]
(3) flood·ing
exposure therapy in which there is prolonged confrontation with an anxiety-provoking stimulus (MWM)

It is clear from the entry in the technical Merriam-Webster Medical Dictionary (5) that *flooding* has a conventional meaning in the context of medicine and psychology. From the perspective of the general dictionary (2), this usage of *flooding* is unconventional and metaphorical. Roughly speaking, the metaphorical usage of *flooding* lies in the fact that 'an anxiety-provoking stimulus' (3) can be compared to 'water from a river or from rain' (2) and 'prolonged confrontation' (3) to 'cover large areas of land' (2).The basic underlying conceptual structure may correspond with FLOODING and ANXIETY TREATMENT. We will suggest that conventional technical metaphors of psychology such as *Anxiety treatment is flooding* may be treated by experts much in the same way as conventionalized metaphors are in everyday discourse. At the same time, the same statements may be treated by novices as novel metaphors. This means that a novice (not being acquainted with the term *flooding* and the underlying conceptual metaphor) may engage in an on-line comparison between the two involved domains, 'flooding' and 'anxiety treatment', mapping features from the former onto the latter.

Using the career of metaphor account means limiting possible processing options to two: comparison and categorization (which is, however, already one option more than proposed by the bulk of psycholinguistic theories of metaphor processing). Other approaches to automatic metaphor processing, such as lexical disambiguation (Giora, 1997; Sanford, 2002), or questions about deliberate metaphor processing (Steen, in press), will be backgrounded for the time being since

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[49] In the following, I use the more comprehensive American English dictionaries Merriam-Webster *Medical* Online Dictionary of English (Merriam-Webster, 2012a; labeled MWM) and the Merriam-Webster Online Dictionary of English (Merriam-Webster, 2012b; labeled MW) to determine contextual and more basic senses of lexical units. Merriam-Webster is taken to be representative of the lexical knowledge of a population of intermediate American college students (close to their BA-degree in psychology), which appears to be an 'informed public', not a 'general public'. Both MW and MWM are usage-based (cf. Merriam Webster, 2012a; Merriam Webster, 2012b).
[50] Merriam-Webster does not provide an entry for the noun *flooding*, but only for the verb *flood*. This is why I turn to Macmillan (MM) in this specific case.

the current objective is to test whether the career of metaphor theory (and its methods) can be successfully applied to investigating the role of expertise in one domain of academic discourse. In the current study, although metaphor occurs in academic discourse in many different lexico-grammatical forms and discourse functions (see Chapters 5 and 6), materials will be hence restricted to such metaphors that have a current psychological theory-constitutive function (Boyd, 1993; Semino, 2008) and which can be presented in the nominal *A is B / A is like B* format (e.g., *The mind is [like] a computer*). In terms of meaning/functions, within psychological discourse, these conventional technical metaphors can be contrasted to other metaphors that do not express key concepts of psychological theories (for example, general "academic vocabulary" and "general service vocabulary"; cf. Hirsh, 2010). In terms of lexico-grammatical forms, the nominal (*A is B*) form was chosen to link the present study to the current paradigm in psycholinguistic metaphor studies which has concentrated mainly on metaphor processing in the A is B format, such as *The mind is a computer* (Bowdle & Gentner, 2005), *Discipline is a fertilizer* (Jones & Estes, 2006), and *My job is a jail* (Glucksberg & Keysar, 1990) and to keep experimental design at a reasonable degree of complexity by excluding other linguistic forms of metaphor.

7.1.2 Academic metaphor and expertise. In academic discourse, metaphor is not only manifest in the surface text, where around 18% of all lexical units of scientific discourse are conventionally related to metaphor (see Chapter 5); it can also be accounted for in the underlying conceptual structure of academic discourse (see Chapters 2, 4, and 6). Across disciplines, countless studies show that metaphor and figurative analogy play a crucial role in academic language and thought. Hoffman et al. (2009) give the most recent overview of this literature, with the following remark: "As far as we can tell there exists no such thing as a modern philosopher or psychologist of science who has *not* argued or at least mentioned that analogies (or metaphors) are in some way essential to science (2009, p. 127).

Since metaphor is taken to be pervasive in academic language and thought (including in science), expertise in an academic discipline may involve both lexico-grammatical knowledge and usage[51] of discipline-specific metaphorical terms (cf. Honeck & Temple, 1992, p. 242; Hoffman, 1992, p. 115). This assumption is reinforced by Cooke and Bartha (1992). A number of qualitative studies have attempted to delineate expert metaphor use in different technical domains of discourse, for example in mnemonics (Bellezza, 1992), expert system design (LaFrance, 1992), political rhetoric (Voss, Kennet, Wiley, & Schooler, 1992), and software engineering (Weitzenfeld, Riedl, Chubb, & Freeman, 1992). These studies suggest that there are manners in which experts use metaphors, or vice versa, that

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[51] See the distinction of grammar and usage in Steen (2007).

there are metaphors that are particular to experts of some discipline. However, such studies essentially focus on technical metaphor use in some special discourse domain, and do not offer direct (or indirect) comparison with novices. Meanwhile, other studies do investigate metaphor use more explicitly within the expert/novice paradigm, including the ones mentioned above (Beger, forthcoming; Cooke & Bartha, 1992; Gentner & Gentner, 1983; Hsu, 2006).

Expertise can be understood in large part "as access to enormous amounts of knowledge stored in long-term memory" (Sternberg & Frensch, 1992) and is correlated with less error and firmer knowledge. This knowledge come in two kinds; *declarative knowledge*, which roughly speaking is fact knowledge, and *procedural knowledge* (cf. Sternberg & Ben-Zeev, 2001), which is the know-how to use fact knowledge in tasks, jobs, and problem solving. With respect to the present study, the "fact knowledge" aspect of expertise may be roughly linked to the direct availability of a vast set of technical concepts tied to metaphorical terms and expressions (e.g., *flooding, The mind is a computer*), which might provide "shortcuts" for experts in situations where novices try to establish meaning by dwelling on commonalities between target and base terms. Furthermore, in the present context, the aspect of "less error and firmer knowledge" is relevant since the stimuli of both experiments will also include literal statements (comparisons and categorizations). We expect that experts clearly prefer the comparison form for the literal comparisons *(e.g., delusions are like hallucinations*), and the categorization form for the categorization statements *(alcoholism is an addiction*) – since other preferences would be technically incorrect. Thus, the literal statements (among other things) might serve as an additional assessment of the level of expertise.

Secondly, experts' representations generally seem to be situated on a "deeper level", relying on abstract principles and schemas, while novices as a rule work with "surface features" (cf. Chi, Feltovich, & Glaser, 1981). We assume that experts have encountered a technical metaphorical expression often enough to have formed an abstract representation for it (roughly speaking on the "deeper", more abstract, level of knowledge representation), which they can call up when needed, while novices may not possess the adequate technical abstract schema and may start to compare the base term with the target term by mapping salient ("surface") features (see the example of *flooding* above).

A third aspect of expertise that is interesting for the present study is that experts' information processing is taken to be primarily automatic, preconscious, and not controlled, whereas novices' processing seems to be largely "conscious and controlled" (Chi et al., 1988; Sternberg & Frensch, 1992). This aspect of expertise can be linked to the conventionalization of metaphors: The more often an item is used (actively and passively), the more automatic usage may get thereafter (and processing may happen by categorization). Just like any skill (e.g., driving a car,

which is one example in expertise research), the processing of a particular figurative item in language is automatized as experience grows.

A fourth aspect worth considering here is that experts are not necessarily tied to automatic information processing. Sternberg and Frensch point out that in emergency situations, experienced car drivers "become more like the novice again, having to devote their full attentional resources to the situation at hand" (1992, p. 194). When transferred to the processing of conventional metaphorical language, this would mean that experts, instead of an automatic categorization of the target as an instance of the conventionalized base term, may be able to re-vitalize the metaphorical meaning by comparison: a horizontal alignment (between two concepts roughly on the same level of abstractness) and selective inference-processes from the base to the target (e.g., assessing which features and relations of FLOODING are relevant for ANXIETY TREATMENT). This is consistent with Bowdle and Gentner's claim about conventional metaphor processing: For conventional metaphors too there is the option of discarding the vertical alignment between the target and the superordinate category and "going back" to the comparison mode.

In the following, expertise will be defined operationally as experience, measured in terms of years of formal training received in academic psychology. Experience includes a wide range of skills and abilities, but given the topic of the present study, our operationalization homes in on the interlinked acquisition of the technical jargon and individuals' technical knowledge of academic psychology. With regard to metaphorical language and thought, expertise (measured in terms of years of formal training) then implies a participant's familiarity with conventional technical metaphors of psychology.

7.1.3 Research questions and general predictions. The research question addressed in this study is the following:

> *Do experts and novices differ in grammatical form preference when understanding conventional technical metaphorical statements of psychology (with the grammatical categorization form [A is B] indicating categorization processing and the comparison form [A is like B] indicating a comparison process)?*

The assumption is that experts do not invest too much cognitive effort when dealing with conventional and familiar figurative language since they possess a routine knowledge (see Schumacher & Czerwinski, 1992) and a "relatively entrenched set of linguistic conventions (jargon), including metaphorical ones, to encode and express this knowledge" (Honeck & Temple, 1992, p. 239). Experts thus should process conventional technical metaphors by means of categorization. On the other hand, novices who are being introduced to a new subject within a new

discourse are likely to "try out metaphorical interpretations" (see Cameron, 2003, p. 59; Charteris-Black, 2000, for similar claims). To put it differently (in the words of expertise psychology), novices' problem-solving strategy for the interpreting of unfamiliar metaphorical technical word usage would be activation of a non-metaphorical sense of a word and its comparison to the conceptual metaphorical one, resulting in deep processing (structural alignment, extraction of common relational schema, and candidate inference projection).

In both experiments, metaphor processing will be measured by means of the same grammatical form preference task that was administered in the Bowdle and Gentner studies. With this method, it is assumed that asking participants for their preference in grammatical form for figurative statements provides one measure of processing strategies, with preference for the categorization form (A is B) corresponding with categorization as a processing strategy, and preference for the simile form (A is like B) corresponding with processing by comparison. In the original studies, the categorization form was preferred more often for conventional metaphors and the simile form more often for novel metaphors. In the current study, conventional technical metaphors should hence be preferred in the simile form by novices, while they should be preferred in the metaphor form by experts.

The materials will consist of technical metaphorical statements (*Forgetting is [like] decay)*, but also two sets of control items, firstly literal technical statements including comparisons and categorizations, and secondly "everyday figuratives" on psychological topics (see Appendix C). With regard to the literal statements, the prediction is that experts should be better at dealing correctly with literal comparison and categorization statements than novices, preferring comparison form in comparisons (*Recall is like recognition*) and categorization form in categorizations (*Anger is an emotion*). As for the everyday figuratives, these are metaphors which make assertions about psychological topics that are linguistically and conceptually conventional within general discourse. We predict that roughly an equal number of both novices and experts will prefer these statements in the categorization form, for all participants should be familiar with everyday figuratives (such as *Consciousness is [like] a stream)* and have established stable representations.

The two experiments manipulate the independent variable expertise each in a separate way: Experiment 1 compares two different populations with each a different degree of psychology expertise, whereas Experiment 2 actively manipulates expertise by means of a training phase. In Experiment 1 *in vivo* expertise is thus manipulated by juxtaposition of two populations: a group of first-year students and a group of advanced BA students, with years of study (participant variable) as an independent variable between participants. In Experiment 2, *in vitro* expertise is induced during the experiment with first-year students being familiarized with particular conventional technical figuratives of psychology. The

independent variable in Experiment 2 is whether items were studied during the training session, both within and between participants.

7.2 Experiment 1: Is Expertise a Predictor of Metaphor Processing?

Experiment 1 assesses whether there is an effect of expertise on the processing of conventional technical metaphors of psychology. According to the grammatical concordance principle (Bowdle & Gentner, 2005), processing strategies will be indicated in the grammatical form preference task by a mean preference for either the simile (comparison) or the metaphor form (categorization). There will be two groups, novices and experts, which will be subjected to the same task. Expertise is a participant variable. We expect that the novice group will more often process the underlying scientific analogies by means of *comparison* than the expert group, which instead will engage in *categorization* more often. Novices will thus prefer the technical figuratives in simile-form (*A is like B*) more often, whereas experts will prefer the metaphor form (*A is B*) more often. Furthermore, for the baseline, we predict that both groups will generally process the literal categorization statements by a categorization process, indicated by a mean preference for the *A is B* form, while both groups will process the comparison statements by a comparison process, indicated by a mean preference for the simile form. However, since a higher level of expertise is correlated with less error and firmer knowledge experts may demonstrate a clearer mean preference for the *A is B* form for categorization statements than novices and, vice versa, a clearer preference for the *A is like B* form for comparison.

7.2.1 Method.

Participants. Forty Grand Valley State University students: The novice group consisted of 20 first-year students of psychology; the expert group[52] consisted of 20 students attending psychology *capstone* courses (in the last year of the BA studies). Participants participated for partial fulfillment of a course requirement (first year courses and capstone courses), extra credit (capstone courses) or voluntarily (capstone courses).

Materials and design. During stimuli construction, two sets of figurative statements were created: One set of technical psychology pairings (conventional technical metaphors), and one set of everyday figuratives. We did not construct novel metaphors, since we stipulated that novices would treat technical metaphors in much the same way as participants treated novel metaphors in Bowdle and

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[52] Given that the experts in these experiments are not genuine experts in the full sense of the word, we utilized a graded notion of expertise.

Gentner's studies. The criteria for construction of the different statements types were the following:

"Technical figuratives".
a) Technical: expressing key concepts of academic psychological discourse.
b) Conventional: indicating conventional metaphor within academic psychology at the conceptual level of analysis.
c) Familiar: frequently used within academic psychology at the linguistic level of analysis.
d) Succinct: fitting the A-B format, roughly the same length.

"Everyday figuratives".
a) Popular: expressing psychological topics in everyday discourse.
b) Conventional: indicating conventional metaphor within general discourse at the conceptual level of analysis.
c) Familiar: frequently used within *general* discourse at the linguistic level of analysis.
d) Succinct: fitting the A-B format, roughly the same length.

Additionally, two sets of non-metaphorical items were constructed, using the following criteria: "Literal categorization statements" (a) express non-metaphorical taxonomic relationships between two key concepts of academic psychology; (b) are frequently used within academic psychology; and (c) are succinct, fitting the A-B format, roughly the same length as the figuratives. "Literal comparison statements" (a) express non-metaphorical similarity relationships between two key concepts of academic psychology;(b) are frequently used within academic psychology; (c) are succinct, fitting the A-B format, roughly the same length as the other statement types. Figure 7.1 (below) shows six examples from each category.

The entire set of experimental materials consisted of 64 statements about psychological topics, of which 16 were the technical psychological figuratives described above (=target stimuli), 16 everyday psychological figuratives, 16 literal psychological comparisons, and 16 literal categorization statements.

The 48 statements pertaining to technical psychological language were derived from textbooks (Clark, 1997; Griggs, 2006; Kaplan, 2006; Reed, 2006; Westen, 2001) and taken from the vast literature on psychological metaphors (cf. Draaisma, 2000; Leary, 1990b; Miller, 1986; Sternberg, 1990). The 16 everyday figurative statements on psychological topics were partly newly constructed and confirmed by *google* hits, partly taken from the existing literature on metaphor processing (see Bowdle & Gentner, 2005).

Technical figurative	Everyday figurative	Literal Categorization	Literal Comparison
Forgetting is (like) decay.	Children are (like) sponges.	Alcoholism is an addiction.	Attachment is like imprinting.
Groups of neurons are (like) circuits.	Conformity is (like) a straitjacket.	Anger is an emotion.	Classical conditioning is like operant conditioning.
Long-term memory is (like) a warehouse.	Consciousness is (like) a stream.	Attributions are inferences.	Clinical psychologists are like psychiatrists.
Mental representations are (like) models.	Education is (like) a ladder.	Case studies are descriptive research.	Delusions are like hallucinations.
The mind is (like) a computer.	Faith is (like) an anchor.	The DSM-IV is a manual.	Electroconvulsive therapy is like psychosurgery.
Neurotransmitters are (like) messengers.	Ideas are (like) possessions.	Extroversion is a personality trait.	Empathy is like altruism.

Figure 7.1. Examples of stimuli per statement type. All stimuli were presented on a scale, with the two grammatical forms at the extremes.

Procedure. During the test phase, each participant received all 32 figurative statements (the 16 technical psychological figuratives and the 16 everyday figuratives) in both forms, the comparison (simile) and the categorization (metaphor) form. In addition, each participant received 16 literal categorization statements and 16 literal comparison statements in both grammatical forms. (Examples of all statement types are given in Figure 7.1 above.)

Forgetting is like decay.	1 2 3 4 5 6 7 8 9 10	Forgetting is decay.

Figure 7.2. Stimulus presentation in GFP task. Participants were asked to consider the meaning of both statement forms and indicate their preference by circling the appropriate number on the scale, with 1 indicating a strong preference for the statement to the left and 10 a strong preference for the statement to the right.

Participants were asked to indicate their form preference on a scale from 1 to 10, with the two grammatical forms at the two extreme points. The factors were thus statement type (four levels), and expertise (two levels), with statement type within subjects and expertise between subjects.

Participants were run in expertise-homogeneous groups of 1-10 participants. Each participant was seated at a desk and given one of two versions of the test booklet containing 64 statements: 16 academic psychological figuratives, 16 non-academic psychological figuratives, 16 literal psychological comparisons, 16 literal psychological categorization statements.

The statements were presented in both the comparison (simile) form and the categorization (metaphor) form, with the two grammatical forms separated by a 10-point numerical scale (see Figure 7.2).

Prior investigation had shown that no significant effect of position of grammatical forms (left and right hand side) could be expected. Therefore, the position of grammatical forms on the scale was not counterbalanced. Half the participants in both expertise groups received the stimuli in the order 1-64, and half received the stimuli in the order 64-1.

Participants were asked to consider the meaning of statements "describing various psychological topics" and to indicate which form – comparison or categorization – they preferred by circling a number on the 10-point scale (for the instructions, see Figure C5 in the Appendix). They were told that the more they preferred the statement on the left, the closer their answer should be to 1, and the more they preferred the statement on the right, the closer their answer should be to 10. After completing the test phase, participants received a psychological knowledge survey. Here, they indicated their knowledge of the target domains of the psychological figuratives on a scale from 1 to 5 (1 = *not at all knowledgeable* and 5 = *very knowledgeable*.

Data analysis. The data were analyzed with the linear mixed models procedure of SPSS 18.0. In the analyses, item and participant were treated as random factors and the other factors (statement type and expertise) were treated as fixed factors. We used a mixed model ANOVA to compare the four statement type means (technical figurative, everyday figurative, literal categorization, literal comparison). A significant *F*-test was followed by pairwise comparisons to locate the pairwise differences between group means.

Table 7.1

Mean Preferences for the Categorization Form for Experiment 1

	Statement type			
	Technical figurative	Everyday figurative	Lit. categorization	Lit. comparison
Novices	4.41 (.43)	4.29 (.39)	7.99 (.37)	4.68 (.32)
Experts	4.57 (.43)	4.21 (.39)	8.11 (.37)	3.93 (.32)

Note. Maximum score = 10; standard error in brackets.

Results. Table 7.1 shows mean form preference ratings, with higher numbers indicating a preference for the categorization (metaphor) form over the comparison (simile) form.

The ANOVA rendered a main effect of statement type (F (3, 27.66) = 31.57, p < .001). Pairwise comparison shows that mean ratings of the type literal categorization are significantly higher than all other statement type means (all p's <.001). No other significant difference between statement type means could be observed. This includes the difference between the types literal comparison and technical figurative within the expert group, which was investigated separately since it appeared significant. Furthermore, the ANOVA showed that the predicted main effect of expertise was not significant (F<1). However, there was a significant interaction between statement type and expertise (F (3, 2453.02 = 4.44, p< .01). Further pairwise analysis revealed that experts and non-experts only differ with respect to the statement type literal comparison, where the experts' mean (M=3.93) is significantly lower than the novices' (M=4.68), t(37.99)=.69, p=.01. There was no main effect of knowledge.

The results thus show that the predicted effect of expertise on grammatical form preference for the technical figuratives was not significant. However, the general presupposition that a higher level of expertise is correlated with less error and firmer knowledge was partly confirmed by the presence of an effect of expertise on ratings for the statement type literal comparison (see Table 7.1).

7.2.2 Discussion. The reported main effect of the type literal categorization suggests that all participants processed the literal categorization statements by categorization, since they preferred the subordination of term A under term B (*Alcoholism is an addiction)* to a comparison between A and B. Note that with the 16 literal categorization statements, a preference for the simile form would have been plainly incorrect (**Alcoholism is like an addiction*), indicating a misconception of A or B or both. Regardless of level of expertise, participants correctly indicated subordination of term A under term B. In terms of structure mapping theory,

participants presumably used structural alignment and complete inference projection to call up the representation of the B terms as categories superordinate to the A terms.

Conversely, the significant difference between literal categorization and literal comparison statements may indicate that literal comparison statements (*Meditation is like hypnosis)* are understood by horizontal alignment between the two terms A and B and selected inference projection. For literal comparison statements, a preference for the other grammatical form would have been logically wrong as well *(*Meditation is hypnosis)*, indicating a cognitive misconception of the involved concepts. The principle of grammatical concordance, which posits a close link between grammatical form and comprehension strategy, is presumably also at work for the literal stimuli (Bowdle & Gentner, 2005, p. 200).

The interaction effect of Expertise and Statement type, with literal comparison behaving differently between the two groups than all other statement types, suggests that the groups indeed varied in terms of expertise. (Note that the mean score for literal categorization statements was higher for experts, too, but not significantly.) We assume that the advanced students were more successful in recognizing the literal (dis)similarities between two domains for having formed more reliable representations of the respective concepts. This can be supported by analogy research that shows that the ability to form (literal) analogies is an advanced skill which presupposes deep(er) knowledge of the involved concepts (e.g., Gentner & Kurtz, 2006; Gentner & Markman, 2006; Gentner & Wolff, 2000; Gentner et al., 2001). Individuals need to possess well-structured representations of both *A* (e.g. 'meditation'), and *B* ('hypnosis') to align in the first place. They also need to know which part of the aligned relational structure is relevant for inference projection (e.g., 'state of altered consciousness'; 'trancelike'; 'resembles sleep', see MWM, entry for "hypnosis"). The higher mean ratings of novices here may indicate that instead of projecting partial inferences from *B* to *A*, novices projected all inferences (categorization), including the inadequate 'induced by a person whose suggestions are readily accepted by the subject' (MWM), probably for lack of knowledge of the differences between A and B. In the following discussion, the absence of an expertise effect on grammatical form preference will be approached from two angles. Firstly, a brief section will discuss the role of the explanatory variable expertise. This way of approaching the absence of an effect is assuming that the effect was too small to be measured.

An explication of the absence of an effect of expertise in Experiment 1 may be that the difference between first year students and students prior to BA graduations was not big enough to exert an effect. Either, the first year students have already formed representations of the conventional technical (theory-constitutive) metaphors in much the same degree as the more advanced students have (*ceiling effect*), or the more advanced students have not established the representations and therefore do

not differ from the beginners (*threshold effect*). At first glance, the obtained effect of expertise on the mean ratings of literal comparison statements (where experts' mean was significantly lower, indicating a stronger preference for the comparison form and possibly firmer knowledge of the concepts) seems to go against the latter assumption. Another possible way of making sense of the results is a further exploration of other variables that could account for unexplained variance in the mean ratings for the technical figuratives. This is interesting and relevant since the ANOVA showed a relatively high degree of statistical error (see Table 7.1). In general, an effect is significant when the variance accounted for by its predictor(s) is larger than the variance that cannot be accounted for (cf. Field, 2009). While we cannot examine which particular factors may have prevented the expertise effect from reaching significance, we can explore factors that seem likely to have had an influence on processing strategies.[53] Among these are the materials, and visual inspection suggested zooming in on concreteness and conventionality of base terms. Firstly, as for concreteness of base terms, the results reported by the original career of metaphor Studies had led us to assume no significant difference between abstract and more concrete base terms (see results in Bowdle & Gentner, 2005, p. 201; p. 207), but it seemed worthwhile to test in our particular study possible interferences of concreteness of base terms: Visual inspection of the mean ratings obtained for the technical figuratives suggested that in stimuli with concrete base terms, participants may have had a systematic preference for the simile form. Secondly, with regard to conventionality, the particular goals pursued and the methodology used in the present study forced us to pitch conventionality at the level of concepts, not at the level of lexical units. This, however, may have produced a substantial amount of variance, since some of the stimuli (but not all) appeared to be also linguistically conventional (with metaphorical senses of the base terms reflected by dictionary entries). In sum, it seems worthwhile to examine whether the factors Base term concreteness and Base term conventionality may be able to explain part of the unaccounted variation obtained in the experiment. In the two rounds of data exploration we tested whether there were main effects of concreteness and conventionality of base terms and whether these interacted with expertise.

