

## Metaphor in Specialist Discourse

# *Metaphor in Language, Cognition, and Communication (MiLCC)*

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The aim of the series is to publish theoretical and empirical interdisciplinary research on the effective use of metaphor in language and other modalities (including, for instance, visuals) for general or specific cognitive and communicative purposes. The aim of the series is to offer both fundamental and applied contributions to the state of the art. The series also invites proposals for inter-cultural and cross-cultural studies of metaphor in language, cognition, and communication. Room will be given as well to publications on related phenomena, such as analogy, metonymy, irony, and humor, as long as they are approached from a comparable perspective. The scope of the series comprises approaches from the humanities and the social and cognitive sciences, including philosophy, cultural studies, linguistics, cognitive science, communication science, media studies, and discourse analysis. More focused attention may be paid to the role of metaphor in the domains of religion, literature and the arts, the media, politics, organization and management, law, economics, health, education, and science.

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## **Volume 4**

Metaphor in Specialist Discourse

Edited by J. Berenike Herrmann and Tony Berber Sardinha

# **Metaphor in Specialist Discourse**

*Edited by*

**J. Berenike Herrmann**

Göttingen University, Germany

**Tony Berber Sardinha**

São Paulo Catholic University, Brazil

John Benjamins Publishing Company  
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*To David, Oskar and Helene*  
Berenike

*To Marilisa and Julia*  
Tony



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# Preface

Lynne Cameron

The Open University, United Kingdom

In a development of the discourse strand of metaphor studies, this exciting volume on metaphor in specialist discourse asks important new questions, using genre and register as starting parameters for deeper exploration, and pushing further to open up new areas and possibilities.

When I first entered the (rather strange) world of academic metaphor studies in the late 1980s, it seemed to be peopled by assertive scholars making loud, and very particular, claims about the nature of metaphor. Metaphor, they claimed, is essentially conceptual; language can in future be ignored as no more than a surface phenomenon. The over-claiming of the ‘conceptual turn’ in metaphor provoked responses from applied linguists that opened up what we might call a ‘discourse shift’ in metaphor studies. Language proved not to be so easy to dismiss; along with gesture, language as use remains a key entry point and modality for exploring how metaphor works. The discourse shift in metaphor studies has prompted much greater precision about what is meant by ‘language’ and ‘language use’, and about the interaction of language and metaphor. The focus on specialist discourse takes this precision a step further.

Scholars will never agree on an answer to the big question, “What is metaphor?”, even if from time to time they persuade themselves that they know it. The human ties of metaphor lead to continual variation and creativity. As a result, we are more likely to be able to answer questions such as “How does metaphor work?”, or, even more precisely, “How did metaphor work in that particular discourse event? How was it employed? How was it understood? How did it contribute to the meanings found by participants?”

The book’s contributions to the study of metaphor in specialist discourse point to the scope and potential of this new field. The editors provide a model – as a way of understanding how things may be working – that serves as an interpretive and analytic instrument. The chapters offer studies in depth of particular areas of specialist discourse that expand the model, indicate the breadth of scope of the area, and indicate the extent and value of further possible work. By venturing across disciplines, modalities, cultures and languages, the volume shows how vast the field

of specialist discourse can be, while illustrating how researchers can focus down into it to produce valid and valuable work. Of particular interest and importance, it seems to me, is the description of ‘popularizing discourse’, in which a specialist, as author or speaker, enters into dialogue with the non-specialist reader, listener or (most often, in today’s screen-based information world) viewer.

As co-founder of the RaAM (Researching and Applying Metaphor) association, I am pleased to see its impact on publications such as this one. From its inauguration, the association has stood for rigorous research into metaphor in the real world. We can of course debate what kind of thing that ‘real world’ may be, how we can know it, and whether it even can be said to exist. Another way forwards is to try to understand the nature of that world by going there and exploring. That is the promise of this volume – it steps out into the real world of specialist discourse, delves deep and wide, and offers a first view of the richness of metaphor used there.

## SECTION I

# Introduction



# Metaphor in specialist discourse

## Investigating metaphor use in specific and popularized discourse contexts

J. Berenike Herrmann and Tony Berber Sardinha

Göttingen University, Germany / São Paulo Catholic University, Brazil

This chapter introduces the overall purpose, theoretical background, and structure of this collective volume. We start with our initial motivation, advancing the empirical study of metaphor *in specialist discourse*. Matching our goal, depicting metaphor use across a range of specialist domains and communities of discourse, we give an overview of the individual articles. The main emphasis, however, is on sketching a model of metaphor use in specific and popularized discourse settings that serves as a framework for the volume. Specifically, we draw on the latest discourse- and cognition-oriented metaphor studies, in particular conceptual metaphor theory, which we link to genre and register studies. We propose that aspects of discourse variability are the beginning, not an afterthought, of accurate empirical metaphor studies.

### 1. Idea for the book

The idea for this book was born at the 2010 International Researching and Applying Metaphor (RaAM) conference on ‘Metaphor and Domains of Discourse’ at VU University Amsterdam. Inspired by the conference’s general theme, we sensed that the multifaceted nature of metaphor culminates in registers and genres that fall into specialist domains of discourse, such as academic prose, biology research articles, soccer commentaries, and penal policy documents. Recent years have witnessed an increased interest in metaphor use in specific domains of discourse (e.g., Semino, 2008), e.g., in the NWO Vici project on metaphor in discourse (cf. Steen, Dorst, Herrmann, Kaal, & Krennmayr, 2010a). At the same time, the study of languages for specific/special purposes (LSP) has become a mature discipline (cf. Bahtia, Sánchez Hernández, & Pérez-Paredes, 2011; Bowles, 2012), and initial attempts have been made to bring together metaphor studies and LSP explicitly (Muschard, 2007; Richardt, 2005; cf. Herrmann, 2013). Yet there is a general lack

of publications on the topic of metaphor and discourse specialization. For us as editors, it therefore seemed natural to take the issue one step further, from metaphor in discourse to metaphor in specialist discourse, and to create a scope for observing emerging patterns, functions, and themes in specialist discourse. The articles in this volume are mostly papers selected from the 2010 RaAM conference that were in part substantially revised for this book. They are complemented by a selection of invited papers written specifically to match the theme. Our overall aim is to offer an overview of metaphor use across a range of specialized domains and communities of discourse, with metaphor explicitly being treated as a phenomenon of specialist discourse contexts.

On a theoretical note, this approach can be supported by reference to Biber and colleagues' approach to linguistic variation (e.g., Biber, 2012; Biber & Conrad, 2009; Biber, Johansson, Leech, Conrad, & Finegan, 1999), following their argument about the centrality of the notion of register. Biber's corpus research of some 30 years has shown that there is no such thing as 'the (English) language', but systematic differences exist in patterns of linguistic variation across registers and sub-registers as well as genres of various kinds, on all linguistic levels, including lexical patterns, grammatical patterns, and lexico-grammatical associations (cf. Biber & Conrad, 2009). This essentially means that register (and genre) must be shifted from the periphery to the core of linguistic description in general and in the linguistic description of metaphor in particular.

Our book is not the first to highlight the connection. The MIPVU team's dissertations modelled it extensively (Dorst, 2011; Herrmann, 2013; Krennmayr, 2011; Kaal, 2012; Pasma, 2011; see also Steen et al., 2010a), and it is reflected in the corpus design of the VUAMC (Steen et al., 2010b) as well as in the manual for metaphor identification across registers/discourse domains (Steen et al., 2010c). In this kind of research, *register* is understood as a general language variety defined by contextual features (Biber, 1995; cf. Eggins & Martin, 1997; Halliday & Hasan, 1985/1989), with the four main registers news, fiction, academic prose, and conversation "being (a) important, highly productive varieties of language, and (b) different enough from one another to represent a wide range of variation" (Biber, Johansson, Leech, Conrad, & Finegan, 1999, pp. 15–16). Discourse events can be described also by means of the category *genre*. In Swales's seminal work, genres are defined as "classes of communicative events which typically possess features of stability" (Swales, 1990, p. 9), and genre-type communicative events hence not only consist of the texts themselves (spoken or written – or a combination), but also of "encoding and decoding procedures as moderated by genre-related aspects of text-role and text-environment" (Swales, 1990, p. 9).

From this perspective, register and genre are the beginning for metaphor, not an afterthought. The articles of this book reflect this in showing a heightened

awareness for the situated origins and multi-dimensional nature of discourse, examining metaphor in and across distinct registers and genres. However, while natural discourse comes in a great variety of registers and genres, the present volume is most interested in their role in shaping metaphor in *specialist discourse*, which we see as communication defined by a relatively high degree of specialization in language features, but also in topic, audience, and production circumstances (cf. Schulze & Römer, 2008).

Our book was inspired by the RaAM conference and pursues RaAM's aims: the application of metaphor research to real-world issues, the development of rigorous research methods, and an interdisciplinary approach. This approach has provided motivation for other books (such as the collective volume edited by MacArthur, Oncins-Martínez, Sánchez-García, & Piquer-Píriz, 2012). Yet whereas MacArthur et al. focus on the complexity and variability of real-world metaphor in non-specialist contexts, the present book deliberately zooms in on metaphor use in discourse specialization and its relation to popularization. With regard to metaphor studies more generally, a few (collected) volumes exist that are similar to the present one in their discourse-analytical, usage-based, and cognitive-linguistic approaches to metaphor (e.g., Deignan, Littlemore, & Semino, 2013; Low, Cameron, Deignan, & Todd, 2010; Semino, 2008; White & Herrero, 2012; Zanotto, Cameron, & Cavalcanti, 2008; Zinken & Musolff, 2009), but no comparable collective publication has thus far devoted itself directly to the specialist side of metaphor – at least not in juxtaposing a substantial number of different specialist domains and thereby forming a comparative overview.

Our volume presents analyses of metaphor in very distinct target domains, registers, and genres in order to reflect the variability of metaphor in specialist discourse, with specific linguistic forms, underlying concepts, and distinct communicative goals. The individual chapters deal with academic writing, the aetiology of cancer, broadband network design, biology, counselling, conversation, fiction, industrial work floor communication, news, psychology, the penal system, and soccer. In addition to offering insights about metaphor as it is used in language for such distinct specific purposes, the volume also aims to shed some light on metaphor use in the continuum between specialist and general discourse. This concerns the issue of popularized specialist discourse as well as that of variability in the degree of discourse specialization (in terms of knowledge, audience, and language and genre conventions). Although not a theoretical book, it offers a contribution to metaphor theory, enabling – however preliminarily – an account of metaphor in specialist discourse, seen as specialist language use across different varieties.

At the same time, the presented research addresses current issues and controversies in metaphor studies, such as the extent and status of conceptual mappings and the question of noticing/observing deliberate metaphor, as well as the still

important question of how to identify metaphor reliably, and possibly accurately, in different discourse contexts. That being said, the volume's focus is on the (linguistic) variability of metaphor that derives from varying degrees of specialization and popularization across distinct domains of discourse. In this way, it offers a much-needed perspective on metaphor, highlighting specificities as well as possible generalities of metaphorical language (and thought) in specialist discourse.

## 2. Theoretical framework and methodologies

This book approaches its content from the angle of metaphor studies. More specifically, our central theme is metaphor use in specialist discourse, which means that the general focus is on metaphorical language as register, genre-, and context-specific data. This focus enables the investigation of micro contexts (such as workers' interaction in a salmon factory) as well as macro contexts (such as academic writing). One of the unifying concepts underlying the present volume is Biber and colleagues' notion of *register* (cf. Biber, 1988; Biber & Conrad, 2009; Biber et al., 1999), understood as a language variety influenced by contextual (situational) factors. Ample empirical research suggests that variation underlies all language use, which implies that one important level of analysis is at the more specific level of register.

Yet our book explores metaphor not only at a general register level (e.g., academic prose, news, fiction, political discourse, or conversation; cf. Semino, 2008; Steen et al., 2010a, 2010b, 2010c), but also beyond it, in more specialist pockets of language use, and from a perspective that takes into account even more the situated aspects of the discourse. Here is where the level of genre comes into play, seen as conventionally expected text types with a characteristic internal structuring, used by specific discourse communities for specific purposes (cf. Swales, 1990, 2004). We apply Biber's concept of register and Swales's concept of genre to render a unified approach to specialist discourse, modelled on different levels of specialization in topic, audience, and language use, much as once famously demanded by Swales when he put under the spotlight of analysis "variation in communicative purpose, addresser–addressee relationships and genre conventions" (Swales, 1990, p. 3). Whereas Swales expressed reservation towards "registral labels, such as scientific, medical, legal or even newspaper English" that might "overprivilege homogeneity of content" at the expense of the mentioned variability in non-textual dimensions, in our volume, we do not wish to lose out on more general levels of description: both discourse and corpus linguistic research from the last fifteen years or so has shown that language can be validly described at different levels of generality, as long as principled decisions about that level of analysis are built into

the research design and reflections on the scope of claims generated from it (cf. Biber & Conrad, 2009). Table 1 shows how Biber and Conrad (2009) summarize the defining characteristics of register versus genre analysis.

**Table 1.** Defining characteristics of registers and genres

Defining characteristic	Register	Genre
Textual unit	text samples	whole texts
Aspects/features of interest	lexicogrammar in general	specialized items, internal organization, layout
Distribution of features	recurrent and pervasive within and across the texts	incidence in and/or preference for particular places along the text, with concentration in parts of the text, often once-occurring
Interpretation	communicative, with a focus on the functions arising from the association among features	culturally expected text constructions, with a focus on the text-internal patterning emerging from the clustering of features

Note. Adapted from "Register, Genre, and Style", by D. Biber and S. Conrad, 2009, p. 16, Cambridge: CUP. Copyright by Cambridge University Press.

Most recently, Deignan et al. (2013) have offered a model of metaphor use in different contexts that incorporates a detailed account of both register and genre. Along the lines of the basic distinction offered by Biber and Conrad (2009), they analyze metaphor separately at the genre level and at the register level: register analysis looks at lexico-grammatical features as defined by contextual factors, cutting across very different genres and texts, with important parameters being "Field", "Tenor", and "Mode" (Halliday, 1978; cf. Deignan et al., 2013, p. 31); genre analysis is an examination of the internal organization of whole texts, with crucial parameters being "discourse community", "purpose", and "stage" (cf. Swales, 1990). Drawing on Systemic Functional Linguistics, Goatly (1997, p. 293) summarizes these three parameters as follows: "Field (what's going on), Tenor (who's involved in what relations) and Mode (the role of language)". Similarly, Deignan et al. propose that "[f]ield, tenor and mode provide a multi-dimensional framework for considering text types from a linguistic perspective, developing and adding detail to a description of genre" (2013, p. 49). Our volume concurs with Deignan et al. in treating metaphor at the register and the genre levels, but has a slightly different aim. While in a collective volume such as ours a disadvantage is the necessarily less tightly tailored theoretical framework, an advantage is that very distinct types of metaphor research can be collected, all of which hone in on aspects of register and genre.

In terms of metaphor theory and methodology, the present volume reflects the diversity that has developed over the last years within empirically oriented research on metaphor in language usage (see, e.g., Cameron & Low, 1999; Cameron & Maslen, 2010; Deignan, 2005; Steen et al., 2010c). Thus, the independent chapters not only approach the phenomenon of metaphor from slightly different angles theoretically, but also apply slightly distinct methods of analysis tailored to their aims (descriptive, quantitative, multi-dimensional, ethnographic, intra-register variation, discourse analysis, content analysis). However, from the perspective of metaphor studies, certain linchpins exist that keep the volume together on both a theoretical and a methodological level, and authors were asked to ensure that this standard was maintained: The definition of metaphor, rigor and explicitness in metaphor identification, the definition of specialist discourse, an emphasis on an empirical approach to metaphor in discourse, and a focus on variability rather than homogeneity in metaphor-in-use.

As far as the operationalization of metaphor is concerned, the basic definition of metaphor pursued in this volume is a set of correspondences, or a mapping, between two conceptual domains. This definition, originally proposed by Lakoff and Johnson (1980; cf. Lakoff, 1993), has been maintained in more comprehensive models of metaphor in discourse (Steen, 2007, 2011) and parallels that of similar approaches (e.g., Cameron, 2003). In our volume, metaphor is set at the level of discourse (cf. Cameron, 2003; Musolff, 2004; Semino, 2008), meaning that metaphor was identified at the linguistic/gestural level of analysis as well as the level of underlying conceptual structure and that of language processing and communication (see also Cameron, 2003; Steen, 2007). In short, for our purposes, metaphor is seen as a cross-domain mapping present in linguistic forms (including gesture), conceptual structures, and communicative functions in discourse (cf. Steen, 2007, 2011). This broad definition was a focal point for all chapters.

With regard to conceptual metaphor theory (CMT; e.g., Lakoff & Johnson, 1980), separating the analysis into linguistic, conceptual, and behavioural levels is necessary when seriously considering the various criticisms of CMT (e.g., Murphy, 1996, 1997; Ritchie, 2003, 2004; Vervaeke & Kennedy, 1996, 2004). Because of its contextual and multifaceted nature, metaphor is difficult to identify in a reliable and accurate way (cf. Low & Todd, 2010; Steen, 2007). This is particularly true for specialized discourse settings, where metaphoricity is regulated by discourse communities and the specificity of meanings and concepts poses additional difficulties for the analyst (cf. Herrmann, 2013, pp. 72–89). In tackling this problem, contributors to our volume have adopted different analytical strategies, but all have striven to maintain rigor and explicitness in metaphor identification on all applicable levels of analysis.

With regard to the specific purposes dimension, our volume is inspired by LSP research on varieties of language in fields of activity where professional knowledge

of some sort is required, with language for specific/special purposes being the opposite of ordinary language (cf. Muschard, 2007). Our chapters share the working definition of *specialist discourse*, understood as communication defined by a relatively high degree of specialization in topic, audience, production circumstances, and language features (cf. Giles, 2008; Schulze & Römer, 2008) as well as register (cf. Biber & Conrad, 2009) and genre (cf. Bahtia et al., 2011; Swales, 1990, 2004). With this focus, our view on uses of specialist discourse is rather global, encompassing “social as well as interactional and cognitive issues (in the sense of knowledge maintenance and knowledge transfer)” (Schulze & Römer, 2008, p. 266), and is based on the reciprocal relationship between specialized language and discourse domain:

[S]pecialized language on the one hand is constitutive of the domain, and the domain on the other hand affects or even shapes specialized language in that it provides knowledge about the specific needs to be covered in such specialized language. (Schulze & Römer, 2008, p. 266)

In our view, specialist discourse encompasses both technical and scientific communication, assuming that these “share a common goal to communicate to a specified audience” (Giles, 2008, p. 5). On another note, specialist discourse is by definition subject to what could be termed popularization, with technical and scientific topics being communicated to some (more) general audience (cf. Richardt, 2005; Schulze & Römer, 2008). For our purposes, popularization extends to the continuum between expert-expert and expert-layperson communication (cf. Grove Ditlevsen & Kastberg, 2011; Littlemore, 2012) or between specialist and ordinary languages (cf. Muschard, 2007). Although our focus on specialist discourse/register specialization was clear from the beginning, the issue of popularization emerged during the editing process, with different degrees, or types, of popularization being described by several chapters. However, in hindsight, this can be explained by the very fact that the volume approaches language from the point of view of language users in particular contexts, not from the perspective of the language system: popularization emerges where specialized knowledge is communicated by language users along knowledge asymmetries (Grove Ditlevsen & Kastberg, 2011).

This is why we prefer the term *specialist* to *specialized*: the former implies the role of specialist language users in defining the language in use. Specialized language generally implies a ‘restricted language’ (a sublanguage) (Biber, 1994, p. 53), with a ‘distinctive grammar’ (Grishman & Kittredge, 1986, p. ix) arising out of reference to very specific subject domains (Biber, 1994, p. 53). Specialist users, in contrast, might or might not make use of specialized language. For instance, popular science articles are produced by specialists, but the language in the articles is not immediately recognized by the use of a specialized scientific sublanguage; quite the opposite, the language of science tends to be rephrased for the benefit

of a wider audience. Popular science is therefore arguably specialist discourse, but not inherently specialized language. The language is specialized not in the restricted sublanguage sense, but in another way – namely, it is shaped by the situational context in which it will appear, thereby incorporating the typical linguistic characteristics that set it apart from other kinds of registers. As the chapters in this book argue, one such major characteristic is metaphor, a vital component in the constitution of specialist discourse that has been missing from most of the literature examining register distinctions in different languages.

That metaphor is still widely neglected as a key element in specialist communication can be seen in Ferguson's (2004, p. 20) inventory of features:

People participating in recurrent communication situations tend to develop similar vocabularies, similar features of intonation, and characteristic bits of syntax and phonology that they use in those situations.

We would add metaphor to this list of features, for which the individual studies in this book provide ample support.

The book as a whole places a strong emphasis on an empirical approach to metaphor in discourse (cf. Low & Todd, 2010; Pragglejaz group, 2007; Steen, 2007). All studies are based on naturally occurring data ranging from written (e.g., scientific journal articles, textbooks, policy documents, newspaper articles) to spoken (soccer broadcasts) and multi-modal (gestures). The empirical approach also includes making explicit the method(s) applied, paying special attention to describing the criteria for metaphor identification and clarifying on which level of analysis the study mainly operates.

Within empirical metaphor studies, our book encapsulates a new research approach. Although the first wave of metaphor research was based on single texts or impressionistic evidence (e.g., Lakoff & Johnson, 1980) and the second wave concentrated on constructing whole language corpora (e.g., Deignan, 2005), we are presently witnessing a third wave unfolding – namely, register/genre-based analyses. Our explicit focus on variability rather than homogeneity in metaphor-in-use has distilled from this general trend the research topic of metaphor in specialist discourse. This has theoretical implications: by bringing into focus the realm of specialist discourse in metaphor studies, our volume acknowledges the need for theoretical modelling of the relationship between metaphor (seen as a cross-domain mapping, present in linguistic forms, conceptual structures, and communicative functions in discourse, cf. Steen, 2007, 2011) and specialist discourse (seen as communication defined by a relatively high degree of specialization in topic, audience, production circumstances, and language features, cf. Schulze & Römer, 2008). Although this is not the place to model the relationship extensively, we believe that this conceptualization in particular, as well as the

volume in general, will help advancing a full-fledged account of the forms and functions of metaphor in specialist discourse settings.

### 3. Overview

The book comprises three empirical sections ordering the broad range of specialized topics and domains by the following general patterns. In the section ‘Metaphor Variation in Specialist Discourse’, two studies suggest that metaphor use varies both within and across particular domains of discourse due to specific factors. Beger singles out the use of metaphor in particular fields of expertise within psychology (i.e., counseling versus academic psychology). Berber Sardinha examines metaphor variation on a quantitative basis across different registers (academic prose, news, fiction, and conversation), on a cline from more specialized to non-specialized discourse.

In the section ‘Metaphor in Specific Contexts’, three studies discuss the forms and functions of metaphor use in different specialist discourse environments. Deignan and Armstrong’s chapter discusses the role of metaphor in Scottish Penal Policies. Thalhammer examines metaphors used in soccer radio broadcasts in English and German. Harrison approaches technical metaphor use on a multimodal level, discussing metaphor in gestures used on the work floor of a French salmon factory.

The section on ‘Metaphor in Science Writing’ comprises three analyses of metaphor use in what can broadly be described as science writing. Looking at the level below the register, Herrmann presents a fine-grained quantitative analysis of distinct metaphor types across sub-registers of academic prose; combining a genre and register analysis, Knudsen assesses the attitudes towards metaphor reflected in contemporary research articles from biology; and Smith shows how sets of metaphors coin reference to dynamical systems in expository texts.

In the section on ‘Metaphor and Popularization’, another two studies examine aspects of metaphor use when communicating to a general public: Williams Camus examines how a discourse community applies metaphor via-à-vis the popularization of cancer cell research in both English and Spanish news, whereas Williams looks at metaphor use in the policy press release genre in regards to a Canadian broadband network. Popularization has emerged as an important factor in metaphor in specialist discourse, which is present in many other chapters as well (e.g., Beger, Knudsen, Herrmann, Smith), approached where specialist language (and metaphor) use confronts laypersons as interlocutors.

Finally, in her summarizing commentary, Littlemore revisits all of the chapters, offering observations on the data studied, the methodologies employed, and

the conclusions reached while also suggesting how the chapters relate to current issues in metaphor studies. She rounds off her paper by discussing implications and proposing possibilities for further research into metaphor within both applied linguistics and psycholinguistics.

The present volume is unique for bringing together studies on metaphor in very different areas of specialist discourse, depicting metaphor's relationship to specialization in topics and language use, popularization, and communicative goals. It thus brings into focus the issue of metaphor as being determined by register and genre factors on situative as well as linguistic levels of description and to varying degrees of generality (cf. Biber, 2012; Biber & Conrad, 2009). We hope that these contributions on metaphor use for specific purposes in distinct discourse settings will be of value to linguists and metaphor scholars of different persuasions, graduate students of linguistics and related disciplines, and practitioners of specialized areas with an interest in (verbal or gestural) language use in their areas of expertise.

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## SECTION II

# Metaphor variation in specialist discourse



# Register variation and metaphor use

## A multi-dimensional perspective

Tony Berber Sardinha  
São Paulo Catholic University, Brazil

One of the consistent findings in the literature from a corpus-based perspective is that the incidence of metaphor varies across different registers. The goal of this chapter is to verify to what extent the variation in metaphor use is systematic in English, from a Multi-Dimensional perspective. The VU University Annotated Metaphor Corpus was used, comprising over 200,000 words in four registers. In total, 250 different features were included in the study. The main results show which dimensions underlie metaphor use in English, how metaphor relates to the dimensions of variation in English, how much variation can be accounted for by knowing register distinctions, and which are the metaphor-based text types in English.

### 1. Introduction

Corpus-based research into metaphor has provided valuable insights into a range of aspects of metaphor use, including frequency, patterning, and distribution within and across texts. One of the most consistent findings coming out of this research is that metaphor use varies across different specialized language varieties, such as genres, registers, and text types. The literature offers both direct and indirect evidence of a relationship between metaphor use and specialist texts. Different studies offer indirect evidence by looking into distinct text varieties. If we concentrate on frequency alone, which is just one of the features that such studies consider, we will realize it varies considerably across different varieties. For instance, in classroom discourse, the average rate of metaphor use is once every 37 words (Cameron, 2003), and once every 22 in business conference calls (Berber Sardinha, 2008a). Taken together, these two studies suggest metaphor frequency may influence register variation. A problem with approaching metaphor across different studies like this is that many variables are not controlled for, and the differences noted may be due to unknown influences rather than to

true situational or linguistic characteristics relevant to these registers. This problem can be ameliorated by looking at metaphor and register variation directly in register-diversified corpora. Studies focusing on metaphor variation directly control for identification method, among other issues, and therefore offer a more straightforward perspective on variation.

A number of studies have documented how metaphor is related to a wide range of lexical, semantic, pragmatic, cognitive, rhetorical and discourse-based aspects, including individual thought processes (Gibbs, 2008), recurrent language patterns (Deignan, 2005), discourse flow (Cameron, 2008) and configurations (Semino, 2008), contextual factors (Cameron, 2003), age (Piquer-Piriz, 2008), interactions among participants (Zanotto & Vesaro Palma, 2008), and historical circumstances (Berber Sardinha, 2012b), to mention only a few. In keeping with the theoretical underpinning for this volume, the study reported in this chapter takes the view that register is a major driving force behind metaphor use in authentic language. As such, the theoretical standpoint advocated here is that the emergence of metaphor in (spoken and written) texts can be accounted for at least in part by the multiple interactions among metaphors on the one hand and by the interactions among metaphors and the different linguistic features that are put in play to enact these metaphors, on the other. In other words, particular linguistic configurations conspire to make the incidence of metaphor at times a likely and at times an improbable event in ordinary language use. The claim put forth here is that a register perspective can potentially reveal these configurations, and as a result throw light onto the question of why metaphor turns up in discourse as it does.

To address this issue, this study advocates that metaphor is a complex emergent phenomenon that invites the analyst to take a multidimensional perspective. As such, consistent with the theme of this volume, this chapter takes a comparative perspective on specialist discourse by looking at a set of different registers. The registers analyzed here include academic writing, news, fiction, and conversation, and they range from highly specialized, such as academic writing, to less specialized ones, i.e. conversation.

So far few studies have taken a direct perspective on metaphor and register variation, not least because of the large amount of effort involved in coding metaphor (cf. Berber Sardinha, 2012a). To date, there are two main sources for register variation studies in metaphor use. One is a set of studies that includes Steen et al. (2010), Krennmayr (2011), Dorst (2011), Kaal (2012), and Herrmann (2013), all of which employed the VU Amsterdam Metaphor Corpus (VUAMC), a sample of the BNC Baby entirely hand-coded for metaphor using MIPVU as the identification method; and Steen et al. (2010) and Pasma (2011), who analyzed a similar Dutch corpus. Analyses of the VUAMC show that metaphor relates to register mainly

with respect to frequency and word class. With regard to frequency, metaphor occurs more often in academic writing (where 17.5% of the words are metaphorically used), followed by news (15.3%), fiction (10.9%), and conversation (6.7%). And as far as word class is concerned, most metaphorically used words are verbs and prepositions in all registers except academic writing. Results also reveal that the share of different parts of speech varies significantly across registers, suggesting intricate patterns of metaphor variation.

The second literature source is Berber Sardinha (2011b), which takes a multi-dimensional perspective on metaphor and register variation. Based on a small corpus of Brazilian Portuguese comprising newspaper, academic, and conversation texts, this study has identified two tentative dimensions of metaphor variation, namely ‘involved narrative production versus metaphor use,’ and ‘non-specific metaphor use.’ The first one reflects an interaction between frequency of metaphor use and narrative concerns, and shows a split between conversation, on the ‘low metaphor frequency, narrative’ end of the dimension, and the other two registers, which are ‘high metaphor frequency, non-narrative.’ The second dimension, in turn, marks a distinction between conversation, being more ‘specific’ with respect to metaphor use as it selects mostly topics related to ‘people,’ and the other registers that are more diverse in this regard.

This body of research presents a complex picture of the relationship between metaphor and register variation. As Kaal (2012, p. 56) argues, “the study of metaphor would greatly benefit from a register-variation approach that is able to separate register-defining metaphor use from general and shared patterns.” To accomplish this, this chapter resorts to the (Multi-Feature) Multi-Dimensional framework (Biber, 1988, *et seq.*) and multivariate statistical techniques in order to examine the interplay between register variation and metaphor use in English.

The following questions were formulated and will be addressed in turn in the chapter:

1. Is there a relationship between Biber’s (1988) dimensions of register variation for English and metaphor use? In other words, by using the major dimensions of variation (Biber, 1988), and given that we know the scores for each text on them, are there significant associations between these scores and metaphor use? If so, which parameters of variation are associated with metaphor use?
2. What dimensions of variation are specific to the VUAMC corpus? Do they differ from those obtained by Biber (1988)? What is the role of metaphor on the dimensions?
3. Are differences among mean register scores on each dimension significant?
4. What are the text groupings that cut across register categories for the individual dimensions?

## 2. The multi-feature multi-dimensional approach

The Multi-Feature Multi-Dimensional, or simply the Multi-Dimensional (MD) approach, was developed by Biber (1988 *et seq.*) with the aim of finding the communicative parameters that underlie register variation. The MD approach has been applied to a number of different contexts, ranging from specific genres, such as TV episodes (Rey, 2001), to broad registers, such as conversation (Biber, 2004), and even to whole languages, such as English (Biber, 1988), Spanish (Biber, Davies, Jones, & Tracy-Ventura, 2006; Parodi, 2007) and Portuguese (Berber Sardinha, 2011a, 2014a, b). With the exception of Berber Sardinha (2011b) and the project reported here, no MD study has incorporated metaphor in the set of features analyzed. The following are the steps in a full MD analysis:

1. A corpus is collected that represents the registers needed to attain the research objectives.
2. A review of the literature indicates the features necessary for the analysis of the corpus.
3. A corpus is tagged automatically, interactively, and/or by hand for those features.
4. The frequencies of each feature are counted, and normalized to control for text size.
5. The data are screened statistically, and features that do not meet the necessary requirements for factor analysis are discarded.
6. Frequencies for the remaining features are further standardized to a mean of 0 and a standard deviation of 1 to control for differences in feature frequency.
7. An initial unrotated Factor Analysis is run to determine the number of factors in the data as well as the variables that will remain in the analysis.
8. Further factor extractions are performed, and rotation of these factors indicates which variables are present on each factor, with their respective weights.
9. Each text receives a factor score, based on the standardized frequencies of the variables on each factor.
10. A mean score is calculated for each register, and registers are placed on a scale representing the range of scores on each factor.
11. Factors are interpreted and given labels to express their underlying communicative or discourse parameters. These are the dimensions of register variation.
12. Statistics are computed to assess the amount of variation captured by each dimension.

### 3. Method

#### 3.1 Corpus

The corpus used for this study is the VUAMC (VU Amsterdam Metaphor Corpus), which in turn is a sample of BNC Baby that was hand coded for metaphor by the members of the Metaphor in Discourse project (Steen, et al., 2010). The corpus was downloaded off the Oxford Text Archive and, after processing with the Biber tagger, it had the size shown in Table 1.

**Table 1.** Composition of the VUAMC Corpus after processing

Register	Tokens	Texts
Academic	68,276	15
Conversation	48,768	11
Fiction	45,663	12
News	46,208	46
Total	208,915	84

#### 3.2 Metaphor identification

The VUAMC corpus had been coded for metaphor using MIPVU, a procedure that consists of the following steps:

1. Find metaphor-related words (MRWs) by examining the text on a word-by-word basis.
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).
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).
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).

5. When a word functions as a signal that cross-domain mapping may be at play, mark it as a metaphor flag (MFlag).
6. When a word is a new-formation coined, examine the distinct words that are its independent parts according to steps 2 through 5. (Steen, et al., 2010, p.25)

### 3.3 Tagging

The corpus had its original part of speech tags removed and was then tagged over with the Biber tagger, a software program regularly employed in MD research that automatically identifies more than 200 different linguistic features. It was later post-processed by the Biber Tag Count program, which calculated the frequencies of 127 selected features. To identify semantic features, the EngCG parser was used (Bick, 2009).

### 3.4 Variables

A review of the metaphor literature indicates the following features as potentially relevant:

1. Metaphor frequency: density of metaphor use differentiates registers, as noted in the introduction.
2. Metaphor signaling: words that act “as a signal that a cross-domain mapping may be at play” are considered metaphor signals, or flags (Steen, et al., 2010, p.26).
3. Metaphor manifestation: metaphors can be expressed:
  - a. Directly: Words whose metaphorical status is signaled directly (Steen, et al., 2010, p.39), by words such as *resembling*, *as*, and *like*. E.g.: *He's like a favorite old coat*. (Steen, et al., p. 93).
  - b. Indirectly: Words whose metaphoricity is not explicitly signaled (Steen, et al., 2010, p. 33). This is how metaphors manifest themselves by default. E.g.: *high wages* (Krennmayr, 2011, p. 31).
  - c. Implicitly: Words whose metaphorical status is realized by substitution (e.g. *it in to embark on such a step is not necessarily to succeed immediately in realizing it*, where *it* refers back to the metaphorically used word *step*) or ellipsis (*but he is [an ignorant pig]*, where *is* receives the code for implicit, elliptical metaphor, in place of the omitted fragment in brackets) (Steen, et al., 2010, p. 40).
4. Metaphor clustering: Metaphor cases are distributed unevenly in text, forming clusters of neighboring metaphors (Cameron & Stelma, 2004).

5. Metaphor conventionalization: Conventionalized metaphors, or those that “go unnoticed in everyday life” (Deignan, 2005, p. 5, pp. 40–47), represent a large share of metaphor use.
6. Metaphor semantics: Assigning metaphor cases to semantic groupings is useful in categorizing metaphor use (Cameron & Maslen, 2010). In addition, semantic fields have been used as a starting point for metaphor detection (Berber Sardinha, 2012a; Hardie et al., 2007; Kaal, 2012; Krennmayr, 2011).
7. Metaphor word class: Previous studies found that frequency of different parts of speech distinguishes registers (Dorst, 2011; Kaal, 2012; Krennmayr, 2011; Pasma, 2011; Herrmann, 2013).

As a result, three different kinds of variables were extracted from the corpus: structural, semantic, and metaphor related. The source for the structural variables was the tags assigned to each word by the Biber tagger, which were then post-processed by the Biber counter. For semantic variables, the source was the tagging done by the EngCG tagger. And for metaphor variables, the source was the manual annotation added to the corpus by the MIPVU team.

The search strings used for extracting metaphor-related words and flags from the VUAMC appear in Table 2.

**Table 2.** Search strings for metaphor cases

XML markup	Meaning
type=“impl”	Implicit metaphor
type=“lit”	Explicit metaphor
type=“met”	Indirect metaphor
seg function=“mFlag”	Metaphor flag
subtype=“WIDLII”	Borderline cases

All borderline cases were incorporated in the actual counts for each metaphor type.

Metaphor variables were combined with both structural and semantic variables and processed through scripts that the author developed using algorithms such as:

For each metaphor category (indirect, direct, implicit, flag):

- a. Find each metaphor-related word in each text;
- b. Detect the major part of speech assigned to it;
- c. Count how many times this metaphor-related word was used
- d. in each text as that part of speech;
- e. Repeat for each semantic field.<sup>1</sup>

1. This refers to all the semantic fields that can be assigned to a word.

The major part of speech categories were adjective, adverb, article, coordinating conjunction, determiner, existential *there*, foreign word, infinitive marker, interjection, *not*, noun, number, pre-quantifier, preposition, pronoun, qualifier, subordinating conjunction, *that* clause, verb, wh-word.

This algorithm produced a breakdown of the frequency of each metaphor category by part of speech and semantic class. For instance, indirect metaphors were counted as:

Indirect metaphors, nouns;  
Indirect metaphors, adjectives;  
Indirect metaphors, adverbs;  
Indirect metaphors, action semantic field;  
Indirect metaphors, building semantic field;  
Indirect metaphors, container semantic field;  
And so on.

In addition to structural, semantic, and metaphor-related variables, two other variables were computed. The first was metaphor bundles, which captures metaphor conventionalization. It was operationalized through a count of high-frequency lexical bundles (Biber, Conrad, & Cortes, 2004) that incorporate a metaphor-related word. Bundles were processed as follows:

1. For each file, create 3-grams, that is, sequences of three neighboring words;
2. For each of these 3-grams, determine if it incorporates metaphorically used words by matching it to the annotated corpus;
3. For each 3-gram that has a metaphorically used word, match it to the list of COCA (Corpus of Contemporary American English; [corpus.byu.edu/coca](http://corpus.byu.edu/coca)) 3-grams;
4. Count matching 3-grams in each file.

For example, in the excerpt in Table 3 (file FEF, academic), there are two metaphorically used words (*field* and *thing*) and four matching COCA 3-grams ('the electric field', 'the same thing', 'same thing for', and 'thing for the').

The second extra variable was metaphor clustering, which operationalizes metaphor distribution. A metaphor cluster was defined as a sequence of at least three metaphor-related words (direct, indirect, or implicit metaphors) at a distance not greater than  $D$  from each other.  $D$  was calculated as the average distance between metaphors, which was eight (208,915 tokens / 25,429 MRWs = 8.21, rounded off to 8). To illustrate, below is a sentence from file *fef* that contains a metaphor cluster formed by the use of the metaphor words *satisfied*, *potential* and *called* in close proximity:

- (1) Since it is the equation [formula removed] that needs to be satisfied, we should choose the potential as a vector (called, not without logic, the vector potential), defined by the equation [formula removed].

Table 3. Identifying metaphor bundles

Tokenized text	Metaphor?	3-gram	Contain a metaphorically used word?	Match COCA 3-gram list?
the		The other equation		
other		Other equation for		
equation		Equation for the		
for		For the electric		
the		The electric field	Yes	Yes
electric		Electric field strength*	Yes	
field	Yes	field strength* formula*	Yes	
...				
Can		Can we do		
we		We do the		
do		do the same		
the		the same thing	Yes	Yes
same		same thing for	Yes	Yes
thing	Yes	thing for the	Yes	Yes
for		for the magnetic		
the		the magnetic quantities		
magnetic		magnetic quantities no*		
quantities?		quantities no* but*		

Note. \* These words do not appear in the text sample quoted.

Table 4 gives details of the number of features present in the corpus by variable type.

Table 4. Total features used in annotating the corpus

Variable type	Features in tag set	Features present in the corpus
Structural	401	127
Semantic	270	36
Metaphor	1162	123
Total	1833	250

The total number of features present in the corpus excludes semantic variables because these were only counted for metaphor-related words, and therefore their count is already incorporated in the metaphor tagset. Hence, all variables fell in two groups: structural and metaphor related. The figure for structural variables refers to the features selected by the Biber counter, and it is smaller because the

counter considers only the most important tags in the tagset, collapsing tags into groups. All counts were normed per 1,000 words. For example, the frequency of indirect metaphors in text A1E was 86. Since this text had 598 tokens, its normed count for indirect metaphors was 143.8, that is,  $86/598 * 1000$ . Norming controls for text size, thus enabling comparisons across texts of different sizes.

## 4. Results

### 4.1 Question 1: Relationship between metaphor and previous dimensions of variation

Answering this question did not require a new Factor Analysis to be run, but that the factors already extracted by Biber (1988) be applied to the VUAMC corpus. Hence, for each text in the corpus, factor scores were computed using the same variables, means, and standard deviations as used in Biber (1988). After that, correlations were run between the scores for each text on Biber's (1988) dimensions and the main metaphor variables, namely, counts for indirect, direct, and implicit metaphor, and for metaphor flags. The results appear in Table 5.

**Table 5.** Correlation coefficients for main metaphor counts and text scores on each of Biber's (1988) dimensions

Count	Biber's (1988) dimension				
	1	2	3	4	5
Indirect metaphor	-.574 p = .000	-.336 p = .000	.558 p = .000	-.009 NS	.270 p = .013
Direct metaphor	-.047 NS	.025 NS	-.091 NS	.014 NS	-.029 NS
Implicit metaphor	-.110 NS	-.092 NS	.084 NS	.038 NS	.159 NS
Metaphor flag	-.074 NS	.087 NS	-.100 NS	-.153 NS	-.012 NS

As the table shows, the correlations with Biber's dimensions are moderate at best (.558 at most). In addition, indirect metaphor is the only type that had any significant scores at all (with Dimensions 1, 2, and 3), meaning any relationship between these dimensions and metaphor use is restricted to that particular kind of metaphor. Dimension 1 (information vs. involvement) had a negative coefficient, meaning that a high score on the 'information' side of dimension would predict a large number of metaphors in the text, while a high score on 'involvement' would

indicate few metaphors. In turn, Dimension 3 (explicit vs. situation-dependent reference) had a positive score, indicating that a high scoring text on ‘explicit reference’ would have abundant metaphors, while a ‘situation-dependent’ text would have few metaphors. However, because the correlation coefficients were moderate, these relationships between metaphor use and the text characteristics marked by the dimensions are tentative. They would suggest that metaphor is more likely to occur in texts that are literate (i.e. with negative scores on Biber’s Dimension 1), non-narrative (negative scores on Dimension 2), and reference explicit (positive scores on Dimension 3). At the same time, texts with the opposite characteristics would be more likely to avoid metaphor: more involvement (positive score on Dimension 1), narrative concerns (positive score on Dimension 2), and with situation-dependent reference (negative scores on Dimension 3).