Base term concreteness. Visual inspection suggested that low ratings (a preference for *A is like B*) might be correlated with base terms that have a relatively concrete meaning. Five coders were hence asked to judge the concreteness of base terms for the 16 psychological figuratives. Reliability was good (Cronbach's alpha = .86). A one-way repeated measures ANCOVA examined the effect of base term concreteness on mean grammatical form preference ratings per item (examined were the 16 technical figuratives only). An *F*-test examined the effect of expertise on

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[53] Else, the effect may have been too small to be detected in the first place, and it absence may thus be totally independent of the amount of statistical error.

grammatical form preference ratings and the relation between base term concreteness and these ratings. Expertise was entered as a within-items variable and concreteness of base terms as a between-items covariate. The ANCOVA showed a significant main effect of the covariate concreteness of base term ratings on the mean rating per item (F (1,14)=8.67, p=.01). This effect is true for both expertise groups (experts F (1, 14) = 5.98, p=.03; novices F (1, 14) =10.75, p=.01). There was no significant effect of expertise on the mean rating per item (F<1), and no interaction between expertise and concreteness of base terms rating per item. Figure 7.3 shows a negative correlation between concreteness of base terms and mean form preference ratings per item. This means that participants preferred the *A is like B* form for concrete bases, regardless of whether they belonged to the novice or expert group. Thus, concreteness of base terms may be a predictor of form preference ratings, and more speculatively, also of processing strategies of technical metaphorical statements.
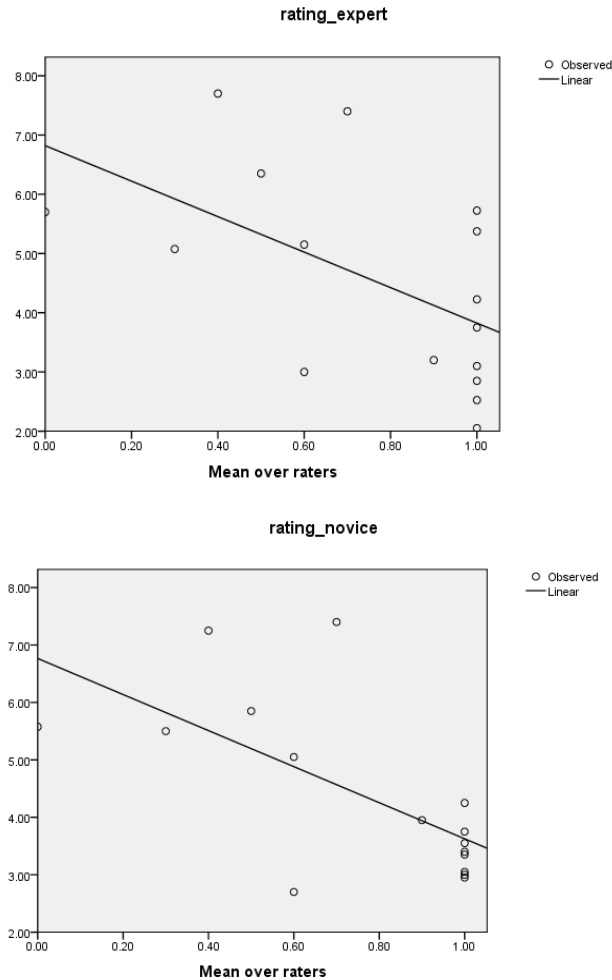
Figure 7.3. Regression lines for grammatical form preference and concreteness ratings (technical figuratives).

A similar effect of concreteness was obtained by Gibb and Wales (1990a) in a sentence-completion task where participants were asked to fill in either "is" or "is like" between a given target and base term. Gibb and Wales reported that metaphors were preferred for abstract base terms, while similes were preferred for concrete base terms. An effect of base term concreteness on grammatical form preference was also suggested by Harris, Friel, and Mickelson (2006), who conducted a form-preference task in which participants had to select either the metaphor or the simile form of a given figurative statement. They found a clear preference for the simile

form over the metaphor form (72% and 28%, respectively), which was post hoc motivated by the fact that all materials had concrete base terms only. Further research shows that a greater degree of concreteness of metaphorical (base) terms is associated with more intense imagery (Gibb & Wales, 1990b) and with particular discourse goals (Harris et al., 2006).

In my study, the variable Rated concreteness of base terms had a significant effect on form preference – in contrast to the variable Expertise. The present data exploration thus seems to suggest that concreteness of base terms could have direct implications for the interpretation of the kind of conventional technical (theory-constitutive) metaphorical statements used in the present study, not only in learners and other non-experts, but also in experts. As a general conclusion, future experiments exploring the role of expertise in metaphor comprehension should control for concreteness of stimuli.

Base term conventionality. I subsequently investigated whether conventionality of base terms did have any effect on form preference rating and whether it may after all interact with expertise. We had adopted the criterion of conceptual conventionality of target-base parings, combined with linguistic familiarity (cf. Bowdle & Gentner, 2005; Gentner & Bowdle, 2001). Conceptual conventionality results from frequently encountering a particular (theory-constitutive) target-base mapping and gets stored in long-term memory, by means of an abstract schema. In this respect, our notion of conceptual conventionality by and large seems correspond with Lakoff and Johnson's (1980), "conceptual metaphors", with rich and complex mappings between target and base domains stored in memory (e.g., MIND-COMPUTER). By contrast, linguistic conventionality of base terms refers to the abstraction of a category which gets attached to the base term of a mapping alone, resulting in lexical polysemy. Consider, for example, the stimulus *neurotransmitters are (like) messengers* (which was clearly preferred in the *A is B* form by both groups, indicating categorization). Its base term, *messenger*, has a basic sense ('one who bears a message or does an errand'), but also an additional, metaphorical technical sense, 'a substance (as a hormone) that mediates a biological effect' (3). This means that *messenger* is a linguistically conventional metaphor to an informed public (such as college students).

Messenger
1 one who bears a message or does an errand
2 a light line used in hauling a heavier line (as between ships)
3 a substance (as a hormone) that mediates a biological effect
4 messenger rna   (MW)

The stimulus *The mind is (like) a computer*, however, (which was preferred in the *A is like B* form by both groups), which is a theory-constitutive metaphor of psychology as well, has a base term (*computer*) with monosemous non-metaphorical entries in all three dictionaries (MW, MM, and LM), and no entry in the specialist medical edition MWM. This suggests that the word *computer,* taken on its own, is not a linguistically conventional metaphor. By contrast, other base terms, such as *censorship* (stimulus: *Repression is [like] censorship)* do have technical senses that are metaphorical from the point of view of general discourse when taken on their own:

> Censorship
> exclusion from consciousness by the psychic censor (MWM)

All 16 base terms of the technical figuratives were examined for metaphorical senses with the help of the MW, the MWM, and the search engine google.com. Items were classified into three categories: *non-metaphorical* (if there was no conventional metaphorical sense for the base term alone, e.g., *computer*), *domain-general* (if there was a domain-general metaphorical sense available, e.g. *decay: '*to decline from a sound or prosperous condition', MW), and *technical* (if there was a metaphorical sense with only a technical, but no domain-general meaning, e.g., *censorship*). Secondly, an *F*-test examined the effect of base term conventionality on mean grammatical form preference ratings per item, comparing the two expertise groups (as in the first round of data exploration, the 16 technical figuratives were examined only). The analysis shows that there is no interaction effect of expertise and base term conventionality and no main effect of expertise on grammatical from preference rating (all *Fs*<1). However, there is a significant main effect of conventionality on mean form preference ratings (F (2,76)= 33.8, $p<$.001). Pairwise comparison showed that ratings did not differ significantly between the two categories technical and domain-general (*p's* > .05). This means that participants preferred the *A is B* form for conventional bases (which is suggested to indicate categorization as a mode of processing), regardless of their degree of expertise and regardless of whether the term was conventionally metaphorical within or outside the technical domain of discourse (e.g., *decay*, which has a technical definition in its relation to memory, but a domain-general abstract meaning in general discourse). This round of data exploration thus rendered results very similar to the ones obtained by Bowdle and Gentner (2005) and is hence compatible with the original career of metaphor theory, which assumes that metaphorical conventionality predicts grammatical form preference (and mode of processing). Since the career of metaphor theory emphasizes that conventionalized metaphorical base terms are polysemous, it is essentially a theory about metaphorical conventionality on a

linguistic level of analysis, even though it has not been explicitly formulated as such.

With regard to the interlinked notions of polysemy, conventionality, and lexicalization, the career of metaphor is somewhat ambivalent. On the one hand, Bowdle and Gentner (2005) use the notion of *polysemy* in a sense that appears to conceive of *lexicalization* as inevitable and necessary for metaphor conventionalization, with polysemy as "lexical extension of the base term" (2005, p. 198): "Conventional base terms are polysemous, with the literal and metaphoric meanings semantically linked because of their similarity" (2005, p. 199). On the other hand, the authors do not state whether polysemy is understood as a lexical or conceptual phenomenon, or both. This is expressed by statements such as "the senses retrieved during metaphor comprehension are abstract metaphoric categories" (2005, p. 199), with an apparent identity between *senses* (linguistic level) and *categories* (conceptual level). Ultimately, Bowdle and Gentner leave open the analytic level of the *base term* of a metaphorical expression: Is the base term seen linguistically, as a lexical unit with different, contrasting meanings? Or is it seen as a concept, with a possible superordinate category? In the current version of the theory, it appears to be both.

My post-hoc analysis suggests that rather than conceptual conventionality, may be linguistic conventionality that predicts grammatical form preference (and, one may argue, the processing strategy). Future experiments within the career of metaphor paradigm may thus benefit from a finer grained account of metaphor conventionality in stimuli construction, with linguistic and conceptual metaphor conventionality being teased apart. In other words, even if a metaphorical statement, such as *the mind is a computer* seems to be a familiar metaphor on the linguistic level (frequently encountered in this form, cf. Gentner & Bowdle, 2001, p. 204; p. 229), and conventional on the conceptual level (cf. Lakoff & Johnson, 1980), the base term itself (in this case *computer*) is not necessarily conventionally metaphorical on the linguistic level, as it is no lexical unit with two contrasting senses. The latter is important, since the career of metaphor theory is essentially a theory about the (domain-general) base terms of metaphorical expressions, explaining metaphor conventionalization as a process that occurs when one base term is repeatedly paired with a range of different targets. It is not a theory that explains the processing of base terms that are limited to one specific target (as *computer* appears to be limited to *mind*).

In sum, future research could first of all try out a stronger manipulation of the participant variable expertise (as to prevent threshold and ceiling effects), it should secondly be aware of the influence of concreteness of base terms, and, finally, of the kind of metaphor conventionality (conceptual versus linguistic) of the used stimuli within the discourse of the field of expertise. All this should allow for carefully

controlled stimuli construction and a differentiated theoretical account of the processing of metaphorical language in particular domains of discourse.

7.3 Experiment 2: Is *"in vitro* Expertise" a Predictor of Metaphor Processing?

One plausible explication of the absence of an effect of expertise in Experiment 1 seemed a threshold effect, with the expert group possibly not having established the mental schemata representing the conventional technical, or theory-constitutive, metaphors of psychology. Since the career of metaphor posits that the initial alignment and comparison between a target and base terms highlights relational commonalities between the two, and that the "highlighted system may in turn give rise to an abstract metaphoric category of which the target and base can be seen as instances" (Gentner & Bowdle, 2001, p. 228), we may assume that repeated alignments and comparisons may induce the process of schema abstraction from figurative target-base mappings also under experimental conditions.[54] Therefore, in Experiment 2 a study phase was administered to manipulate expertise with the aim of directly inducing schema abstraction – an *in vitro* conventionalization of metaphor. The basis of our study was Bowdle and Gentner's (2005) Experiment 3, which suggested that conventionalization of metaphorical base term meanings could be induced in an *in vitro* manipulation (see also Nakamoto & Kusumi, 2004, for a replication of the experiment, and Gentner & Gentner, 1983, who found that learning a particular analogy increased performance in understanding aspects of electrical circuits). Bowdle and Gentner presented participants with a set of novel similes where base terms were constant (e.g., *butterfly*) and target terms varied (e.g., *acrobat* and *figure skater*). They assumed that the repeated exposure to the same base term would induce an abstract schema which then would allow for categorization as a processing strategy and found that these previously novel statements were indeed preferred after the training in categorization form, which was then taken as suggesting categorization as mode of processing.

We aimed to induce the abstraction of schemas for particular theory-constitutive target-base pairings of psychology (e.g., ATTENTION – FILTER*)*. Our method included a study phase and a subsequent test phase. In the study phase, participants

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[54] In discussion of Experiment 1, we suggested that conventionality seems to predict metaphor processing not at the conceptual level, but only at the linguistic level. Experiment 2 also served as a test of this hypothesis: it was run over the same set of stimuli, aiming to induce conceptual conventionalization of metaphorical statements, but not linguistic conventionality of particular metaphor base terms. If this kind of *in vitro* conventionalization was to fail, the importance of pitching conventionality at the linguistic level of analysis would be underlined.

were asked to produce interpretations of half of the 16 conventional technical metaphors from Experiment 1. In order to guide novices towards analogy construction in this phase, participants were presented with the technical figuratives in the simile form (e.g., *attention is like a filter)*. We assumed that this form would elicit on-line comparison, with structural alignment between the two domains (*attention* and *filter*) and projection of selected inferences (e.g., projecting the feature 'removing unwanted parts' of the domain *filter* onto the domain of *attention*). Merriam-Webster defines *attention* as 'an organismic condition of selective awareness or perceptual receptivity; *specifically*: the complex of neuromuscular adjustments that permit maximum excitability or responsiveness to a given class of stimuli' (MWM), and *filter* is defined as 'a porous article or mass [as of paper or sand] through which a gas or liquid is passed to separate out matter in suspension' (MWM). The mapping between *attention* and *filter* thus compares at least three features. Firstly, a particular 'organismic condition' (target) is matched to a concrete filter, 'a porous article or mass' (base) and secondly, a 'selective awareness or perceptual receptivity' (target) to the action of passing 'a gas or liquid' through the filter (base). Thirdly, the goal of attention is to 'permit maximum excitability or responsiveness to a given class of stimuli' (target) – in the mapping it is compared to the parallel goal of the filtering activity 'to separate out matter in suspension' (base).

We hypothesized that this mapping eventually may result in a common relational schema abstracted from target and base concepts and that the statements might subsequently be processed by means of categorization, as would be indicated by a mean preference for the simile form in a grammatical form preference task. In the test phase, participants were thus presented with the same grammatical form preference task as in Experiment 1, containing all 64 statements from Experiment 1. In analogy to the *in vitro* study carried out by Bowdle and Gentner (2005) we predicted a more pronounced preference for *the categorization form (A is B)* for the technical figuratives that were previously *studied* (as opposed to those that were not studied).

7.3.1 Method.

Participants. Forty-five Grand Valley State University first-year students of psychology participated for partial fulfillment of a course requirement.

Materials and design. The entire set of experimental materials consisted of 64 statements about psychological topics, and was identical to the one used in Experiment 1 (16 academic psychological figuratives, 16 non-academic psychological figuratives, 16 literal psychological comparisons, and 16 literal categorization statements).

Procedure. The key manipulation occurred during the study phase, in which half of the 16 psychological statements were given to participants in simile form (*A is like B*) and freely interpreted for 15 minutes. The instruction read "Below you will find a number of statements describing various psychological concepts from psychology textbooks. After reading each statement, please write down your interpretation of the statement. In other words, what do you think the statement means?" The expertise condition was counterbalanced both within and between subjects (half the participants studied items 1-8, but not items 9-16, whereas the other half studied items 9-16, but not items 1-8; .each subject thus rated 8 studied items and 8 non-studied items).

The test phase was identical to Experiment 1. The factors were thus statement type (four levels), and, for the psychological figurative statements, expertise (two levels), with statement type and expertise being within-subject variables.

Participants were run in groups of 1-10. For the study phase, each participant was seated at a desk and given one of four different versions of a booklet each containing 8 of the 16 academic psychological figuratives in simile form in random order (22 participants were randomly assigned statements 1 to 8, with two versions presenting the stimuli either in the order from 1 to 8 or in the reverse order from 8 to 1, while 23 participants received statements 8 to 16, again with two versions by order). Participants were instructed to write down their interpretation of the statements. They were told that the statements described "various psychological concepts from psychology textbook". After participants had completed the study phase (15 min), a 20-min filler task was administered (based upon Guilford's *Alternative Uses Task* [Guilford 1967]).

The test phase was run identically to that of Experiment1. After completing the test phase, participants received a psychological knowledge survey including the target domains of the psychological figuratives. There, they indicated their knowledge with each item on a scale from 1 to 5, with 1 = *not at all knowledgeable* and 5 = *very knowledgeable*.

Data analysis. The data were analyzed with the linear mixed models procedure of SPSS 18.0. Item and participant were treated as random factors. Since in the experimental design manipulation in terms of expertise was administered to the technical figurative statements only, the statistically most elegant analysis was to collapse the difference between statement type (four levels) and expertise (two levels) into one fixed factor with five levels (technical figurative (studied); technical figurative (non-studied); everyday figurative; literal comparison; literal categorization). The statistical model thus estimated five different means corresponding to technical figurative (studied), technical figurative (non-studied), everyday figurative, literal categorization, and literal comparison. A significant *F*-

test was followed by pairwise comparisons to locate the differences between the five means. There was no main effect of knowledge.

Results. Table 7.2 shows the mean grammatical form preference ratings from the test phase, with higher numbers indicating a preference for the categorization (metaphor) form over the comparison (simile) form. The ANOVA revealed a significant main effect of statement type (F (4, 30.3) = 19.77, $p<.001$). Further analysis revealed that the mean for literal categorization (M=7.79) was significantly higher than all the other means (all p's < .001). None of the other pairwise comparisons showed any significant differences (all p's >.50). This includes the comparison between studied and non-studied technical figuratives (t(659)=1.14, p=.25). This means that the study phase did not render any observable effect on metaphor processing.

Table 7.2
Mean Preferences for the Categorization Form for Experiment 2

Statement type	Mean	Std. error
Technical (studied)	4.27	.32
Technical (non-studied)		
Everyday	4.49	.39
Literal comparison	4.40	.37
Literal categorization	4.52	.21
	7.79	.36

Note. Maximum score = 10.

7.3.2 Discussion. The general result of the second experiment shows the absence of a difference between studied and non-studied technical figuratives, but a significantly higher mean for literal categorization. This is comparable to what was observed in Experiment 1. However, unlike the first experiment, it is notable that all other type means (*studied psychological figuratives, everyday figuratives, non-studied psychological figuratives*) are statistically on a par with the mean rating for *literal comparison* statement, because this may indicate that the processing strategy applied to these three types is on-line comparison. In particular, we had predicted a relative preference for the simile form for items that were not previously studied, comparable to Bowdle and Gentner's novel figuratives, and a relative preference for the metaphor form in previously studied items, comparable with Bowdle and Gentner's conventionalized figuratives. However, this prediction could not be confirmed, with no statistical difference observed for these two types. Also, we tacitly expected the lowest mean of all types for *comparison,* because it would indicate a preference for the comparison form (A is like B). Instead, there is no notable difference between literal comparison statements and all three figurative types. This may indicate that the figurative statements are processed by on-line comparison as well, based on the grammatical concordance principle, which assumes a correspondence between a preference for the linguistic form *A is like B* and on-line comparison as a mode of processing.

The fact that Bowdle and Gentner in the *in vitro* conventionalization reported a conventionalization effect after only three repetitions of the base term in fact seems to underline the distinct character of our manipulation. While Bowdle and Gentner's training elicited the conventionalization of a *single term independent of targets* (and the formation of a domain-general metaphorical category from the base), we had intended the conventionalization *of a whole statement* (the formation of a specific target schema tied to the base). In other words, we did not aim at the abstraction of domain-general categories from multiple pairings, but at the abstraction of a schema from studying a highly specific target-base pairing. We thus manipulated metaphor conventionalization at the conceptual level (in the study phase), but tested it at the linguistic level (by means of the grammatical form preference task), and this may be a reason why no effect could be obtained. The grammatical form preference task presumably works on the basis of a very close link between linguistic conventionality of metaphorical senses, grammatical choice, and processing strategy, but it seems that our manipulation did not induce conventionalization of the separate base terms (e.g., *filter* for *attention*, *decay* for *forgetting*, *warehouse* for *long-term memory*), which is a probable explanation for the absence of an effect. If inducing conventionality in the base terms alone had been our goal it very possibly would have required a different type and/or intensity of manipulation. Another explication for the absence of an effect is the possible "conceptual conservatism" of participants. Research in the acquisition of expertise and mental models shows that people are quite conservative in changing such complex entities as mental models (cf. Gentner & Wolff, 2000; Schumacher& Czerwinski, 1992; Sternberg & Frensch,

1992). For example, Gentner and Gentner (1983, p. 127) suspect that "one reason subjects may be slow to begin using a new analogy for an area is that they normally enter a study with existing models of the domain". Since participants were essentially asked to change at least some of their mental models, the 15-minute training session may have been too short or too superficial.

There are thus so far two explications possible for the absence of an expertise effect, which may be inter-related. Firstly, the conventionalization of entire target-base pairings may have failed because the measurement (the grammatical form preference task) was actually not fitted to observe conceptual conventionalization. Secondly, the task may have been too substantial, especially considering a possible counter-effect of conceptual conservatism and the great amount of freedom allowed during the study phase. As remarked above, the result obtained in the current experiment may strengthen the supposition derived from Experiment 1 that conventionality predicts grammatical form preference at the linguistic level, but not at the conventional level. A third way of following up on the absence of the predicted effect is an exploration of the factors that may have played a role in preventing an expertise effect from reaching significance. Again, as with Experiment 1, we homed in on concreteness and metaphorical conventionality of base terms as possible factors. The remainder of this section will this report on a *data exploration* of the base terms of the 16 experimental target items.

Base term concreteness. A one-way repeated measures ANCOVA examined the effect of base term concreteness on mean grammatical form preference ratings per item (examined were the 16 technical figuratives only). An *F*-test examined an effect of expertise on grammatical form preference ratings and the relation between base term concreteness and these ratings. Expertise was entered as a within-items variable and concreteness of base terms as a between-item covariate. The ANCOVA showed that there was a significant main effect of the covariate ('concreteness of base term ratings') on the mean rating per item ($F(1,14)=8.26$, $p= .01$), type technical figurative.
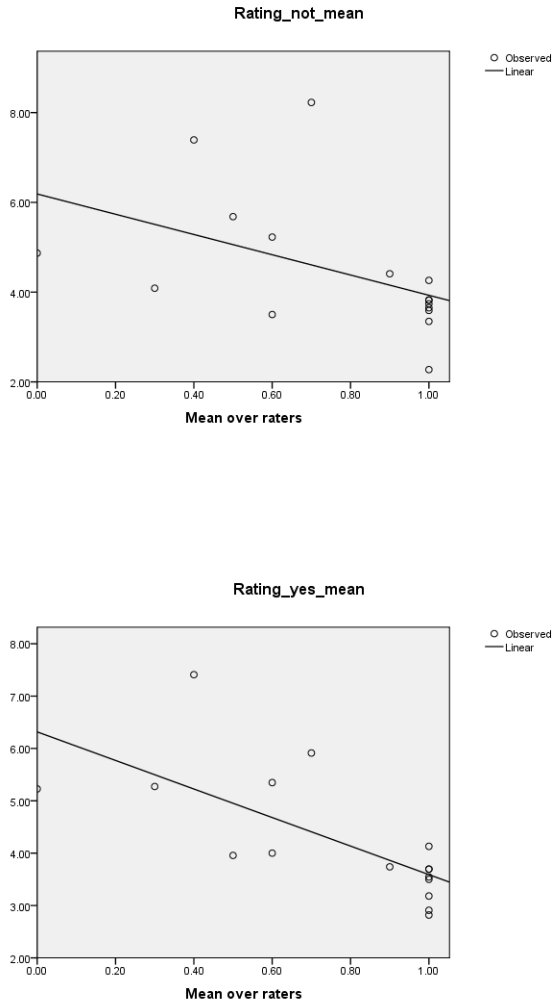
Figure 7.4. Regression lines for the relation between grammatical form preference and concreteness ratings. Non-studied items =Rating_not; studied items = Rating_yes.

There was no significant effect of studying on the mean rating per item ($F<1$), and no interaction between expertise and concreteness of base terms rating per item. The parameter estimates show that the relation between concreteness of base terms and grammatical form preference is negative. This could indicate concreteness of base terms as a predictor of grammatical form preference: The higher the concreteness rating, the lower the mean grammatical form rating, indicating a preference for the simile form, and maybe comparison as a mode of processing. This may be tentatively explained by abstract base terms being more "domain general" or "mutable" with respect to possible conventional contexts of occurrence, including technical and others, while concrete base terms may be more "domain-specific" and, in case of the technical metaphors, restricted to a particular target. The results of this round of data exploration resemble very much the ones obtained in Experiment 1, with no effect of expertise, but an effect of concreteness rating (see Figure 7.4).