The answer to question 1, therefore, is that there is no strong statistical association between the existing dimensions for English and metaphor use. However, the correlations suggested a possible ‘natural environment’ for metaphor use: information density, non-narrative focus, and reference that is independent of context. This can inform the extraction of a new set of dimensions that takes into account the use of metaphor, so that metaphor use is reflected directly in the dimensions, and at the same time, register variation in English reflects metaphor use.

#### 4.2 Question 2: Dimensions of variation

A fresh multi-dimensional analysis must include the extraction of factors, rather than relying on previously determined ones. To do that, variables were selected that met two main criteria:

- a. The subjects to variables (STV) ratio should be at least 2, that is, there had to be twice as many texts (subjects) as there were variables. There are many different STV ratios in the literature, from just above 1 to 20 (Zhao, 2009). In the MD literature, STVs range from 2.6 for Korean (150 texts, 58 features), 5.3 for Tuvalan (222 texts, 42 features), 7.2 for English (481 texts, 67 features), and 7.4 for Somali (483 texts, 65 features) (Biber, 1995, pp. 89–100). In this study, hand analysis of metaphor constrains the size of the corpus, even though the VUAMC corpus has more tokens than either the Somali or the Korean corpus (Biber, 1995), but fewer texts. At the same time, metaphor needs to be explored in as much detail as possible, which contributes a large number of features. These two considerations led to the decision to adopt an SVT that was compatible with both prescriptions in the statistics literature and the lower range of previous MD analyses. Consequently, as there are 84 texts in the corpus, the maximum number of variables was 42.

- b. These 42 variables should have the highest communalities in the data set, and no communality should be less than .2 (Biber, 1995, p. 138). Communalities indicate the degree to which the ‘variation of a particular feature overlaps with the total pool of shared variance in a factor analysis.’ (Biber, 1995, p. 138). In other words, high communality variables have a greater influence than low communality ones on variation, which is what is being measured, and therefore by removing features with low communalities, the factor analysis loses ‘clutter’, gains clarity, and the analyst is better able to focus on the variables that have more influence on the results.

To obtain these 42 highest communalities, an initial Factor Analysis was run, using a subset of the total 250 variables. This subset comprised all 47 variables used to compute the five major dimensions of variation for English in Biber (1988), in addition to the 52 metaphor-related variables that had a mean normed frequency of .1 (i.e., they occurred at least 10 times per 1,000 words). This Factor Analysis solution was unrotated, using Principal Axis Factoring as the extraction method. The 42 variables retained appear in Table 6.

**Table 6.** Final variable set

Tag	Label
1 adj_attr	attributive adjective
2 advs	adverb
3 agls_psv	agentless passive verb
4 all_METIMPL	implicit metaphors
5 all_MTLIT	explicit metaphors
6 all_METMET	indirect metaphors
7 be_state	verb ‘be’ (uninflected present tense, verb and auxiliary)
8 bundles	metaphor is in a high frequency COCA 3-gram
9 clusters	metaphor is part of a cluster
10 contrac	contraction
11 gram_METIMPL_pronoun	implicit metaphor is a pronoun
12 gram_MTLIT_verb	direct metaphor is a verb
13 gram_METMET_adjective	indirect metaphor is an adjective
14 gram_METMET_noun	indirect metaphor is a noun
15 inf	infinitive verb
16 it	pronoun ‘it’
17 n	noun
18 n_nom	singular noun – nominalization
19 p_and	coordinating conjunction – phrasal connector
20 pany	nominal pronoun (e.g. someone, everything)
21 pasttnse	past tense verb
22 pdem	demonstrative pronoun

**Table 6.** (*continued*)

Tag	Label
23	perfects
24	pos_mod
25	prd_mod
26	prep
27	pres
28	pro1
29	pro2
30	pro3
31	pro_do
32	prtcle
33	prv_vb
34	sem_abstract_METMET
35	sem_action_METMET
36	sem_feature_METMET
37	sem_food_METMET
38	sem_perception_METMET
39	sem_process_METMET
40	sem_thing_METMET
41	wh ques
42	whiz_vbn

It turns out that there were 26 structural variables and 16 metaphor-related variables. Indirect metaphor was by far the most common type on the list, and was the most frequent in the corpus. This suggests that the other kinds of metaphor (direct and implicit) and metaphor signaling devices (flags) may not be as relevant to mark register variation in English.

A further unrotated Factor Analysis was run with these 42 variables. The scree plot indicated four factors as the likely number of factors in the data (each dot along the line is a factor). After the fourth dot, there is a break on the line, forming a ‘scree’ (Figure 1).

A third factor analysis was then conducted, this time requiring that four factors be extracted. Principal Axis Factoring was used for extraction, with Promax as the rotation method, which are standard choices for MD analyses (Biber, 1988). To test for sampling adequacy, the Kaiser-Meyer-Olkin (KMO) test was carried out, achieving .811 out of a maximum of 1, thus signaling that the data set used in this analysis (84 texts and these 42 variables) is adequate. Bartlett’s test of sphericity was also performed to rule out the possibility that the data were an identity matrix (where all diagonal cells are 1, and off-diagonal ones are 0), which would mean that the variables were not correlated except with themselves. The result

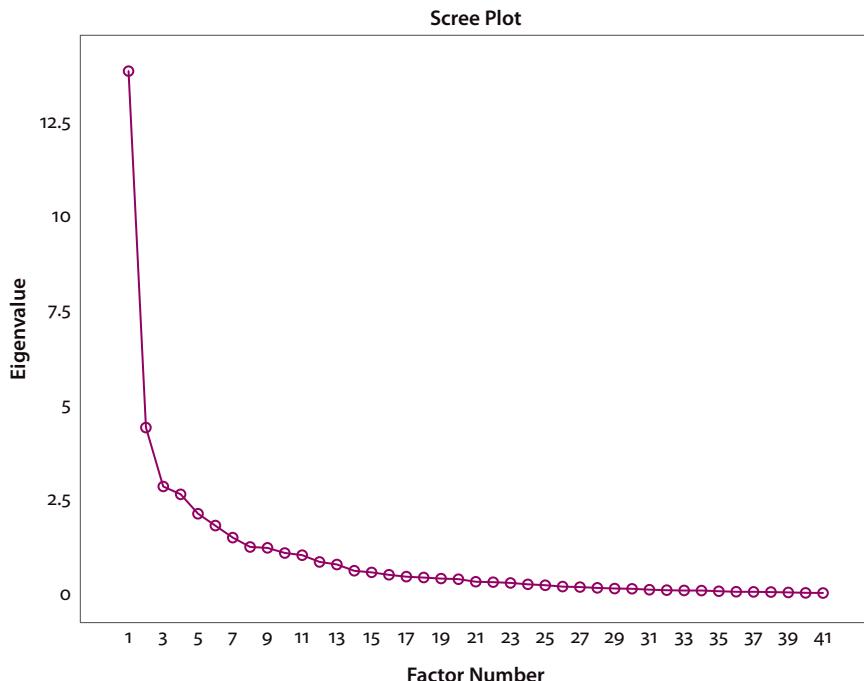


Figure 1. Scree plot for unrotated solution

was significant ( $\chi^2 = 3055.1$ ,  $p = .000$ ), suggesting that the data were not an identity matrix, and thus were adequate.

Factor 1 had two poles (negative and positive), shown in Table 7; features in parentheses had a higher loading on a different factor, and therefore were not entered in the computation of scores for this factor. Hence, they did not play a part in the distribution of registers along the dimensions, but were taken into account during the interpretation of the data. The table shows the features that loaded on this factor; as with other factors, and consistent with Biber (1988), only those features with a loading of at least .35 were considered.

Factor 1 did not include any metaphor-related variables, and was very similar to Biber's (1988) Factor 1. In his research, it was interpreted as marking a distinction between Involvement and Information in language production, with features in the positive pole indicating the former, and those in the negative pole signaling the latter. A comparison of the features shared by both factors shows the overlap is not perfect, as the following features that are on our Factor 1 were on different factors in Biber (1988): modals of prediction, in Biber's Dimension 4, Overt expression of persuasion; past tense in his Dimension 2, Narrative concerns; and both agentless passives and passive nominal modifiers in his Dimension 5, Abstract information. With the exception of past tense verbs, all others were entered in the

**Table 7.** Factor 1 pattern matrix

Feature*		Loading
pres	verb (uninflected present, imperative and third person)	.992
pro_do	verb 'do'	.872
prtcle	discourse particle	.854
pro2	second person pronoun / possessive	.852
it	pronoun 'it'	.849
contrac	contraction	.798
wh_ques	Wh-question	.781
pro1	first person pronoun / possessive	.714
prv_vb	private verbs (e.g. believe, feel, think)	.606
pdem	demonstrative pronoun	.564
prd_mod	modal of prediction (will, would, shall)	.542
pany	nominal pronoun (e.g. someone, everything)	.488
(pos_mod	modals of possibility (can, may, might, could)	.354)
(pasttnse	past tense verb	-.378)
agls_psv	agentless passive verb	-.422
whiz_vbn	passive postnominal modifier	-.572
adj_attr	attributive adjective	-.617
n	noun	-.801
prep	preposition	-.816

Note. \* Features in brackets have higher loadings on a different factor, and were not used to compute factor scores.

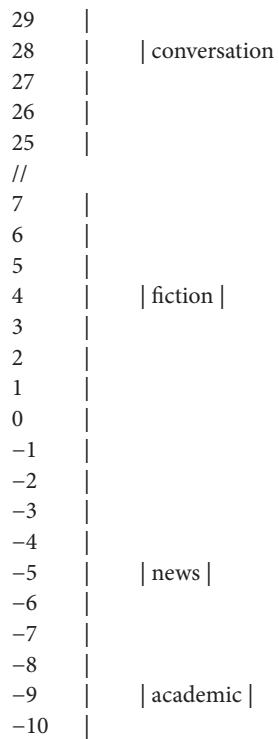
computation of our Factor 1 scores. In addition, Biber's Factor 1 had more features than ours, with 23 exclusive variables versus 17.

To determine the real extent of overlap, factor scores were computed for each text on both this factor and Biber's (1988) Factor 1, for all texts in the VUAMC corpus. The variables chosen to compute scores for Biber's Factor 1 were those used in his study, whereas the variables to calculate scores for our Factor 1 were those depicted in Table 7. The results show an almost perfect correlation ( $r = .978$ ,  $p = .000$ ), suggesting that these two factors are tapping into the same dimension, even if with slightly different features. Hence, this factor received the same label as Biber's (1988) Factor 1 (Involved versus Informational production).

Mean factor scores for each register were calculated and plotted on a graph (Figure 2). Again, this distribution resembles Biber's (1988) Dimension 1, with conversation and fiction being more 'involved' and news and academic writing being more 'informational'.<sup>2</sup>

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2. Since this dimension does not incorporate metaphor, and due to space limitations, no text samples will be offered to illustrate typical texts of each register.



**Figure 2.** Mean scores for Dimension 1: involved versus informational production

Factor 2 concentrated most of the metaphor-related variables, and had only one pole (positive). Table 8 gives details of its features.

**Table 8.** Factor 2 pattern matrix

Feature		Loading
all_METMET	indirect metaphors	.936
clusters	metaphor is part of a cluster	.928
gram_METMET_noun	indirect metaphor is a noun	.829
sem_abstract_METMET	indirect metaphor is in the 'abstract' semantic field	.772
sem_action_METMET	indirect metaphor is in the 'action' semantic field	.736
sem_perception_METMET	indirect metaphor is in the 'perception' semantic field	.715
bundles	metaphor is in a high frequency COCA 3-gram	.684
sem_process_METMET	indirect metaphor is in the 'process' semantic field	.648
sem_feature_METMET	indirect metaphor is in the 'feature' semantic field	.569
gram_METMET_adjective	indirect metaphor is an adjective	.532

Indirect metaphor was the only metaphor type present on the factor. As with the previous factor, correlations were computed between the scores for each text on this Factor 2 and their scores on Biber's (1988) factors. As Table 9 shows, correlations were moderate with Factors 1 and 3, and low or non-existent with the others. Therefore, this factor seems to be unique, in that it does not share any of the previous underlying parameters of register variation for English. This is to be expected, since no previous study of register variation in the MD framework included metaphor variables. At the same time, it does suggest that metaphor has a role to play in register variation in English, and should be considered for inclusion in MD studies.

**Table 9.** Pearson correlations between Factor 2 and Biber's (1988) factor scores

Biber's (1988) Factor	Correlation	p
1	-.536	.000
2	-.383	.000
3	.563	.000
4	.024	NS
5	.299	.000

The salient metaphor features comprised indirect metaphors and their subtypes, that is, indirect metaphor nouns and adjectives, in addition to specific semantic fields conveyed by these metaphors, namely abstraction (view, assessment, scale, etc.), action (collapse, come, charge, etc.), perception (skilled, vocational, clear, etc.), process (flow, growth, drift, etc.), and features (power, interests, technique, etc.). They also encompassed clusters, which reflect metaphor distribution within texts, and bundles, which represent conventionalization.

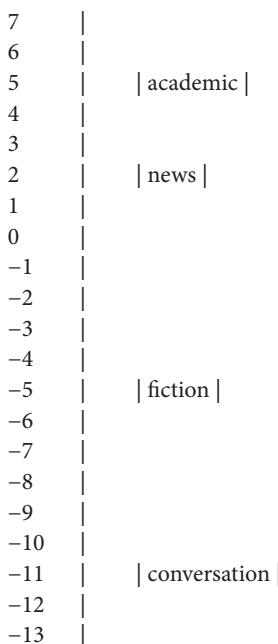
The fact that most metaphor variables were present on this factor, coupled with the observation that all of them are indirect metaphors, the most frequent kind, led to the hunch that this factor might be correlated with the total count of metaphors in the texts. To test this hypothesis, correlations were run between individual scores on this factor and the total number of metaphors in each text (the sum of counts for indirect, direct, and implicit metaphors) (Table 10). It must be remembered that this total was not previously included in the analysis, and therefore had not been directly accounted for.

**Table 10.** Correlations between each factor and total metaphor count

Factor	Correlation	p
1	-.577	.000
2	.949	.000
3	.308	.004
4	.243	.026

Results show a very high correlation with Factor 2, confirming the importance of metaphor density on this factor. The correlation was high because this factor includes the most frequent type of metaphor (indirect), and when its various manifestations were summed up, this count approached the total number of metaphors in each text. Consequently, a suitable interpretive label for this factor is simply Metaphor Density.

The plot in Figure 3 shows the mean scores for each register on Dimension 2.



**Figure 3.** Mean scores for Dimension 2: metaphor density

The plot shows a basic opposition between metaphor dense registers (academic prose and news) and metaphor sparse ones (fiction and conversation). The sample below illustrates a very dense presence of metaphor in academic text FEF (score = 24.91):

- (2) Since it is the equation [formula] that needs to be satisfied, we should choose the potential as a vector (called, not without logic, the vector potential), defined by the equation [formula]. Substituting the above equation into eqn (3.1) we get [formula].

The ten metaphors in this 41-word excerpt represent a density of one metaphor every 4.1 words, or a normed count of 244 metaphors per thousand words. For the whole text, the count is 241 metaphors per thousand words, which is higher than the average, at 146 metaphors per thousand words.

The text is also dense with metaphor clusters: the normed count for clusters is 170, higher than the corpus average of 74. In the sample, these clusters are present:

satisfied...potential...called  
potential...called...without  
called...without...potential  
without...potential...defined  
Substituting...above...into  
above...into...get

There are three bundles in the sample (figures in brackets are COCA frequencies): *to be satisfied* (323), *potential as a* (177), *defined by the* (915). The overall normed count for bundles in the text is 165, higher than the corpus average of 123.

The salient semantic fields for this dimension are frequent in the text; below are some examples (bold identifies semantic features). As mentioned, the semantic categories were assigned by the Eng-CG tagger; the word *functions* was considered an ‘abstraction’ mostly because it refers to be an abstract noun; *travel* was coded as ‘action’ on the basis of being a verb of motion; *density* was tagged as a ‘feature’ because it functions as an attribute or aspect of a the noun *current*; technical was labeled as ‘perception’ because technicality reflects personal judgment (a term from physics may be perceived as technical in literature, but not in physics); and finally, *flows* was classed as a ‘process’ because it denotes a continuous action. In corpus analysis, semantic classification is notoriously problematic, given the multiple classes into which words can be assigned (cf. Biber, 2006). An advantage of using a semantic tagger is that it will apply the classification criteria faithfully, even though some of the criteria and some of the decisions can be debated.

- (3) Abstraction: All our variables can be functions of space [...]
- (4) Action: Since charged particles rarely travel close to the velocity of light...
- (5) Feature: If the current density is specified, [...]
- (6) Perception: Using a technical term borrowed from electron optics, [...]
- (7) Process: When current flows through two materials, [...]

News has the second highest score on this dimension, indicating that it is also metaphor dense. Below is a text sample (file A9J, score 18.51) that illustrates the salient features on the factor.

- (8) All these have in fact only constituted the outer layer of an inner mechanism of civilian rebellion. The second, and complementary, part of the Intifada strategy concentrated on the construction of an indigenous national authority. As Israel's authority was being lifted, the population began creating an alternative authority of their own.

The 16 metaphors in this 52-word sample represent a high metaphor density of one metaphor every 3.25 words. In the whole text, the normed total metaphor count is 278, considerably higher than the average of 146. All of the metaphors in the sample are indirect.

Ten clusters are formed by these metaphors:

*these...in...outer  
in...outer...layer  
outer...layer...of  
layer...of...inner  
of...inner...mechanism  
inner...mechanism...of  
part...of...concentrated  
of...concentrated...on  
concentrated...on...construction  
on...construction...of*

For the whole text, the normed frequency for clusters is 216, much higher than the corpus average of 74.

The sample is also teeming with 13 bundles: *have in fact* (160), *in fact only* (46), *the outer layer* (70), *outer layer of* (88), *of an inner* (86), *part of the* (60849), *concentrated on the* (493), *on the construction* (176), *the construction of* (3249), *construction of an* (159), *of an indigenous* (80), *authority of their* (30), *of their own* (8854). For the whole text, the normed bundled frequency is 197, again higher than the corpus average of 123.

The sample has one metaphor in the semantic field of action (*construction*), but the text has several occurrences of the salient semantic characteristics, such as those shown below. In the examples below the tagger decisions reflect the notion that *consciousness* is an abstract noun, *acts* denotes an action, capacity refers to a *feature* or aspect of the referents signaled by *we*, *conscious* refers to a perception by an individual (the author), and *process* is a token of the class by the same name.

- (9) Abstraction: The struggle reflects a struggle in mass consciousness.
- (10) Action: a rotating Unified National Command acts in the role of field-general
- (11) Feature: we have the capacity to bring coherence and organization to...
- (12) Perception: it is a conscious effort.
- (13) Process: its pains and sufferings are all reminiscent of the process of birth.

Fiction is on the negative pole of the dimension, which means it exemplifies metaphor sparseness. The sample below is from text FAJ (score of -10.74):<sup>3</sup>

- (14) She has in front of her a typewriter, her recorder and her notes. A servant is preparing lunch on a fire. Claudia hears something. She looks up into the sky in the direction of Ol Doinyo Lengai.

The only metaphor-related word is in; as a result, there are no clusters in the sample. Likewise, there are no frequent COCA bundles formed with in, and no semantic features. The whole text has only 73 metaphors per 1,000 words, which is only half of the 146 found on average in the corpus. This has the effect of reducing both clusters and bundles counts as well; the text has only 84 bundles and 13 clusters per 1,000 words, as opposed to 123 and 74 on average, respectively, for the corpus.

Finally, the lowest scoring register on this dimension is conversation. The following (adapted) excerpt from text kcc (score of -14.24) illustrates its metaphor sparseness:

- (15) PSOF5: He bought himself a padded shirt, you know?  
 PSOF7: A padded shirt like Alfred had for Christmas?  
 PSOF7: Robert had for Christmas.  
 PSOF5: He had one for Christmas, did he?  
 PSOF7: Well I, I, I asked him what he wanted for Christmas.  
 PSOF5: Yeah?  
 PSOF7: And he said get me a padded shirt.

This sample has no metaphors, and consequently no clusters, bundles, or metaphor-related semantic features. The full text has a normed frequency of only 45 metaphors, 47 bundles and 5 clusters, as opposed to corpus averages of 146, 123, and 74, respectively. The difference between the total of metaphors (45) and clusters (5) indicates that those few metaphors are a long way from each other along the text, which highlights the absence of metaphors in the text.

Factor 3 has no metaphor-related variables, just like Factor 1. Its pattern matrix appears in Table 11.

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3. Text samples are chosen based on how well they illustrate a particular dimension. In this case, this sample was chosen because it has very few metaphors and therefore typifies 'metaphor sparseness.' This particular sample does not claim to represent the register of fiction.