Base term conventionality. A second round of data exploration again investigated the role of linguistic conventionality of metaphorical base terms. We were interested in whether the (degree of) conventionality of a base term may interact with the expertise variable on grammatical form preference. An *F*-test examined the effect of base term conventionality on mean grammatical form preference ratings per item across study groups (examined were the 16 technical figuratives only, conventionality was recoded as non-metaphorical, general, technical). The analysis shows that there is no interaction effect of *in vitro* expertise and base term conventionality and no main effect of *in vitro* expertise on grammatical from preference rating (all *Fs*<1). However, there is a significant main effect of conventionality ($F(2,88)= 9.74$, $p<.001$)

The main effect of conventionality of base terms on mean form preference ratings per item suggested that in absence of a conventional metaphorical meaning of a base term (e.g., *computer*) low form preference ratings were likely, indicating a relative preference for the simile form (regardless of whether an item was studied or not). Thus, a fifteen minute study phase in which novices read and interpret psychological theory-constitutive similes did not increase the probability of preference for the *A is B* form, and neither did three years of experience in the domain of academic psychology (see the identical results in Experiment 1). Within the limits of an exploratory post-hoc study, the main effect of conventionality could, however, be taken as support for the career of metaphor theory: For items with conventional base terms, the *A is B* form is more often preferred, which may indicate categorization as a mode of processing.

In sum, the results of both data explorations of concreteness and conventionality of base terms in Experiments 1 and 2 support prior studies on the effect of concreteness (Harris et al., 2006; Wales & Gibb, 1990a; 1990b) and conventionality (Bowdle & Gentner, 2005, Gentner & Bowdle, 2001; Nakamoto & Kusumi, 2004)

of metaphorical base terms. In the current studies, it appears that it may be more important that a base term has a concrete or a conventionally metaphorical sense than whether it is conventionally applied to a specific target within a the psychological domain of discourse or whether the interpreter does have psychological expertise or not. However, given the possible threshold (or ceiling) effect of expertise in Experiment 1 and the likelihood of the cognitive conservatism hypothesis being an explanation of why the study phase did not have an effect on mean grammatical form preference ratings in Experiment 2, further studies are needed with a stronger manipulation of expertise. Although the predicted main effect of studying technical figuratives of psychology on form preference ratings could not be observed, a crucial benefit of Experiment 2 was to prepare the grounds for further experimental and theoretic inquiry, suggesting among other things a specification of the career of metaphor theory: It seems that its claims about processing strategies need to be restricted to linguistically conventional metaphors.

7.4 General Discussion and Conclusions

Bowdle and Gentner (2005) claim that conventional figuratives can be processed either as comparisons or as categorizations, while truly novel figuratives are processed by comparison. The goal of the two studies presented above was to apply their career of metaphor theory to an investigation of metaphor processing as dependent on the level of individual expertise in one particular domain of discourse, with the hypothesis that novices of that domain may treat technical but conventional metaphors in much the same way as novel metaphors are treated in general discourse: by an on-line comparison between the involved domains. However, neither of the experiments provided support for the idea that expertise predicted grammatical form preferences for technical figuratives. This can be explained as follows.

Firstly, and probably most crucially, the assessment of processing differences between groups may have been hampered in both experiments by the fact that the GFP tasks seems to measure not conceptual conventionality, but *linguistic conventionality*. This means that even if there were differences between expertise groups in the extent to which the technical figurative statements are conventionalized in thought, the used method may not have been adequate to measure it.

Secondly, one possible explication is a threshold effect, the absence of conventionalization in all groups of participants. In Experiment 1, all participants, even those belonging to the advanced group, were undergraduate students of psychology. Thus, their levels of expertise might not have been distinct enough from

each other to be reflected in form preferences for psychological figuratives. It may also be the explication for why Experiment 2 may have failed to induce conventionalization of the technical figuratives in the participants altogether: According to current theories of expertise, expertise is acquired in stages (cf. Sternberg & Ben-Zeev, 2001), and it may be that – in respect to figurative aspects of knowledge representation and processes – first-year and fourth-year BA students are still be in a similar, initial phase, and that this cannot be altered by the type of in vitro expertise induced in Experiment 2. However, this is not a very likely explanation, since the data exploration showed that conventional bases were indeed preferred in categorization form, and even independently of level of expertise.

A third explication is the opposite: a ceiling effect, with many stimuli being already equally conventionalized in experts and novices in Experiment 1, and no further conventionalization being induced in the novice participants in Experiment 2 by a study phase. With the contact between psychological discourse and everyday discourse (and other relations between everyday and technical senses of base terms), some, if not many, statements might have seemed more conventionally metaphorical than novel to novices.

Ultimately, in post hoc analysis, two factors could be singled out that account for part of the relatively large amount of unexplained variation, though not necessarily for the absence of an expertise effect. These were concreteness and conventionality of base terms. Firstly, both studies showed covariate effects of concreteness of base terms on grammatical form preference ratings (indicating that items with concrete items are preferred in simile form, and more speculatively, that such items were processed by comparison), but did not interact with expertise. That concreteness of base terms affects metaphor comprehension is supported by similar findings by Harries et al. (2006), and Gibb and Wales (1990a, 1990b). Secondly, main effects of conventionality of base terms were detected, which were correlated with form preferences (and tentatively, processing), but again did not interact with expertise. Especially the effect of conventionality of base terms supports the career of metaphor theory, but also suggests that it is valid only for linguistically conventionally metaphorical terms, not for metaphors whose conventionality is restricted to the conceptual level of analysis.

On another note, a communicative-pragmatic explication of the lack of an expertise effect may be a possible interference of *truth-value judgment.* Presenting students of psychology with a rating task on "psychological topics" might have led participants to interpret the goal of the task as to assess "objective" knowledge, with "right" and "wrong" answers: a knowledge test. As a result, participants might have engaged in a truth value judgment (cf. Eisele & Lust, 1996) rather than an indication of form preference. This idea can be supported by the fact that for the literal statements there were indeed "objectively" right and wrong answers. For example, a literal comparison statement like *Attachment is like imprinting* is correct in the

comparison form, but incorrect without the comparison particle: *Attachment is imprinting*. Vice versa, a literal categorization statement like *Alcoholism is an addiction* is correct in the categorization form, but incorrect with a comparison particle *Alcoholism is like an addiction*. For the technical figuratives, this at first was not thought to be the case. For example, both versions of the technical figurative *The mind is a computer* and *The mind is like a computer* are sensible statements. There is no objective "right" or "wrong" answer, since both forms, at least from a usage-based perspective on language use, are both logically and cognitively sound. However, if truth-value judgments are indeed involved as a communicative goal, then participants may have interpreted *A is B* statements like *The mind is a computer* and *Children are sponges* as logically wrong, and dismissed categorization as a processing strategy (even if a previously stored schema may have been principally accessible). Thus, although conventional metaphor in the current framework is taken to be comprehended by the same process as "literal" language, there may be certain conditions (probably especially in academic contexts, with its traditional rejection of figurative language) under which interlocutors become "suspicious" of metaphorical language and may reject existent abstract schemas.

In sum, a number of conclusions may be drawn from the results of the two experiments. First of all, it is possible that future experiments may obtain significant differences between experts and novices by a stronger manipulation of the variable of expertise (both *in vivo* and *in vitro*). Secondly, other factors also require explicit attention, such as the level of concreteness and especially conventionality of the metaphorical base terms (linguistic as opposed to conceptual). Thirdly, in the particular circumstances of academic discourse, a possible pragmatic interference may be performed by the communicative goal of 'truth-value judgment'. Fourthly, with respect to metaphor conventionality, it seems possible that the grammatical form preference task is much more suited to indicate the mode of processing when conventionality is pitched at the linguistic level of analysis, with lexicalized domain-general metaphorical meanings – but not at the kind of conceptual conventionality that was examined in the present study, with specific target-base pairings, often without domain-general meanings of base terms.

In the present chapter, due to restrictions in time and technical equipment, I could provide only one kind of evidence, the indication of grammatical form preference. Unlike the original career of metaphor experiments, we were not able to report on reaction times. I am well aware that in absence of the converging evidence of reaction times (which supported and complemented the initial results gained by grammatical form preference tests in the career studies) our results are more tentative and exploratory. It is self-evident that an *offline* measure such as the grammatical-form preference rating can be used only tentatively to say something about *on-line* processing (cf. Fletcher, 2006; Kendeou & van den Broek, 2007). However, the results obtained in the present studies can serve as a basis for future

research on metaphor processing of natural metaphorical language and, more specifically, metaphor processing in domains of discourse, and last, but not least, the question of expert-novice differences in metaphor processing.

The exploration of the relationship between metaphor processing and conceptual knowledge in technical discourse has only begun, and more research is needed, both within the simile-metaphor paradigm (e.g., Aisenman, 1999; Bowdle & Gentner, 2005; Glucksberg & Haught, 2006; Jones & Estes, 2006) *and* based on the usage patterns of natural (technical) language and thought (see Chapters 2, 5, and 6). The difficulties in the present study also suggest that attention should be paid to pragmatic aspects and the communicative function of metaphorical language (cf. Steen, in press, who proposes that metaphors in both the *A is B* and *A is like B* form may be interpreted as deliberate and therefore processed by means of comparison). Finally, the significant results of the post-hoc exploration of data seem to suggest that any study of metaphor processing using the grammatical concordance principle has to strictly control base term conventionality – on a linguistic level. My study points towards the possibility of a specification of the career of metaphor theory. Bowdle and Gentner (2005, p. 210) introduced the novel claim that "conventionality and grammatical factors are factors that must be controlled" in metaphor research. I should like to extend this claim and suggest that controlling both factors in an even more sophisticated way (controlling conventionality on a strictly linguistic/lexical level, controlling conventionality with regard to the domain of [technical] discourse) may offer even more insight into the actual processing of metaphorical language across domains of discourse and levels of individual expertise, both in metaphor production and reception.

Linguistic conventionality itself appears to work differently within specialized domains of discourse, such as psychology. Technical terms like *flooding*, *imprinting*, and *developmental stage* seem deeply conventional within the technical jargon. However, such conventional metaphorical base terms appear to be restricted to very specific targets within the scientific discourse community (e.g., *flooding* – *exposure therapy in which there is prolonged confrontation with an anxiety-provoking stimulus; imprinting* – *a rapid learning process that takes place early in the life of a social animal and establishes a behavior pattern,* see MWM). In technical terms such as *developmental stage*, pre-modifiers (*developmental*) indicate the target domain, while the noun working as the head of the noun phrase indicates the base domain (*stage*). The restriction of particular base terms to specific targets and the accordingly highly specific meanings of metaphorical technical terms in academic prose can be motivated by the need for specification and exactness in academic discourse (cf. Biber et al., 1999; see Chapters 5 and 6). It needs to be taken into account by studies investigating metaphor processing in specialized settings.

In sum, my study suggests that future experiments may still reveal effects of expertise on grammatical form preference ratings when (a) manipulating the variable

expertise more strongly and (b) constricting stimuli to metaphorical statements with linguistically conventional bases – that have roughly the same level of abstractness. Using other methods than grammatical form preference tests may avoid possible interferences of "truth value judgment" and may be able to assess whether conventionality pitched at the level of thought, but not at the linguistic level, does predict the mode of processing. In relation to this, it appears that the notion of conventionality in the career of metaphor (and probably other cognitive-psychological theories of metaphor processing) can/should be further specified. The present study thus offers modest, but useful, implications for further research on the connection between expertise, genre, and metaphor in the fields of cognitive linguistics, psycholinguistics, cognitive psychology, science learning, and applied linguistics.

CHAPTER 8
Discussion and Conclusion

The preceding seven chapters have brought into focus the multi-facetted nature of metaphor in academic discourse. Metaphor use is not only specifically frequent in academic prose in comparison with other registers of English, but is pervasive in academic prose in that it is relatively evenly spread across academic sub-registers/disciplines. What is more, my work has shown that metaphor is present in academic prose across eight word classes, and that in some of these word classes, such as prepositions, verbs, and nouns, it has a stronger position than in others, for example adjectives and adverbs. Across all word classes, metaphor seems to be fulfilling a number of specific discourse functions, in particular referential specification and textual coherence creation, but also indirectly expressed evaluation and illustrative explanation. Finally, in the last chapter, I reported a study on metaphor processing, which suggests that concreteness and conventionality of metaphorically used words are predictors of grammatical form preference (and hence possibly metaphor processing), whereas conceptual conventionality of metaphorical mappings alone appear not to necessarily influence grammatical form preference (and processing). The present chapter will review how these insights about metaphor in language and thought were obtained, discuss the findings in some more detail, and address some of the limitations. I will finally address practical and theoretical implications as well as topics of future research.

8.1 Aims and Research Questions

The main objectives of the present study were (a) to determine important linguistic forms of metaphor use in natural academic discourse in comparison with other main registers, relating them to their potential communicative functions, and (b) to give some insight about metaphor processing in an academic discourse context. My research was part of the recent framework of interdisciplinary discourse approaches to metaphor (e.g., Cameron, 2003, Cameron & Maslen, 2010; Charteris-Black, 2004; Deignan, 2005; Gibbs, 2008; Goatly, 1997; Musolff, 2004; Musolff & Zinken, 2009; Semino, 2008; Steen, 2007, 2008, 2011a), with metaphor understood as a conceptual mapping between two distinct conceptual domains (cf. Lakoff, 1993) and discourse understood as verbal communication in natural situations (cf. Schiffrin et

al., 2001). It was assumed that metaphor is a ubiquitous and conventional feature of natural discourse in general (e.g., Deignan, 2005; Lakoff, 1987, 1993; Lakoff & Johnson, 1980, 1999) and of academic discourse in particular (e.g., Aubusson et al., 2006; Black, 1962; Brown, 2003; Corts & Pollio, 1999; Darian, 2003; Giles, 2008; Hoffman, 1980, 1985; Jäkel, 1997; Keller, 1995; Leary, 1990b; Littlemore, Trautman, Koester, & Barnden, 2011; Low, 2008b; Maasen et al., 1995; Pulaczewska, 1999; Richardt, 2005; Rigney, 2001; Salager-Meyer, 1990; Semino, 2008).

Applying Steen's (2007, 2008, 2011a) approach to metaphor in semiotic structure, this thesis treated linguistic forms, communicative functions, conceptual structures, and cognitive representations of metaphor at distinct levels of analysis, matched by distinct empirical questions on each level. In order to ensure reliability and consistency in metaphor identification at the linguistic level of analysis (e.g., Cameron, 1999; Pragglejaz Group, 2007; cf. Steen, 2007; cf. Todd & Low, 2010), in the present thesis, a variant of *MIP* (Pragglejaz Group, 2007), the comprehensive and reliable *MIPVU* (cf. Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010), was used; it was applied with special attention to the particular circumstances of metaphor identification in academic discourse (e.g., Goschler, 2007).

Two basic approaches to metaphor in academic discourse inform the ideas about its linguistic forms, conceptual structures, communicative functions, and cognitive representations. On the one hand, it is widely accepted that metaphor is an integral part of academic language and thought, as language is an integral part of knowledge construction (e.g., Myers, 1990). This is the perspective of CMT, which suggests that metaphor should be relatively frequent in the abstract discourse of academic disciplines. It finds support for example in Biber's fifth dimension ("abstract information"), where academic prose shows a higher score than the other three registers. At the same time, however, there appears to be a continuity of stylistic conventions in academic writing that involve a "plain" and metaphor-less style, "as Bacon casts his long shadow over the field" (Giles, 2008, p. 41). Driven by this apparent opposition between cognitive linguistics and positions of applied stylistics, I asked to which degree metaphor is present or absent in academic discourse, especially in comparison with other main domains of discourse, such as news, fiction, and conversation.

Building on the framework of register variation by Biber and colleagues (Biber, 1988; Biber et al., 1999), I worked with the basic assumption that register variation can be approached in the textual dimension (Biber, 1988), by measuring and comparing frequencies of basic linguistic features, such as word class – and relation to metaphor. Studies from the field of register/discourse studies (e.g., Biber, 1988, 2006b; Biber et al., 1999; Conrad & Biber, 2001; Charles, Hunston, & Pecorari, 2009; Crawford Camiciottoli, 2007; Halliday, 2004b; Hunston & Thompson, 2000; Hyland, 2011a, 2011b; Hyland & Bondi, 2006) have reported a wide range of

particular linguistic characteristics of written academic discourse, but largely excluded relation to metaphor. Taking into account findings from both metaphor studies and register/discourse studies, I hence asked how linguistic forms of metaphor are distributed across registers, across word classes, and in terms of different metaphor types. With the variability and heterogeneity of academic discourse being an issue increasingly discussed (e.g., Flowerdew & Peacock, 2001; Hyland, 2006a; 2006b), I also asked how metaphor is distributed across different sub-registers of academic discourse.

Functional-systemic linguistics and studies inspired by it (e.g. Biber, 1988; Biber et al., 1999; Eggins & Martin, 1997) have suggested that the linguistic features defining registers at the textual dimension are directly linked to functional correlates, with Biber et al. (1999) suggesting six particular discourse functions (ideational, textual, personal, interpersonal, contextual, and aesthetic functions). At the same time, metaphor scholars have proposed a range of functions of metaphorical language that may be at work in academic discourse, some of which are directly compatible with Biber's approach – such as Goatly's (1997) application of Halliday's meta-functions to metaphor (ideational, interpersonal, and textual functions) and Semino's (2008) approach that identified different functions of metaphor in different domains of discourse – while others are more specific to metaphor analysis, in particular, Boyd's (1993) model of theory-constitutive and pedagogic functions of metaphor in science. I hence asked which communicative functions can be identified for the particular linguistic forms of metaphor identified in the frequency comparisons.

The semiotic analysis of metaphor (cf. Steen, 2007, 2011a; cf. Mittelberg, 2006) can be complemented by an analysis at the behavioral level, scrutinizing "individual processes and products of metaphor use" (Steen, 2011a, p. 44). Specifically, the career of metaphor theory (Bowdle & Gentner, 2005; Gentner & Bowdle, 2001) has presented a model that can account for the behavior associated with the processing of metaphorical language on a continuum of novelty/conventionalization. In particular, there appears to be a relation between grammatical form of metaphor and people's processing behavior, with grammatical form preferences allowing inferences about whether understanding metaphorical statements involves (a) a comparison process or (b) less costly categorization. In the present thesis, I aimed to examine aspects of metaphor processing in academic contexts, tapping into existing research on metaphor comprehension in the contexts of academic psychological and physics discourse (Gentner & Grudin, 1985; Gentner & Jeziorski, 1993; Hoffman, 1980; Leary, 1990b), specifically as constrained by expertise (Cooke & Bartha, 1992; Gentner & Gentner, 1983). With regard to people's processing of discipline-specific metaphors of psychology, I hence asked whether processing strategy (as measured by grammatical form preference as proposed by the career of metaphor paradigm) would be influenced by disciplinary expertise.

In all, this study treats metaphor in academic discourse as a multidimensional phenomenon, at the levels of linguistic forms, conceptual structures, communicative functions, and cognitive representations. In this respect, it forges new links between the discourse/cognitive-linguistic paradigm of metaphor studies, the field of functional-systemic-oriented register studies of academic discourse, and cognitive psychology. Its aim is to provide a comprehensive and analytically sound insight into metaphor in semiotic structure and behavior associated with academic discourse.

8.2 Summary and Discussion

8.2.1 The identification of metaphorical language in academic discourse.
One general goal that motivated my research was to minimize intuitive moments both in metaphor identification and analysis. Therefore, *MIPVU* was devised as a maximally comprehensive and detailed procedure. Secondly, with *MIP* (Pragglejaz Group, 2007), the quality of the application of *MIPVU* was monitored throughout annotation by means of reliability tests. Chapter 2 introduced the main issues that an analysis of metaphor in (academic) discourse has to deal with and introduced how these were going to be dealt with in the annotation manual *MIPVU* reported in Chapter 3. Among these issues were: (1) the level on which metaphor is to be operationalized, i.e., that of linguistic or conceptual similarity, which determined whether other forms of metaphorical language, namely direct and implicit expressions of metaphor, may be included; (2) the unit of identification of metaphorical meaning, i.e. whether to include contemporary language use or also historical metaphor and what to define as the smallest unit of analysis, which entailed questions about whether to include metaphor in morphology, or whether to stick with word class; (3) the resources that were to be part of the procedure, i.e. whether the data collection process should be standardized by specifying the procedure with reference to particular dictionaries, which also included the question about whether special resources should be allowed for dealing with the specialized prose of academic discourse; (4) whether to incorporate a "borderline" category that would label all cases for which clear yes/no decisions about relation to metaphor are impossible.

The main concurrence between *MIPVU* and its starting point *MIP* is the way in which contextual and more basic meanings of lexical units are identified, with contextual meanings being tagged as metaphor-related if a contrast and similarity between the two meanings of a word can be established. Both procedures work with recourse to the usage-based synchronic dictionary *The Macmillan English Dictionary for Advanced Learners* (Rundell, 2002). However, *MIPVU* eventually

went beyond *MIP* in a number of aspects; for example, with respect to the unit of analysis (e.g., in defining word class, and not lemma, as the basic unit, and in including specific multiword units); in including a borderline category, the WIDLII (When In Doubt Leave It In), that accounted for problematic cases of metaphoricity; in pitching metaphor at the level of cross-domain mappings, which meant that not only indirect language use, but also directly expressed forms of metaphor (e.g., the simile *nature is like an enormous restaurant*) and implicit metaphor (cohesive devices that co-refer to metaphorically used lexical units) could be included with the analysis; and lastly, in developing highly explicit guidelines for using dictionaries in annotation. With respect to the specific problems posed by identifying metaphor in academic prose, Chapter 2 identified the problem of register-specific lexis and its potential relation to metaphor. This problem was operationally solved by adopting the position that the language user is the idealized native speaker of English as represented in the description of English by the dictionary of a particular period (*Macmillan* Dictionary, *Longman* Dictionary as backup). This allowed for comparing metaphor distribution directly and systematically to the other registers, with exactly the same procedure applied to all varieties. The problem of specialized lexis was furthermore attacked by adding the WIDLII category to the binary metaphor identification of *MIP*: In being able to flag clear metaphor, non-metaphor, and also in-between cases, annotation could retain such lexical units (e.g., specialized lexis) that could not easily be established as either metaphor or non-metaphor.

In Chapter 4, it was then shown how *MIPVU* serves the identification of various cases of linguistic metaphor in academic discourse in a variety of case studies of academic discourse. The range of examples discussed in this chapter included clear-cut cases as well as cases that demanded special methodological attention, and it was demonstrated how *MIPVU* can account for the particularities of the register. A review of the reliability tests showed that in particularly "difficult" cases of academic prose individual decisions were perhaps affected by differences in prior knowledge and/or intuitions. This reinforced the *MIPVU* policy of assuming a general (idealized) reader for all registers, with the systematic utilization of a corpus-based learner's dictionary as a norm. Chapter 4 also showed how *MIPVU* can cater to specific and less frequent instances of metaphorical word usage in academic discourse, such as implicit and direct metaphor. In all this, Chapters 2 through 4 prepared the conceptual-methodological grounds for the ensuing empirical analysis of the linguistic forms of metaphor in academic discourse in the quantitative macroscopic corpus-linguistic study (Chapter 5) and in the functionally oriented microscopic analysis in Chapter 6.

8.2.2 The corpus-linguistic study

Metaphor in cross-register comparison. The quantitative study showed that academic prose leads the register rank order of metaphoricity in quantitative terms. It has the highest proportion of words related to metaphor of all registers (18.5%), followed by news (16.4%), while fiction occupies a middle position (11.9%), and conversations have the lowest overall proportion of MRWs (7.7%). Metaphor is hence an integral part of all four registers, but most common in academic prose, followed by news. The finding appears to be correlated with the respective position of these registers on Biber's (1988) informational/involved dimension (Dimension 1), where academic prose and news are situated at the informational extreme and conversation at the involved extreme, but fiction in between. Metaphorical language use may thus play a special role in the careful production of the registers associated with informational exposition, specifically with regard to their focus on conveying densely packed and highly precise information (cf. Biber & Conrad, 2003, p. 186). By contrast, the fact that conversation exhibits less reliance on metaphorical language appears to be connected to the involved nature of its production, under real-time constraints and reflecting interactiveness and high personal and situational involvement (Biber & Conrad, 2003, p. 186). In academic prose, metaphor appears to participate not only in informational production, but simultaneously play a role in its high abstract production (Biber's Dimension 5, abstract versus non-abstract information) and its high degree of explicit, elaborated reference (Biber's Dimension 3, explicit versus situation-dependent reference). In this respect, metaphor in academic discourse appears to be a linguistic device involved in producing densely packed and often abstract informational contents in a textually highly elaborated prose.

Metaphor and word class. Variation in metaphor use across registers could also be observed across the distinct word classes. Here, academic prose had the highest relative proportion of metaphor in prepositions and verbs, but also in nouns and the remainder (that included mainly pronouns). These four word classes are where frequencies of metaphor use appeared to reflect the rank order described as "familiar" by the Longman grammar (Biber et al., 1999, p. 578), with conversation at one extreme and academic prose at the other: Firstly, this is the case in the two "prototypical" word classes of informational production as described by Biber (1988), prepositions and nouns. Metaphor-related prepositions (*in, on, at,* etc.) and, interestingly, also nouns (*way, field, form,* etc.) are clearly related to the textual function of packaging and linking of informational units, as well as to the ideational establishment and delimitation (especially nouns such as *form of, way of,* etc.) of highly explicit reference, which mostly involves abstract concepts. Furthermore, metaphorical nouns, but also prepositions embedded in larger units, (e.g., <u>*at this*</u>

point) play a role in performing contextual functions seen as intra-textual and intra-discursive deixis in academic prose (cf. Biber et al., 1999). Relatively surprisingly, metaphor-related nouns in academic prose also perform personal and interpersonal functions: By indirect meaning, metaphorical nouns such as *attack, myth,* and *erosion* appear to convey an evaluative perspective on certain referents. It appears that in academic prose, such lemmas are predominantly used for building up arguments, but also for persuasion and signaling of stance – all in a rather backgrounded, non-overt, and conventional manner that accords with stylistic conventions.

Another relatively surprising result was that two of the word classes typically associated with involved production, verbs and pronouns, appeared to "turn informational" when related to metaphor. Metaphorical pro-forms of the remainder (*it, they, one,* etc.) have the textual function of establishing precise coherence relations in the text, whereas metaphorical verbs cater to the textual function of linking of phrases and clauses, as well as to ideational functions such as indicating basic existence and causation (*have, make, follow,* etc.). In addition, verbs are often used in academic prose with inanimate subjects – and hence metaphorical by personification. The textual and ideational functions performed by "semantically reduced" verbs (Biber et al., 1999) that are typical of academic prose can hence now be explained by relation to metaphor. At the same time, these verbs are used in their (mostly bodily-related) basic senses in fiction and conversation much more commonly. In addition to the predominant functions of metaphorical verbs typically associated with informational production, metaphorical verbs (e.g., *attack, embrace*) can also be used to convey stance, to persuade, and to build up argumentation – much like nouns, verbs hence appear to exploit the indirectness of meaning in line with good academic style, probably on a regular basis.

None of the remaining word classes showed the "familiar order" in terms of frequency of metaphor-related items. Firstly, conjunctions deviated from a clear-cut pattern in that they were largely devoid of metaphorical items (save for *where,* with its predominant textual function) and did not show significant variation across registers. Secondly, adjectives, which normally indicate informational production when frequent (cf. Biber, 1988), showed a relatively low number of metaphor in academic prose, but a high number of unequivocal non-metaphorical meanings among the semantic class *classifiers* (*electric, statistical, political*). Interestingly, metaphorical instances of adjectives appeared to be largely restricted to the semantic class *descriptors* (*large, wide, direct* etc.), indicating abstract extent, quantity and number – and in this finally appear to exert predominant ideational functions. However, and this again comes as a surprise, metaphorical adjectives appear to be used regularly for in (inter-)personal functions in academic prose as well. With metaphorical senses that are highly conventional and frequently repeated, this function, however, appears to be (stylistically) backgrounded. By contrast, the

higher frequency of metaphorical adjectives in news and fiction appears to result from different predominant purposes and goals of these registers, including aesthetic pleasure, the conveyance of subjective world-views, or attention-raising (e.g., in news headlines).Thirdly, for adverbs, whose frequent use normally indicates involved production (cf. Biber, 1988), a similar metaphor distribution as that of adjectives was found. In academic prose, they comprised a high number of non-metaphorical instances, most of which appear to have precise and often technical meanings (e.g., *significantly, statistically*, *only*). The metaphor-related instances in academic prose were specifically place adverbs (e.g., *here, where, above*), with their contextual / textual function to establish situation-dependent, but text-internal (or discourse-internal) reference. However, again similarly to adjectives, it was suggested that other adverbs are used for stylistically sound interpersonal and personal functions (e.g., *intelligently*), but also for ideational functions (e.g., *roughly*). Fourthly, for determiners, the analyses showed that metaphor-related instances of *this, that, these,* and *those* are slightly more frequent in academic prose than in the other written registers, but less frequent than in conversation. These word forms appear to guarantee the ideational specification of referents and the textual establishing of text-internal (co-)reference in academic texts. By contrast, in conversation, they may – as a rule –be used with vaguer meanings and less constricted referents, with regard to both text-internal and text-external reference (cf. Biber, 1988).

Chapter 6 also examined the most frequent lexical types per word class. This suggested that in functional word classes metaphorical word use indicates underlying mappings with mostly spatial source domains (e.g., prepositions such as [*distinction*] <u>between</u>, and [*increase*] <u>in; the</u> conjunction <u>where</u>; and the determiners <u>*this, that, these, those*</u>), but that in lexical word classes, mappings have a wider range of source domains (e.g., space and objects such as *point, here, widely, low*; bodily- and perception-related domains, such as *make*, *see*, *clear, gently*; more culturally-based ones such as *flooding, field, poor, stage*; and abstract domains such as *produce*, *force, intelligently*).

In all, the pattern found across word classes showed that relation to metaphor interacts both with register and the typical functions of the word classes. Hence, in academic prose, metaphorical language use across all word classes caters to textual functions and in some word classes to ideational functions. This corresponds with the role of metaphor as an integral part of an informational production. However, the review of the *LGSWE* showed that the interactional – and argumentative – aspects of academic prose have an important relation to metaphorical language use as well, with metaphor in all lexical word classes involved with interpersonal and personal functions – apparently, on a regular basis. Biber et al. (1999) were surprised by regular persuasive and attitudinal functions of certain word classes in academic prose, and my study showed that such functions could be assigned to metaphor-

related instances of all four lexical word classes, including nouns (*myth, erosion, cabbage*), verbs (*attack, embrace*), adjectives (*high, low*), and adverbs (*intelligently, drawn too low*). This conclusion is in turn compatible with findings about interpersonal functions in academic discourse (e.g., Biber, 2006b; Charles, 2003; Del Lungo Camiciotti & Tognini-Bonelli, 2004; Fahnestock, 1999; Hunston & Thompson, 2000; Hyland, 2004a, 2004b; Gilbert & Mulkay, 1984; Halliday & Martin, 1993), but also with research conducted within discourse-analytically metaphor studies on academic discourse (e.g., Charteris-Black, 2004; Goatly, 2007; Hellsten, 2008; Nerlich & James, 2009; Semino, 2008; Wallis & Nerlich, 2005). In academic prose, personal and interpersonal functions are backgrounded much more than in other types of discourse, with – probably – a relatively high rate of repetition among conventionally metaphorical lemmas. Underlying all communicative functions, metaphor is a conceptual tool that exploits familiar knowledge to render possible the creation of abstract discourse, across a wide range of source domains, but with an interesting restriction of functional word classes to spatial source domains.

Academic register and metaphor type. The findings obtained for the distribution of metaphor type across registers in Chapter 5 showed that metaphors across registers are largely indirectly used (e.g., *This view, as we shall see, has been attacked on the grounds; Nineteen flooding sessions were used; The terminology in this field is not standardized*). Indirect metaphor use thus appears to be the default, across registers. In academic prose, indirect metaphor use is distributed across almost all word classes (except for pronouns), and used mainly for textual, ideational, and sometimes (inter-)personal tasks. Overall, in academic prose, indirect metaphor use is conventional, but frequent. By contrast, direct metaphors (e.g., *analyse [the structure of the fossil] almost as if it were [a piece of engineering]; Poplar leaves have [an elegant outline] resembling [that of an arab minaret])* are relatively uncommon overall, in particular in academic prose, when compared with news and fiction. This was explained by stylistic conventions of academic prose, with overt figurative language use (with its semantic richness and ambiguity) possibly being seen as compromising the objective and precise transmission of information associated with academic prose. Direct metaphor was observed in academic prose with mainly pedagogic and illustrative goals, as well as evaluative ones. There is a link between direct metaphor and deliberate metaphor use, with direct metaphors profiling the source domain sense of a word in context (*a piece of engineering; an arab minaret*), simply because this sense is the one directly referred to in context. By contrast, indirect metaphor is overall less likely to be interpreted as deliberate in discourse (cf. Steen, in press, p. 12), since indirect metaphorical word use often corresponds with the most salient sense of a word (Giora, 2003), with the more basic senses not accessed. My findings may hence be extended to the

hypothesis that metaphorically used words in academic prose are mostly not deliberately metaphorically used. The count of implicit metaphors (e.g., *should* in *If we agree that in that case women should be <u>embraced</u> by the liberty principle then so <u>should</u> children*) was overall low as well, but higher in academic prose than in the other registers. It seems to be directly related to the higher general proportion of indirectly used metaphor-related words in academic prose. It also appears to reflect the particular co-reference structure of academic prose, which integrates long and densely integrated sentences by way of establishing explicit reference with antecedent metaphor-related words.

Academic sub-registers and metaphor type. The more exploratory analysis of metaphor distribution across sub-registers suggested that natural sciences may be more inclined to direct metaphor use than other disciplines. It was tentatively proposed that differences in metaphor type use could be related to stylistic traditions in the disciplines, which in turn regulate the communicative functions of metaphor use. For example, direct metaphor use may pursue educational goals more often in the natural sciences, while serving evaluative or even aesthetic purposes more often in the humanities. More, both quantitative and qualitative, research is needed to test the validity of this hypothesis.

Conclusion. In all, the corpus study showed that metaphorical word use is pervasive in academic prose and relatively stable in terms of frequency across academic sub-registers. This is compatible with the basic position of CMT (Lakoff, 1987, 1993; Lakoff & Johnson, 1980, 1999) which sees metaphor as an indispensable phenomenon of natural discourse spread across all domains, and more abstract domains in particular. What is more, my study showed that metaphor is more frequent in academic prose than in news, fiction, and conversation. This distribution was interpreted with regard to Biber's (1988) comparative study of spoken and written discourse, suggesting an important role of metaphorical word use in informational production, but also in abstract production and elaborated reference. At the same time, metaphor is distributed across the major word classes in academic prose in a rank order that only partially complies with the "typical" involved-informational pattern sketched out for word classes in Biber (1988), with relation to metaphor apparently interacting with the communicative function of the particular word classes.

With regard to the communicative functions as defined by Biber et al. (1999), I suggested that metaphorical word use in academic prose has predominantly ideational and textual functions: Metaphors establish – but also specify – reference. This finding is supported on a general level by Boyd (1993), Goatly (1997), Pulaczewska (1999), and Semino (2008), who assign metaphor a crucial role in the

establishment of reference. As far as the specification of reference is concerned (*form of, field of* etc.), findings may largely be related to Cameron's (2003) observation about the importance of "nominal groups" involving *of* and that work as "some kind of quantifiers", as well as to Deignan (2005), who found that metaphorical word use in natural language in general is relatively fixed in terms of syntagmatic word strings. In terms of the textual (and the occasional contextual) functions performed by metaphorical language in academic texts, may findings can be related for example to Fleischman (1991) who reports an important role of metaphorical place adverbs in orienting readers in the text (cf. Goatly, 1997, who identifies similar functions in popular scientific discourse). One of the most interesting results of my study is probably that metaphor-related verbs are semantically relatively restricted, expressing simple existence, occurrence, and relationships. This result can be related to a predominant textual function and just a basic ideational function of verbs in informational production (Biber et al., 1999), and is supported by studies such as Master (1991) and Cameron (2003). Master suggests that active verbs with inanimate subjects have the two major functions of showing causality and explanation, while Cameron (2003, p. 94) describes the "delexicalized nature of many [metaphorical] verbs". My review of the *LGSWE* also showed that typical functions of metaphor in academic discourse furthermore include (inter)personal functions, such as education, evaluation, and even persuasion. Similar claims have been made for example by Boyd (1993), Charteris-Black (2004), Goatly (2007), Semino (2008), and by Cameron and Low (2004) in expert-non-expert communication in educational contexts. Lastly, my study suggested that metaphor use exerts aesthetic functions, possibly including the occasional creation of aesthetic pleasure in some academic fields/disciplines (for linguistic variation across academic sub-registers in general, cf. Biber, 2006b), but mainly constricted to a "good style" (Biber et al., 1999, p. 43), which appears to be a predominantly "plain style" (cf. Giles, 2008). This style appears to incorporate metaphor use that is backgrounded, and is linked to the heavy dominance of the indirect type of metaphor use: In communication, indirect metaphors in academic discourse appear not likely to be interpreted by recourse to the more basic senses of the words (cf. Steen, in press) and hence apparently are seldom used in a deliberate way.

In the corpus-linguistic study, metaphor was treated as a linguistic phenomenon (cf. Pragglejaz Group, 2007; Steen, 2007), but occasionally, the level of concepts and conceptual mappings was addressed. It was suggested that mappings underlying functional word classes have normally spatial source domains, whereas mappings underlying lexical word classes have a much wider range of possible source domains. In aligning two conceptually distinct domains, metaphor provides a representational potential at both the symbolic and behavioral level. The experimental study that will subsequently be summarized in some more detail set

out to explore the activation of this potential in one specific domain of academic discourse, psychology.

8.2.3 The experimental study. In their career of metaphor paper, Bowdle and Gentner (2005) claim that conventional figuratives can be processed either as comparisons or as categorizations, while truly novel figuratives are processed by comparison. Chapter 7 applied the career of metaphor theory to an investigation of metaphor processing as dependent on the level of individual expertise in one particular domain of discourse (cf. Chi, Glaser, & Rees, 1982; Sternberg & Ben-Zeev, 2001), with the hypothesis that novices of that domain may treat theory-constitutive but conventional metaphors in much the same way as novel metaphors are treated in general discourse: by an on-line comparison between the involved domains (for a similar thought, see Honeck & Temple, 1992). Metaphor processing was here related to grammatical form, assuming a form-function analogy (the grammatical concordance principle), with preference for the simile form (*A is like B*) indicating cross-domain comparison whereas preference for the metaphor form (*A is B*) was taken to indicate categorization (Bowdle & Gentner, 2005; Glucksberg, 2008). However, neither of the experiments using theory-constitutive metaphorical statements of psychology provided evidence that expertise was a predictor of grammatical form preferences – and, by inference of processing strategy. A number of conclusions could be drawn from the results.

First of all, differences in grammatical form preference and processing behavior may be obtained between experts and novices when the variable expertise is manipulated in a stronger or different way (both *in vivo* and *in vitro*). Secondly, it was suggested that in examining metaphor processing, two factors require more explicit attention: the level of concreteness of base terms and the type of conventionality of base terms. Both factors did not interact with expertise in my experiments, but did have an effect on grammatical form preference across groups. While base term concreteness has been examined by some (cf. Gibb & Wales, 1990a, 1990b; Harries et al., 2006), it is metaphor conventionality with its differentiation into linguistic and conceptual conventionality that appears to be most promising for future research. When conventionality is pitched strictly at the linguistic level of analysis (cf. the Pragglejaz Group, 2007; Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010), and not at the conceptual level alone (Lakoff & Johnson, 1980; Lakoff, 1993), Bowdle and Gentner's grammatical concordance principle may be a more reliable indicator of the mode of processing, since only those terms that are lexicalized would be treated as conventional metaphors. (When conventionality is pitched at the linguistic level of analysis, a base term such as *computer* in *The mind is a computer* is not conventionally metaphorical, because the lexical unit constituting the base term (*computer*) does not have a lexicalized metaphorical sense. By contrast, *blueprint* in a *Gene is a blueprint* is linguistically

conventional, as documented in the dictionary.) The study of metaphor processing that deals with comparison and categorization as two possible modes (Bowdle & Gentner, 2005; Gentner & Bowdle, 2001; see also Glucksberg, 2008) may hence generally benefit from further specification of the notion *metaphor conventionality*. This extends to the notion of linguistic conventionality, which itself might work differently within a specialized domain of discourse, such as psychology. In such contexts, conventional metaphorical "base terms" may be possibly restricted to very specific targets within the scientific discourse community (and hence be "domain-specific", but not "domain-general" in the sense of Gentner and Bowdle, 2005).

A third insight obtained by our experiments was that under the particular circumstances of academic discourse, a possible pragmatic interference may be performed by the communicative goal of "truth-value judgment" (cf. Eisele & Lust, 1996). Other methods than grammatical form preference tests may thus help in this environment to avoid possible interferences of "truth value judgment". The fourth conclusion was that more evidence is needed for the presumed concordance between grammatical form preference and mode of processing (Bowdle & Gentner, 2005; Gentner & Bowdle, 2001). In my experiments, the grammatical form preference test was used to make inferences about on-line *processes*, but, as an offline measure, it was actually pitched at the level of the *products* of these processes (cf. Fletcher, 2006). Since the assessment of reading comprehension is "not an overt process that can be directly observed" (Fletcher, 2006, p. 324), this practice has been adopted in many discourse studies (cf. Kendeou & van den Broek, 2007). It should, however, be stressed that with my materials and design, measures that access *online* processing more directly (such as reading time measures) may lead to different results. In all, Chapter 7 offered modest, but useful insights about the connection between expertise, register/genre, and metaphor in terms of processing behavior.

8.2.4 Contributions of this study. The present study suggested that, as a rule, metaphorical word use in academic prose is largely devoid of the polyvalence associated with metaphor in a traditional and often literary sense (Jakobson, 1956; Lodge, 1977; cf. Semino & Steen, 2008). Metaphorical word use in academic discourse seems to generally convey highly precise meanings that are conventionally used to (a) establish reference with abstract topics, relations, and processes (cf. Biber et al. 1999; cf. Boyd 1993; Darian, 2003; Goatly, 1997; Semino, 2008); (b) delimitate the interpretability of words (cf. Biber et al., 1999); (c) link words, phrases, and establish exact coherence relations (cf. Biber et al., 1999; Halliday & Hasan, 1976; Hyland, 2006b; for metaphor and coherence, see also Cameron & Low, 2004; Corts & Pollio, 1999; Darian, 2003; Fleischman, 1991; Goatly, 1997; Semino, 2008). These functions are spelled out by the *LGSWE* per word class – with more or less explicit reference to metaphor – and are intrinsically linked to what appears as informational, and abstract, production with elaborate reference structures

in Biber's (1988) model. In one or the other form, many of these form-function relations have also been identified in the literature on metaphor (Boyd, 1993; Darian, 2003; Semino, 2008). The analyses also showed that distinct types of metaphor are distributed in a highly unequal way, with indirect metaphor use by far more frequent across all registers, but in particular in academic prose. In all this, metaphor use in academic prose may appear largely "literal" to the reader in typical reading situations, and be possibly even represented and processed as "literal language" in behavior – despite the fact that metaphorical meanings and cross-domain mappings can be identified on a symbolic level. This was supported by the fact that in my experiments, participants – regardless of their level of expertise preferred statements with conventional metaphorical base terms (vehicles) in categorization form (A is B), which appears to indicate categorization also as a mode of processing (cf. Bowdle & Gentner, 2005).

At the same time, it seems that metaphorical language in academic prose can also be used in interpersonal and personal functions, such as in (d) explanation and exposition (e.g., Boyd, 1993; Goatly, 1997; Hoffman, 1985; Semino, 2008), (e) the conveyance of authorial stance (cf. Biber et al., 1999; Biber, 2006a, 2006b; Charles, 2003; Goatly, 1997; Hyland, 2004a, 2004b; Semino, 2008), and (f) persuasion (e.g., Goatly, 2007; Semino, 2008). In this latter group of functions, it seems, metaphor may work as a tool for transmitting messages between people on a social level, but in a way that respects the stylistic conventions of academic language usage, and thus is still relatively devoid of polyvalence, overt expression of subjective goals (cf. Hunston, 1994; Hunston & Thompson, 2000; Hyland, 2004b, 2009b), and figurativeness in general (Giles, 2008). From the present study, it seemed that conveyance of stance (e) and persuasion (f) may be achieved mostly by means of a set of conventional, mostly inconspicuous metaphors across the lexical word classes, such as verbs and adjectives, which manage the particular politeness and objectiveness conventions of different sub-registers of academic prose. Here, finally, metaphor appears in its traditional paper as a rhetorical device for influencing the readership in an indirect way.

By contrast to the general restriction of metaphor use in academic prose to inconspicuous, conventional and "exact" metaphors, the use of metaphor in the other resisters, particularly in news and fiction (both of which have entertainment functions, and, as written registers, are produced without the real-time constraints of conversation), may allow for a higher degree of polyvalence and possibly vividness and deliberateness (cf. Steen, in press). In news, metaphors seem to be used often deliberately to catch the attention of readers, to entertain them, and to make opinion-driven punch lines (cf. Krennmayr, 2010). In fiction, metaphors used may cater to stylistic pleasure and to reveal new perspectives on topics of cognitive and emotional interest to the readers (cf. Dorst, 2010). In conversation, which is expressive by definition, metaphors may be expected to be commonly used to

express emotions, however, probably due to on-line production constraints, mostly in highly conventional word use without much deliberateness (cf. Kaal, 2012).

On a methodological note, these results could be achieved since the present study treated metaphorically used language as *potentially metaphorical* at a symbolic level of analysis, which meant that annotation could remain agnostic towards assumptions about the conceptual structure underlying the language, both in terms of symbolic and behavioral analyses; but that on the other hand hypotheses could be generated for the level of processing. It also meant that the corpus study could include function words such as determiners and prepositions[55] and keep both conventional and novel uses of metaphor in the analysis, as well as deliberate and non-deliberate usage. All this provided the analysis with ample opportunity to explore the many facets of metaphor usage in natural discourse. Thus, while other studies, especially more traditional or rhetoric-oriented ones, may have preferred to exclude function words, non-deliberate or conventional metaphor use, the present study adopted a broad approach towards metaphor including all potential cases of metaphor-related usage to explore the full variety.

8.3 Limitations and Methodological Insights

8.3.1 Annotation. As far as what other possible resources might have been, recruiting specialized and diachronic dictionaries was not practicable for our particular goal, which after all was to produce annotations in a corpus of a reasonable size that is not limited to academic discourse. This means that a few cases of specialized lexis that could have been identified in a straightforward manner may have remained borderline cases in my study. However, since the rate of borderline cases in academic prose was similar to the other registers (among all lexical units, academic prose had 1.0 % WIDLIIs, news 1.1%, fiction 0.9% and conversation 0.9%), there was only a small group of borderline cases.

8.3.2 Quantitative analyses. The present study used chi-square and hierarchical log-linear tests (HLLT) to compute the interaction of the respective variables. While these statistical models have been commonly used in corpus linguistics, problems with it have been discussed as well (Rietveld, Hout, & Ernestus, 2004). In particular, the HLLT and chi-square tests measure words as independent cases, which is not entirely suited to the fact that words are almost always parts of syntagmatic

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[55] A quantitative analysis of the lexical word classes only (excluding the remainder, conjunctions, determiners, and prepositions) showed that metaphor-related words are distributed in the same way across registers, but with slightly higher proportions: academic prose (19.8%), news (18.3%), fiction (13.5%), and conversation (8.9%).

constructions, and pertain to sentences, paragraphs, and texts written by specific authors. More recently, multi-way regression analysis has been proposed as a possibly more suitable way of analysis (cf. Jaeger, 2008), but at the time of running our analyses, such models were not available.

Another issue that the current study has to face is that of representativeness of the corpus. In comparison with other corpora analyzed in corpuslinguistics, the *VUAMC* is not particularly big, which means eventually that findings should be somewhat cautiously extrapolated to the reality of academic prose. The present study has taken care to proceed with due caution in this respect. Automatic annotation, that would have rendered a larger annotated corpus, was not feasible at the time of corpus compilation (and seemingly is still no viable option). Even though a few computational tools have been introduced that could aid the automatic identification of metaphorical language (cf. Berber-Sardinha, 2008; Fass, 1991; Martin, 1994; Mason, 2004), their degree of precision is still considered problematic. Extensive case studies with the tool WMatrix (Koller et al., 2008; Rayson, 2009; Semino et al., 2009) showed that metaphor identification here basically depends on a comparable amount of manual work, while the automatic semantic tagging proceeded on a relative general level (Herrmann, 2009b). Yet the *VUAMC* is by far the largest and varied corpus that has been annotated at a high degree of reliability and specificity. Therefore, it is a contribution both to the corpslinguistic study of academic prose and to the study of metaphor that cannot be underestimated.

8.3.3 Qualitative analyses. This study combined a quantitative approach to metaphor with more qualitative hands-on work in Chapters 4 and 6. However, the qualitative analyses did not exceed paragraph length and were normally restricted to sentence-length or below. Analyses of larger data samples of academic prose are thus desirable to reveal even more insights about the features and functions of metaphorical language in academic prose, or to validate hypotheses. Specifically, an analysis that takes into account text position (analyzing initial, middle, end paragraphs), with the text-structuring functions of metaphor being well described in the literature (e.g., Cameron & Low, 2004; Ponterotto, 2003), might reveal interesting patterns. Lastly, the conceptual level of metaphor analysis was theoretically present throughout this thesis, but was not further explored in examinations of their own right (cf. Herrmann, 2009a).