**Table 11.** Factor 3 pattern matrix

Feature*		Loading
(adj_attr	attributive adjective	.439)
p_and	coordinating conjunction – phrasal connector	.416
(pdem	demonstrative pronoun	.405)
n_nom	singular noun – nominalization	.391
(pres	verb (uninflected present, imperative & third person)	.355)
(prv_vb	private verbs (e.g. believe, feel, think)	-.405)
perfects	verb – perfect aspect	-.621
pro3	third person pronoun (except ‘it’)	-.795
pasttnse	past tense verb	-.922

Note. \* Features in brackets have higher loadings on a different factor, and were not used to compute factor scores.

Factor 3 has five features on the positive pole, but only two of them have higher loadings on it, namely coordinating conjunction as a phrasal connector and singular noun nominalization; the other features have higher loadings on the negative pole of Factor 1, Informational production. The negative pole has four features, three of which are more salient on this factor (perfect aspect verbs, third-person pronouns, and past tense verbs); the other variable, private verbs, has a higher score on Factor 1, for Involved Production.

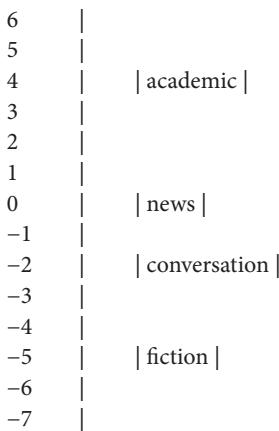
The salient features on the positive pole are both part of Biber’s (1988) Dimension 3 positive pole, Explicit Reference. And salient features on the negative pole all appear in Biber’s (1988) Dimension 2 positive pole, Narrative concerns. Correlations between this factor and Biber’s (1988) factors are shown in Table 12.

**Table 12.** Pearson correlations between Factor 3 and Biber’s (1988) factor scores

Biber’s (1988) Factor	Correlation	<i>p</i>
1	-.338	.002
2	-.874	.000
3	.577	.000
4	.062	NS
5	.359	.001

These correlations indicate a high degree of inverted overlap between this factor and Biber’s (1988) Dimension 2, narrative concerns, that is, texts that score high on this factor tended to score low on Biber’s Dimension 2, and vice-versa. In other words, the positive pole of this factor is associated with non-narrative concerns, and the negative, with narrative concerns. There is also a moderate correlation with Dimension 3, Explicit reference. This factor seems to be a blend of Biber’s

(1988) Dimension 3 and Dimension 2, and was therefore labeled ‘Explicit reference versus Narrative Concerns.’ The mean scores for each register were computed and plotted on the graph in Figure 4.



**Figure 4.** Mean scores for Dimension 3: explicit reference versus narrative concerns

The plot shows academic writing to be the register that depends on explicit reference the most. News is mostly neutral with respect to either parameter; conversation is mostly narrative- and situation-dependent for reference, and fiction is the most marked for both narrativity and situation-dependent reference.

However, the absence of metaphor is relevant, and suggests that metaphor is not a key element in marking either parameter of variation, namely narrativity and explicit reference. Just like with Factor 1, which also saw an absence of metaphor, this factor does not rule out the possibility of using metaphor to narrate events or to make references explicit, but it indicates that metaphor is not a central device for these functions in English, at least from a quantitative, register variation perspective.

Factor 4 is the last factor extracted, and its pattern matrix is shown in Table 13.

**Table 13.** Factor 4 pattern matrix

Feature*		Loading
gram_METIMPL_pronoun	implicit metaphor is a pronoun	0.716
all_METIMPL	implicit metaphors	0.639
pos_mod	modals of possibility (can, may, might, could)	0.497
inf	infinitive verb	0.491
(p_and	coordinating conjunction – phrasal connector	-0.388)

Note. \* The feature in brackets has a higher loading on a different factor, and was not used to compute factor scores.

Factor 4 is a mixture of both metaphor and structural features. The metaphor features are all related to implicit metaphor, namely the total count for this type of variable, and the use of pronouns as implicit metaphorical devices. The structural features, in turn, are possibility modals, infinitive verbs, and (negatively) phrasal coordinating conjunctions (which have a higher weight on Factor 3). An examination of the occurrences of these features revealed that the salient metaphor and grammatical features seldom co-occur in the same clauses (as in *which allows them to be legally sold in the UK*, which combines an implicit metaphor and a to-infinitive clause), and therefore metaphor and structure mostly work in separate syntactic units within the texts. Implicit metaphor is a rare feature (mean frequency of .3 per 1,000), and metaphorical pronouns realizing metaphor are even more infrequent (.2 per 1,000). Structural features are much more frequent: infinitive verbs occur 13.02 times per 1,000, possibility modals 6.2, and phrasal coordination 1.9. Hence, the salient grammatical features are much more pervasive than the metaphor ones.

Infinitive verbs serve a variety of functions, such as reporting “intentions, desires, efforts, perceptual states, and various other general actions” (Biber, Johansson, Leech, Conrad, & Finegan, 1999, p. 693). Coordinating conjunctions “link elements with the same syntactic role” (Biber et al. 1999, p. 79), in this case, within phrases. And modals of possibility express the likelihood of actions or states.

Correlations with Biber’s (1988) dimensions are all low, as Table 14 shows. This suggests that this factor might represent a dimension not yet described for English.

Table 14. Pearson correlations between Factor 4 and Biber’s (1988) factor scores

Biber’s (1988) factor	Correlation	<i>p</i>
1	-.043	NS
2	-.180	NS
3	.117	NS
4	.293	.007
5	.385	.000

Correlations between scores for Factor 4 and variables not on the factor were computed. Correlations are moderate or weak, which is to be expected since these variables did not load on the factor, and the highest coefficient was with to-complement clauses expressing stance (.635, *p* < .01). As Biber explains:

Stance expressions can convey many different kinds of personal feelings and assessments, including attitudes that a speaker has about information, how certain they are about its veracity, how they obtained access to the information, and what perspective they are taking. (Biber, 2006, p. 87)

Below are examples of *to*-clause stance expressions found in the corpus (marked in bold).

- (16) Verb controlled (.528,  $p < .01$ ): coherent enough to allow for the existence of a unified resistance
- (17) Adjective controlled (.334,  $p < .01$ ): Leinster look certain to face an uphill struggle
- (18) Noun controlled (.325,  $p < .01$ ): The East German Government's decision to let the refugees leave ...
- (19) Suasive verbs were also common (.412,  $p < .01$ ), some of which occurred in to-clauses, as in (marked in bold):
- (20) it could do no harm to concede a point he had already taken.

There were two instances of numbers (.402,  $p < .01$ ) used as implicit metaphor (in bold):

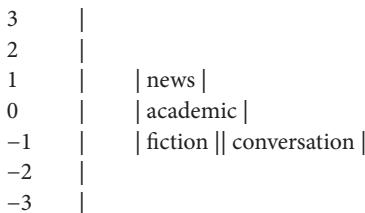
- (21) adjustments you need to make are mental ones
- (22) the slip was a telling one

Finally, causative verbs (.351,  $p < .01$ ) are frequent, as in (marked in bold):

- (23) its blankness will slowly dissolve and let life in

These features seem to be connected to a modalized, stance-marked style, which prompted the decision to label this dimension as stance expression.

The plot in Figure 5 shows that the distribution of registers on this dimension is compact, as there is not much difference between register scores.



**Figure 5.** Mean scores for Dimension 4: stance expression

All 12 top-scoring texts are news, and the sample below is from the highest scoring one (file AHD, 13.6 score):

- (24) Small children **can** sometimes be persuaded to **eat** cow cake in the same way that old people will eat cat food, but the chief result of all this farming was **to produce** huge food mountains which we **could** then refuse **to give** to the Third World, or to the socialists of Eastern Europe, in order **to teach** them the error of their ways. (...) The masts **may** seem unsightly to those unused to them, but I am sure it is simply a matter of getting accustomed.

The sample shows that the writer exploits the salient features to express their stance on farming.

By contrast, texts with low scores on this dimension have fewer of these characteristics. The sample below is from a news item about auctions (text a39, -4.3 score), which only includes phrasal coordination as a salient feature.

- (25) They are mixing Islamic art from the Middle East with Indian **and** South-East Asian. (...) Homely Persian pottery of the twelfth to thirteenth century combines animal **and** bird images with sinuous plant motifs and marks the beginning of lustre wares; they are mostly priced in the 500 to 1,000 range and rate high on charm.

The text provides a description of the items on auction, but the author does not express their stance on the event.

In view of these results, the answer to question 2 is that four dimensions of variation were identified, two of which replicate Biber's (1988) dimensions. The other two are novel metaphor-related dimensions that include metaphor in different degrees. Dimension 2 comprises most metaphor features, while Dimension 4 includes only two metaphor characteristics. Thus, Dimension 2 is more representative of the role of metaphor use in register variation than Dimension 4.

Concerning the role of metaphor in register variation, these dimensions suggest that registers vary with respect to metaphor density and stance expression. Higher density registers tend to be more literate, such as academic writing and news, while lower density ones tend to be more oral, such as conversation and fiction. This corroborates previous research that saw metaphor sparseness in conversation (Berber Sardinha, 2008b; Kaal, 2012).

#### 4.3 Question 3: Significance of register distinctions

Table 15 gives the statistics for indicating whether there are statistical differences among the mean register scores for each dimension. The *F* and *p* columns indicate whether the mean register scores were statistically different, and the *R<sup>2</sup>* value shows how much of the variation in the data is captured by the register differences.

**Table 15.** Significance tests for the differences among registers

Dimension	<i>F</i>	<i>p</i>	<i>R<sup>2</sup></i>
1. Involved versus informational production	141.8	.000	.836
2. Metaphor density	20.3	.000	.411
3. Explicit reference versus narrative concern	34.9	.000	.551
4. Stance expression	1.8	NS	.029

According to Table 15, the differences across registers on the first three dimensions are statistically significant, ranging from 83.6% ( $R^2 = .836$ ) for Dimension 1, 41.1% ( $R^2 = .411$ ) for Dimension 2, and 55.1% ( $R^2 = .511$ ) for Dimension 3. This reflects the different degrees of separation among the registers on each dimension, as shown in Figures 2, 3 and 4. To recap, on Dimension 1, conversation has a mean score of 28, fiction 4, news -5, and academic -9; on Dimension 2, the mean score for academic is 5, news 2, fiction -5, and conversation -11; and on Dimension 3, they are: academic 4, news 0, conversation -2, and fiction -5. The amount of variation captured by the linguistic features on factor 1 is therefore greater than that captured on the other factors (e.g. the distance between the highest scoring and the lowest scoring registers is 29 points). This is normal, since earlier factors tend to concentrate more variation than later ones. There are no statistical differences among the registers on Dimension 4, though, as could be anticipated given the fact that the four registers have very similar scores on this dimension. Hence, the only metaphor dimension that relates significantly to register is metaphor density.

Most of the variation across the registers is not accounted for by metaphor density alone, as  $R^2$  is below .5. It must be noted, though, that accounting for 41% of the variation is acceptable in MD analyses; in Biber (1988, p. 127), for example, Dimension 4 (overt expression of persuasion) had an  $R^2$  of only .169, and it was considered a valid dimension all the same. The  $R^2$  statistic is therefore a measure of the possibility of distinguishing registers (or whatever classifications are considered) on the basis of the incidence of metaphor (or some other feature), not necessarily a judgment on the validity of a dimension.

#### 4.4 Question 4: Cutting across register differences

The scores for each text on a dimension can be compared to each other in order to generate clusters of texts that share similar scores. That is, each cluster is a group of texts that have similar scores, regardless of their register. A cluster analysis was then run on the factor scores for each individual dimension, using the Two-Step Cluster Analysis option in SPSS (having log-likelihood as the distance measure and BIC<sup>4</sup> as the clustering criterion). This procedure determines “which solution provides the best ‘fit’ to the data,” answering the question “in which solutions are the texts within each cluster maximally similar while the clusters themselves are maximally distinct?” (Biber, 1995, p. 321). This use of cluster analysis is similar to text type identification in MD research (see next section), where text types

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4. The Bayesian Information Criterion is a criterion that indicates the number of clusters that are latent in the data.

are defined as groups of texts sharing similar linguistic characteristics. The clusters extracted here are also linguistically, rather than situationally, based, but the main difference is that in text type analysis, all dimensions are considered at once, whereas here each dimension was considered in turn. Hence, the resulting clusters are not text types, as they do not cut across all dimensions; rather, they are dimension-specific text groupings. In other words, in an MD text typology, the text types are identified by a cluster analysis that takes as input the dimension scores for all the dimensions, so that only one cluster analysis is performed that incorporates all dimensions at once. In our case, this would mean that for each text analyzed, four scores would be entered in a single cluster analysis. However, in the analysis presented in this section, four different cluster analyses were run, one for each dimension, and therefore the results show four different clusterings, an overview of which is shown in Table 16. The difference in method reflects a different in purpose: in an MD text type analysis, the motivation is to find groupings of texts that share similar linguistic profiles, as measured by the underlying dimensions, which in turn produces a separate classification from that provided by the dimensions. In contrast, in the current analysis, the goal is to preserve the dimensions, but instead of looking for register differences along each dimension, look for differences among groups of texts that are independent of register (the clusters). After the clusters were identified, statistical tests measuring the strength of the distinctions among the clusters along each dimension were computed, similarly to those calculated for the register distinctions (Table 15). The score differences among registers were then compared to the score differences among clusters to determine whether the texts grouped by cluster were more distinct among themselves than the texts grouped by register (Table 16).

**Table 16.** ANOVA and  $R^2$  for dimension-internal clusters

Dimension	Qty. of clusters	F	p	$R^2$	Comparison with register-based distinctions
1	2	261.0	.000	.761	-7.5%
2	3	170.4	.000	.803	+39.2%
3	2	143.8	.000	.632	+8.1%
4	3	169.4	.000	.802	+77.3%

The cluster analysis suggested either two- or three-cluster solutions for each dimension. As mentioned, significance tests were conducted for the clusters on each dimension; these tests measure the ability to distinguish the clusters on the basis of its dimension score, or in other words, how good a predictor of the dimension scores each cluster is. The comparison between the  $R^2$  obtained for the cluster solutions and for the register-based distinctions showed that the cluster of texts are more

distinct among themselves than the registers, with the exception of Dimension 1 (83.6% variation captured for register distinctions versus 76.1% for cluster distinctions). The most dramatic increases were for the metaphor dimensions, namely 2 (41.1% for registers distinctions versus 80.3% for cluster distinctions) and 4 (2.9% for registers, 80.2% for clusters). This suggests that metaphor variation is better modeled by these text clusters than by the original register classification. For the 'non-metaphor' dimensions (1 and 3), the differences in  $R^2$  are small in comparison to register distinctions, which suggests that for grammar, register categories are as good predictors of variation as text clusters. For metaphor dimensions, the reverse is true: non-register distinctions are more powerful discriminators of metaphor use.

The actual clusters for the metaphor dimensions are shown in Tables 17 and 18.

**Table 17.** Text clusters for Dimension 2 (metaphor density)

Cluster	Register	N	Percentage	Mean
1	Academic	2	13%	-8.8
	Conversation	11	100%	-10.7
	Fiction	11	92%	-5.3
	News	16	35%	-3.6
	Total	40	48%	-6.3
2	Academic	10	67%	4.5
	Fiction	1	8%	-0.6
	News	25	54%	3.1
	Total	36	43%	3.4
3	Academic	3	20%	17.5
	News	5	11%	15.3
	Total	8	10%	16.1

**Table 18.** Text clusters for Dimension 4 (stance expression)

Cluster	Register	N	Percentage	Mean
1	Academic	5	33%	-1.8
	Conversation	8	73%	-1.9
	Fiction	4	33%	-1.7
	News	19	41%	-2.2
	Total	36	43%	-2.0
2	Academic	10	67%	0.7
	Conversation	3	27%	0.0
	Fiction	8	67%	-0.3
	News	21	46%	0.9
	Total	42	50%	0.6
3	News	6	13%	7.8
	Total	6	7%	7.8

For Dimension 2, the three clusters represent three distinct bands of metaphor density:

- Low band: texts have low metaphor density, including all conversations (all of them are in this band) and most fiction (92%);
- Mid band: texts have average metaphor density, and are mostly academic;
- High band: texts have high metaphor density, and are predominantly academic and news texts.

The low and mid-density bands combined account for 91% of all texts. Thus, the unmarked status for English texts seems to be 'low' or 'mid-density'. Conversations are particularly marked for anything other than low density, which again corroborates previous research (Berber Sardinha, 2008b; Kaal, 2012) on metaphor in conversation. 'High density' is typical of very few texts, being therefore a marked characteristic of English discourse.

For Dimension 4, the three clusters indicate different levels of stance expression:

- Less marked, applies to all registers, typical of conversation (73%);
- Somewhat marked, relates to all registers, typical of academic and fiction (67% each);
- Highly marked, restricted to a small number of news texts.

In summary, these are the profiles for each register:

Academic: mid-range metaphor density, somewhat marked for stance.

News: mid to low metaphor density, varying levels of stance expression.

Fiction: low metaphor density, somewhat marked for stance.

Conversation: low metaphor density, low on stance.

Previous research has not devoted much attention to the relationship between stance and (linguistic) metaphor use. One of the few studies is McEntee-Atalianis (2013), who examined the combined use of metaphor and stance in light of DuBois's 'Stance Triangle,' which is not realized by the same linguistic characteristics as in Biber's framework, thereby hindering a direct comparison. In that view, stance 'involves three acts ... of evaluation, positioning, and alignment to context, proposition and/or others' (p. 312), and is not necessarily marked by complement clauses of the kind that loaded on this dimension. The results shown here for this dimension therefore provide an initial glimpse into the ways in which stance and metaphor interact and the effects of this interaction on registers. More research is needed at the interface of Biber's model of stance and metaphor before a more clear picture of how these two devices work together in discourse can be achieved.

## 5. Concluding remarks

This study revealed a number of different findings about the relationship between metaphor and register in English, some of which are highlighted below. The first main finding is the identification of two metaphor dimensions of variation in English, one related to metaphor density, where metaphor is the chief element, and the other to stance expression, where metaphor plays a marginal role, in quantitative terms. Secondly, the study revealed that metaphor accounts for 41% at most of register variation in English, with grammar capturing twice as much variation than metaphor alone. Being a much less frequent aspect of language use than grammatical structure, it is nonetheless striking that metaphor can account for register differences by such a degree. Thirdly, a comparison of metaphor incidence counts and scores on Biber's (1988) dimensions suggested that metaphor seems to thrive in literate, non-narrative, reference explicit texts. To more adequately account for the role of metaphor in register variation, a new factorial extraction had to be carried out and dimensions specific to the VUAMC corpus were determined that explicitly included metaphor as a variable. Fourthly, the dimensions of register variation based on the VUAMC separated metaphor from the lexicogrammatical features, suggesting that they are independent of each other. This indicates that metaphor and grammar are two distinct levels of language that give rise to different frequencies and distributions in text, thereby splitting apart onto different dimensions. In other words, although grammar and metaphor are associated, they each provide a different perspective on register variation. Finally, this study pointed out the existence of text groupings that better account for metaphor variation than register categories, with the chief grouping representing a scale of metaphor density that specifies three bands of density.

As regards further research, it seems necessary to 'unpack' Dimension 2 (metaphor density). This dimension is the most important for register variation but is actually a composite of different metaphor features that provide a rather crude way of looking at register from a metaphor perspective. By virtue of aggregating many different metaphor characteristics, it simply distinguishes between registers with more metaphor from those with less metaphor. Although this is an important distinction, it is not nuanced enough to capture the various different roles that metaphor plays in language use. The reason why this dimension came about in the first place must have to do with the mutual segregation effect described above. In other words, if metaphor and grammar variables had not been added together to the variable pool, but instead metaphor had been considered on its own, the picture emerging might have been much sharper in terms of seeing fine-grained associations between registers and particular metaphor uses (see Herrmann, this volume).

In general, the findings from this study corroborate the results of previous studies that looked in detail at the use of metaphor in individual registers, such as Steen et al. (2010), Krennmayr (2011), Dorst (2011), Pasma (2011), Kaal (2012), and Herrmann (2013), all of which have demonstrated how individual registers impose a distinct metaphorical configuration on texts. In addition, this study replicated the major relationship in metaphor use found by Berber Sardinha (2011b) between greater interlocutor involvement and lesser metaphor incidence in Brazilian Portuguese. The same basic distinction also seems to apply to English, as shown here, with more dialogic interactive texts generally tending to have fewer metaphors, and more monologic non-interactive texts tending to have more metaphors.

The dimensions unveiled in this chapter must not be considered final, as more research is needed, for instance with a corpus containing a wider variety of registers, and also with data from additional languages. It is hoped, though, that the research reported here has shown that a combination of metaphor research and MD analysis might be a promising avenue for further research.

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## Appendix

Descriptive statistics for each register on each factor

### Factor 1

Register	Mean	Std. deviation	N
Academic	-9.0504	4.17705	15
Conversation	28.4308	6.76348	11
Fiction	4.3029	5.18995	12
News	-4.9700	5.07909	46

### Factor 2

Register	Mean	Std. deviation	N
Academic	5.3750	8.67702	15
Conversation	-10.6741	2.17070	11
Fiction	-4.9289	2.63581	12
News	2.0856	6.10712	46

*Factor 3*

Register	Mean	Std. deviation	N
Academic	4.4288	2.36938	15
Conversation	-1.5376	1.91356	11
Fiction	-4.4485	1.72228	12
News	.0840	2.48833	46

*Factor 4*

Register	Mean	Std. deviation	N
Academic	-.1091	1.42066	15
Conversation	-1.3696	1.08428	11
Fiction	-.7402	.77542	12
News	.5562	3.54533	46



# Metaphors in psychology genres

## Counseling vs. academic lectures

Anke Beger

Flensburg University, Germany

This chapter analyzes metaphor use in specialist discourse by comparing ANGER and LOVE metaphor use in experts in the domain of psychology in two different genres, online counseling and academic lectures. The study is based on two small-scale corpora that comprise written and spoken language and were compiled for an exploratory investigation. The analysis of linguistic and conceptual metaphors in the discourse contexts in which the metaphors are used brings out interesting differences in the experts' metaphor use for LOVE and ANGER between the two genres. I argue that these differences are probably due to the distinctive groups of participants as well as the different discourse structures and goals in the psychology genres, online counseling and academic lecturing.

### 1. Introduction

Written online counseling and academic lectures differ greatly in regard to their discourse participants, structure and goals. These particularities of the contextual and situational features constitute specific language varieties and thus distinct genres (cf. Herrmann & Berber Sardinha, this volume; see also Steen, 2011, for an interdisciplinary model of genre). However, both genres belong to a specialist discourse domain, *psychology*. More specifically, the particular discourse events in both counseling and lecturing involve situations in which experts communicate with laypersons and use metaphors in order to convey specialist knowledge about psychology. Thus, in those two genres experts use specialist language. At the same time, another shared feature of the two genres in this study is that of popularization: Both the counselors and the academic experts in my data communicate their professional knowledge to a more general audience. However, the audiences of the two genres also vary – not only in terms of their position on the expert-lay cline, but also in regard to their specific expectations of the respective discourse events. In this chapter, I will argue that it is precisely these differences, along with

the other particularities of the two distinct genres, that result in distinct patterns of metaphor use (see Biber & Conrad, 2009, for a comprehensive discussion of the relationship between *genre* and *register* and *linguistic variation*). Although there are studies investigating the use of metaphors in the genre of counseling (e.g. Angus & Kormann, 2002; McMullen & Conway, 2002), as well as in spoken academic discourse (e.g. Cameron, 2003; Corts & Pollio, 1999; Low, Littlemore & Koester, 2008), to my knowledge, there is no systematic research that compares the experts' use of metaphors between these two genres.

This paper presents two exploratory studies in which Cognitive Metaphor Theory (Lakoff, 1993; Lakoff & Johnson, 1980) is applied to authentic data in the genres of online counseling and psychology lectures. The aim is to compare experts' use of metaphors in the two specialist discourse genres for two important target domains of psychology, LOVE and ANGER. This will shed light on the question if experts in psychology differ in their metaphor use as an effect of genre. Furthermore, I explore what the factors are that account for possible variation in metaphor use among specialists in the field of psychology. For this purpose, two special small-scale corpora of written and spoken English were compiled. The first corpus consists of written expert advice on LOVE and ANGER within the discourse of counseling. The second corpus consists of expert data from psychology classes given at an American college in which the professor conveys concepts of the same emotions to his student audience. The spoken data is supplemented by written data from the textbooks parts the students are assigned to read for the respective classes. In both corpora, specialists communicate with laypersons about LOVE and ANGER, which makes it possible to compare their metaphor use for these target domains in the two distinct genres. This comparison allows us to point out the influences of situational factors on the variation of linguistic and conceptual patterns, more specifically, variation of metaphor use.

## 2. The corpora

Discourse events in the domain of psychology from two distinct genres were selected in order to examine how genre-specific features might lead to variation in metaphor use in specialist language. In this section, the discourse events under investigation are described in more detail for the corpus of counseling (2.1), and the corpus of academic lectures (2.2).

## 2.1 The counseling corpus

The corpus of the study investigating the metaphor use for LOVE and ANGER in the discourse of counseling consists of two registers. The texts are taken from websites, mainly used by Americans, on which experts offer advice about emotional problems or difficulties in relationships, for example [teengrowth.com](http://teengrowth.com), [mentalhelpnet.com](http://mentalhelpnet.com), or [links2love.com](http://links2love.com). From these websites, a random selection of texts about problems with love and romantic relationships or anger and aggression was chosen in order to obtain authentic language data for a metaphor analysis. On the one hand, these are short dialogs between experts and laypersons in which laypersons briefly describe their problem and where an expert responds to them with his or her advice. On the other hand, these are expert texts that are not a response to a specific question of a layperson, but provide advice on more general issues with LOVE and ANGER for a broader target group of laypersons. An initial visual inspection of the data suggested that the laypersons also use metaphors when describing their problems with LOVE or ANGER. Since the experts' use of metaphors in their advice might be influenced by the problem description of the laypersons (and their use of metaphors), I included the laypersons' requests for advice in this corpus. By analyzing both the experts' and the laypersons' use of metaphors, I was able to get a better picture of what accounts for the experts' metaphor choice.

The expert data of the counseling corpus consist of roughly 19,800 words. The ANGER/AGGRESSION subcorpus comprises about 10,700 words and the slightly smaller LOVE/ROMANTIC RELATIONSHIPS subcorpus consists of approximately 9,100 words.

## 2.2 The academic lecture corpus

The core of the corpus of academic lectures consists of spoken language data recorded in psychology classes at a US-American college. I filmed six meetings in Social Psychology, an intermediate level class that was held by one professor. Two of these meetings had LOVE/ROMANTIC RELATIONSHIPS as their discourse topic and the other four lectures were given on ANGER/AGGRESSION (none of the topics was treated from the point of view of metaphor). The class was lecture-based which means that the bulk of the spoken language data came from the professor. Also, the initial visual inspection of the data showed that the students' share of the data did not contain any metaphors for the target domains under investigation. Furthermore, almost all of the metaphors uttered by the professor did not occur after a student's comment or question. Therefore, in contrast to the first study, the metaphor analysis is limited to the expert's data.

Each of the class meetings was transcribed for analysis. Overall, the six class meetings yielded approximately 45,200 words. The two lectures on LOVE/ROMANTIC RELATIONSHIPS constitute a subcorpus of roughly 12,400 words and the four lectures on ANGER/AGGRESSION constitute a subcorpus that comprises about 32,800 words.

Since the corpus of counseling consists of written data, I decided to include written data also in the lecture corpus. Therefore, I included the textbook chapters about love and aggression that the students were assigned to read in preparation for the filmed classes. This not only supplemented the study of academic lectures by adding written data to this genre, but also by adding a second specialist (the textbook author). The supplementary written data of the academic lecture corpus comprise another 37,100 words of which approximately 19,300 belong to the chapter about LOVE/ROMANTIC RELATIONSHIPS and 17,800 to the chapter on ANGER/AGGRESSION. Altogether, the analyses I introduce in the following sections are based on spoken and written language data that comprise approximately 102,100 words.

### 3. Method

In this study, metaphor is operationalized as a mapping between two conceptual domains, a target and a source domain (Lakoff, 1993; Lakoff & Johnson, 1980; Steen, 2007). As pointed out in the introductory chapter of this edited volume, this cross-domain mapping is “present in linguistic form, conceptual structures, and communicative functions in discourse” (pp. 8–9), and these levels are also observed in the present study. In the following, I will elaborate the process of identifying linguistic metaphors (3.2) before making explicit the process of revealing the underlying conceptual structures (3.3). However, since I am most interested in metaphor use in relation with particular discourse topics, namely love and anger, I will first describe the nature of these target domains in more detail (3.1).

#### 3.1 The target domains

In this study I treat LOVE and ROMANTIC RELATIONSHIPS as one and the same target domain. This is slightly problematic, since love is an emotion of an individual person and romantic relationships are certain kinds of relationship between two individuals. However, there are reasons to subsume these two concepts under one target domain. The emotion LOVE is usually connected to a particular person or object. I do not just love, I love *someone* or *something*. In this study, the aim is to analyze people’s metaphorical concepts about the *romantic* feeling of love that they

feel for someone else and the relationship between those people that often results from, and is usually characterized by, this emotion. For the study presented here, I consider the concept of romantic relationships as belonging to our concept of the emotion love and therefore subsume linguistic metaphors for both, romantic love and romantic relationships under the single conceptual domain LOVE. This approach is well-established in research about conceptual and cultural concepts of LOVE attested by metaphors (e.g. Kövecses, 1988, 1990). For easier reading, I will only use the term LOVE as a target domain when I refer to both, ROMANTIC LOVE and ROMANTIC RELATIONSHIPS. However, I recognize the differences between LOVE and ROMANTIC RELATIONSHIPS and illustrate them in Examples (1) through (3).

- (1) Researchers are also identifying the process through which couples either detach or rebuild their relationships.
- (2) We met through a dating site. He picked me up at home and the rest is history. He knew I was falling for him and began to retreat.
- (3) Love: An overlapping of selves – you become part of me, I part of you.

Example (1), taken from the written academic lectures data, shows that a romantic relationship is usually conceptualized as something shared by two individuals who are both taking part in beginning, maintaining and ending that relationship. However, the emotion of love does not necessarily require to be shared with someone. It might also be an unanswered feeling toward another person, as Example (2), taken from the layperson part of the counseling corpus, illustrates. In our cultural model of love (cf. Kövecses, 1988), though, the feeling of love is shared between the two partners in a romantic relationship and defines this relationship, as can be seen in Example (3), which is taken from the written academic lectures data.

Similarly to summing up LOVE and ROMANTIC RELATIONSHIPS as the single target domain LOVE, I also merge ANGER and AGGRESSION into the single target domain ANGER. When I refer to aggression here, I only mean the type of aggression that the textbook author and the professor call ‘hostile aggression’. Anger and hostile aggression are tightly interconnected in that, according to the textbook, hostile aggression is the behavior that results from the emotion anger (Myers, 2008, p. 345). Anger itself is in turn defined as the “emotional readiness to aggress” (Myers, 2008, p. 350). The general concept of ANGER seems to include the concept of AGGRESSION as a visible and noticeable consequence of the emotion.

Although I have now determined what is conceptually considered to be LOVE and ANGER, I have not yet operationalized how I establish that a given expression refers to either LOVE or ANGER. For most instances, the identification of these

expressions is fairly straightforward. These are the instances in which the lexemes *anger*, *rage*, *hostile aggression*, *love* or *romantic relationship(s)* actually occur in an expression. Yet, there are instances in which this is not the case, as in the following example:<sup>1</sup>

- (4) Then sometimes he snaps out of it, or blows up again.

The context of this sentence informs us that a father with an anger problem *blows up* repeatedly. Consulting the Macmillan Online Dictionary as a resource for determining the target domain underlying the utterance, I find that one of the meanings of *blow up* is ‘to suddenly become angry’ (blow up, 2014), which fits the context of Example (4). Therefore, the dictionary indicates that the expression *blow up* is indeed related to the target domain ANGER. Using the dictionary in this way helps to validate the identification of target domains (cf. Pragglejaz group, 2007).

### 3.2 Identification of linguistic metaphors

After having identified expressions referring to the target domains, the next step was to determine whether or not there are metaphorically used words in the respective passage. In general, I followed the guidelines of the Metaphor Identification Procedure (MIP), as devised by the Pragglejaz group (2007). Since I was not interested in finding every metaphorically used word in my data, but only those that have either LOVE or ANGER as a target domain, I had to adjust MIP to suit my research goals. I took the following steps to identify the metaphorically used words for ANGER and LOVE:

1. The longer texts (this mainly applies to the audio data of the academic lectures corpus) were sub-divided into sections according to the discourse topics (the textbook was already sub-divided and most of the counseling discourse was already short enough and only covered one topic).
2. I read each section in order to develop a general understanding of the individual sections (MIP, step 1).
3. I determined whether or not a given section comprised lexical units referring to the target domains under investigation. If I found that the section did not comprise any lexical units referring to ANGER or LOVE, the section was disregarded for further analysis.

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1. In the following, metaphorical expressions in examples are underlined. Conceptual metaphors are given in small capitals.

4. If I found passages with lexical units relating to the examined target domains, these passages were analyzed in the following way: First, each lexical unit referring to the target domains was identified and its contextual meaning was established (MIP, step 2 and 3a). I then determined if a given lexical unit has a more basic meaning (MIP, step 3b). If I was uncertain, I consulted the Macmillan Online Dictionary, as proposed in the MIP. If the lexical unit had a more basic meaning, I determined if it contrasts with the contextual meaning (MIP, step 3c). I marked the lexical unit as metaphorical if the contextual meaning of a lexical unit contrasts with the basic meaning but can be understood by comparing it with the basic meaning (MIP, step 4).

This process is illustrated with Example (5), which is taken from the textbook in Social Psychology (Myers, 2008, p. 410).

(5) Studies of men and women falling in and out of love reveal some surprises.

Example (5) occurs in the textbook section with the heading “Variations in Love: Culture and Gender”. I read the section and established that the first half is about differences between cultures regarding their concept of LOVE and how it relates to marriage. The second half of the section in which Example (5) occurs, deals with differences between men and women regarding the readiness to start and end romantic relationships (step 2). This textbook section features several instances of lexical units that refer to the target domain LOVE (step 3). In Example (5), the lexical unit *love* itself appears in the text. I then determined that there are 14 lexical units in Example (5). In this example, each lexical unit consists of a single word but this does not always have to be the case. When I identified the lexical units, I used the Macmillan Online Dictionary and followed the MIP in treating, for example, phrasal verbs as single lexical units (Pragglejaz group, 2007, p. 15). In the next step (4), I identified the lexical units that relate to the target domain LOVE and determined whether or not they are used metaphorically. In Example (5), the lexical units *falling*, *in*, and, *out* were identified as being used metaphorically by contrasting their contextual and their basic meanings. The contextual meaning of *falling* can be described as a rather sudden and unplanned change of emotional state (beginning or cessation of love). This contrasts with the more basic meaning of the verb *fall* which is defined in the Macmillan Online Dictionary as quickly moving downward from a higher position, usually by accident. In this example, the contextual meaning can be understood by comparing it with the basic meaning. The sudden and unplanned change of the emotional state (LOVE) is hence understood in terms of quickly and accidentally changing one's physical position. Similarly, in the context of Example (5), the prepositions *in* and *out* denote the beginning and the end of an emotional state (LOVE). The more basic meaning

of these prepositions introduces a ‘container’ or ‘bounded space’ which one can physically enter or exit. Again, the contextual meaning contrasts with the basic meaning, but can be understood by comparison with it. At the level of concepts, Example (5) suggests that emotions are conceptualized as containers. The beginning of experiencing the emotion of love can then be understood as entering a container and the stopping of experiencing this emotion as leaving the container.

While I usually followed the guidelines of MIP as demonstrated in the identification of metaphorically used lexical items in Example (5), I made an exception in the treatment of similes. In the case of similes and analogies, I adopted the view of Steen et al. (2010) that these are (potential) instances of “indirectness in conceptualization [...] directly expressed by direct language” (11) – direct metaphor.<sup>2</sup> The sentence *Think about this tank of water as the reservoir within your soul, that aggressive impulses are dripping into* (see Example (18) in Section 4.2.2), which was uttered by the professor in Social Psychology, illustrates a case of a direct metaphor. The professor instructs the students to compare their soul to a tank of water. These are two distinct domains that are directly compared to each other by using the word ‘as’. Within this analogy, the professor proceeds with an indirect metaphor in which aggression is conceptualized as a fluid that drips into the soul.

### 3.3 Grouping metaphorical expressions and formulating conceptual metaphors

Linguistic metaphors are assumed to reflect underlying conceptual structures (cf. Lakoff, 1993; Lakoff & Johnson, 1980). Systematic mappings between two particular conceptual domains are especially convincing if one finds linguistic evidence of cross-domain mappings in several metaphorical expressions. In order to detect possible underlying conceptual structures, I determined the source domains of the metaphors I identified for the target domains LOVE and ANGER. Afterwards, the metaphors were grouped according to their source domains to establish and compare the experts’ conceptualizations of LOVE and ANGER. For the groupings, I changed the unit of analysis from the lexical units to metaphorical expression.<sup>3</sup> Although lexical units are useful for the reliable identification of linguistic metaphors, I considered it more appropriate for my further analysis, pitched at the level of concepts, to continue with metaphorical expressions. In

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2. See Steen et al. (2010, especially Chapters 1 and 2) for reasons to refine the MIP, and for a guideline to apply these refinements.

3. A metaphorical expression might be everything from a word to a clause. See Cameron (2003) for a comprehensive overview of grammatical forms of linguistic metaphors.

Example (5), the lexical unit *fall* is further qualified by the lexical units *in* and *out* in that the people referred to are falling into a bounded space or out of it, as opposed to just falling to the ground, for example. Thus, I grouped the three metaphorically used lexical units as a single metaphorical expression under a source domain called CONTAINER.

Another reason to continue the analysis with metaphorical expressions as the unit of examination is to enable the comparison of metaphor use between the different experts groups. If I listed *in* and *out* from Example (5) as two occurrences of the LOVE IS A CONTAINER metaphor in the corpus of the academic experts, and the *in* in a sentence like *You're in love with him* from a counselor as one occurrence of LOVE IS A CONTAINER in the counseling corpus, I might infer that academic experts conceptualize LOVE as a CONTAINER twice as often as counselors do. In my view, this would be quite misleading.

When all metaphorical expressions were grouped according to their source domains, I identified the conceptual metaphors. As previous discussions have pointed out, this process of subsuming different metaphorical expressions under one source domain label and identifying conceptual metaphors always involves an abstraction from the language data and therefore is partially subjective (cf. Ritchie, 2003; Steen, 2007). However, I examined the actual metaphorical expressions carefully to formulate the conceptual metaphors as closely to the language data as possible. In the case of ANGER metaphors, for example, this involved distinguishing between metaphorical expressions that can be grouped under ANGER IS A FLUID IN A CONTAINER and those that can be grouped under ANGER IS A HOT FLUID IN A CONTAINER. Although these two conceptual metaphors seem very similar and it could be argued that metaphorical expressions grouped under ANGER IS A HOT FLUID IN A CONTAINER are only more specific versions of those grouped under ANGER IS A FLUID IN A CONTAINER, I decided on the basis of the language data that the two conceptual metaphors highlight distinctive aspects of the emotion (for a discussion, see Section 4.2.2).

Another decision in identifying conceptual metaphors concerns the systematicity of metaphorical expressions. In my data, there are many individual metaphorical expressions with a source domain that is not shared by any other (different) metaphorical expression. An example is (...) *the flow and ebb of romantic love follows the pattern of addictions to coffee, alcohol, and other drugs*, where love is understood as the water of an ocean, or, more generally, a fluid. However, my data does not exhibit any other metaphorical expressions that conceptualize love as any kind of fluid. In such cases, the metaphorical expression was categorized under 'others'. Other examples include expressions like *Hatred that is completely conquered by love passes into love, as a relationship ripens toward greater intimacy, or when you feel romantic attraction to someone*.

## 4. Results

In the following subsections, I compare experts' metaphor use in online counseling to academic lectures in regard to the target domains LOVE and ANGER. As I have already mentioned in the description of the counseling corpus (see Subsection 2.1), it seemed necessary to give an account on the laypersons' metaphors in the discourse of counseling in order to understand the counselors' use of metaphors. Therefore, I begin the results sections for LOVE (4.1) and ANGER (4.2) with a comparison of the metaphors used by experts and laypersons in online counseling. Then, I move on to contrasting the experts' use of metaphors in the counseling corpus to the experts' use in the lecture corpus.

### 4.1 LOVE metaphors

#### 4.1.1 *The counseling corpus*

The purpose of this subsection is to establish what metaphors are used by the counseling experts in order to prepare comparison with the academic experts. Possible reasons for the counselors' particular metaphor use are developed by considering the laypersons' metaphors to which the expert group in this genre responds. I concentrate on the most frequent metaphors for LOVE identified in the counseling corpus.<sup>4</sup>

**Table 1.** Frequency of metaphorical expressions instantiating particular conceptual metaphors of LOVE in the counseling corpus

LOVE IS ...	Experts		Laypersons	
	n	%	n	%
... A CONTAINER	18	16.1	8	29.6
... A STRUCTURED OBJECT	17	15.2	1	3.7
... A LIVING ORGANISM	12	10.7	0	0
... A UNITY OF PARTS	9	8.0	9	33.3
... A BUSINESS TRANSACTION	7	6.3	0	0
Other	49	43.8	9	33.3
Total	112	100	27	100

As can be seen in Table 1, which illustrates the five most frequently occurring conceptual metaphors in the counselors' data, the counseling experts most

4. A full overview of all conceptual metaphors detected in the discourse of counseling can be found in Beger (2011b).

frequently draw on LOVE IS A CONTAINER. This is also one of the most frequently used conceptual metaphors of the laypersons. Since LOVE IS A CONTAINER is a conventionalized metaphor (cf. Lakoff & Johnson, 1980, pp. 29–32), it does not come as a surprise that it is among the most frequently applied metaphors. It is, however, noticeable that the laypersons draw on this metaphor almost twice as often as the experts. In many instances, these underlie metaphorical expressions such as *to fall in love*.

Consider the following examples from the laypersons' data in the counseling corpus:

- (6) Last January, I finally accepted his proposal after taking a full year to admit I had fallen in love with him.
- (7) We have been going out for three months now, but we fell in love after going out for three weeks.
- (8) My boyfriend is such an awesome guy and I eventually fell head over heels in love for him, and forgot about my ex.