8.3.4 Behavioral study. Chapter 7 was designed to obtain empirical evidence of metaphor processing in academic psychological discourse. As reported above, no effect of expertise could be obtained on grammatical form preference ratings (and by inference, on metaphor processing). Possible reasons have been discussed at length

in Chapter 7, which resulted in a number of advices for future studies, with respect of manipulating the degree of expertise, the concreteness and conventionality of materials, and the methodology. In particular, the grammatical concordance principle (Bowdle & Gentner, 2005) seems to be tailored to measuring the linguistic conventionality of metaphor which corresponds with the lexicalization of metaphorical senses, but not the conventionality or familiarity of underlying mappings as a whole. Another issue that many cognitive- and psycho-linguistic studies – as the present one – have to face is that *offline* measures are not a direct assessment of *on-line* processes, but of their products (e.g., Fletcher, 2006; Kendeou & van den Broek, 2007). In the career of metaphor paradigm, grammatical form preference tasks have thus been combined with an online measure, reading time. In my study, for practical reasons, incorporating an online measure was, however, not feasible.

8.4 Implications and Future Research

The present study has a number of implications for diverse fields of study and application. On a general level, it has been a contribution to three main fields, the (a) the cognitively-informed, discourse-oriented, metaphor studies, (b) the systemic-functional approach to register studies, in particular, to academic prose, and (c), the cognitive psychology of discourse comprehension. With regard to (a), the present research has demonstrated how metaphor studies can benefit from deepening the already existent link to the study of register, benefitting from a vast body of methodological, theoretical and descriptive knowledge that can be exploited for metaphor analysis. With regard to (b), the present study has shown that (academic) register studies should factor in the linguistic phenomenon metaphor, with its indirect, direct, and implicit forms across word classes – simply because relation to metaphor can explain a part of the variation of linguistic features and functions across registers. In terms of (c), applying a rigorous linguistic perspective to the cognitive-psychological study of metaphor processing has shed new light on material construction, but also suggested a slight theoretical modification of the career of metaphor theory.

Regardless of the main perspective adopted, the established link between metaphor studies and register analysis opens up a myriad of future possibilities for study, on the levels of linguistic forms, conceptual structures, cognitive representations, and communicative functions (in the sense of Steen, 2011a). Firstly, more examination is needed of the textual dimension of metaphor use. In particular, metaphor's relation with finer-grained factors of lexico-grammatical patterning needs more attention, such as passive voice, text and sentence position, or formulaic

language, but also broader factors such as authorial and disciplinary style, genre, communicative mode (spoken or written), and, last, but not least, content. (It remains an open question how specialized metaphorical meanings are distributed in comparison with more accessible "academic vocabulary" and "general service vocabulary"; Hirsh, 2010). In this respect, the role of collocations and formulaic language is of special interest, both at the level of general discourse (Deignan, 2005) and on that of academic prose (e.g., Biber, 2006b; Biber et al., 2004; Biber, 2009; Biber et al., 1999; Barlow & Kemmer, 2000; Hyland, 2008a). Another topic that came up in the present study is the role of personification (cf. Low, 1999, 2005) / inanimate agency (cf. Dorgeloh & Wanner, 2009; Master, 1991), also in comparison with other registers, such as fiction (Dorst, 2011b). The present study put an emphasis on the quantitative examination of linguistic metaphor, while qualitative analysis was restricted to relatively short fragments. Future qualitative studies could examine aspects of metaphorical language use in academic prose in larger textual units. In terms of methodology, the present study adopted a strictly comparative and synchronic take on metaphor. However, variants of *MIP*/*MIPVU* could be applied incorporating specialized resources (specialist dictionaries or informants), or with a diachronic perspective on the highly conventionalized scientific terms that are often metaphorical due to diachronic variation and semantic change. In terms of corpus size, future studies should aim big: The present study used manual annotation to ensure reliable and exact annotation, but through this, it was relatively restricted in sample size. With the automatic tagging of metaphorical language being under development at an increasing level of quality, the results of the present study, including the *VUAMC* (Steen, Dorst, Herrmann, Kaal, Krennmayr, & Pasma, 2010), could aid the creation of automatic tools.

Secondly, with regard to the conceptual level of metaphor analysis, further examination is needed of the particular mappings that can be identified in academic prose, possibly in relation to the abovementioned factors such as style, content, genre, and discipline. Further examination into the apparent relation between functional word classes /spatial source domains and lexical word classes/a wider range of source domains could reveal important knowledge about the conceptual structures of academic discourse. Such examinations should give the conceptual analysis of metaphor its own right, applying a maximally explicit and systematic procedure (Steen, 1999, 2009; cf. Herrmann, 2009a).

Thirdly, more study is needed of the cognitive processes and products of metaphorical language use and thought in academic discourse. The present study pointed out several ways in which this level may be approached, with a combination of *offline* and *on-line* measures of processing, a more pronounced contrast between participant groups in terms of expertise, and, with regard to the career of metaphor theory (Bowdle & Gentner, 2005), the stricter manipulation of metaphor conventionality at the level of lexical units. What is more, in specialized domains of

discourse (such as academic discourse), the use of metaphorical many terms appears to be domain-specific (as opposed to domain-general; cf. Bowdle & Gentner, 2005), which influences lexicalization / conventionality, and therefore, assumedly, metaphor processing. With very few studies present, there is hence a great need of more research on the influence of academic subdomain and genre on the comprehension processes and products of the linguistic forms of metaphor. Generally, future studies could examine a greater range of linguistic forms of metaphor in academic discourse, including indirect, direct, and implicit forms. Yet other studies could examine gestures accompanying metaphor as a window into the behavioral dimension of discourse, as already demonstrated by studies such as Corts and Pollio (1999) and Mittelberg and Waugh (2009) for university lectures, and Littlemore (forthcoming) for elicited explanations of management theory. The factoring in of the variables discourse community, disciplinary expertise, and multimodal expression of metaphor is likely to reveal exciting evidence.

This leads me to the fourth and last topic, linked to the communicative dimension, deliberateness in metaphor use (Steen, 2011a, in press; for a critical perspective see Gibbs, 2011a; Musolff, 2011). Here, more research such as Beger's (2011) examination of colleague lectures is needed, specifically into the indirect forms of metaphor. Running analyses on deliberateness in combination with factors such as register, genre, communicative mode, discipline, and multimodality will lead to important new insights about metaphor in academic discourse.

There are several possible fields of practical application of the present findings, such as higher education instruction (e.g., Cameron & Low, 1999a; Littlemore, 2009; Littlemore & Low, 2006; Low, 2008a) and academic specialist communication on expert-expert and expert-lay levels (e.g., Glynn, 2008; Knudsen, 2003; Larson, 2009; Littlemore, forthcoming; Nerlich, Elliott, & Richardt, 2005; Semino, 2008). To give an example, in the field of "second language instruction", proficient metaphor use is associated with higher level language skills (cf. Lindstromberg, 1991), specifically with regard to idioms (Deignan, 2003). Metaphorical word use is relatively culture-specific (Boers & Littlemore, 2003; Kövecses, 2005; for behavioral evidence, see e.g., Boroditsky, 2001; Casasanto et al., 2004), and – as the present study has shown – , also dependent on discipline and register. For these reasons, it can hence be a potential obstacle not only to international learners of academic English (cf. Littlemore, 2001; Littlemore et al., 2011). Since few of the studies of metaphor in university-level education and second language learning have focused on metaphor on the grammatical level or used a corpus of comparable size, the findings gathered by the present thesis may thus be a welcome source of information to aid learners in mastering the potential pitfalls. Another example of application is "the public understanding of science", where metaphor has been identified as an important factor in the transmission of scientific and technological expertise into contemporary life, with strong ideational and

interpersonal functions, including the transmitting of ideologies (cf. Goatly, 2007; Semino, 2008). The knowledge gathered by the present thesis about typical lexico-grammatical features, communicative functions, and cognitive representations of metaphor in academic discourse may ultimately help informing the "understand[ing of] science–public interactions, [and] challeng[ing] scientific rhetorics where they are problematic or unjustified" (Condit, Lynch, & Winderman, 2012, p. 397).

More research on the role of metaphor in (English) academic discourse is hence important, not only because it helps to provide better instruction to learners at university level, both in terms of disciplinary content and language skills, or because scientists and scholars can be advised in enhancing their academic communication. It is also important in the light of a steadily increasing number of international speakers/writers of academic English (see, e.g., Hyland, 2009a; Mauranen, 2009), and, ultimately, in the light of an increased power of the scientific realm in everyday life, with academic discourse as "the dominant mode for interpreting reality and our own existence" (Hyland, 2011a, p. 172; cf. Halliday & Martin, 1993). Diverse fields of application can hence benefit from the unprecedentedly comprehensive account of metaphor use in academic prose – in terms of data on linguistic forms and their communicative functions, on the underlying conceptual structures, and on cognitive aspects of understanding metaphor in academic discourse. With this high level of complexity and detail, the full picture of metaphor in academic discourse is, however, still far from being fleshed out. The present thesis may be seen as a comprehensive sketch that will hopefully be regarded as useful by many more studies to come.

Appendices

Appendix A

Chapter 5

1)	*Academic, A6U: 'Her Dress Hangs Here': De-Frocking the Kahlo Cult.* Oriana Baddeley, Oxford Art Journal, Oxford University Press, Oxford (1991), 10-17. Sample containing about 27,329 words from a periodical (domain: arts)[56].
2)	*Academic, ACJ: Principles of criminal law.* Ashworth, Andrew. Oxford University Press, Oxford (1991). Sample containing about 37,678 words from a book (domain: social science).
3)	*Academic, ALP: A Non-punitive Paradigm of Probation Practice: Some Sobering Thoughts. Singer, Lawrence.* British journal of social work. Oxford University Press, Oxford (1991). Sample containing about 25,632 words from a periodical (domain: social science).
4)	*Academic, AMM: Fossils: The key to the past.* Fortey, Richard. London: Natural History Museum Publications, 1991, pp. 52-123. Sample containing about 39,563 words from a book (domain: natural sciences).
5)	*Academic, AS6: Tackling the inner cities: The 1980s reviewed, prospects for the 1990s.* Pimlott, Ben; MacGregor, Susanne (eds.). Oxford University Press, Oxford (1991), 1-92. Sample containing about 30,938 words from a book (domain: social science).
6)	*Academic, B17: Crime.* Marsh, Ian, Longman Group UK Ltd, Harlow (1992), 1-94. Sample containing about 34,305 words from a book (domain: social science).
7)	*Academic B1G: Handling geographical information: Methodology and potential applications.* Blakemore, Michael; Masser, Ian (eds.), Longman Scientific & Technical, Harlow (1991), 55-176. Sample containing about 38,559 words from a book (domain: applied science).
8)	*Academic CLP: The mind at work: Psychological ergonomics.* Singleton, W. T., Cambridge University Press, Cambridge (1989), 1-129. Sample containing about 40,742 words from a book (domain: applied science).
9)	*Academic CLW: Frameworks for teaching: Readings for the intending secondary teacher.* Dale, Roger; Fergusson, Ross; Robinson, Alison (eds.), Hodder & Stoughton Ltd, Sevenoaks, Kent (1992), 201-299. Sample containing about 38,714 words from a book (domain: social science).
10)	*Academic CRS: Policies for diversity in education.* Booth, Tony; Swann, Will; Masterton, Mary; Potts, Patricia (eds.), Routledge & Kegan Paul plc, London (1992), 112-209. Sample containing about 40,250 words from a book (domain: social science).
11)	*Academic CTY*: *White mythologies: Writing history and the West.* Young, Robert, Routledge & Kegan Paul plc, London (1990), 1-90. Sample containing about 43,131

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[56] There are two divergent ways in which excerpts are classified in the BNC Baby: as sub-registers in the metadata embedded in the xml codes (see Table A1), and in terms of domains in the bibliography (as in this list). At times, the classifications seem to contradict each other. In the present thesis, I report both classifications to provide the full picture.

words from a book (domain: world affairs).

12) *Academic EA7: France in the making, 843-1180.* Dunbabin, Jean, Oxford University Press, Oxford (1991), 223-335. Sample containing about 25,531 words from a book (domain: world affairs).

13) *Academic ECV: The Philosopher's Child.* Hughes, Judith. In *Feminist perspectives in philosophy.* Griffiths, Morwenna; Whitford, Margaret (eds.), MM Publishers Ltd, Basingstoke (1989), 1-109. Sample containing about 40,343 words from a book (domain: belief and thought).

14) *Academic EW1: The age of Balfour and Baldwin, 1902-1940.* Ramsden, John, Longman Group UK Ltd, Harlow (1978), 65-151. Sample containing about 41,695 words from a book (domain: world affairs).

15) *Academic FEF: Lectures on electromagnetic theory.* Solymar, Laszlo, Oxford University Press, Oxford (1984), 5-118. Sample containing about 26,854 words from a book (domain: applied science).

Figure A1. Overview of excerpts from BNC files: Academic prose[57]

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[57] Based on Burnard (2003, November 22).

Table A1

Overview of Annotated Files From BNC Baby: Academic Prose

File ID	Sub-register	BNC			VUAMC	
		Total no. words	Total no. divisions	ID no. file division	No. lexical units
A6U	Humanities arts	27,329	6	2	2,814
ACJ	Polit law edu	37,678	2	1	4,189
ALP	Soc science	25,632	4	1	2,253
AMM	Nat science	39,563	2	2	3,866
AS6	Soc science	30,938	4	1	3,366
AS6	Soc science	id	id	2	2,840
B17	Soc science	34,305	3	2	1,608
B1G	Soc science	38,559	2	2	3,006
CLP	Soc science	40,742	2	1	3,368
CLW	Polit law edu	38,714	1	1	3,748
CRS	Polit law edu	40,250	3	1	2,044
CTY	Humanities arts	43,131	5	3	3,434
EA7	Humanities arts	25,531	3	3	2,771
ECV	Humanities arts	40,343	7	5	3,847
EW1	Humanities arts	41,695	2	1	3,708
FEF	Nat science	26,854	4	3	2,703
Total	__	522,264	__	__	49,561

Note. Total number of lexical units includes DFMAs and genitive apostrophes; Humanities arts = humanities, arts, Nat science = natural sciences, Polit law edu = politics, law, education; Soc Science = social sciences.

Table A2

Distribution of Non-MRWs vs. MRWs Across Word Classes and Registers

Register		AJ	AV	CJ	DT	N	PR	V	RE	Total
					Word class					
Academic prose	Non-MRW	82.4%	89.9%	98.6%	91.9%	82.4%	57.5%	72.3%	97.4%	81.5%
	MRW	17.6%	10.%	1.4%	8.1%	17.%	42.5%	27.7%	2.6%	18.5%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
News	Non-MRW	79%	89%	99.1%	94.%	86.8%	61.9%	72.4%	97.5%	83.6%
	MRW	21%	11%	0.9%	5.9%	13.%	38.%	27.%	2.5%	16.%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Fiction	Non-MRW	80.%	90.%	99%	92.%	89.%	66.%	84.%	99.%	88.%
	MRW	19.%	9.3%	1%	7.6%	10.%	33.%	15.%	0.9%	11.9%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Conversation	Non-MRW	92.%	84.%	91.%	92.%	66.%	90.%	99.%	98.%	86.%
	MRW	7.5%	15.6%	8.3%	7.7%	33.8%	9.1%	0.2%	1.5%	13.3%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total	Non-MRW	81.6%	90.9%	98.8%	91.1%	86.7%	62%	81.3%	98.9%	86.4%
	MRW	18.%	9.1%	1.2%	8.9%	13.3%	38%	18.7%	1.1%	13.6%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note. AJ=Adjectives; AV=Adverbs; CJ=Conjunctions; DT=Determiners; N=Nouns; PR=Prepositions; V=Verbs; RE=Remainder.

Table A3

Standardized Residuals of Non-MRWs and MRWs Across Word Classes: By Register

Register			Word class						
		AJ	AV	CJ	DT	N	PR	V	RE
Academic prose	Non-MRW	0.7	4.7**	10.4**	9.5**	1.2	-21.4**	-9.2**	11.7**
	MRW	-1.5	-9.8**	-21.9**	-19.9**	-2.5*	45.0**	19.3**	-24.5**
News	Non-MRW	-3.1**	2.7**	8.4**	8.6**	4.0**	-17.0**	-10.9**	10.5**
	MRW	7.0**	-6.2**	-18.9**	-19.5**	-9.1**	38.5**	24.6**	-23.8**
Fiction	Non-MRW	-4.4**	1.5	5.8**	3.2**	1.4	-14.9**	-4.2**	10.3**
	MRW	11.9**	-4.0**	-15.8**	-8.7**	-3.8**	40.6**	11.6**	-28.0**
Conversation	Non-MRW	-2.4	0.1	3.2**	-5.3**	0.4	-13.5**	-1.7	9.5**
	MRW	8.5**	-0.5	-11**	18.4**	1.5	46.9**	5.7**	-33.0**
Total	Non-MRW	-5.9**	5.3**	13.6**	7.5**	0.7**	-35.5**	-10.6**	24.2**
	MRW	14.8**	-13.3**	-34.3**	-19**	-1.8	89.3**	26.7**	-60.9**

**significant at α=.01

Note. Standardized residuals are based on chi-squares computed for the four registers (and hence different from those in Table A4). AJ=Adjectives; AV=Adverbs; CJ=Conjunctions; DT=Determiners; N=Nouns; PR=Prepositions; V=Verbs; RE=Remainder.

Table A4

Standardized Residuals of Non-MRWs and MRWs Across Registers: By Word Class

Word Class		Register			
		Academic prose	News	Fiction	Conversation
AJ	Non-MRW	0.6	-1.8	-0.6	2.4
	MRW	-1.3	3.8**	1.2	-5.0**
AV	Non-MRW	-0.5	-0.9	-0.1	1.1
	MRW	1.6	3.0**	0.3	-3.6**
CJ	Non-MRW	-0.1	0.1	0.1	-0.1
	MRW	0.8	-1.3	-0.9	1.2
DT	Non-MRW	0.7	2.3	0.9	-4.6**
	MRW	-2.2	-7.4**	-2.9**	14.6**
N	Non-MRW	-5.3**	0.2	2.9**	4.1**
	MRW	13.5**	-0.5	-7.5**	-10.3**
PR	Non-MRW	-4.6**	-0.1	3.8**	2.7**
	MRW	5.9**	0.1	-4.9**	-3.4**
V	Non-MRW	-9.0**	-8.8**	3.1**	11.7**
	MRW	18.8**	18.3**	-6.4**	-24.4**
RE	Non-MRW	-1.1	-1.0	0.1	1.0
	MRW	10.2**	9.5**	-1.4	-9.9**
Total	Non-MRW	-11.6**	-6.3**	4.0**	14.0**
	MRW	29.3**	15.8**	-10.2**	-35.2**

**significant at $\alpha = .01$

Note. Standardized residuals are based on chi-squares computed for each of the eight word class samples (and hence different from those in Table A3). AJ=Adjectives; AV=Adverbs; CJ=Conjunctions; DT=Determiners; N=Nouns; PR=Prepositions; V=Verbs; RE=Remainder.

Table A5

Distribution of Metaphor Types Across Registers: Standardized Residuals

Metaphor type	Register			
	Academic prose	News	Fiction	Conversation
Indirect	29.7**	+15.4**	-11.2**	+15.4**
Direct	-5.2**	+3.5**	+9.4**	+3.5**
Implicit	5.0**	+1.8	-1.9	+1.8
Non-met	-11.6**	-6.3**	+4.0**	-6.3**

*significant at α=.05
**significant at α=.01

Table A6

Distribution of Metaphor Types Across Academic Sub-Registers: Standardized Residuals

Metaphor type	Sub-register			
	Humanities & arts	Natural science	Politics, law & education	Social science
Indirect	0.4	-3.0**	-0.6	2.0*
Direct	2.1*	2.9**	-2.8**	1.7
Implicit	2.9**	0.2	-0.5	-2.7**
Non-met	0.4	1.3	0.4	-0.7

*significant at α=.05
**significant at α=.01

Table A7
Sentence Length across Sub-Registers

		Sub-register			
Sentence length		Humanities & arts	Natural science	Politics, law & education	Social science
Very short	Freq.	4.0%	9.4%	4.0%	2.7%
1 to 10 words	Std. Res.	- 1.9	+19.8**	-1.4	-9.5**
Short	Freq.	15.4%	26.4%	19.2%	18.8%
11 to 20 words	Std. Res.	-9.9**	+14.3**	1.0	0.0
Medium	Freq.	24.3%	27.1%	30.3%	36.9%
21 to 30 words	Std. Res.	-13.5**	-4.4**	0.4	15.9**
Long	Freq.	56.3%	37.1%	46.5%	41.6%
31 and more words	Std. Res.	17.6**	-11.6**	-0.6	-9.9**
Total	Freq.	100.0%	100.0%	100.0%	100.0%

**significant at $\alpha=.01$

Appendix B

Chapter 6

Table B1
Proper Nouns in the informational Registers: Relation to Metaphor

Relation to metaphor	Register		
	Academic prose	News	Total
Non-MRW	1,058	2,419	3,477
MRW	1	10	11
Total	1,059	2,429	3,488
	(30.4%)	(69.6%)	(100.0%)

Note. Total percentages in brackets.

Table B2
Distribution of Metaphor-Related Where *(Tagged as Conjunction) Across Registers*

Relation to metaphor	Register			
	Academic prose	News	Fiction	Conversation
Non-MRW	12	14	16	7
MRW	28	7	1	0
Total	40	21	17	7

Appendix C

Chapter 7

> ➤ Attention is like a filter.
> ➤ The cerebral cortex is like a map.
> ➤ Circadian rhythms are like clocks.
> ➤ Critical periods are like windows.
> ➤ Depression is like a disease.
> ➤ Dreams are like jigsaw puzzles.
> ➤ Forgetting is like decay.
> ➤ Groups of neurons are like circuits.
> ➤ Long-term memory is like a warehouse.
> ➤ Mental representations are like models.
> ➤ The mind is like a computer.
> ➤ Neurotransmitters are like messengers.
> ➤ Repression is like censorship.
> ➤ Short-term memory is like a workspace.
> ➤ The spinal cord is like a superhighway.
> ➤   Stereotypes are like caricatures.

Figure C1. Technical figuratives. This figure shows one type of stimulus used in the grammatical form preference task.

> ➤ Children are like sponges.
> ➤ Conformity is like a straitjacket.
> ➤ Consciousness is like a stream.
> ➤ Education is like a ladder.
> ➤ Faith is like an anchor.
> ➤ Ideas are like possessions.
> ➤ Ignorance is like blindness.
> ➤ Inspiration is like a spark.
> ➤ Intelligence is like a gift.
> ➤ Knowledge is like a tree.
> ➤ Laughter is like medicine.
> ➤ Love is like a rose.
> ➤ Lust is like hunger.
> ➤ Motivation is like fuel.
> ➤ Prejudice is like poison.
> ➤   Smiles are like magnets.

Figure C2. Everyday figuratives. This figure shows one type of stimulus used in the grammatical form preference task.

> ➢ Alcoholism is an addiction.
> ➢ Anger is an emotion.
> ➢ Attributions are inferences.
> ➢ Case studies are descriptive research.
> ➢ The DSM-IV is a manual.
> ➢ Extroversion is a personality trait.
> ➢ Hormones are chemicals.
> ➢ Language is a symbol system.
> ➢ Maintenance rehearsal is repetition.
> ➢ Phantom limbs are illusions.
> ➢ Phobias are fears.
> ➢ Praise is reinforcement.
> ➢ Prototypes are concepts.
> ➢ Reflexes are automatic responses.
> ➢ Schizophrenia is a psychosis.
> ➢   Traumatic experiences are stressors.

Figure C3. Literal categorization statements. This figure shows one type
of stimulus used in the grammatical form preference task.

> ➢ Attachment is like imprinting.
> ➢ Classical conditioning is like operant conditioning.
> ➢ Clinical psychologists are like psychiatrists.
> ➢ Delusions are like hallucinations.
> ➢ Electroconvulsive therapy is like psychosurgery.
> ➢ Empathy is like altruism.
> ➢ Episodic memories are like semantic memories.
> ➢ The mode is like the mean.
> ➢ FMRI scans are like PET scans.
> ➢ Hypotheses are like theories.
> ➢ Meditation is like hypnosis.
> ➢ Recall is like recognition.
> ➢ Rods are like cones.
> ➢ Rorschach inkblot tests are like Thematic Apperception Tests.
> ➢ Self-efficacy is like self-esteem.
> ➢   Sensation is like perception.

Figure C4. Literal comparison statements. This figure shows one type of
stimulus used in the grammatical form preference task.

On the following pages you will be presented with pairs of statements describing various psychological topics. One statement in each pair asserts that something is LIKE something else, and the other asserts that something IS something else. For example, you might receive a pair such as *gender is like sex* and *gender is sex.* Your task is to consider the meaning of both statements in each pair, and then to decide which of the two statements you prefer. Indicate your preference by circling the appropriate number on the scale provided between the two statements. The scale ranges from 1 to 10, where 1 indicates that you strongly prefer the statement on the left (i.e., something IS LIKE something else), and 10 indicates that you strongly prefer the statement on the right (i.e. something IS something else). Note that the strength of your preference for one statement over the other may vary from pair to pair. Thus, the more you prefer the statement on the left, the closer your answer should be to 1, and the more you prefer the statement on the right, the closer your answer should be to 10.