Examples (6) through (8) suggest that the emotion of love is a sudden, unintended, and accidental event. This concept of love is insofar problematic as it suggests that the person experiencing the emotion is completely at its mercy and has no direct influence on it. The same aspects of LOVE are also highlighted by the laypersons' most frequently used conceptual metaphor LOVE IS A UNITY OF PARTS, which is illustrated in the following example taken from the laypersons' data:

- (9) It just tore us apart as it was more out of spite than real love for the guy I lived with.

Example (9) shows that there seems to be a force that is separating the unity of the partners in the romantic relationship and they do not have any control over this force. The partners' own influence on their relationship seems to be minimal. Interestingly a much lower proportion of metaphorical expressions instantiating LOVE IS A UNITY OF PARTS appears in the counselors' data (see Table 1).

Most of the metaphors used by the laypersons conceptualize the emotion love and romantic relationships as something they do not have any influence on. More than 60% of all metaphorical expressions in the laypersons' data belong to conceptual metaphors highlighting the aspect of passivity. Indeed, the very problem of the laypersons seems to be that they do not approach romantic relationships as something one can actively control, change, construct or shape.

In contrast to the laypersons' conceptualizations of LOVE, the metaphor use by the experts suggests that the partners have to be actively involved in the process of *building* and *maintaining* relationships, of *keeping* romantic relationships *alive*:

Counselors make frequent use of LOVE IS A STRUCTURED OBJECT and LOVE IS A LIVING ORGANISM.<sup>5</sup> Those are the second and third most frequently applied conceptual metaphors in the counselors' data. The following examples further illustrate the counselors' use of the conceptual metaphors LOVE IS A LIVING ORGANISM and LOVE IS A STRUCTURED OBJECT, in which love is conceptualized as a machine or building (cf. Kövecses, 1988, p. 80):

- (10) There's quite a lot of time and energy that goes into making one [relationship] work.
- (11) The best things in life depend on our ability to create and maintain great relationships.
- (12) Like anything in life, relationships must be tended to and renovated to be kept at full capacity, call it love spring cleaning.
- (13) The challenge is to keep your relationship alive and interesting during this leveling out stage.
- (14) So, nonverbal communication is vital to keeping our relationships strong and healthy.

In Examples (10) through (14), LOVE is conceptualized as a building or a machine. In opposition to the passive view on love encountered in the laypersons' data, these examples suggest that relationships require time, energy and conscious planning (cf. Kövecses, 1988, p. 81) at the beginning and throughout the relationships' existence. Indeed, romantic relationships need to be taken care of constantly and regularly, just as one would *maintain*, *renovate* and *clean* buildings. All of this is the responsibility of the partners in a romantic relationship. The mixed metaphor in Example (12) indicates that the quality of a romantic relationship will suffer if the partners do not take proper care of it, just as a machine will not function properly if it is not tended to.

A similar view of love can be found in the Examples (13) and (14), which are instances of LOVE IS A LIVING ORGANISM. It is crucial to note here that the living organism does not seem to be able to take care of itself. Romantic relationships are conceptualized as something the partners have to take care of (like a baby/child, a pet, or an indoor plant) in order to make sure that it lives and thrives. Just as when maintaining buildings and machines, this also requires effort and energy on the part of the lovers. Example (14) additionally suggests that the success or

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5. Entailments of this metaphor are discussed in Kövecses (1988, pp. 80–88) and also in Lakoff and Johnson (1980), who call this metaphor LOVE IS A COLLABORATIVE WORK OF ART and consider it as unconventional (cf. Lakoff & Johnson, 1980, p. 139).

failure of romantic relationships is a process. Relationships do not just suddenly end, but they may get 'weak and sick'. To prevent this, the partners can take care of their romantic relationship to keep it *strong* and *healthy*. This view opposes the inevitability and suddenness of the resolution of a romantic relationship over which the partners have no influence (Examples (6) through (9)).

The observation that laypersons do not apply any metaphorical expressions that belong to LOVE IS A LIVING ORGANISM, and only rarely use metaphorical expressions that realize LOVE IS A STRUCTURED OBJECT, suggests that different concepts of LOVE exist between experts and laypersons. While the laypersons' conceptualizations of love leave them in a helpless passive state, the experts' use of metaphors is characterized by ascribing conscious planning, creation and responsibility to partners in a relationship. It seems that the experts' application of metaphors is, in most instances, influenced by the discourse setting in which they are confronted with certain problematic views on LOVE expressed by the other discourse participants, the laypersons. The discourse goal in counseling is to help the laypersons to deal with their emotions and relationships in a healthy way and it is the counselors' role to give advice in a way that this discourse goal is achieved. The experts' focus on aspects of LOVE that ascribe activity and responsibility to the partners in romantic relationships, as opposed to the laypersons' passive view on love, suggests that the experts' use of metaphors might be an (conscious or unconscious) attempt to perform a therapeutic reframing.

#### 4.1.2 *The counseling vs. academic lectures*

In this subsection, I look at the use of LOVE metaphors by the experts in the academic discourse and compare it to the counselors' use of metaphors. If expertise is the main factor that contributes to the experts' use of metaphors, I would expect both expert groups to use similar metaphors. However, if the discourse context is more influential on the choice of metaphors, I might expect to find a different use of metaphors by experts in academic lectures and the online counseling, despite their shared expertise in the domain of psychology.

Table 2 shows considerable differences in the application of metaphors between the counseling experts and the experts in the academic lectures. It is even more important to notice that one of the big distinctions between the two expert groups is in their use of the metaphor LOVE IS A STRUCTURED OBJECT.

I discussed this conceptual metaphor in the previous subsection and argued that counselors apply it to reframe the laypersons' concept of LOVE. The fact that the counselors draw on LOVE IS A STRUCTURED OBJECT more than twice as often as the experts in the lectures suggests that the frequent use of LOVE IS A STRUCTURED OBJECT in counseling might indeed be influenced by the particular discourse

setting in counseling. As opposed to the counselors, the experts in the academic discourse setting do not need to focus on aspects of love that involve the activity and responsibility of the partners in a romantic relationship. Their discourse goal is not to change their students' perspective on love, but to supply additional, scientific concepts to broaden the students' knowledge. These distinct aims in the counseling and academic lectures genres seem to be reflected in the different use of metaphors between the two expert groups.

**Table 2.** Frequency of metaphorical expressions instantiating particular conceptual metaphors of LOVE in the counseling and academic lectures corpora

LOVE IS ...	Counseling		Academia	
	n	%	n	%
... A CONTAINER	18	16.1	37	18.8
... A STRUCTURED OBJECT	17	15.2	14	7.1
... A LIVING ORGANISM	12	10.7	14	7.1
... A BUSINESS TRANSACTION	7	6.3	66	33.5
... A UNITY OF PARTS	9	8.0	19	9.6
Other	49	43.8	47	23.9
Total	112	100	197	100

This is further attested by the differences in the frequency of the application of LOVE IS A LIVING ORGANISM. Again, the experts in the academic genre draw less frequently on a metaphor that the counselors seem to apply for therapeutic reasons. However, the academic experts still use these two metaphors more frequently than the laypersons in the counseling data. This could either suggest that LOVE IS A STRUCTURED OBJECT and LOVE IS A LIVING ORGANISM are expert-specific metaphors, or it might indicate that the laypersons in the discourse of counseling are in such a troubled state that their perspective on LOVE is presently quite restricted and leads to a metaphor use that only reflects very few aspects of LOVE.<sup>6</sup>

An even greater distinction in the use of metaphors between the academic experts and the counselors can be found in their application of LOVE IS A BUSINESS TRANSACTION.<sup>7</sup> This is the most frequently applied conceptual metaphor of the experts in the academic discourse setting (see Table 2). With over a third of all

6. For a comparison of metaphor use between laypersons that consult experts on the internet for advice on emotional problems and laypersons that are not presently troubled by anger, love or sadness, see Beger (2011a).

7. Kövecses (1988) discusses similar metaphor, love is an economic exchange, where partners in a relationship are also seen as business partners exchanging a valuable commodity (cf. Kövecses, 1988, p. 58).

metaphorical expressions for LOVE in the lecture corpus indicating LOVE IS A BUSINESS TRANSACTION, this conceptualization of love seems to be quite important in academic discourse. Since I have not discussed LOVE IS A BUSINESS TRANSACTION so far, let us consider the following metaphorical expressions instantiating this conceptual metaphor, taken from the lecture corpus:

- (15) And that relationship depends upon each person getting out of the relationship something that's proportional to what they're putting in – that they are getting a fair trade with this other person.
- (16) She's putting in the time and effort, and resources that she's invested in this – and the resources she's getting in return (...).
- (17) When it turns out that one of you is being exploited by the other – in other words: you're getting more than you're giving (sic!) – that relationship probably isn't going to last.

In Examples (15) and (16), romantic relationships are understood as economic transactions between business partners. Additionally, the prepositions *in* and *out* suggest that this business relationship is a CONTAINER in which one puts VALUABLE OBJECTS like *time*, *effort* and *resources* and expects to get something equally valuable in return. Thus, the valuable things one contributes to his or her romantic relationships are not considered selfless acts that arise from a romantic feeling and the wish to please one's partners and make them happy. Instead, it is seen as an *investment* that will someday pay off in terms of some advantages. This resembles the motivation of businessmen and businesswomen when they make a deal. If one gains something from his or her contribution to the romantic relationship, this is understood as a *fair trade*. However, if what one gains is less valuable than their contribution to the romantic relationship, it is conceptualized as *being exploited*, as Example (17) illustrates.

Such a view on love as displayed by LOVE IS A BUSINESS TRANSACTION is not how we usually conceptualize romantic relationships (or any relationship to friends and family members) (cf. Kövecses, 1988) – at least not consciously. Thus, it does not come as a surprise that I do not find any instances of LOVE IS A BUSINESS TRANSACTION in the laypersons' data of the counseling corpus. The frequent use of LOVE IS A BUSINESS TRANSACTION seems specific for the language of experts in an academic genre of psychology.

Still, the question remains why the lecture corpus shows such a high frequency of LOVE IS A BUSINESS TRANSACTION. To shed some light on this question, I now take a closer look at the discourse units in which the academic experts apply LOVE IS A BUSINESS TRANSACTION. The topics relating to the metaphorical expressions that pertain to LOVE IS A BUSINESS TRANSACTION explain the importance of this conceptual metaphor in the academic discourse setting. In the spoken

data from the lectures, the professor applies LOVE IS A BUSINESS TRANSACTION when he explains theories of love and romantic relationships, namely Homan's *Exchange Theory*, the *Reward Theory* and the *Matching Hypothesis*. The only other instance in which the professor applies LOVE IS A BUSINESS TRANSACTION is at the beginning of the second class when he starts with a short summary of the last class meeting in which the previously mentioned theories were explained. In the textbook chapter, I also find metaphorical expressions belonging to LOVE IS A BUSINESS TRANSACTION almost exclusively at comparable points. The textbook author uses instances of this conceptual metaphor when he explains the *Matching Phenomenon* (called *Matching Hypothesis* by the professor), the *Reward Theory* and the *Equity Principle*. The conceptual metaphor LOVE IS A BUSINESS TRANSACTION portrays exactly those concepts of LOVE that are crucial parts of the particular theories the academic experts try to communicate.

The frequent use of LOVE IS A BUSINESS TRANSACTION seems hence to be tied to the discourse goals of the academic experts. They are supposed to communicate relevant theories of LOVE to the students and an efficient way to achieve this goal seems to involve a frequent application of LOVE IS A BUSINESS TRANSACTION. In contrast, in counseling, there does not seem to be a great need for LOVE IS A BUSINESS TRANSACTION, since the primary aim of the discourse event is apparently not to communicate academic theories of LOVE, but to help the laypersons with their immediate problems. It appears to be exactly these distinctions in discourse goals, discourse structure and groups of discourse participants that lead to differences in metaphor use between the counselors and the academic experts.

## 4.2 ANGER metaphors

In the ensuing subsections, following up on the conclusions drawn from the detailed analysis of LOVE metaphors in the previous subsection, I illustrate and discuss additional evidence gained by the examination of ANGER metaphors.

### 4.2.1 Counseling

The overall result for the use of ANGER metaphors in the discourse of counseling repeats the overall finding for the LOVE metaphors: Experts and laypersons differ in their conceptualization of the emotion (see Table 3). The main differences in the concepts of ANGER displayed by the metaphor use of the experts and laypersons are that laypersons conceptualize ANGER as something dangerous and uncontrollable. This is attested by the laypersons' frequent use of ANGER IS AN EXPLOSIVE and ANGER IS INSANITY (see Table 3). ANGER IS AN EXPLOSIVE indicates a sudden increase of the emotion which leads to a loss of control and results in a damage of

the angry person or the people around them. ANGER IS INSANITY also involves a loss of control in that a person loses the ability to function normally (cf. Lakoff & Kövecses, 1987, p. 391).

**Table 3.** Frequency of metaphorical expressions instantiating particular conceptual metaphors of ANGER in the counseling corpus

ANGER IS ...	Experts		Laypersons	
	n	%	n	%
... A HOT FLUID IN A CONTAINER	27	25.7	7	17.9
... A WEAPON	12	11.4	1	2.6
... HEAT	11	10.5	1	2.6
... AN EXPLOSIVE	5	4.8	5	12.8
... A COVER	5	4.8	0	0
... INSANITY	2	1.9	7	17.9
Other	43	41.0	18	46.2
Total	105	100	39	100

By contrast, the experts' use of metaphors is again characterized by an attempt to reframe a potentially problematic perspective on ANGER. Their most frequent metaphors are ANGER IS A WEAPON and ANGER IS HEAT. The main feature of ANGER displayed by ANGER IS A WEAPON is the aspect that one can control ANGER and determine the direction it *points to*. ANGER IS HEAT even suggests that one can reduce the angry feeling by *cooling anger off*.<sup>8</sup> Most of the metaphorical instances realizing ANGER IS HEAT actually consist of the expression *cool(ing) off*. Laypersons barely use anger metaphors indicating that ANGER can be controlled or reduced and experts only rarely employ metaphors for ANGER that suggest a loss of control and danger.

#### 4.2.2 Counseling vs. academic lectures

The experts' metaphor use indicates that it is largely influenced by the discourse goal of reframing the laypersons view on ANGER, just as was suggested by their application of LOVE metaphors. In order to see whether this interpretation for ANGER metaphors finds further support, I will now examine the lecture corpus. Based on the comparison of LOVE metaphors used by experts in counseling and experts in academic lectures in a previous subsection (4.1.2), my hypothesis is that metaphor use here also differs substantially from the counselors' metaphor

8. Lakoff and Kövecses (1987) discuss ANGER IS HEAT in more detail and address the issue of the physiological grounding of this metaphor.

use. Although the two groups of experts have mutual topics in psychology and share the aspect of expertise, the findings for LOVE above suggested that they still vary greatly in their use of metaphors. The analysis indicated that the distinct discourse goals, participants and discourse structures seem to account for the use of metaphors, rather than the shared topical domain and the feature of expertise.

Table 4 shows that counselors and experts in academic discourse indeed differ in their use of anger metaphors. However, there are also similarities that are surprising. ANGER IS A WEAPON does not seem to be specific to the counseling setting, since experts in the academic setting draw on this metaphor with at least equal frequency. However, the use of ANGER IS HEAT to suggest that anger can be reduced seems to be a result of the particularities of the counseling genre. The experts in the lecture discourse rarely apply this metaphor, probably because there is no urgent reason to point out the reducibility of anger to the students.

**Table 4.** Frequency of metaphorical expressions instantiating particular conceptual metaphors of ANGER in the counseling and academic lectures corpora

ANGER IS ...	Counseling		Academia	
	n	%	n	%
... A HOT FLUID IN A CONTAINER	27	25.7	13	10.7
... A WEAPON	12	11.4	17	14.0
... HEAT	11	10.5	3	2.5
... AN EXPLOSIVE	5	4.8	4	3.3
... A FLUID IN A CONTAINER	0	0	42	34.7
Other	50	47.6	42	34.7
Total	105	100	121	100

In fact, their most frequently applied metaphor, ANGER IS A FLUID IN A CONTAINER, indicates that it is impossible for a person to reduce ANGER and that an ANGER outburst is inevitable, given certain external circumstances. This particular conceptual metaphor is completely absent in the whole counseling corpus, supposedly because such a perspective on ANGER would be counterproductive in a counseling setting. It is obvious that ANGER IS A FLUID IN A CONTAINER is similar to ANGER IS A HOT FLUID IN A CONTAINER in that it conceptualizes ANGER as a fluid inside the human body container. In both conceptualizations, ANGER becomes apparent in aggressive behavior as soon as the fluid escapes the container. However, the main difference between the two is that in ANGER IS A HOT FLUID IN A CONTAINER, ANGER gets out of the container when the water is heated up enough to make the fluid rise and escape through the top of the container, or when the pressure in the container, due to the heat, becomes so intense that the container explodes. The negative effects of ANGER are caused by heat, but the heat is inside

one's body and can be regulated internally. One is able to *cool down* and prevent the ANGER from surfacing or the container from exploding. This is different in ANGER IS A FLUID IN A CONTAINER, as the following metaphorical expressions taken from the academic experts exemplify:

- (18) Think about this tank of water as the reservoir within your soul, that aggressive impulses are dripping into.
- (19) And as this tank fills up, the pressure of the weight of these [aggressive] impulses becomes stronger and stronger and they push on this plug that keeps it bottled up.
- (20) Now, you don't behave aggressively, until all of this stuff kind of explodes and comes pouring out of you.

In ANGER IS A FLUID IN A CONTAINER, the aspect of heat is missing. As Examples (17) through (20) illustrate, ANGER escapes the container through a hole at the bottom, which is secured by a plug. This plug is pressed out of the container as soon as the weight of the water becomes too much. However, one has no control over the amount of water in their body container, since it is dripping into the top of the container, which is unprotected. Since the water perpetually and unavoidably keep on dripping one will inevitably act out his or her ANGER, as soon as the amount of fluid is heavy enough to push out the plug. This model of ANGER is based on a hydraulic model by Konrad Lorenz (cf. Lorenz, 2002). Lorenz's model is however more complex than the model illustrated by the metaphorical expressions. Most of the metaphorical expressions instantiating ANGER IS A FLUID IN A CONTAINER occur when this hydraulic model is explained. This accounts for the fact that more than a third of all metaphorical expressions used by the experts in academic discourse can be assigned to ANGER IS A FLUID IN A CONTAINER.

The analysis of the use of ANGER metaphors suggests that the differences between the two expert groups are due to the distinct genres. On the one hand, the conceptual metaphor ANGER IS A FLUID IN A CONTAINER seems to be quite specific for academic lectures, as it is tightly connected to a particular psychological model that has no application in counseling. On the other hand, the metaphor ANGER IS A HOT FLUID IN A CONTAINER is part of our everyday concept of ANGER and metaphorical expressions belonging to it are highly conventionalized in the everyday language of English speakers (cf. Lakoff & Kövecses, 1987, pp. 380–385). However, in contrast to the counseling genre, metaphorical expressions realizing this conceptual metaphor are infrequently found in the academic lectures corpus (see Table 4). This is probably due to the particular goal pursued by the academic lectures, aiming to change the students' lay models into academic theories. By contrast, in the discourse of counseling, problematic lay models are supposed to be changed into constructive ones.

## 5. Conclusion

In this investigation, I examined the experts' metaphors of LOVE and ANGER in two different genres of specialist discourse by means of two exploratory studies. The purpose of providing evidence from two distinct studies was to examine whether the particularities of the two distinct genres lead to variation in the experts' patterns of metaphor use. Based on the metaphors in language, tentative conclusions regarding the conceptualizations of these emotions were drawn. The analysis provides interesting insights for further research in the role of metaphor variation in genres of specialist discourse.

My analysis of LOVE and ANGER metaphors in the counseling and academic lectures corpora showed that the use of metaphors that refer to the same topic differed greatly between expert groups in the two genres. In the analysis, I pointed out the patterns of metaphor use that seem to be characteristic for each of the two genres. By closely examining the overall situational factors, I was able to reveal possible features of genre that influence the differences in the choice of metaphors. I argued that, in my data, the metaphor use of psychology experts seems to be highly influenced by the discourse goal, the discourse structure and the discourse participants.

The experts in the counseling genre are faced with problematic views on LOVE and ANGER described by the laypersons, who turn to them for advice. This constitutes a discourse structure that is different from the academic lectures. Whereas the academic experts (the lecturing professors and textbook authors) may wish to change their students' (naïve) conceptualizations of the respective emotions into expert theories, the goal of the counselors is to intervene practically with personal problems of lay clients. Counselors are supposed to change the laypersons' problem-ridden view on LOVE or ANGER in ways that help them overcome their problems with these emotions. For LOVE, I demonstrated that the counselors frequently use conceptual metaphors involving aspects of activity, creation and responsibility of partners in romantic relationships. It was suggested that these metaphors are applied to counteract the laypersons' passive attitudes towards LOVE. In the case of ANGER, the counselors' use of metaphors seems to aim at conveying a concept of the emotion that involves the possibility to reduce anger and prevent actual aggressive behavior. This might be a reaction to the laypersons' concept of ANGER displayed in their metaphor use, which is characterized by the loss of control over the emotion.

On the other hand, the discourse goals, and also the discourse role, of the experts in the lectures are not to provide new or more constructive lay models. Instead, the academic experts are supposed to let the students change their lay models into specialist conceptual models, i.e. academic theories. These diverging

aspects of the respective discourse settings seem to explain the differences in the metaphor use in the two genres. I argued that, in the case of LOVE, frequently applied metaphors are tightly connected to specific theories of LOVE in psychology that regard romantic relationships as BUSINESS TRANSACTIONS. These theories are important for students of psychology, but are probably not particularly helpful for the laypersons in the discourse of counseling. In the case of ANGER, I showed that the academic experts frequently use a conceptual metaphor that is entirely absent in the counseling corpus, ANGER IS A FLUID IN A CONTAINER. Its specific nature opposes the perspective that the counselors try to communicate in their use of ANGER metaphors. In this case, the specific groups of discourse participants, along with the particular discourse goals, again seem to explain the observed variation in metaphor use.

My investigation points out differences in metaphor use of two expert groups in the domain of psychology and how these variations can be explained by the distinct genres. There are a number of ways in which the present study can inform further research. First of all, a broader basis of data, especially with regard to the spoken lecture data, could extend and probe the findings of the present study. Secondly, my findings pose interesting questions for ensuing investigations of metaphor use in specialist discourse. For example, the observation of one of the ANGER metaphors in academic discourse being tightly connected to a specific expert model suggests that instructors and textbook authors employ particular metaphors to change students' lay concepts into specialist conceptualizations. If this is generally the case, we should find (an accumulation of) specific metaphors in lectures when instructors are explaining (new) academic models or theories. Indeed, some studies of psychology lectures (e.g., Beger, 2011c) and linguistics lectures (e.g., Mittelberg, 2008) suggest this. However, further investigations of different topics, and of the students' metaphor comprehension, as well as studies of different genres, are needed to determine the importance of metaphor use in academic discourse and in specialist discourse in general.

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### **SECTION III**

## **Metaphor in specific contexts**



# Payback and punishment

## Figurative language in Scottish penal policy

Alice Deignan and Sarah Armstrong

University of Leeds, United Kingdom / University of Glasgow, United Kingdom

This paper presents an analysis of metaphors for punishment in policy discourse in Scotland, which has embarked on an ambitious programme of penal reform. We analysed a corpus consisting of the four key policy documents of the penal reform programme. Our objectives were firstly, to identify the most frequently used lexical metaphors and metonyms in the corpus, and then to analyse the entailments that these metaphors have, and how they frame the topics of the texts. We found widespread use of metaphors from the domain of management, providing support for the thesis that the discourse of management frames public services in the UK. We then specifically investigated the use of *payback* because of its salience in current penal philosophy, with the objective of finding out how frequently it is used, and whether the theme of reparation frames the texts more widely. Our findings suggest that as a metaphor from the source domain of reparation, it appears to be a 'one-shot' metaphor. However, in terms of semantic groupings, it could perhaps be viewed as a metaphor of business and management.

### 1. Introduction

Cognitive linguists have claimed that metaphor structures thought, and that all metaphors both highlight and hide aspects of their topic (Lakoff & Johnson, 1980). Metaphors thus frame ideas about their topic from a particular perspective, and in the case of complex, controversial issues, this may be one that is not shared by all stakeholders. For instance, Schön's study (1993, originally published in 1979) analysed policy texts from the 1960s, to identify the metaphors that were being used to frame the debate on housing policy. He demonstrated that poor quality housing was discussed using a DISEASE metaphor, which implied a 'cure' in the form of demolition, eradicating 'blight'. This use of metaphor, he argued, downplayed an alternative perception of inner city housing as communities, effectively blocking this as a way of thinking about the issue and imposing a one-sided frame. Schön's

study is an early example of a series of studies of the application of metaphor analysis to social issues. Todd and Low (2010) overview a number of more recently published articles by social scientists describing studies of metaphor use in a range of contexts, all of which seek to learn more about how topics and relationships are framed by metaphor (for another study on metaphor in governmental policy in this volume, see Williams). Writers such as Lakoff and Johnson (1980) have considered political implications of the property of metaphor to frame topics, arguing that it is deliberately harnessed to produce powerful persuasive effects. For instance, Lakoff (2003) claims that the US administration exploited the conceptual metaphor *A NATION IS A PERSON* to justify war in the Persian Gulf, while Charteris-Black (2004, 2005) has studied how political leaders use metaphor to present their messages effectively.

The arguments outlined above suggest that metaphor analysis can be a powerful tool in examining thinking around controversial social issues. Further, the choice of metaphors by policy makers may indicate the direction in which they hope to shape public opinion, perhaps more so than what is said overtly, because metaphor conveys its message off-record. The systematic metaphors that frame issues will be detectable at the linguistic level through uses of figurative language. Documents proposing change might be expected to demonstrate especially interesting uses of metaphorical language, because they are likely to be reframing issues, and may use new metaphors to do this. In this chapter we analyse a set of four such policy documents. Our objectives were:

- To identify the most frequently used lexical metaphors and metonyms in the corpus;
- To consider the entailments of these, and how they are used to frame the topics of the texts;
- To consider especially the use of ‘payback’ as a metaphor in the texts, given its salience in Scottish discourse around penal policy.

We use a combination of automatic corpus techniques and manual analysis, in order to understand how the controversial issue of punishment was being framed and reframed metaphorically in Scotland during a key period of change, 2008–2010. Although we were especially interested in metaphor, for its well-documented framing and persuasive properties, we also identified uses of metonymy and considered whether these could contribute to our understandings of how justice was framed in our corpus.

## 2. Context of the present analysis

The four texts that we analyse in this chapter were produced at the start of, and are used to represent, a major period of penal reform in Scotland:

1. Scotland's Choice: Report of the Scottish Prison Commission (July 2008)
2. Revitalising Justice – Proposals To Modernise And Improve The Criminal Justice System (September 2008)
3. Protecting Scotland's Communities: Fair, Fast and Flexible Justice (December 2008)
4. Criminal Justice and Licensing (Scotland) Bill [as introduced] (March 2009)

We refer to the texts collectively as 'the documents corpus'. Before considering the linguistic features of the documents corpus, we outline the policy context in which the texts were produced. Scotland, like England and Wales, consistently has had one of the highest imprisonment rates among western European countries, a league table position that has troubled policy makers and provided justification for almost never ending reform within Scottish criminal justice (McAra, 2008).

The first text chronologically was the official report of the Scottish Prisons Commission, *Scotland's Choice: Report of the Scottish Prisons Commission* (July 2008, hereafter referred to as *Scotland's Choice*). The Commission was established by Government to provide an independent review of the use of imprisonment in Scotland and to make recommendations on its future, and its work was to guide Government plans to reform criminal justice policy in Scotland.<sup>1</sup>

*Scotland's Choice* is a foundational document in that the other three texts analysed here were produced directly or mainly in response to it. It was considered innovative because it positioned criminal justice policy as an area, like all public services, that raised general questions about good governance. Rather than simply a domestic problem, choices about how to use imprisonment, and how many prisons there should be, were articulated as choices about what kind of nation Scotland would like to become. (These developments in Scotland are in contrast to England and Wales, where a political agenda to be seen as tough on crime has led to rapid expansion in the prison population, which grew from 49,500 to 82,100 between 1995 and 2009<sup>2</sup>).

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1. Scottish Government (2007), 'About the Scottish Prisons Commission,' <http://www.scotland.gov.uk/About/spc/About>

2. Ministry of Justice (2009), The Story of the Prison Population 1995–2009, Ministry of Justice Statistics Bulletin, 31 July.

*Scotland's Choice* urged a reduction in the use of imprisonment, and expanded use of community sentences. It identified a new penal concept, that it termed *payback*, which was defined to cover a variety of penal purposes: incapacitation, rehabilitation, restorative justice and financial restitution. *Payback* was intended as an umbrella concept under which the different purposes of punishment could be accommodated within a single sanction, and moreover, which would establish a community-based sanction as the default punishment for many crimes. (The UK government has also introduced a 'payback' notion into its criminal justice policy in England and Wales, but has stated that unlike the Scottish version which includes rehabilitative and reparative aims, the "primary purpose of the [English payback] order is punishment".<sup>3</sup>)

The second and third texts appeared shortly after the publication of *Scotland's Choice* and were written by Government civil servants. *Revitalising Justice* (September 2008) is a pre-legislative document announcing the intended measures to be contained in an omnibus criminal justice bill. It proposes reforms affecting nearly every part of the criminal legal and justice systems, from policing powers to evidence disclosure to licensing laws for pricing of alcohol to penal reform. *Protecting Scotland's Communities* (December 2008), though appearing after *Revitalising Justice*, has a more direct connection to *Scotland's Choice*, constituting the official Government response to it. Its coverage is limited to penal reform; in other words its contents mirror those of *Scotland's Choice* while the other two texts include many other criminal legal and justice issues. Significantly it adopts *payback* as the principle justifying proposed legislative measures.

The fourth text we analyzed was the proposed legislation resulting from the consultation process of which the three prior texts were a part. The *Criminal Justice & Licensing (Scotland) Bill* was introduced in March 2009 and includes almost all of the proposed measures in the same or slightly modified form as described in the *Revitalising Justice* document. The bill attempts a range of reforms across many areas of the criminal justice system, and proposes one of the most ambitious penal reform plans seen in a generation. The concept of *payback* appears in the Bill in the form of a new order called the 'community payback order' (CPO). In sum, these four documents provide important empirical markers of the beginnings of a major attempt to change how Scotland justifies, organises and runs its penal system. The bill was enacted in 2010 with its payback provisions intact; the Community Payback Orders began to be used in February 2011.

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3. Email from Jill Shaw (National Offender and Management Service) to Helen Rolph (Scottish Consortium on Crime and Criminal Justice), 29 January 2010. See also, Cabinet Office (2008) Engaging Communities in Fighting Crime – A Review by Louise Casey, available online: [http://www.cabinetoffice.gov.uk/media/cabinetoffice/corp/assets/publications/crime/cc\\_full\\_report.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/corp/assets/publications/crime/cc_full_report.pdf)

### 3. Method

The problems of searching for metaphors in corpora are well known (for example, Deignan, 2005). Concordancing, the main tool used in automatic processing of corpus data for meaning, is essentially a bottom-up technique and researchers can easily miss metaphors that they have not identified in advance. However, at 131,000 tokens, the document corpus is small enough to hand search, so we began by reading the documents, using corpus-processing software as an additional tool rather than as our starting point. Although this was a formidable task, it should be noted that the metaphor analysis reported here was part of a larger study of the changes in Scottish Penal Policy, which one of the authors worked on for two years, in the process becoming very familiar with the four texts in the documents corpus. We read (or rather, mostly re-read) the corpus and marked up metaphors while reading. Because our interest was in how figurative language is used to frame justice, we were concerned to identify only field-specific metaphors. We therefore did not include highly conventionalized and non-field specific metaphor use in our analysis. It follows that we make no claims regarding the overall frequency of metaphor use in the documents corpus.

In this way, we manually identified conventional and innovative metaphors whose topic was specific to the framing of justice and penal policy. We based our definition of metaphor and our identification procedure on MIP (Metaphor Identification Procedure, Pragglejaz group, 2007). For the use of a lexical unit to be considered a metaphor, MIP requires its contextual use to be related to a more basic meaning by a relation of comparison or similarity. For example, this allows *pay back* to be considered a metaphor. As a phrasal verb, it is a single lexical unit under MIP, it has a more basic meaning associated with ‘reparation, money and debt’, and there is a relationship between the basic and contextual meaning. An example of what MIP excludes is the ‘prison’ meaning of *sentence*, because there is not a more basic meaning of this word that is, currently, semantically associated with its meaning in this discourse context. The only candidate for a basic meaning of *sentence* is ‘linguistic unit’, which does not seem to be related by comparison to the contextual meaning of ‘time to be spent in prison’.

There is no single widely-agreed procedure for searching for metonyms. We interpreted metonymy as the linguistic product of the process defined by Gibbs (1994, p. 320) as follows: “People take one well-understood or easily perceived aspect of something to stand for the thing as a whole”. We considered as metonyms cases where the lexical unit in context clearly had a different referent from a more basic sense, and where the relationship was one of contiguity rather than comparison. The main example that we found was where *court*, the place where decisions about justice are made, was used to stand for the people who make those decisions, or for the process of justice.

In a parallel process to the manual identification of metaphors and metonyms, we used the program WordSmith Tools v.5 (Scott, 2007) to perform automatic frequency counts. This identified the 200 most frequently used word forms in the documents.

We used the same program to generate concordances of the lexical words from this list, and of the less frequent metaphors and metonyms that we had identified in our hand search. Using concordances allowed us to examine the typical linguistic context of each word more efficiently and accurately than is possible when citations are viewed separately, in their individual contexts.

We compared citations of the metaphors and metonyms that we found in the documents corpus with citations of the same words in the Oxford English Corpus, henceforth referred to as the 'OEC'. This is a 2 billion-word corpus of spoken and written English from a range of contemporary naturally-occurring sources (see <http://oxforddictionaries.com/page/oec>). This was processed using the program Sketch Engine (<http://www.sketchengine.co.uk>). We limited the OEC concordances to samples of up to 500 citations. We compared form and meaning of citations from the documents corpus and the OEC by hand. Given the subject matter of the policy documents, we were not expecting that usage would be identical, and we do not always draw conclusions from differences in use between the specialised policy document corpus and the general corpus. For instance, it is to be expected that the most frequent use of *sentence* in a document about penal policy is the meaning that refers to an amount of time that an offender is to spend in prison. However, as we show below, in some cases it was informative to note differences in meaning and lexical grammar between the documents corpus and general use as represented by the OEC.

Using corpus techniques such as frequency counts and concordancing does not easily allow us to consider development over the period of time that the documents were produced, and tends to lead to us seeing the documents corpus as an undifferentiated whole. Part of our interest lies in the progression of ideas and the metaphors that express these, therefore we do not lose sight of the role of each document in working towards the Criminal Justice Bill, and throughout our analysis we compared the documents against each other.

#### 4. Findings from automatic frequency analysis

##### 4.1 Most frequent figuratively-used lexical words

Of the 200 most frequent word forms identified using WordSmith Tools, 115 were lexical and 85 grammatical. Although grammatical words frequently have metaphorical meanings (such as the prepositions *in*, *on*, *at*), none found in these data were field-specific. They were therefore not of interest to us, as noted above. The

most frequent lexical word is *act*, used to refer to a piece of legislation. Our analysis using MIP suggests that this is a metaphor, being derived from the more basic sense ‘a single thing that someone does’ (the first sense listed by the Macmillan Online Dictionary). The use in the documents corpus is technical and institutionalized, and hence does not refer to some concrete person’s activity. It is, as far as we can see, evaluatively neutral.

The second most frequent lexical word is *court*. Analysis of citations shows that *court* is almost invariably used as a metonym, often, as commented above to refer to the people who work in a court, usually the judge. This is a classic example of Lakoff and Johnson’s INSTITUTION FOR THE PEOPLE RESPONSIBLE metonymy (1980, p. 38). Literal uses of *court* are almost entirely confined to its use as a noun modifier, in expressions such as *court officials* and *court proceedings*. The following metonymic citations are from *Scotland’s Choice*:

- (1) The court also aims to ‘make justice swift’.
- (2) ... where a person is sentenced to life imprisonment, the court is required to specify the ‘punishment part’ of the life sentence.

In the *Criminal Justice and Licensing (Scotland) Bill*, almost all of the 471 citations of *court* metonymically stand for the decision makers in a court, as in the following citation.

- (3) If the court decides not to follow the guidelines, it must state the reasons for its decision.

The introduction to the Bill partly explains this use: “Court means the High Court, the sheriff, or the justice of the peace court” (p. 17), (the Sheriff in Scotland is a position analogous to that of Judge in England and Wales) though it will be noted that two of the three entities that *court* can mean are themselves metonymies. The metonymic use of *court* has the effect of depersonalising the decisions made about offenders. Further, in enabling the writer to avoid any reference to individual people, such as Sheriffs/Judges, this use implies that decisions are made by a single entity throughout the country, and are therefore completely consistent.

*Court* is also a place where offenders are required to come, appear and often return to. Again this use is metonymic, standing for the process of justice, here exemplifying Lakoff and Johnson’s THE PLACE FOR THE INSTITUTION metonymy (1980, p. 38). The following citation is from *Scotland’s Choice*:

- (4) ...requiring the offender to come back to court multiple times.

The plural form *courts* is used in a similar way, in citations such as the following from *Scotland’s Choice*, where courts stands for decision-makers:

- (5) The courts appear to make liberal use of alternative sanctions including fines, community service, probation and suspended sentences.

The third most frequent figuratively-used word is *support*, the 68th most frequent lexical word. In the document corpus, *support* usually has one of a network of related metaphorical meanings of verbal, financial and/or emotional encouragement, in contrast to the basic meaning of physical support. An analysis of OEC citations suggests that these related metaphorical meanings are vastly more frequent than the literal meaning in general English (247 of a random sample of 250 citations in the OEC were metaphorical). Its metaphorical use in the document corpus therefore does not seem to deviate significantly from general use.

The fourth most frequent figuratively-used word is *payback*, the 73rd most frequent lexical word in the documents. One of the authors interviewed the document writers at an earlier stage in the larger project of which this study is a part. The writers discussed the notion of ‘payback’, and confirmed that it is key to the thinking behind the changes in penal policy in Scotland. Because of the importance of the term, we analyze and discuss it in a separate section, below.

The remaining figuratively-used words in the list produced using WordSmith Tools are not of especial interest. The next item (the 79th most frequent lexical word) is *high*, used figuratively in collocations such as *high risk* and *high numbers*. It is followed by the 112th most frequent lexical word, *take*, which is used figuratively in a number of fixed phrases such as *take forward*, *take account of*, *take the lead*, *take [crime] seriously*. These did not appear to be field-specific uses so we did not analyze citations further. Our analysis found no other figuratively-used words in the 115 most frequent lexical word forms in the documents corpus. It can be concluded from this that on a raw frequency basis, use of semantically rich figurative language is not especially high in these documents. However the hand-searches we ran in addition to the frequency list showed some other linguistic metaphors that though less frequent are nonetheless important given the subject matter of the documents.

#### 4.2 Payback

*Payback*, the fourth most frequent figuratively-used word form, is given a definition in the earliest document, *Scotland's Choice*, as follows:

By payback, we mean finding constructive ways to compensate or repair harms caused by crime. It involves making good to the victim and/ or the community whether by unpaid work, engaging in rehabilitative work [...] or some combination of these and other approaches.

This figurative use of *payback* is of particular interest because the concept it refers to is given prominence in the documents and the penal reform more widely. It occurs 32 times in *Scotland's Choice*, and 27 times in *Protecting Scotland's Communities*. It does not occur at all in the second document, *Revitalising Justice*, the document that paved the way for the final document, the *Criminal Justice and Licensing (Scotland) Bill*. In the final document, *payback* occurs 70 times, but always within the collocation *community payback order*, often abbreviated to CPO, suggesting that by that point in the development of policy the term had become established, having an official status and meaning.

15 of the 32 citations of *payback* in *Scotland's Choice* raise or tackle questions about the meaning of *payback*, how much payback is appropriate and what forms it should take, suggesting that the term is still evolving. In *Protecting Scotland's Communities*, the notion seems to have become established; it is generally used without questions being raised around it and is not generally used with a definition. 9 of the 27 citations appear in the collocation *community payback sentence*. The following are typical of the remaining 18:

- (6) ... clarity in sentencing, investment in local reparative and rehabilitative services and visible offender payback.
- (7) ... his key finding underscores our core objective to tackle re-offending through robust community penalties that deliver visible and immediate payback for communities.
- (8) Sentences served in the community should involve payback.
- (9) ... sentences that provide the appropriate balance of support for offenders and payback to the communities affected by their offending.

We compared the use of *payback* in the documents with uses in the OEC, in an attempt to answer the following questions:

- Is the metaphorical use of *payback* in the documents also found in a general corpus?
- Which literal meaning of *payback* is most likely to be the 'basic meaning' (in MIP terms) corresponding to this metaphorical use?
- What is the evaluative, connotational value of this basic meaning?

The word form *payback* occurs 3,699 times in the OEC. A random sample of 500 citations was examined for meaning. Three central meanings were found, with three further, smaller groups of citations. The three main meanings are 'revenge', '(literal) return on (financial) investment', and '(non-literal) return on (abstract) investment', this third meaning apparently being a metaphorical extension of the second. The smaller groups were firstly where the phrasal verb *pay back* was

spelled as one word – which also happens in the policy documents – and secondly citations mentioning a 1999 film, *Payback*, starring Mel Gibson. The film title is clearly taken from the ‘revenge’ meaning of the word; the most widely used publicity picture shows the actor pointing a gun directly out of the picture, and is captioned “get ready to root for the bad guy”. The third smaller group is the use found in the policy documents, in citations apparently coming from similar texts or from news reports about them. This answers our first question: if the OEC can be assumed to represent general English as experienced by British speakers, as it is intended to, the use found in the documents corpus does not appear outside this specialized genre, in more general English. Table 1 shows examples and frequencies of these six groups of citations.