Make sure that you read both statements in each pair before responding. Also, make sure that you provide a response for each pair of statements. If you understand the nature of this task – and when the experimenter says "please turn the page" – you may begin.

Figure C5. Instructions grammatical form preference task. This text was read out to the participants before the test phase in Experiment 1 and Experiment 2.

Bibliography

Aisenman, R. A. (1999). Structure-mapping and the simile-metaphor preference. *Metaphor and Symbol, 14*(1), 45-51.

Ankersmit, F. R. (1994). *History and tropology: The rise and fall of metaphor*. Berkely: University of California Press.

American Psychological Association (2010). *Publication manual of the American Psychological Association (APA)*. 6th ed. Washington, DC: American Psychological Association.

Arbib, M. A., & Hesse, M. B. (1986). *The construction of reality*. Cambridge: Cambridge University Press.

ArcaneXor (2009, December 1). Re: Wort boil, lid on or off? [Online forum comment]. Retrieved from http://www.homebrewtalk.com/f39/wort-boil-lid-off-97345/

Aubusson, P., Harrison, A. G., & Ritchie, S. M. (2006). *Metaphor and analogy in science and education.* Dordrecht: Springer.

Axler, R. et al. (2011, January 31). Water column. [Entry in online glossary of educational data base]. Retrieved from http://www.waterontheweb.org/resources/glossary.html#W

Baake, K. (2003). *Metaphor and knowledge: The challenges of writing science*. Albany: State University of New York Press.

Barlow, M., & Kemmer, S. (Eds.). (2000). *Usage based models of language*. Stanford: CSLI Publications.

Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology, 59*, 617-645.

Bazerman, C. (1981). What written knowledge does: Three examples of academic discourse. *Philosophy of the Social Sciences 11*, 361-387.

Beger, A. (2011). Deliberate metaphors? An exploration of the choice and functions of metaphors in US-American college lectures. *metaphorik.de, 20*.

Beger, A. (forthcoming). Metaphors in the domain of psychology: The discourse of counseling vs. academic discourse. In J. B. Herrmann & T. Berber Sardinha (Eds.), *Metaphor in specialist discourse: Investigating metaphor use in technical, scientific and popularized discourse contexts*. Amsterdam: John Benjamins.

Bellezza, F. S. (1992). The mind's eye in expert memorizers' descriptions of remembering. *Metaphor and Symbolic Activity, 7*(3-4), 119-133.

Berber-Sardinha, T. (2008). Metaphor probabilities in corpora. In M. S. Zanotto, L. Cameron & M. do Couto Cavalcanti (Eds.), *Confronting metaphor in use* (pp. 127-147). Amsterdam: John Benjamins.

Biber, D. (1988). *Variation across speech and writing*. Cambridge: Cambridge University Press.

Biber, D. (2006a). Stance in spoken and written university registers. *Journal of English for Academic Purposes, 5*, 97-116.

Biber, D. (2006b). *University language: a corpus-based study of spoken and written registers*. Amsterdam: John Benjamins.

Biber, D. (2007). On the complexity of discourse complexity: A multi-dimensional analysis. In S. Conrad & D. Biber (Eds.), *Variation in English: Multi-dimensional studies* (pp. 215–240). London: Longman.

Biber, D. (2009). A corpus-driven approach to formulaic language in English: Multi-word patterns in speech and writing. *International Journal of Corpus Linguistics, 14*(3), 275-311.

Biber, D., & Conrad, S. (2001). Register variation: A corpus approach. In D. Schiffrin, D. Tannen & H. Hamilton (Eds.), *The handbook of discourse analysis* (pp. 175-196). Oxford: Blackwell.

Biber, D., Conrad, S., & Cortes, V. (2004). If you look at…: Lexical bundles in university teaching and textbooks. *Applied Linguistics, 25*(3), 371-405.

Biber, D., Johansson, S., Leech, G., Conrad, S., & Finegan, E. (1999). *The Longman Grammar of Spoken and Written English*. London: Longman.

Black, M. (1962). *Models and metaphors. Studies in language and philosophy*. Ithaca: Cornell University Press.

Black, M. (1993). More about metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 19-41). Cambridge: Cambridge University Press.

Boers, F., & Littlemore, J. (Eds.). (2003). Cross-cultural differences in conceptual metaphor: Applied linguistics perspectives. Special edition of *Metaphor and Symbol*, 18 (4).

Boroditsky, L. (2000). Metaphoric structuring: Understanding time through spatial metaphors. *Cognition, 75*, 1-28.

Boroditsky, L. (2001). Does language shape thought? English and Mandarin speakers' conceptions of time. *Cognitive Psychology, 43*(1), 1-22.

Bowdle, B. F., & Gentner, D. (2005). The career of metaphor. *Psychological Review, 112*(1), 193–216.

Boyd, R. (1993). Metaphor and theory change: What is 'metaphor' a metaphor for? In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 481–533). Cambridge: Cambridge University Press.

Brown, T. L. (2003). *Making truth: Metaphors in science*. Champaign: University of Illinois Press.

Burke, K. (1945/1969). *A grammar of motives*. Berkely: University of California Press.

Burnard, L. (2007, January). Miscellaneous other tags. Wordclass tagging in BNC XML. [Entry in *BNC User Reference Guide*]. Retrieved from http://www.natcorp.ox.ac.uk/docs/URG/posguide.html#m2misc

Burnard, L. (2003, November 22). List of works excerpted. Texts included in BNC Baby: Full alphabetical listing. [Entry in *BNC User Reference Guide*]. Retrieved from http://www.natcorp.ox.ac.uk/corpus/baby/thebib.html

Cameron, L. (1999). Operationalising metaphor for applied linguistic research. In L. Cameron & G. Low (Eds.), *Researching and applying metaphor* (pp. 3–28). Cambridge: Cambridge University Press.

Cameron, L. (2003). *Metaphor in educational discourse*. London: Equinox.

Cameron, L. (2008). A discourse approach to metaphor. In A. Tyler, Y. Kim & M. Takada (Eds.), *Language in the context of use: Cognitive and discourse approaches to language and language learning* (pp. 321-338). Berlin: Mouton de Gruyter.

Cameron, L. (2010). What is metaphor and why does it matter? In L. Cameron & R. Maslen (Eds.), *Metaphor analysis* (pp. 3-25). London: Equinox.

Cameron, L., & Low, G. (1999a). Metaphor. *Language Teaching, 32*(2), 77-96.

Cameron, L., & Low, G. (Eds.). (1999b). *Researching and applying metaphor*. Cambridge: Cambridge University Press.

Cameron, L., & Low, G. (2004). Figurative variation in episodes of educational talk and text. *European Journal of English Studies, 8*(3), 355-373.

Cameron, L., & Maslen, R. (Eds.). (2010). *Metaphor analysis*. London: Equinox.

Carter, R. (2004). *Language and creativity. The art of common talk*. London: Routledge.

Casasanto, D., & Boroditsky, L. (2008). Time in the Mind: Using space to think about time. *Cognition 106*, 579–593.

Casasanto, D., Boroditsky, L., Phillips, W., Greene, J., Goswami, S., Bocanegra-Thiel, S., . . . Gil, D. (2004). *How deep are effects of language on thought? Time estimation in speakers of English, Indonesian, Greek, and Spanish*. Paper presented at the 26th Annual Conference Cognitive Science Society.

Case, R. (1992). *The mind's staircase: Stages in the development of human intelligence*. Mahwah: Erlbaum.

Chafe, W. (1994). *Discourse, consciousness, and time: The flow and displacement of conscious experience in speaking and writing*. Chicago: University of Chicago Press.

Charles, M. (2003). 'This mystery. . .': a corpus-based study of the use of nouns to construct stance in theses from two contrasting disciplines. *Journal of English for Academic Purposes, 2*, 313-326.

Charles, M., Hunston, S., & Pecorari, D. (Eds.). (2009). *Academic writing: At the interface of corpus and discourse*. London: Continuum.

Charteris-Black, J. (2000). Metaphor and vocabulary teaching in ESP economics. *English for Specific Purposes, 19*(2), 149-165.

Charteris-Black, J. (2004). *Corpus approaches to critical metaphor analysis*. Basingstoke: Palgrave Macmillan.

Chi, M. T., Feltovich, P., & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science, 5*, 121-152.

Chi, M. T., Glaser, R., & Farr, M. J. (1988). *The nature of expertise*. Hillsdale: Erlbaum.

Chi, M. T., Glaser, R., & Rees, E. (1982). Expertise in problem solving. In R. Sternberg (Ed.), *Advances in the psychology of human intelligence* (Vol. 1, pp. 7-75). Hillsdale: Erlbaum.

Chilton, P. (1996). *Security metaphors: Cold war discourse from containment to common European home*. Berne: Peter Lang.

Cienki, A. (2010). Multi-modal metaphor analysis. In L. Cameron (Ed.), *Metaphor analysis: Research practice in applied linguistics, social sciences and the humanities*. London: Equinox.

Clark, A. (1997). *Being there: Putting brain, body, and world together again*. Cambridge: MIT Press.

Clark, H. H. (1973). Space, time, semantics, and the child. In T. Moore (Ed.), *Cognitive development and the acquisition of language* (pp. 27-63). New York: Academic Press.

Condit, C. M., Lynch, J., & Winderman, E. (2012). Recent rhetorical studies in public understanding of science: Multiple purposes and strengths. *Public Understanding of Science, 21*(4), 386-400.

Conrad, S., & Biber, D. (Eds.). (2001). *Variation in English: Multi-dimensional studies*. London: Longman.

Cooke, N. J., & Bartha, M. C. (1992). An empirical investigation of psychological metaphor. *Metaphor and Symbol, 7*(3), 215-235.

Cornelissen, J. P., Oswick, C., Thøger Christensen, L., & Phillips, N. (2008). Metaphor in organizational research: Context, modalities and implications for research — Introduction. *Organization Studies, 29*(1), 7-22.

Corrigan, R., Moravcsik, E. A., Ouali, H., & Wheatley, K. M. (Eds.). (2009). *Formulaic language* (Vol. 1; 2). Amsterdam: John Benjamins.

Corts, D., & Pollio, H. (1999). Spontaneous production of figurative language and gesture in college lectures. *Metaphor and Symbol, 14*(2), 81–100.

Corts, D. P., & Meyers, K. (2002). Conceptual clusters in figurative language production. *Journal of Psycholinguistic Research, 31*(4), 391-408.

Crawford Camiciottoli, B. (2007). *The language of business studies lectures: A corpus-assisted analysis*. Amsterdam: John Benjamins.

Croft, W., & Cruse, D. A. (2004). *Cognitive linguistics*. Cambridge: Cambridge University Press.

Darian, S. (1973). Similes and the creative process. *Language and Style, 6*(1), 48-57.

Darian, S. (2000). The role of figurative language in introductory science texts. *International Journal of Applied Linguistics, 10*(2), 163-186.

Darian, S. (2003). *Understanding the language of science*. Austin: University of Texas Press.

Davidson, D. (1978). What metaphors mean. *Critical Inquiry, 5*(1), 31-47.

De Knop, S. (1987). *Metaphorische Komposita in Zeitungsüberschriften*. Tübingen: Niemeyer

De Knop, S., Dirven, R., & Smieja, B. (Eds.). (2010). *Bibliography of metaphor and metonymy (METBIB). The interdisciplinary resource on figurative language*. Amsterdam: John Benjamins.

Debatin, B. (1995). *Die Rationalität der Metapher. Eine sprachphilosophische und kommunikationstheoretische Untersuchung. [The rationality of metaphor: An analysis based on the philosophy of language and communication theory]*. Berlin: De Gruyter.

Deignan, A. (1999). Linguistic metaphors and collocation in nonliterary corpus data. *Metaphor and Symbol, 14*(1), 19-36.

Deignan, A. (2003). Metaphorical expressions and culture: An indirect link. *Metaphor and Symbol, 18*(4), 255-271.

Deignan, A. (2005). *Metaphor and corpus linguistics*. Amsterdam: John Benjamins.

Deignan, A. (2006). The grammar of linguistic metaphors. In A. Stefanowitsch & S. T. Gries (Eds.), *Corpus-based approaches to metaphor and metonymy* (pp. 106–122). Berlin: Mouton de Gruyter.

Deignan, A. (2008). Corpus linguistics and metaphor. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought.* Cambridge: Cambridge University Press.

Deignan, A. (2009). Searching for metaphorical patterns in corpora. In P. Baker (Ed.), *Contemporary corpus linguistics*. London: Continuum.

Deignan, A., & Semino, E. (2010). Corpus techniques for metaphor analysis. In L. Cameron & R. Maslen (Eds.), *Metaphor analysis. resaerch practice in applied linguistics, social sciences and the humanities* (pp. 161-179). London: Equinox.

Del Lungo Camiciotti, G., & Tognini-Bonelli, E. (Eds.). (2004). *Academic Discourse: New insights into evaluation*. Berne: Peter Lang.

Demandt, A. (1978). *Metaphern für Geschichte*. Munich: C.H. Beck.

Dirven, R. (2002). Introduction. In R. Dirven & R. Pörings (Eds.), *Metaphor and metonymy in comparison and contrast* (pp. 1-38). Berlin: Mouton de Gruyter.

Dirven, R., & Pörings, R. (2002). *Metaphor and metonymy in comparison and contrast*. Berlin: Mouton de Gruyter.

Dirven, R., & Ruiz de Mendoza, F. (2010). Looking back at thirty years of Cognitive Linguistics. In E. Tabakowska, M. Choinski & L. Wiraska (Eds.), *Cognitive Linguistics in action* (pp. 14-70). Berlin: Mouton de Gruyter.

Dorgeloh, H., & Wanner, A. (2009). Formulaic argumentation in scientific discourse. In R. Corrigan, E. A. Moravcsik, H. Ouali & K. M. Wheatley (Eds.), *Formualic language* (Vol. 2: Acquisition, loss, psychological reality and functional explanations, pp. 523-544). Amsterdam: John Benjamins

Dorst, A. G. (2011a). *Metaphor in fiction: Language, thought and communication*. Oisterwijk: Box Press.

Dorst, A. G. (2011b). Personification in discourse: Linguistic forms, conceptual structures and communicative functions. *Language and Literature, 20*(2), 113-135.

Draaisma, D. (2000). *Metaphors of memory: A history of ideas about the mind*. Cambridge: Cambridge University Press.

Drew, P., & Holt, E. (1998). Figures of speech: Figurative expressions and the management of topic transition in conversation. *Language and Society, 27*, 495-522.

Dunbar, K. (2001). The analogical paradox: Why analogy is so easy in naturalistic settings, yet so difficult in the psychology laboratory. In D. Gentner, K. J. Holyoak & B. N. Kokinov (Eds.), *Analogy: Perspectives from Cognitive Science*. Cambridge: MIT Press.

Eco, U. (1976). *A theory of semiotics*. Bloomington: Indiana University Press.

Eco, U. (1984). *Semiotics and the philosophy of language*. Bloomington: Indiana University Press.

Eggins, S., & Martin, J. R. (1997). Genres and registers of discourse. In T. A. van Dijk (Ed.), *Discourse as structure and process* (pp. 230–256). London: Sage.

Eisele, J., & Lust, B. (1996). Knowledge about pronouns: A developmental study using a truth-value judgment task. *Child Development, 67*, 3086-3100.

Fahnestock, J. (1999). *Rhetorical figures in science*. Oxford: Oxford University Press.

Fass, D. (1991). Met*: A method for discriminating metonymy and metaphor by computer. *Computational Linguistics, 17*(1), 49–90.

Fauconnier, G., & Turner, M. (2008). Rethinking Metaphor. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 53-66). Cambridge: Cambridge University Press.

Field, A. (2009). *Discovering statistics using SPSS*: Sage.

Fleischman, S. (1991). Discourse as space/discourse as time: Reflections on the metalanguage of spoken and written discourse. *Journal of Pragmatics, 16*(4), 291-306.

Fletcher, J. M. (2006). Measuring Reading Comprehension. *SCIENTIFIC STUDIES OF READING, 10*(3), 323-330.

Flowerdew, J., & Peacock, M. (Eds.). (2001). *Research perspectives on English for academic purposes*. Cambridge: Cambridge University Press.

Forceville, C., & Urios-Aparisi, E. (Eds.). (2009). *Multimodal metaphor*. Berlin: Mouton de Gruyter.

Francis, G. (1994). Labelling discourse: an aspect of nominal group lexical cohesion. In M. Coulthard (Ed.), *Advances in written text analysis* (pp. 83-101). London: Routledge.

Gentner, D. (1982). Are scientific analogies metaphors? In D. S. Miall (Ed.), *Metaphor: Problems and perspectives* (pp. 106-132). Brighton: The Harvester Press.

Gentner, D. (1983). Structure-mapping: A theoretical framework for analogy. *Cognitive Science, 7*, 155-170.

Gentner, D., Bowdle, B., Wolff, P., & Boronat, C. (2001). Metaphor is like analogy. In D. Gentner, K. J. Holyoak & B. N. Kokinov (Eds.), *The analogical mind: Perspectives from cognitive science* (pp. 199-253). Cambridge: MIT Press.

Gentner, D., & Bowdle, B. F. (2001). Convention, form, and figurative language processing. *Metaphor and Symbol, 16* (3 & 4), 223-248.

Gentner, D., & Bowdle, B. F. (2008). Metaphor as structure-mapping. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 109-128). Cambridge: Cambridge University Press.

Gentner, D., & Gentner, D. R. (1983). Flowing waters or teeming crowds: Mental models of electricity. In D. Gentner & A. L. Stevens (Eds.), *Mental models* (pp. 99-129). Hillsdale: Erlbaum. (Reprinted from: M. J. Brosnan (Ed.), Cognitive functions: Classic readings in representation and reasoning. London: Greenwich University Press).

Gentner, D., & Grudin, J. (1985). The evolution of mental metaphors in psychology: A 90-year retrospective. *American Psychologist, 40*, 181-192.

Gentner, D., & Jeziorski, M. (1993). The shift from metaphor to analogy in western science. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 447-480). Cambridge: Cambridge University Press.

Gentner, D., & Kurtz, K. (2006). Relations, objects, and the composition of analogies. *Cognitive Science, 30*, 609-642.

Gentner, D., & Markman, A. B. (2006). Defining structural similarity. *The Journal of Cognitive Science, 6*, 1-20.

Gentner, D., & Wolff, P. (2000). Metaphor and knowledge change. In E. Dietrich & A. Markman (Eds.), *Cognitive dynamics: Conceptual change in humans and machines* (pp. 295-342). Mahwah: LEA.

Gibb, H., & Wales, R. (1990a). Metaphor or simile: Psychological determinants of the differential use of each sentence form. *Metaphor and Symbolic Activity, 5*(4), 199-213.

Gibb, H., & Wales, R. (1990b). Psychological responses to the concreteness characteristics of literal and metaphoric expressions. *Language and Cognitive Processes, 5*(1), 29-52.

Gibbs, R. (1994). *The Poetics of mind: Figurative thought, language and understanding*. Cambridge: Cambridge University Press.

Gibbs, R. (1999). Researching metaphor. In G. Low & L. Cameron (Eds.), *Researching and applying metaphor* (pp. 29-47). Cambridge: Cambridge University Press.

Gibbs, R. (2006). *Embodiment and cognitive science*. Cambridge: Cambridge University Press.

Gibbs, R. (2008). Metaphor and thought. The state of the art. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 3-13). Cambridge: Cambridge University Press.

Gibbs, R. (2011a). Are deliberate metaphors really deliberate? A question of human consciousness and action. *Metaphor and the Social World, 1*, 26-52.

Gibbs, R. W. (2011b). Evaluating conceptual metaphor theory. *Discourse Processes, 48*(8), 529-562.

Gibbs, R. (Ed.). (2008). *The Cambridge handbook of metaphor and thought*. Cambridge: Cambridge University Press.

Gibbs, R., & Lonergan, J. E. (2009). Commentary: Studying metaphor in discourse: Some lessons, challenges and new data. In A. Musolff & J. Zinken (Eds.), *Metaphor and Discourse*. Basingstoke: Palgrave Macmillan.

Gibbs, R., & Matlock, T. (2010). Metaphor, imagination, and simulation. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 161-176). Cambridge: Cambridge University Press.

Gilbert, G. N., & Mulkay, M. (1984). *Opening Pandora's box: A sociological analysis of scientists' discourse*. Cambridge: Cambridge University Press.

Giles, T. D. (2008). *Motives for metaphor in scientific and technical communication*. Amityville: Baywood.

Giora, R. (1997). Understanding figurative and literal language: The graded salience hypothesis. *Cognitive Linguistics, 8*(3), 183-206.

Giora, R. (2003). *On our mind. Salience, context, and figurative language*. Oxford: Oxford University Press.

Glucksberg, S. (2008). How metaphors create categories - quickly. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 67-83). Cambridge: Cambridge University Press.

Glucksberg, S., & Haught, C. (2006). On the relation between metaphor and simile: When comparison fails. *Mind & Language, 21*(3), 360–378.

Glucksberg, S., & Keysar, B. (1990). Understanding metaphorical comparisons: Beyond similarity. *Psychological Review, 97*(1), 3-18.

Glynn, S. M. (2008). Making science concepts meaningful to students: Teaching with analogies. In S. Mikelskis-Seifert, U. Ringelband, & M. Brückmann (Eds.), Four decades of research in science education: From curriculum development to quality improvement (pp. 113-125). Münster, Germany: Waxmann.

Goatly, A. (1997). *The language of metaphors*. London: Routledge.

Goatly, A. (2007). *Washing the brain – Metaphor and hidden ideology.* Amsterdam: John Benjamins.

Goffman, E. (1959). *The presentation of self in everyday life*. New York: Doubleday Anchor.

Goschler, J. (2007). Is this a metaphor? On the difficult task of identifying metaphors in scientific discourse. *Cultura, Lenguaje y Representación / Culture, Language & Representation, 5*, 27-41.

Goschler, J. (2008). *Metaphern für das Gehirn: Eine kognitiv-linguistische Untersuchung*. Berlin: Frank & Timme.

Grady, J. (1997). *Foundations of meaning: Primary metaphors and primary scenes*. Berkeley: University of California.

Grant, D., & Oswick, C. (Eds.). (1996). *Metaphor and organizations*. London: Sage.

Grice, H. P. (1975). Logic and conversation. In P. Cole & J. Morgan (Eds.), Syntax and semantics. Vol. 3. Speech acts (pp. 41-58). New York: Academic Press.

Griggs, R. A. (2006). *Psychology. A concise introduction*. New York: Worth.

Grothe, M. (Ed.). (2008). *I never metaphor I didn't like: A comprehensive compilation of history's greatest analogies, metaphors, and similes*. New York: HarperCollins.

Halliday, M. A. K. (2004a). *An introduction to functional grammar* (Third ed.). Oxford: Oxford University Press.

Halliday, M. A. K. (2004b). *The language of science* (Vol. 5). London: Continuum.

Halliday, M. A. K., & Hasan, R. (1976). *Cohesion in English*. London: Longman.

Halliday, M. A. K., & Hasan, R. (1985/1989). *Language, context, and text: aspects of language in a social-semiotic perspective*. Oxford: Oxford University Press.

Halliday, M. A. K., & Martin, J. R. (1993). *Writing science: Literacy and discursive power*: Routledge.

Hallyn, F. (Ed.). (2000). *Metaphor and analogy in the sciences*. Dordrecht: Kluwer.

Hanks, P. (2010). Nine issues in metaphor theory and analysis. *International Journal of Corpus Linguistics, 15*, 133-150.

Harris, R. J., Friel, B. M., & Mickelson, N. R. (2006). Attribution of discourse goals for using concrete- and abstract-tenor metaphors and similes with or without discourse context. *Journal of Pragmatics, 38*(6), 863-879.

Hellsten, I. (2008). Popular metaphors of biosciences: Bridges over time? *Configurations, 16*(1), 11-32.

Henderson, W. (1986). Metaphor in economics. In M. Coulthard (Ed.), *Talking about text* (pp. 109-127). Birmingham: University of Birmingham.

Henderson, W. (2000). Metaphor, economics, and ESP: Some comments. *English for Specific Purposes, 19,* 167-173.

Herrmann, J. B. (2009a). *Finding conceptual metaphor in academic discourse in five steps.* Paper presented at the International Conference of the Center for

Research on the Applications of Language (CRAL), University of La Rioja, Logrono.

Herrmann, J. B. (2009b). *Is a flexible instrument like a MOVEABLE TOOL? Examining the conceptual cases of metaphorically used words with two discourse-analytical methods.* Paper presented at the Annual Meeting of the Society for Text & Discourse (ST&D), Rotterdam.

Hesse, M. B. (1966). *Models and analogies in science*. Notre Dame: University of Notre Dame Press.

Hidalgo Downing, L., & Kraljevic Mujic, B. (2009). INFECTIOUS DISEASES ARE SLEEPING MONSTERS: Conventional and culturally adapted new metaphors in a corpus of abstracts on immunology. *iBérica, 17*, 61-82.

Hirsh, D. (2010). *Academic vocabulary in context*. Berne: Peter Lang.

Hoffman, R. R. (1980). Metaphor in science. In R. P. Honeck & R. R. Hoffman (Eds.), *The psycholinguistics of figurative language*. Hillsdale: Erlbaum.

Hoffman, R. R. (1985). Some implications of metaphor for philosophy and psychology of science. In W. Paprotté & R. Dirven (Eds.), *The ubiquity of metaphor* (pp. 327–380). Amsterdam: John Benjamins.

Hoffman, R. R. (1992). Introduction: From the mouths of experts ofttimes come metaphors. *Metaphor and Symbolic Activity, 7*(3-4), 115-117.

Hoffman, R. R., Eskridge, T., & Shelley, C. (2009). A naturalistic exploration of forms and functions of analogizing. *Metaphor and Symbol, 24*(3), 125-154.

Holton, G. (1995). Metaphors in science and education. In Z. Radman (Ed.), *From a metaphorical point of view: A multidisciplinary approach to the cognitive content of metaphor* (pp. 259–288). Berlin: Walter de Gruyter.

Honeck, R. P., & Hoffman, R. R. (Eds.). (1980). *Cognition and figurative language*. Hillsdale: Erlbaum.

Honeck, R. P., & Temple, J. G. (1992). Metaphor, expertise, and a PEST: Comments on the contributions to this special issue. *Metaphor and Symbolic Activity, 7*(3-4), 237-252.

Hsu, Y.-C. (2006). The effects of metaphors on novice and expert learners' performance and mental-model development. *Interacting with Computers, 18*(4), 770-792.

Hunston, S. (1994). Evaluation and organization in a sample of written academic discourse. In M. Coulthard (Ed.), *Advances in written text analysis* (pp. 191-218). London: Routledge.

Hunston, S., & Thompson, G. (Eds.). (2000). *Evaluation in text: Authorial stance and the construction of discourse*. Oxford: Oxford University Press.

Hyland, K. (2000). *Disciplinary discourses: Social interactions in academic writing*. London: Longman.

Hyland, K. (2004a). A convincing argument: Corpus analysis and academic persuasion. In U. Connor & T. A. Upton (Eds.), *Discourse in the professions: Perspectives form corpus linguistics* (pp. 87-114). Amsterdam: John Benjamins.

Hyland, K. (2004b). Engangement and disciplinarity: The other side of evaluation. In G. Del Lungo Camiciotti & E. Tognini-Bonelli (Eds.), *Academic discourse - New insights into evaluation.* (pp. 13-30). Berne: Peter Lang.

Hyland, K. (2006a). Disciplinary differences: language variation in academic discourses. In K. Hyland & M. Bondi (Eds.), *Academic discourse across disciplines* (pp. 17-45). Frankfurt: Peter Lang.

Hyland, K. (2006b). *English for academic purposes: An advanced resource book*. New York: Routledge

Hyland, K. (2008a). Academic clusters: text patterning in published and postgraduate writing. *International Journal of Applied Linguistics, 18*(1), 41–62.

Hyland, K. (2008b). As can be seen: Lexical bundles and disciplinary variation. *English for Specific Purposes, 27*(1), 4-21.

Hyland, K. (2009a). *Academic discourse: English in a global context*. London: Continuum.

Hyland, K. (2009b). Corpus informed discourse analysis: The case of academic engagement. In M. Charles, S. Hunston & D. Pecorari (Eds.), *Academic Writing: At the interface of corpus and discourse* (pp. 110-128). London: Continuum.

Hyland, K. (2011a). Academic Discourse. In K. Hyland & B. Paltridge (Eds.), *Continuum companion to discourse anlysis* (pp. 171-184). London: Continuum.

Hyland, K. (2011b). Disciplines and discourses: Social interactions in the construction of knowledge. In D. Starke-Meyerring, A. Paré, N. Artemeva, M. Horne & L. Yousoubova (Eds.), *Writing in the knowledge society* (pp. 193-214). West Lafayette: Parlor Press and The WAC Clearinghouse.

Hyland, K., & Bondi, M. (Eds.). (2006). *Academic discourse across disciplines*. Frankfurt: Peter Lang.

Jaeger, F. (2008). Categorical data analysis: Away from ANOVAs (tranformation or not) and towards logit mixed models. *Journal of Memory and Language, 59*, 434-446.

Jäkel, O. (1997). *Metaphern in abstrakten Diskurs-Domänen: Eine kognitiv-linguistische Untersuchung anhand der Bereiche Geistestätigkeit, Wirtschaft und Wissenschaft*. Frankfurt: Peter Lang.

Jäkel, O. (1999). Kant, Blumenberg, Weinrich: Some forgotten contributions to the cognitive theory of metaphor. In R. Gibbs & G. J. Steen (Eds.), *Metaphor in cognitive linguistics* (pp. 9-27). Amsterdam: John Benjamins.

Jakobson, R. (1956). Two aspects of language and two types of aphasic disturbances. In R. Jakobson & M. Halle (Eds.), *Fundamentals of language* (pp. 55-82). The Hague: Mouton.

Johnson, M. (1981). Introduction: Metaphor in the philosophical tradition. In M. Johnson (Ed.), *Philosophical perspectives on metaphor* (pp. 3-47). Minnesota: University of Minnesota Press.

Johnson, M. (1987). *The body in the mind. The bodily basis of meaning, imagination, and reason*. Chicago: University of Chicago.

Johnson, M. (2010). Philosophy's dept to metaphor. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 39-52). Cambridge: Cambridge University Press.

Jones, L. L., & Estes, Z. (2006). Roosters, robins, and alarm clocks: Aptness and conventionality in metaphor comprehension. *Journal of Memory and Language, 55*, 18–32.

Kaal, A. A. (2012). *Metaphor in conversation*. Oisterwijk: BOX Press.

Kaplan. (2006). *The GRE EXAM subject test: Psychology* (Third Ed. ed.). New York: Kaplan Inc.

Keller, E. F. (1995). *Refiguring Life: Metaphors of twentieth-century biology*. New York: Columbia University Press.

Kendeou, P., & van den Broek, P. (2007). The effects of prior knowledge and text structure on comprehension processes during reading of scientific texts. *Memory & Cognition, 35*(7), 1567-1577.

Keysar, B., Shen, Y., Glucksberg, S., & Horton, W. S. (2000). Conventional language: How metaphorical is it? . *Journal of Memory and Language, 43*, 576-593.

Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. Cambridge: Cambridge University Press.

Kittay, E. F. (1987). *Metaphor: Its cognitive force and linguistic structure*. Oxford: Clarendon Press.

Knudsen, S. (2003). Scientific metaphors going public. *Journal of Pragmatics, 35*(8), 1247-1263.

Koller, V. (2003). Metaphor clusters, metaphor chains. *Metaphorik.de, 5*, 115-134.

Koller, V. (2004). *Metaphor and gender in business media discourse: A critical cognitive study*. Basingstoke: Palgrave Macmillan.

Koller, V., Hardie, A., Rayson, P., & Semino, E. (2008). Using a semantic annotation tool for the analysis of metaphor in discourse. *Metaphorik.de, 15*, 141-160.

Kövecses, Z. (2002). *Metaphor. A practical introduction.* Oxford: Oxford University Press.

Kövecses, Z. (2005). *Metaphor in culture: Universality and variation*. Cambridge: Cambridge University Press.

Krennmayr, T. (2011). *Metaphor in newspapers*. Utrecht: LOT.

Kuhn, T. S. (1962). *The structure of scientific revolutions*. Chicago: University of Chicago Press.

Kuhn, T. S. (1993). Metaphor in science. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., 433-542). Cambridge: Cambridge University Press.

Labbo, L. D. (1996). A semiotic analysis of young children's symbol making in a classroom computer centre. *Reading Research Quarterly, 31*(4), 356-385.

LaFrance, M. (1992). Excavation, capture, collection, and creation: Computer scientists' metaphors for eliciting human expertise. *Metaphor and Symbolic Activity, 7*(3-4), 135-156.

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: University of Chicago Press.

Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 202-251). Cambridge: Cambridge University Press.

Lakoff, G. (2010). The neural theory of metaphor. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 17-38). Cambridge: Cambridge University Press.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago: Chicago University Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. New York: Basic Books.

Lakoff, G., & Johnson, M. (2003). Afterword, 2003. In G. Lakoff & M. Johnson (Eds.), *Metaphors we live by* (pp. 243-276). Chicago: University of Chicago Press.

Lakoff, G., & Núñez, R. (2000). *Where mathematics comes from: How the embodied mind brings mathematics into being*. New York: Basic Books.

Langacker, R. W. (1987). *Foundations of cognitive grammar, Vol. 1: Theoretical prerequisites*. Stanford: Stanford University Press.

Langacker, R. W. (1991). *Foundations of cognitive grammar, Vol. 2: Descriptive application*. Stanford: Stanford University Press.

Larson, B. (2011). *Metaphors for environmental sustainability: Redefining our relationship with nature*. New Haven: Yale University Press.

Larson, B., Nerlich, B., & Wallis, W. (2005). Metaphors and biorisks: The war on invasive species and infectious diseases. *Science Communication, 60*, 2629–2639.

Leary, D. E. (1990a). Psyche's muse: The role of metaphor in the history of psychology. In D. E. Leary (Ed.), *Metaphors in the history of psychology* (pp. 1-78). Cambridge: Cambridge University Press.

Leary, D. E. (Ed.). (1990b). *Metaphors in the history of psychology*. Cambridge: Cambridge University Press.

Leatherdale, W. H. (1974). *The role of analogy, model and metaphor in science*. Amsterdam: North-Holland Publishing Company.

Levin, S. R. (1977). *The semantics of metaphor*. Baltimore: Johns Hopkins University Press.

Levin, S. R. (1988). *Metaphoric worlds: Conceptions of a Romantic nature*. New Haven: Yale University Press.

Levine, D. N. (1995). The organism metaphor in sociology. *Social Research, 62*(2), 239-265.

Lindstromberg, S. (1991). Metaphor and ESP: A ghost in the machine. *English for Specific Purposes, 10*(3), 207–225.

Lindstromberg, S. (2010). *English prepositions explained* (revised ed.). Amsterdam: John Benjamins.

Littlemore, J. (2001). Metaphor as a source of misunderstanding for overseas students in academic lectures. *Teaching in Higher Education, 6*(3), 333–351.

Littlemore, J. (2009). *Applying cognitive linguistics to second language learning and teaching*. Basingstoke: Palgrave Macmillan.

Littlemore, J. (forthcoming). The use of verbal and gestural metaphor in explanations of management theory. In M. White & H. Herrero (Eds.), *The use of figurative language in business and economics*. Berlin: Mouton de Gruyter.

Littlemore, J., & Low, G. (2006). *Figurative thinking and foreign language learning*. Basingstoke: Palgrave Macmillan.

Littlemore, J., Trautman Chen, P., Koester, A., & Barnden, J. (2011). Difficulties in metaphor comprehension faced by International students whose first language is not English. *Applied Linguistics, 32*(4), 408–429.

Lodge, D. (1977). *The modes of modern writing: Metaphor, metonymy and the typology of modern literature*. London: Edward Arnold.

Low, G. (1999). "This paper thinks…": Investigating the acceptability of the metaphor AN ESSAY IS A PERSON. In L. Cameron & G. Low (Eds.), *Researching and applying metaphor* (pp. 221–248). Cambridge: Cambridge University Press.

Low, G. (2005). Explaining evolution: The use of animacy in an example of semi-formal science writing. *Language and Literature, 14*(2), 129-148.

Low, G. (2008a). Metaphor and education. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 212-231). Cambridge: Cambridge University Press.

Low, G. (2008b). Metaphor and positioning in academic book reviews. In M. Zanotto, L. Cameron & M. Cavalcanti (Eds.), *Confronting metaphor in use* (pp. 79-100). Amsterdam: John Benjamins.

Low, G. (2010). Wot no similes: The curious absence of simile in university lectures. In G. Low, Z. Todd, A. Deignan & L. Cameron (Eds.), *Researching and applying metaphor in the real world* (pp. 291–308). Amsterdam: John Benjamins.

Low, G., & Littlemore, J. (2009). The relationship between conceptual metaphors and classroom management language: Reactions by native and non-native speakers of English. *Iberica, 17*, 25-44.

Low, G., Littlemore, J., & Koester, A. (2008). Metaphor use in three UK university lectures. *Applied Linguistics, 29*, 428–455.

Low, G., & Todd, Z. (2010). Good practice in metaphor analysis: Guidelines and pitfalls. In L. Cameron & R. Maslen (Eds.), *Metaphor analysis: Research practice in applied linguistics, social sciences and the humanities* (pp. 217-229). London: Equinox.

Low, G., Todd, Z., Deignan, A., & Cameron, L. (Eds.). (2010). *Researching and applying metaphor in the real world.* Amsterdam: John Benjamins.

Maasen, S., Mendelsohn, E., & Weingart, P. (Eds.). (1995). *Biology as society, society as biology: Metaphors*. Dordrecht: Kluwer.

Maasen, S., & Weingart, P. (2000). *Metaphors and the dynamics of knowledge*. New York: Routledge.

MacDonald, S. (1992). A method for analyzing sentence-level differences in disciplinary knowledge-making. *Written Communication, 9*, 533-569.

Mahon, J. E. (1999). Getting your sources right: What Aristotle didn't say. In L. Cameron & G. Low (Eds.), *Researching and applying metaphor* (pp. 69-80). Cambridge: Cambridge University Press.

Martin, J., & Harré, R. (1982). Metaphor in science. In D. S. Miall (Ed.), *Metaphor: Problems and perspectives* (pp. 106-132). Brighton: The Harvester Press.

Martin, J. H. (1994). Metabank: A knowledge-base of metaphoric language conventions. *Computational Intelligence, 10*, 134–149.

Mason, Z. (2004). CorMet: A computational, corpus-based conventional metaphor extraction system. *Computational Linguistics, 30*, 23–44.

Master, P. (1991). Active verbs with inanimate subjects in scientific prose. *English for Specific Purposes, 10*(1), 15-33.

Mauranen, A. (2009). Introduction. In A. Mauranen & E. Ranta (Eds.), *English as a lingua franca: Studies and findings* (pp. 1-9). Newcastle: Cambridge Scholars Publishing.

McGlone, M. S. (1996). Conceptual metaphors and figurative language interpretation: Food for thought? *Journal of Memory and Language, 35*, 544-565.

McGlone, M. S. (2007). What is the explanatory value of a conceptual metaphor? *Language & Communication, 27*, 109-126.

McIntosh, E. (Ed.). (1974). *The concise Oxford dictionary of current English (Fifth ed.).* London: Book Club Associates.

Merriam-Webster (Ed.). (2012a). *Merriam-Webster medical online dictionary*. Retrieved from http://www.merriam-webster.com/medical/

Merriam-Webster.com (Ed.). (2012b). *Merriam-Webster online dictionary*. Retrieved from http://www.merriam-webster.com/dictionary/

Miller, A. I. (1986). *Imagery in scientific thought. Creating 20th-century physics*. Boston: Birkhauser.

Miller, G. A. (1993). Images and models, similes and metaphors. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 357-400). Cambridge: Cambridge University Press.

Mittelberg, I. (2006). *Metaphor and metonymy in language and gesture: Discourse evidence for multimodal models of grammar*. Ann Arbor: University of Michigan.

Mittelberg, I. (2008). Peircean semiotics meets conceptual metaphor: Iconic modes in gestural representations of grammar. In A. C. C. Müller (Ed.), *Metaphor and gesture* (pp. 115-154). Amsterdam: John Benjamins.

Mittelberg, I., & Waugh, L. R. (2009). Metonymy first, metaphor second: A cognitive-semiotic approach to multimodal figures of speech in co-speech gesture. In C. Forceville & E. Urios-Aparisi (Eds.), *Multimodal metaphor* (pp. 329-356). Berlin: Mouton de Gruyter.

Morgan, G. (1986). *Images of organisations*. London: Sage.

Müller, C. (2008). *Metaphors dead and alive, sleeping and waking*. Chicago: The University of Chicago Press.

Müller, C., & Cienki, A. (2009). Words, gestures, and beyond: Forms of multimodal metaphor in the use of spoken language. In C. Forceville & E. Urios-Aparisi (Eds.), *Multimodal metaphor* (pp. 297-328). Berlin: Mouton de Gruyter.

Murphy, G. L. (1996). On metaphoric representation. *Cognition, 60*, 173-204.

Murphy, G. L. (1997). Reasons to doubt the present evidence for metaphoric representation. *Cognition, 62*, 99-108.

Musolff, A. (2004). *Metaphor and political discourse. Analogical reasoning in debates about Europe*. Basingstoke: Palgrave Macmillan.

Musolff, A. (2005). Ignes fatui or apt similitudes? —the apparent denunciation of metaphor by Thomas Hobbes. *Hobbes Studies, XVIII*, 95-111.

Musolff, A. (2011). Migration, media and "deliberate" metaphors. *metaphorik.de, 21*, 7-19.

Musolff, A., & Zinken, J. (Eds.). (2009). *Metaphor and discourse*. Basingstoke: Palgrave Macmillan.

Myers, G. (1990). *Writing biology: Texts in the social construction of scientific knowledge*. Madison: University of Wisconsin Press.

Myers, G. (1992). Textbooks and the sociology of scientific knowledge. *English for Specific Purposes, 11*(1), 3-17.

Nakamoto, K., & Kusumi, T. (2004). *The effect of repeated presentation and aptness of figurative comparisons on preference for metaphor forms*. Paper presented at the 26th Annual Meeting of the Cognitive Science Society, Chicago.

Nerlich, B., Dingwall, R., & Clarke, D. D. (2002). The book of life: How the completion of the human genome project was revealed to the public. *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine, 6*(4), 445-469.

Nerlich, B., Elliott, R., & Larson, B. (Eds.). (2009). *Communicating biological sciences: Ethical and metaphorical dimensions*. Aldershot: Ashgate.

Nerlich, B., & Halliday, C. (2007). Avian flu: The creation of expectations in the interplay between science and the media. *Sociology of Health & Illness, 29*(1), 46-65.

Nerlich, B., & James, R. (2009). ''The post-antibiotic apocalypse'' and the ''war on superbugs'': Catastrophe discourse in microbiology, its rhetorical form and political function. *Public Understanding of Science, 18*(5), 574-590.

Nersessian, N. J. (2008). *Creating scientific concepts*. Boston: MIT Press.

O'Halloran, K. (2007). Critical Discourse Analysis and the corpus-informed interpretation of metaphor at the register level. *Applied Linguistics 28*(1), 1–24.

Ortony, A. (1975). Why metaphors are necessary and not just nice. *Educational Theory, 25*, 45-53.

Ortony, A. (1979). Beyond literal similarity. *Psychological Review, 86*, 161-180.

Ortony, A. (Ed.). (1993). *Metaphor and thought* (2nd ed.). Cambridge: Cambridge University Press.

Ouzounis, C., & Mazière, P. (2006). Maps, books and other metaphors for systems biology. *Biosystems, 85*(1), 6-10.

Pasma, T. (2011). *Metaphor and register variation. The personalization of Dutch news discourse*. Oisterwijk: BOXPress.

Pepper, S. C. (1942). *World hypotheses: A study in evidence*. Berkeley: University of California Press.

Petrie, H. H., & Oshlag, R. S. (1993). Metaphor and learning. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 579-609). Cambridge: Cambridge University Press.

Ponterotto, D. (2003). The cohesive role of cognitive metaphor in discourse and conversation. In A. Barcelona (Ed.), *Metaphor and metonymy at the crossroads* (pp. 283-298). Berlin: Mouton de Gruyter.

Pragglejaz Group, t. (2007). *MIP*: A method for identifying metaphorically used words in discourse *Metaphor and Symbol, 22*(1), 1–39.

Pulaczewska, H. (1999). *Aspects of metaphor in physics*. Tübingen: Max Niemeyer.

Quirk, R., Greenbaum, S., Leech, G., & Svartvik, J. (1985). *A comprehensive grammar of the English language*. Harlow: Longman.

Rayson, P. (2009). Wmatrix: a web-based corpus processing environment. Lancaster University: Computing Department. Retrieved from http://ucrel.lancs.ac.uk/wmatrix/

Rea, L. M., & Parker, R. A. (1992). *Designing and conducting survey research*. San Francisco: Jossey-Boss.

Reddy, M. J. (1993). The conduit metaphor: A case of frame conflict in our language about language. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 164-201). Cambridge: Cambridge University Press.

Reed, S. K. (2006). *Cognition. Theory and applications*. Belmont, CA: Wadsworth Publishing.

Richards, I. A. (1936). *The philosophy of rhetoric*. Oxford: Oxford University Press.

Richardson, P. W. (2004). Reading and writing from textbooks in higher education: A case study from Economics. *Studies in Higher Education, 29*(4), 505-521.

Richardt, S. (2005). *Metaphor in languages for specific purposes. The function of conceptual metaphor in written expert language and expert-lay communication in the domains of economics, medicine and computing*. Frankfurt: Peter Lang.

Rickheit, G., & Sichelschmidt, L. (2007). Valency and cognition – A notion in transition. In T. Herbst & K. Götz-Votteler (Eds.), *Valency: Theoretical, descriptive and cognitive issues* (pp. 163–182). Berlin: de Gruyter.

Ricoeur, P. (1977). *The rule of metaphor: Multi-disciplinary studies in the creation of meaning in language* (R. Czerny, K. McLaughlin & J. S. Costello, Trans.). Toronto: University of Toronto Press.

Rietveld, T., Hout, R., & Ernestus, M. (2004). Pitfalls in corpus research. *Computers and the Humanities, 38*(4), 343-362.

Rigney, D. (2001). *The metaphorical society: An invitation to social theory*. Lanham: Rowman & Littlefield.

Ritchie, D. (2003). "ARGUMENT IS WAR" - Or is it a game of chess? Multiple meanings in the analysis of implicit metaphors. *Metaphor and Symbol Volume, 18*(2), 125 - 146

Romaine, S. (2000). *Language in society: An introduction to sociolinguistics*. Oxford: Oxford University Press.

Rundell, M. (Ed.). (2002). *Macmillan English dictionary for advanced learners*. Oxford: Macmillan.

Saigh, P. A., Yule, W., & Inamdar, S. C. (1996). Imaginal flooding of traumatized children and adolescents. *Journal of School Psychology, 34*(2), 163-183.

Salager-Meyer, F. (1990). Metaphors in medical English prose: A comparative study with French and Spanish. *English for Specific Purposes, 9*, 1456–1590.

Sanford, A. (2002). Context, attention and depth of processing during interpretation. *Mind and Language, 17*(1 and 2), 188-206.

Schiffrin, D., Tannen, D., & Hamilton, H. (Eds.). (2001). *The handbook of discourse analysis*. Malden: Blackwell.

Scholfield, P. (1995). *Quantifying language: A researcher's and teacher's guide to gathering language data and reducing it to figures*. Clevedon: Multilingual Matters.

Schumacher, R., & Czerwinski, M. (1992). Mental models and the acquisition of expert knowledge. In R. R. Hoffman (Ed.), *The psychology of expertise*. New York: Springer.

Searle, J. (1993). Metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 92-123). Cambridge: Cambridge University Press.

Semino, E. (2002). A sturdy baby or a derailing train? Metaphorical representations of the euro in British and Italian newspapers. *Text, 22*(1), 107-139.

Semino, E. (2008). *Metaphor in discourse*. Cambridge: Cambridge University Press.

Semino, E. (2011). Metaphor, creativity, and the experience of pain across genres. In J. Swann, R. Pope & R. Carter (Eds.), *Creativity in language and literature: The state of the art* (pp. 83-102). Basingstoke: Palgrave.

Semino, E., Hardie, A., Koller, V., & Rayson, P. (2009). *A computer-assisted approach to the analysis of metaphor variation across genres.* Paper presented at the Corpus-Based Approaches to Figurative Language: A Corpus Linguistics 2009 Colloquium.

Semino, E., Heywood, J., & Short, M. (2004). Methodological problems in the analysis of metaphors in a corpus of conversations about cancer. *Journal of Pragmatics, 36*, 1271-1294.

Semino, E., & Steen, G. J. (2008). Metaphor in literature. In R. Gibbs (Ed.), *Cambridge handbook of metaphor and thought* (pp. 232-246). Cambridge: Cambridge University Press.

Shutova, E., Sun, L., & Korhonen, A. (2010). *Metaphor identification using verb and noun clustering.* Paper presented at the 23rd International Conference on Computational Linguistics (Coling 2010).

Sinclair, J. (1991). *Corpus, concordance, collocation: Describing English language*. Oxford: Oxford University Press.

Siqueira, M., Flávia Souto de Oliveira, A., Dienstbach Hubert, D., Faé de Almeida, G., & Moreira Brangel, L. (2009). Metaphor identification in a terminological dictionary. *iBéricA, 17*, 157-174.

Skorczynska, H. (2010). A corpus-based evaluation of metaphors in a business English textbook. *English for Specific Purposes, 29*(1), 30-42.

Skorczynska, H., & Deignan, A. (2006). Readership and purpose in the choice of economics metaphors. *Metaphor and Symbol, 21*(2), 87-104.

Skorczynska, H., & Piqué-Angordans, J. (2005). A corpus-based description of metaphorical marking patterns in scientific and popular business discourse. *metaphorik.de, 9*, 112- 129.

Smith, L. D. (1990). Metaphors of knowledge and behavior in the behaviorist tradition. In D. E. Leary (Ed.), *Metaphors in the History of Psychology* (pp. 239-266). Cambridge: Cambridge University Press.

Smith, M. R. (2007). Levels of metaphor in persuasive legal writing. *Mercer Law Review, 58*, 919-947.

Sperber, D., & Wilson, D. (2008). A deflationary account of metaphor. In R. Gibbs (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 84-105). Cambridge: Cambridge University Press.

Steen, G. J. (1994). *Understanding metaphor in literature: An empirical approach*. London: Longman.

Steen, G. J. (1999). From linguistic to conceptual metaphor in five steps. In R. Gibbs & G. J. Steen (Eds.), *Metaphor in cognitive linguistics* (pp. 57-77). Amsterdam: John Benjamins.

Steen, G. J. (2005). Metonymy goes cognitive linguistic: Introduction to special issue. *Style, 38*(4), 1-11.

Steen, G. J. (2007). *Finding metaphor in grammar and usage*. Amsterdam: John Benjamins.

Steen, G. J. (2008). The paradox of metaphor: Why we need a three-dimensional model for metaphor. *Metaphor and Symbol 23* (4), 213-241.

Steen, G.J. (2009). From linguistic form to conceptual structure in five steps: Analyzing metaphor in poetry. In G. Brône and J. Vandaele (Eds.), Cognitive Poetics: Goals, gains, and gaps (pp. 197-226). Berlin: Mouton de Gruyter.

Steen, G. J. (2011a). The contemporary theory of metaphor--now new and improved! *Review of Cognitive Linguistics, 9*(1), 26-64.

Steen, G. J. (2011b). Genre between the humanities and the sciences. In M. Callies, W. R. Keller & A. Lohöfer (Eds.), *Bi-directionality in the cognitive sciences* (pp. 21–42). Amsterdam: John Benjamins.

Steen, G. J. (2011c). Metaphor, language, and discourse processes. *Discourse Processes, 48*(8), 585-591.

Steen, G. J. (in press). Deliberate metaphor affords conscious metaphorical cognition. *Cognitive Semiotics*.

Steen, G. J., Biernacka, E. A., Dorst, A. G., Kaal, A. A., López-Rodríguez, I., & Pasma, T. (2010). Pragglejaz in practice: Finding metaphorically used words in natural discourse. In G. Low, Z. Todd, A. Deignan & L. Cameron (Eds.), *Researching and applying metaphor in the real world* (pp. 165-184). Amsterdam: John Benjamins.

Steen, G. J., Dorst, A. G., Herrmann, J. B., Kaal, A. A., & Krennmayr, T. (2010a). Metaphor in usage. *Cognitive Linguistics, 21*(4).

Steen, G. J., Dorst, A. G., Herrmann, J. B., Kaal, A. A., & Krennmayr, T. (2010b). VU Amsterdam Metaphor Corpus. Oxford: Oxford Text Archives

Steen, G. J., Dorst, A. G., Herrmann, J. B., Kaal, A. A., Krennmayr, T., & Pasma, T. (2010). *A method for linguistic metaphor identification: From MIP to MIPVU*. Amsterdam: John Benjamins.

Stefanowitsch, A. (2006a). Corpus-based approaches to metaphor and metonymy. In A. Stefanowitsch & S. T. Gries (Eds.), *Corpus-based approaches to metaphor and metonymy* (pp. 1-16). Berlin: Mouton de Gruyter.

Stefanowitsch, A. (2006b). Words and their metaphors: A corpus-based approach. In A. Stefanowitsch & S. T. Gries (Eds.), *Corpus-based approaches to metaphor and metonymy* (pp. 63-105). Berlin: Mouton de Gruyter.

Stefanowitsch, A., & Gries, S. T. (Eds.). (2006). *Corpus-based approaches to metaphor and metonymy*. Berlin: Mouton de Gruyter.

Sternberg, R. J. (1990). *Metaphors of mind: Conceptions of the nature of intelligence*. Cambridge: Cambridge University Press.

Sternberg, R. J., & Ben-Zeev, T. (2001). *Complex Cognition: The psychology of human thought*. Oxford: Oxford University Press.

Sternberg, R. J., & Frensch, P. A. (1992). On being an expert: A cost-benefit analysis. In R. R. Hoffman (Ed.), *The psychology of expertise: Cognitive research and empirical AI* (pp. 191–203). New York: Springer.

Summers, D., & Bullon, S. (Eds.). (2005). *Longman dictionary of contemporary English*. Harlow: Pearson Education.

Swales, J. (1990). *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.

Swales, J. (2004). *Research genres: Explorations and applications*. Cambridge: Cambridge University Press.

Sweetster, E. (1990). *From etymology to pragmatics*. Cambridge: Cambridge University Press.

Tay, D. (2011). THERAPY IS A JOURNEY as a discourse metaphor. *Discourse Studies, 13*(1), 47-68.

Tavecchio, L. (2010). Sentence patterns in English and Dutch: A contrastive corpus analysis. Utrecht: LOT.

Tendahl, M., & Gibbs, R. (2008). Complementary perspectives on metaphor: Cognitive linguistics and relevance theory. *Journal of Pragmatics, 40*, 1823-1864.

Thompson, G. (2001). Interaction in academic writing: Learning to argue with the reader. *Applied Linguistics, 22*(1), 58-78.

Thompson, E. (2007). *Mind in life. Biology, phenomenology, and the sciences of mind*. Cambridge: Harvard University Press.

Todd, Z., & Low, G. (2010). A selective survey of research practice in published studies using metaphor analysis. In L. Cameron & R. Maslen (Eds.), *Metaphor analysis: Research practice in applied linguistics, social sciences and the humanities* (pp. 26-41). London: Equinox.

Topitsch, E. (1979). *Erkenntnis und Illusion*. Tübingen: Mohr.

Tversky, A. (1977). Features of similarity. *Psychological Review, 84*, 327-352.

Ungerer, F. (2000). Muted metaphors and activated metonymies in advertising. In A. Barcelona (Ed.), *Metaphor and metonymy at the crossroads* (pp. 321-340). Berlin: Mouton de Gruyter.

van Dijk, T. A. (2008). *Discourse and context. A sociocognitive approach*. Cambridge: Cambridge University Press.

van Dijk, T. A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York: Academic Press.

van Rijn-van Tongeren, G. W. (1997). *Metaphors in medical texts*. Amsterdam: Rodopi.

Varela, F., Thompson, E., & Rosch, E. (1991). *The embodied mind. Cognitive science and human experience.* Cambridge: MIT Press.

Vervaeke, J., & Kennedy, J. M. (1996). Metaphors in language and thought: Falsification and multiple meanings. *Metaphor and Symbolic Activity, 11*(4), 273.

Voss, J. F., Kennet, J., Wiley, J., & Schooler, T. Y. E. (1992). Experts at debate: The use of metaphor in the U.S. Senate debate on the Gulf Crisis. *Metaphor and Symbolic Activity, 7*(3-4), 197-214.

Wallis, P., & Nerlich, B. (2005). Disease metaphors in new epidemics: The UK media framing of the 2003 SARS epidemic. *Social Science & Medicine, 60*(11), 2629-2639.

Weingart, P. (1995). "Struggle for existence": Selection and retention of a metaphor. In S. Maasen, E. Mendelsohn & P. Weingart (Eds.), *Biology as society, society as biology: Metaphors* (pp. 127-151). Dordrecht: Kluwer.

Weitzenfeld, J., Riedl, T., Chubb, C., & Freeman, J. (1992). The use of cross-domain language by expert software developers. *Metaphor and Symbolic Activity, 7*(3-4), 185-195.

Westen, D. (2001). *Psychology: Brain, behavior and culture* (Third ed.). New York: John Wiley & Sons.

White, H. (1978). *Tropics of discourse: Essays in cultural criticism*. Baltimore: Johns Hopkins University Press.

White, M. (2003). Metaphor and economics: The case of growth. *English for Specific Purposes, 22*(2), 131-151.

Winter, S. L. (2001). *A clearing in the forest. Law, life, and mind*. Chicago: University of Chicago Press.

Wray, A. (2002). *Formulaic language and the lexicon*. Cambridge: Cambridge University Press.

Wray, A. (2008). *Formulaic language: Pushing the boundaries*. Oxford: Oxford University Press.

Young, R. M. (1988). *Darwin's metaphor: Nature's place in Victorian culture*. Cambridge University Press.

Yu, N. (1995). Metaphorical expressions of anger and happiness in English and Chinese. *Metaphor and Symbolic Activity, 10*(2), 59-92.

Zanotto, M. S., Cameron, L., & Do Couto Cavalcanti, M. (2008). Confronting metaphor in use. An applied linguistic approach. In M. S. Zanotto, L. Cameron & M. Do Couto Cavalcanti (Eds.), *Confronting metaphor in use* (pp. 1-8). Amsterdam: John Benjamins.

Zanotto, M. S., Cameron, L., & Do Couto Cavalcanti, M. (Eds.). (2008). *Confronting metaphor in use* Amsterdam: John Benjamins.

Zinken, J., & Musolff, A. (2009). A discourse-centred perspective on metaphorical meaning and understanding. In *Metaphor and Discourse* (pp. 1-8). Basingstoke: Palgrave Macmillan.

Summary *Metaphor in academic discourse*

In the last 30 years, it has been established that metaphor is not only prevalent in rhetoric and in literary writing, but is actually an indispensable part of natural language and thought. For example, the verb *conceive* in *The facilities had been conceived with families in mind* does not denote the act of becoming pregnant, but the act of planning a building. There are then two kinds of metaphor present: linguistic and conceptual. The linguistic metaphor *conceive* indicates a metaphorical structure involving two distinct concepts: IDEAS ARE PEOPLE. Such and other conceptual metaphors are assumed to underlie all natural discourse. Metaphor is hence a window to the way people think and communicate, and on how language is structured in different domains of discourse.

In academic discourse, the awareness of metaphor is also relatively new. Prevailing theories have traditionally seen metaphor as a threat to the scientific maxims of accuracy, truth, and explicitness and these views are still reflected in academic writing conventions, which often evaluate metaphorical language negatively. So far, most studies on metaphor in academic prose have been conducted on a small scale or have been restricted in their focus, investigating only a small set of linguistic or conceptual metaphors. Broad quantitative studies which utilize a transparent, systematic method that identifies *all* metaphorical language rather than particular subgroups have largely been absent, particularly in studies of academic prose. Consequently, the actual extent and the forms of metaphorical word use in academic texts, as well as differences between academic texts and other registers, remain largely unknown.

My dissertation begins to fill this gap. Together with my colleagues, I constructed a database of about 190,000 words of natural language covering four broad registers from a sub-corpus of the British National Corpus (academic texts, news texts, fiction, and conversation). This corpus was annotated for metaphorical language use by means of a detailed protocol for identifying metaphor in discourse. Both the protocol and its application to academic prose are unique contributions to metaphor research and have been documented in the book.

In order to produce a high level of validity, I employed the systematic and consistent procedure for metaphor identification to each and every word, comparing academic prose with the other registers. I then examined how common metaphor is in academic texts, how it is distributed across word classes, and what different types can be observed. This quantitative study showed that metaphor is more frequent in academic prose than in the other three registers. What is more, metaphor appears to be evenly spread across academic sub-disciplines. Metaphor therefore appears to be important for tailoring the densely packed, highly precise, and abstract prose of academic discourse.

Yet when taking into account word classes, the findings become more complicated: Some of the word classes examined (e.g., prepositions, verbs, and nouns) have a higher proportion of metaphor than others (e.g., adjectives and adverbs). This finding can, however, only in part be explained by the existing patterns of word class usage in the individual registers. To make sense of the pattern obtained, I investigated the forms and functions of the individual word classes when related to metaphor in detail, by means of the comprehensive corpus-based *Longman Grammar of Spoken and Written English*. I found that in academic prose, metaphor use across all word classes caters to the packaging of information. Also, metaphorical use of many word classes establishes and specifies reference, delimitates the interpretability of words, and establishes exact coherence relations. One of the most important results is that the relatively restricted abstract meanings of verbs in academic prose (expressing simple existence, occurrence, and relationships) can be now explained by their metaphorical usage. At the same time, in conversation (where discourse is situated in its concrete environment and presented with relatively little planning), and fiction (with its simulated conversations and descriptions of concrete situations and actions) the same verbs are used much more often in their non-metaphorical senses. The analysis suggests, however, that metaphor in the lexical word classes (such as nouns, verbs, and adjectives) in academic texts can also help to perform 'social' functions, for example in explanation and exposition, in the conveyance of authorial stance, and in persuasion. Yet, this is often done in a quite inconspicuous way, and appears to be linked to the heavy dominance of so-called indirect metaphor, which is especially frequent in academic prose (e.g., *defend* in *this thesis can be defended*) and may eventually explain its 'literal feel'.

Finally, my work goes beyond corpus linguistics and discourse analysis: In addition to the first, linguistic part, of my dissertation, I conducted an experiment that addresses the question of metaphor processing: For example, do people using the term *electrical current* actually think of streaming water? Considering the highly specialized and technical language of much academic discourse, as well as its specialist audience, I have examined how different groups of people (novices and experts) react to specialist metaphors of psychology. While the role of expertise cannot be fully delineated, the experiment renders another important finding: It appears that metaphor conventionality (which is widely accepted as a crucial factor in metaphor processing) has not been modeled sufficiently from a theoretical point of view, because no sufficient differentiation has been made between linguistic and conceptual conventionality. I suggest that in cognitive research, metaphor conventionality needs to be defined and researched in a more differentiated way.

In all, my work has suggested that, as a rule, metaphorical word use in academic prose is largely devoid of the open-ended meanings associated with metaphor in a

traditional sense. Metaphorical word use in academic discourse is generally highly precise, conventional, and mostly used to establish clearly delineated reference with abstract instances of discourse and to link the discourse. At the same time, metaphorical language in academic prose can also be used as a tool for transmitting messages on a social or personal level, e.g., in explanation and exposition, the conveyance of authorial stance, and persuasion. As a rule, however, the metaphors of academic prose are conventional, and inconspicuous. This holds for such metaphorical words that cater to 'exact' discourse functions (the majority), but also for such metaphors that perform social and subjective functions. This may explain why, in spite of its actually very high frequency of metaphors, academic prose has traditionally been regarded as a 'non-metaphorical' register.

Samenvatting *Metaforen in academisch taalgebruik*

Talige vormen, conceptuele structuren, communicatieve functies en cognitieve representaties

De afgelopen dertig jaar is duidelijk geworden dat metaforen niet uitsluitend met retorica en literatuur geassocieerd moeten worden, maar als een essentieel onderdeel van alledaags taalgebruik te beschouwen zijn. Bijvoorbeeld het werkwoord "voortbouwen" in "Hij staat in de traditie en bouwt voort op het werk van zijn voorgangers" betekent in deze context niet dat iemand daadwerkelijk een gebouw wil vergroten, maar dat hij de manier waarop in het verleden werd gewerkt voort wil zetten. Er zijn twee soorten van metaforen: talige en conceptuele. De talige metafoor "voortbouwen" vertoont een onderliggende metaforische structuur met twee duidelijk te onderscheiden concepten: TRADITIES ZIJN GEBOUWEN. Zulke en andere, conceptuele metaforen blijken aan alle gebieden van natuurlijk taalgebruik ten grondslag te liggen. Metaforen reflecteren dus de manier waarop we denken en communiceren, en de manier waarop taal is gestructureerd.

De aandacht voor metaforen in academisch taalgebruik is nog relatief nieuw. De overheersende theorieën hebben metaforen traditioneel als een bedreiging voor wetenschappelijke grondregels als accuraatheid, waarheid en explicietheid beschouwd, en deze opvatting wordt nog steeds weerspiegeld in adviezen voor academisch schrijven, waar metaforen vaak negatief worden beoordeeld. De meeste studies naar metaforen in academisch taalgebruik zijn kleinschalig of hebben een beperkte focus, waarbij enkel een kleine verzameling talige of conceptuele metaforen wordt onderzocht. Grootschalige, kwantitatieve studies met een transparante, systematische methode die *al* het metaforisch taalgebruik kan identificeren en niet slechts een specifiek type, ontbreken vrijwel geheel. Om deze reden weten we eigenlijk niet echt hoe gebruikelijk metaforisch taalgebruik in academische teksten in werkelijkheid is, welke vormen van metaforen het meest typerend zijn, en hoe de frequentie en het gebruik van metaforen zich verhouden tot metaforen in andere registers.

Deze dissertatie probeert aan deze tekortkomingen iets te doen. In samenwerking met mijn collega's heb ik een database van ongeveer 190.000 woorden opgebouwd van authentiek taalgebruik. Deze database omvat vier registers van een subcorpus van het 'British National Corpus' (academische teksten, nieuwsteksten, fictie en conversatie). Het corpus werd gecodeerd voor metaforisch taalgebruik met behulp van een gedetailleerd protocol voor het identificeren van metaforen in teksten en gesprekken. Zowel het protocol als de toepassing daarvan op academische teksten zijn unieke bijdragen aan het metaforenonderzoek en worden in het boek in detail weergegeven.

Om een zeer hoge graad aan validiteit te bereiken werd deze metafooridentificatiemethode op een systematische en consistente manier op elke woord in elk van de vier registers toegepast, en werden de registers vervolgens op een kwantitatieve manier met elkaar vergeleken. Ik heb bekeken hoe gebruikelijk metafoorgebruik is, welke typen en vormen metaforen gebruikt worden, hoe metaforen verspreid zijn over woordsoorten en wat hun functies zijn. De kwantitatieve analyse van het corpus heeft aan het licht gebracht dat academische teksten een groter aandeel metaforische woorden bevatten dan nieuwsteksten, fictie en conversatie. Bovendien blijkt metaforisch taalgebruik ook relatief gelijkmatig over academische subdisciplines verspreid te zijn. Metaforiek schijnt daarom belangrijk te zijn voor de specifieke manier waarop taal academisch wordt gebruikt, namelijk voor zeer precies en abstract proza, met een hoge informatiedichtheid.

Maar het beeld wordt complexer wanneer de rol van de woordsoorten wordt betrokken bij de analyse. Sommige woordsoorten in academische teksten (zoals voorzetsels, werkwoorden en zelfstandige naamwoorden) vertonen een hoger aandeel aan metaforiek dan andere (zoals bijvoeglijke naamwoorden en bijwoorden). Dit resultaat kan slechts gedeeltelijk worden verklaard door de typische patronen van woordsoortengebruik in de verschillende registers. Om de kwantitatieve uitslag beter te verklaren heb ik een kwalitatief onderzoek gedaan naar de specifieke vormen en functies van de verschillende woordsoorten in relatie tot metaforiek. Voor deze analyse heb ik gebruik gemaakt van een uitgebreide, corpusgebaseerde grammatica van het Engels (*Longman Grammar of Spoken and Written English*). De analyse heeft aangetoond dat metaforisch taalgebruik in academische teksten bij alle woordsoorten wordt gebruikt om een hoge informatiedichtheid te bereiken. Verder hebben in academische teksten vele woordsoorten in metaforisch gebruik de functie om referentie vast te leggen (naar abstracte voorwerpen, relaties en processen), de interpretabiliteit van woorden af te bakenen, woorden en frasen te verbinden en exacte coherentierelaties vast te leggen. Tegelijkertijd laten de drie andere registers afwijkende patronen zien, die geïnterpreteerd moeten worden in samenhang met de specifieke functies van de verschillende woordsoorten in de verschillende registers. Een van de belangrijkste bevindingen is dat de relatief beperkte betekenis van werkwoorden in academische teksten (gebruikt om "bestaan", "optreden" en "relaties" op een eenvoudige manier uit te drukken) nu verklaard kunnen worden door hun metaforisch gebruik. Tegelijkertijd worden dezelfde werkwoorden in registers zoals conversatie (taalgebruik gesitueerd in concrete omgevingen en zonder veel tijd om vooruit te plannen) en fictie (taalgebruik met gesimuleerde conversaties en beschrijvingen van concrete situaties, handelingen etc.) veel vaker in hun niet-metaforische betekenissen gebruikt. Echter blijkt dat metaforen in lexicale woordsoorten (zoals zelfstandige naamwoorden, werkwoorden, of bijvoeglijke naamwoorden) ook "sociale" functies kunnen uitoefenen, bijvoorbeeld voor het geven van uitleg en

beschrijvingen, het uitdrukken van de houding van de schrijver en voor de gerichte beïnvloeding van de lezer, hoewel dit normaliter op een onopvallende manier gebeurt, wat ook gerelateerd blijkt te zijn aan het enorme overwicht aan zogenoemde indirecte metaforen (bv. "voortbouwen" in "bouwt voort op het werk van zijn voorgangers"). Indirecte vormen van metaforische taalgebruik zijn over het algemeen talrijker dan directe vormen (bv. "alarmsignaal" samen met de lexicale markering "beschouwen als" in "deze symptomen moet je beschouwen als een alarmsignaal"), iets wat in academisch taalgebruik nog veel sterker het geval is. Deze bevinding zou uiteindelijk ook het haast "literaire" karakter van veel academische teksten kunnen verklaren.

Uiteindelijk gaat mijn werk verder dan corpus- en discourseanalyse. In aanvulling op het eerste, linguïstische gedeelte van mijn proefschrift heb ik ook een experiment uitgevoerd om de kwestie van metafoorverwerking aan de orde te stellen. Wanneer iemand bijvoorbeeld het begrip "elektrische stroom" gebruikt, denkt hij dan werkelijk aan stromend water? Ten opzichte van de hooggespecialiseerde and technische natuur van academisch taalgebruik heb ik onderzocht hoe verschillende groepen (beginners en experts) reageren op gespecialiseerde academische metaforen op het gebied van de psychologie. Hoewel de rol van kennis (expertise) in metafoorverwerking niet definitief kon worden bepaald, heeft het experiment een belangrijke bevinding opgeleverd: het schijnt dat metafoorconventionaliteit (wat algemeen als een cruciale factor in de verwerking van metaforen wordt gezien) nog niet voldoende vanuit een theoretisch perspectief is gemodelleerd, omdat een voldoende onderscheid tussen talige and conceptuele conventionaliteit nog ontbreekt. Ik stel voor dat metafoorconventionaliteit op een manier gedefinieerd en onderzocht moet worden die een hogere graad aan gedifferentieerdheid heeft.

Samenvattend heeft mijn werk laten zien dat de gebruikelijke meerduidigheid aan betekenissen waarmee metaforiek traditioneel wordt geassocieerd en die typisch is voor literaire teksten, in metaforisch taalgebruik in academische teksten grotendeels ontbreekt. Metaforisch gebruikte woorden in academische teksten hebben over het algemeen zeer nauwkeurige betekenissen die op een conventionele manier referentie naar abstracte voorwerpen vastleggen of elementen in de context met elkaar verbinden. Tegelijk kan metaforiek ook als een werktuig worden gebruikt om op sociaal of persoonlijk niveau te communiceren: bijvoorbeeld voor uitleg en beschrijvingen, het uitdrukken van meningen en het beïnvloeden van de lezer. Het gebruik van metaforen gebeurt hier echter gewoonlijk op een conventionele en onopvallende manier, zowel wat de 'exacte' functies (de meerderheid) als de 'sociale' functies aangaat. De hoge graad aan conventionaliteit kan een verklaring zijn voor het feit dat academische teksten ondanks het in werkelijkheid zeer hoge aandeel van metaforen traditioneel als een 'niet-metaforisch' register worden beschouwd.

Curriculum Vitae

J. Berenike Herrmann studied German Language and Literature, Sociology, and Spanish Language and Literature at the University of Göttingen, Germany and the Universidad Autónoma de Madrid, Spain. After receiving her degree in 2005 and before assuming a position as a PhD student at VU University Amsterdam in 2006, she was a trainee (research assistant) at the Department of Developmental and Comparative Psychology, Max-Planck-Institute for Evolutionary Anthropology in Leipzig. From January-April 2009 she was a visiting PhD student at the Department of Psychology, Grand Valley State University, Grand Rapids, USA. Since March 2011, she is an assistant professor ('wissenschaftliche Mitarbeiterin') at the Department of German Philology at Göttingen University and is a member of the Courant Centre 'Text structures' and the Göttingen Centre for Digital Humanities. Her research interests include the empirical study of literature, digital text analysis, psycholinguistics, genre and register studies, children's narrative development, and, of course, metaphor.