**Table 1.** Meaning, examples and frequencies of *payback* (without spacing) in a random 500 citation sample

Meaning	Example	Citations
1. Revenge	We remember the death of the British consul-general, which was described yet again as payback for Iraq.	197
2. Financial return	... a cost of 174 million pounds, which would require a payback of 36 million pounds a year for 25 years to the consortium.	142
3. Non-financial return for work, or return of a favour (metaphor from 2)	When [she] opened her exam results last August she saw them as payback for nine months of study, personal sacrifices and unwavering commitment.	
	On the one hand there's an obvious payback angle here – Clinton felt he owed Quinn big time.	117
4. Phrasal verb without spacing	... which allows students to payback after they have graduated at a much higher tax rate	27
5. Name of film	Payback, the Mel Gibson movie, works, but in a skillfully mindless action-flick way.	14
6. Repayment for criminal harm	The mayor should make more use of restorative and reparative justice, where offenders have to make amends to victims or payback to society.	3
Total		500

Regarding our second question, it is not completely clear which meaning is the basic one with relation to the use in the policy documents. *Payback* in the OEC is evidently not synonymous with ‘repayment’ or ‘reparation’, though it is often nearly synonymous with ‘revenge’. Our third question concerned the connotations of the basic meaning. These are usually negative; where *payback* has a positive

evaluation, it implies a return on an investment, either a literal, financial one, as in meaning 2, or an abstract one, as in meaning 3.

Like the noun form, the phrasal verb *pay back* does not occur in the second document, *Revitalising Justice* or in the *Criminal Justice and Licensing (Scotland) Bill*. In *Scotland's Choice*, *pay back* occurs 9 times, *paying back* 21 times, *paid back* twice, while *pays back* does not appear. In *Protecting Scotland's Communities*, *pay back* appears twice, *pays back* does not appear, *paid back* appears once and *paying back* appears six times. Typical citations are as follows:

- (10) Ultimately, one of the best ways for offenders to pay back is by turning their lives around...
- (11) ... help them develop skills and qualifications while they pay back.
- (12) ... a duty to reintegrate both those who have paid back in the community and those who have served their time in prison.
- (13) This does not and should not mean stigmatizing and shaming offenders as they go about paying back.

All inflections of *pay* were concordanced in the Oxford English Corpus, and those containing *back* were extracted. This gave a concordance of 10,313 citations, of which a sample 250 were analysed. 64 citations, or around 25% of the sample, contain unrelated uses of *pay* and *back*. In 4 citations, or 1.6% of the sample, *pay back* refers to revenge, and in 7 citations, around 3% of the sample, it refers to repayment in non-financial terms. In the remaining 175 citations, that is, 70% of the sample, and 94% of the sample in which the collocation of *pay* and *back* is a phrasal verb, the meaning is literal and refers to money. Table 2 shows a random sample of 20 citations.

As well as this difference in meaning of phrasal *pay back* between the policy documents and the OEC, there is a grammatical difference. In the OEC citations, *pay back* almost always has an object; in semantic terms, speakers or writers specify what is being paid. The object can appear after *back*, as in the first citation in Table 2, or, if it is a pronoun, between *pay* and *back*. Occasionally the object is found further away in the text. In the policy documents a direct object is not given; that is, the nature of the debt is never specified. This probably accounts for the impression the researchers had that this use of *pay back* is unconventional in some way. The change in the details of lexical grammar is consistent with corpus linguists' observations that different meanings of a word are associated with different forms (Hunston & Francis, 2001). The lexicogrammatical development rapidly leading to a degree of fixedness, also seems symptomatic of the jargonisation of a term: this case can be compared to, for instance, the developments in the business and management domains of forms such as *action* and *impact [on]*, used as verbs rather than in their conventional forms as nouns. This analysis shows that

**Table 2.** Randomly selected extract of the Oxford English Corpus concordance for *pay\* back*

business	obtained a 30 – day grace period to	pay	back \$ 95m to satisfy those lenders
business	method of repayment allows you to	pay	back capital and interest each month.
business	section . Burke had begrudgingly	paid	back “ 10,000 from the total amount
business	Meath , is likely to allow the firm to	pay	back its creditors and could leave it with
business	to change their business culture by	paying	back loans despite economic hardships
news	wants us to work for them as well as	pay	their money back on top of the bank loans
news	Any money they make after they ‘ve	paid	back the loan can either be put back into
news	and New Mexico get 50 percent	pay	directly back to them on oil and gas,
news	duates on low wages being forced to	pay	back their debts. The £ 10,000
news	for the Asian tsunami disaster will be	paid	back to the appeal, in a move that could
paranormal	ntly volunteer to work shifts for no	paying	.People started looking back at
science	authorities make investments and are	paid	back by the private users.” Private
society	of cash that it would later have to	pay	back plus interest (the fee to General
transport	which is insufficient to cover costs ,	pay	back a significant portion of the investments
weblog	borrow money off your parents , and	pay	them back when you get the rest of your
weblog	Being, which would require him to begin	paying	back his student loans. Paying back these
unclassified	and principal on these bonds must be	paid	back , the loan will reduce TSF available
unclassified	Alarmed? The last agreement on	pay	and conditions dates back to 1977. The
news	how much he ‘s going to have to	pay	back. Well, the government says
business	entitled to is \$ 800 .” That means	paying	back up to \$ 800 with your return, though

the contextual meaning of *payback* found in the policy documents is not as clearly related to its basic meanings as might first be assumed, and also that the specialist verbal use has different formal characteristics from its non-specialist equivalent.

In the introduction, it was noted that cognitive metaphor theory holds that metaphors underlie our ways of thinking about a topic. Not all metaphors are equally significant however: Lakoff (1993) makes a distinction between conceptual metaphors, which he regards as key to abstract thought, and one-shot metaphors, which are a single correspondence between source and target, and which he considers to be much less significant to thinking. A conceptual metaphor is normally realised at the linguistic level by a large number of lexical forms. For instance, in Schön’s (1979/1993) example of the mapping of ILLNESS onto housing, the following linguistic metaphors are cited in a relatively short stretch of text: *blight*, *healthy*, *congenital disease*, *palliative*, *cycle of decay*. If penal policy in Scotland has been reframed using a ‘payback’ metaphor of reparation, it would be expected that this would be relexicalised in a similar way throughout the texts, in particular the first and third, which describe thinking more discursively and persuasively. The texts were read in detail, and also searched automatically for likely words from the source domain of PAYMENT AND REPAYMENT. Metaphorical uses of words such as *repay* and *debt* are in fact rare in the documents corpus; these two occur only once each in *Scotland’s Choice* and not at all in the other three documents. In Lakoff’s (1993) terms, *payback* is hence a one-shot metaphor. Cognitive metaphor theory

would suggest therefore that the documents are not framed through this metaphor, and, more tentatively, that it does not underlie the thinking behind them.

We have concluded that PAYBACK is not a systematic metaphor, but it seems pivotal to the texts in other ways. The term appears to have an important discourse function, as a coinage used to bundle and package a collection of related ideas, and to refer to these throughout. Semantically, the use of *payback* has two interesting characteristics: firstly, it is vague, despite the definitions provided early in the documents. That is, there is ambiguity as to whether it refers purely to community-based sanctions, or whether it refers to the entire range of sentencing options that a court has, which includes custodial sentences. The intended meaning seems to vary between these two possibilities at different points in the document corpus. Secondly, *payback* can evoke at least two contrasting approaches to dealing with crime: ostensibly the term refers to a metaphorical repayment for harm done, with a suggestion of rehabilitation, but the corpus analysis above has shown that the term is also associated with revenge. The frequent collocation *payback time* in particular, is used to talk about revenge, sometimes specifically violent punishment for crimes in the OEC.

## 5. Findings from manual analysis

We noted above that as well as examining the most frequent word forms that were identified automatically, we read the documents several times, hand-searching for linguistic metaphors that were not among the most frequent 115 lexical words. A set of meanings that occurred fairly frequently seemed to be taken from the domain of BUSINESS. At this point, we hypothesised that the document writers were mapping concepts from this source domain. We analysed concordance data for words such as *invest* (with its inflections) and *investment* to investigate this hypothesis. However, we found that in all cases where the contextual meanings could be established with any specificity, they seemed to be literal. In the case of *invest* and *investment*, for instance, they referred to a sum of money that had been spent in the hope of recouping or saving money. In some cases the hoped for benefits were not financial, but as the entity that was invested was always money, we decided that these uses were not metaphorical. The following citations are typical:

- (14) Money invested in prisons could be better spent in communities and on nurseries, schools, youth service and hospitals. *(Scotland's Choice)*
- (15) This year we have increased by over a third the investment – from £1.2m to £1.7m directed to local authorities for bail information and supervision schemes. *(Protecting Scotland's Communities)*

Nonetheless, there was some metaphorical use of lexis from business and management. It could be argued that *payback* in fact forms part of this managerial metaphor, though this may not to have been the intention of the authors of the documents. Linguistic examples of the metaphor are *deliver* and *delivery*, and *manage* and *management*, now discussed.

### 5.1 *Deliver*

Hand-searching showed a number of citations for *deliver* (including inflections) and the noun *delivery*. The use that seemed most frequent in the policy texts occurs in collocations such as *deliver services* and seemed likely to be a characteristic of the language of business and management. We used corpus data to compare the use of *deliver* in the OEC business domain with that in the documents. A close examination of the use of the verb *deliver* and its inflections and the noun *delivery* showed no discernible difference in meanings; here the verbal form is reported.

Four main meanings were found. The most frequent literal meaning is ‘take something to a particular place’; the prototypical object is post or parcels but the meaning can cover other scenarios such as ‘introduce drugs into the body’. A metaphorical extension of this use is ‘convey a message’; objects include lecture, speech and message. A further metaphorical extension is the use that we considered to be typical of business, meaning ‘produce or render’, in ‘*deliver services*’. The fourth use refers to assisting at a birth. The data also showed some more infrequent uses, such as a biblical sense of rescuing from danger or evil; these seem insignificant and are grouped together. Table 3 shows examples of the main senses found, with their frequencies in a random 250-citation sample taken from the business domain of the OEC.

To investigate our hypothesis that the main use of *deliver/delivery* in the four policy documents is related to the main use in business, that is, use 3 in the above table, we concordanced and examined all citations in the four documents. We found that apart from one non-metaphorical use in *Revitalising Justice*, and three in the *Criminal Justice Bill*, all the uses in the policy document exemplified this use. Table 4 gives more information about context, and examples from each document.

We also examined the most frequent right collocates of the verb form in the OEC and in the policy documents. This showed us the words that are most typically the object of verbal *deliver*. We used Sketch Engine to identify right collocates in the OEC, then examined concordances for each, and discarded words that typically occur with a different sense of the word, or which are not a grammatical object. We used these data to produce Table 5, which shows objects of *deliver* in descending order of frequency.

**Table 3.** Meanings of *deliver* in the Business Domain of the OEC

Meaning	Example	Citations
1.	Literal	Arnotts [...] delivered wedding items at least two to three times a week. 41
2.	Convey message	... an Irish website called eumom.com that delivers information to pregnant women. 29
3.	Produce, render ('deliver services')	Our performance this year enabled us to deliver strong results. [it] will no longer be able to deliver on its big plan to revolutionise the way US consumers buy their groceries. 172
4.	Assist in childbirth	The consultant has delivered two babies today, so appointments are backed up. 2
5.	Other	... about an hour after Mandelson had delivered the final blow to institutions. 6

**Table 4.** Citations of *deliver* and *delivery* in the Four Policy Documents

Document	No of citations	Object (of verb)/reference (of noun)	Examples
Scotland's Choice	11	justice, service, success, support, community disposals	... the problem of delivering better and swifter justice for offenders, victims and communities.
Revitalising Justice	8	penal policy, system, woman or girl*	... part of the delivery of a coherent penal policy system.
Protecting Scotland's Communities Bill+	43	successful country, justice, system, service document, copy	... a penal policy that will contribute to delivering a safer and stronger Scotland. A postal service which provides for the delivery of a document to be recorded.

\*A literal use ('she will be delivered to her parents').

+All three uses in the Bill are literal.

We identified grammatical objects of *deliver* in the four policy documents using WordSmith Tools concordances; results are shown in Table 6.

The two corpora share the collocation *deliver services*. In the business domain of the OEC, the object of *deliver* is generally associated with money, and other related, positively regarded outcomes of business. The use in the penal policy documents seems to share these positive connotations (or, more specifically, semantic prosody, in Sinclair's (1991) and Louw's (1993) terms). In the policy documents, the object is extended from words associated with service, such as *agenda*, *programme* and *support*, to the non-monetary entities *justice* and *sentences*. Because of

**Table 5.** Objects of *deliver* in the Oxford English Corpus

Rank order of frequency in immediate right position	Word form
1	service
2	services
3	value
4	results
5	growth
6	returns
7	earnings
8	performance
9	quality
10	profits

**Table 6.** Objects of *deliver* in the Documents Corpus

Rank frequency	Word form	Number of occurrences
1	justice	9
2	sentences	6
3	policy	5
4	system	4
	service	4
6	agenda	2
7	programme	1
	support	1
	exchange of information	1
	a successful country	1
	smart disposals	1
	effective solutions	1
	early years framework	1
	payback	1
	plans	1
	change	1
	a safer and stronger Scotland	1

the vague reference of *deliver*, it is not possible to state with certainty whether this extension is metaphorical using MIP, but for this analysis, the issue of metaphoricity is perhaps not important. What does seem significant is that the extension in use seems to package *justice*, *sentences*, and even a *successful Scotland* as entities that are provided by the state, and given to the public.

## 5.2 Manage, management

Hand-searching also showed the words *manage*, and its inflections, and the derivation *management* to be relatively frequent in the policy documents. Historically, *manage* was applied to household and state affairs, finances and provisions, while a contemporaneous meaning is more general, “to cause (persons, animals etc) to submit to one’s control” (Little et al., 1973, p. 1269). Contemporary corpus-based dictionaries<sup>4</sup> are not consistent in whether the business or general sense is given first: Cobuild lists the ‘business’ sense first, while in the Macmillan dictionary it is third, after “to succeed in doing something, especially something that needs a lot of effort or skill” and the general sense, “to deal successfully with a difficult problem or situation”. For the related noun, *management*, Macmillan gives the business sense first, “the control and operation of a business or organization”, followed by the more general meaning, “the process of controlling or managing something”, while Cobuild gives “the people responsible for running a business or organisation” as the first meaning. MIP states that “basic meanings tend to be:

- More concrete
- Related to bodily action
- More precise
- Historically older”

(Pragglejaz group, 2007, p. 3)

Neither the general nor business uses of *manage* are clearly related to bodily action, and it is difficult to establish which is historically older. The business use is more concrete and more precise, but there is not a strong case for treating it as the basic meaning of *manage*. The case seems stronger for *management*, because the contemporary dictionaries agree on placing the ‘business’ meaning before the general meaning. Perhaps the safest assertion is that while ‘business’ meanings of manage/management may or may not be the basic ones, they are prominent and other uses of these words are likely to carry associational meanings across.

An extended sense of *manage* and *management* is to talk about illnesses and pain, as in the following OEC citation:

Combat stress reaction is a normal reaction to a very abnormal situation and does not constitute a psychiatric illness although incorrectly managed it may become one.

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4. Dictionaries consulted in this study: *Collins Cobuild English Dictionary for Advanced Users*, 2001 (3rd ed.); *Macmillan English Dictionary* (online version, 2011); *Shorter Oxford Dictionary on Historical Principles*, 1973 (3rd ed.).

This use of *manage* implies a negative situation that ideally would be eradicated, but as this is not possible, it is dealt with and kept under control. Using MIP, this use is metaphorical, because the contextual meaning is slightly different from either the general meaning or the business meaning, but is related by comparison. OEC citations show that these senses of *manage* and *management* are used to talk about a number of topics. They also appear frequently in the policy documents.

There are 131 citations of *manage* (including its inflections) and *management*, discounting a few clearly unrelated uses such as *manage to*, meaning ‘succeed with difficulty’ in the documents corpus. As for the previous words studied, these forms are vastly more frequent in the first and third texts, where most of the persuasive use of language is found: there are 60 and 57 citations in the first and third documents respectively, compared to 5 and 9 in the second and fourth. The most frequent object of *manage/ management* is *sentence* or *sentences*, collocations that occur 43 times. The second most frequent object is *offender* or *offenders*, found 35 times, and the third most frequent is *risk*, occurring 20 times. Examples of each are as follows:

- (16) ... a 3 stage approach to sentencing and managing community sentences.
- (17) ... a clearer, more understandable system for managing offenders.
- (18) The open estate should review the risk assessment and risk management plan as soon as possible after transfer...

These grammatical objects can be compared to the entities that are typically managed in the OEC. Within the business context, these are most frequently realised by the words *company*, *business*, *resources*, *funds*, *system*, *affairs*, *companies*, *information*, *budget* and *government* (in descending order of frequency). In non-business contexts, with the second of the meanings described above, entities managed include *illness*, *emotions*, *pain*, *(problem)* *hair*, *symptoms*, *depression*, *children’s* [bad] *behaviour*, *children’s special needs*, *fatigue*, *stress*. It will be noted that the second group are typically negative; citations imply that the managing is difficult.

The data suggest that the use of *manage* has become established within the genre during the timespan covered by the texts in the documents corpus. This is shown by a chronological tendency for some groups of collocates with *manage/management* to move from verbal to nominal form. In the first document, *Scotland’s Choice*, the lemma **MANAGE** is expressed as a verb in all of the 18 citations where it occurred with *sentence(s)*. In contrast, in the third document, *Protecting Scotland’s Communities*, the lemma is more likely to be expressed as a noun: there are 8 citations of verbal *manage sentence(s)*, compared to 15 citations of *sentence management*. The action of managing is probably, in Halliday’s (1994) terms, congruently verbal, and expressing it through a noun is to develop

a grammatical metaphor. Billig (2008, p. 786) summarises the arguments of the Critical Discourse Analysis school that “by turning verbs into nouns, speakers/writers convey that the entities, denoted by nominalisation, have a real and necessary existence”. Managing offenders and sentences have thus become concepts whose existence is not in question.

It is not obvious whether *managing offenders* and *managing sentences* are instances of the business use or of the metaphorically related ‘problem’ use. What is clear, however, is the lack of a positive connotation in all uses of *manage* in the policy documents. This is in contrast to the semantic prosody of *deliver*. While effective management is seen in the documents to lead to positive things like less reoffending and harm to communities, this is achieved by containing problems arising from sentences, risks and offenders. If *deliver* is about the positive creation and supply of public goods, then *management* appears to be about limiting the threats to these goods. Here again, not only is the lexis of business borrowed by the policy documents, but its normative orientation is as well. Expectations about the ability of the government to reduce or eliminate crime are lowered through use of the management concept. The limited ability of states to have direct impact on such things as crime has been identified as a key feature of contemporary crime control strategies (Garland, 2001). This analysis shows how language encourages lowered expectations. Unlike a medical model of *CRIME AS DISEASE* – a conceptual frame dominant throughout the 20th century, in a management model crime cannot be cured, but only monitored and (to some extent) contained (Canton, 2010).

A further point arises from considering the relationships between the things that are the most typical objects of *management*: *sentences*, *offenders* and *risk*. Both the entity being controlled (the offender), and the mechanism established to effect that control (the sentence) are to be *managed* in order to limit risk, suggesting that the policy focus of our texts is as much on the organisation of services as on the actor for whom these services are intended.

A linguistic advantage of using nouns rather than verbs to express a concept is that it becomes easier to modify. In 5 of the citations of *sentence management* in *Protecting Scotland’s Communities*, the expression *end-to-end* is also part of the nominal group, forming *end-to-end sentence management*. There is also one occurrence of *end-to-end management*, in which a sentence is implied but not mentioned. *End-to-end* also modifies one of the verbal uses, producing *managing sentences end-to-end*. Other long nominal groups include *sentence management regime*, which occurs five times, and *offender management regime*, which occurs once. This suggests a tendency to growing linguistic fixedness, again evidence that these meanings have become conventionalised within the genre.

## 6. Conclusion

In this chapter, we have analysed the use of metaphors and metonyms in socio-logically significant texts, and have demonstrated how they frame their topic. We believe this shows the contribution that figurative language analysis can make to a sociological analysis of thinking around contemporary issues. Our first example was the metonymy of *court*, which serves to depersonalise the process of justice. We then considered the metaphorical use of *payback*, whose basic sense is less straightforward on closer analysis than at first appearance, and the different connotations of the uses of *deliver* and *manage* in the documents corpus that we examined.

In most of the examples discussed here, the detail of the language was very significant; for example, we have discussed the change in the usual grammatical patterning of *pay back*, the typical objects taken by *deliver*, and the developing nominalisation and fixedness of the lemma **MANAGE**. In other cases, meaning was important: we showed that a very frequent meaning of *payback* in a general corpus is ‘revenge’, and that the ‘reparation’ meaning promoted by the authors of the documents is not widely evidenced in general English. In terms of connotations, we suggested that *deliver* is mostly positively connotated (creation and supply of public goods), whereas *management* appears to be mostly negatively connotated (limiting threats to these goods). Although evident once demonstrated in the data, we would argue that such details of meaning are not reliably accessible without examining a number of naturally occurring citations. Metaphor analysis can make a useful contribution to the study of discourse in society, but needs to be supported with detailed linguistic data analysis.

Our analysis suggests that *payback* as a metaphor suggesting reparation does not frame these documents, and therefore seems unlikely to truly underlie the philosophy of their authors. The metaphors that have a stronger role in framing this discourse are those related to business and management. Where the automatic frequency analysis immediately revealed *payback* to be relatively significant in terms of how many times it was being used in the text, the business lexis was less explicit and became apparent only through open-ended readings of the documents. Unlike the one-shot metaphor quality of *payback*, the language of business is being realised throughout the text by a variety of word uses and forms, suggesting it is making a stronger connection to abstract thought than *payback* is.

Our findings suggest that what were the beginnings of a managerialist orientation in the late 1990s has become a well-established feature of criminal justice policy discourse a decade into the 21st century. This is unlikely to surprise many. What we believe we add to this debate is to show the importance of language, and the tools of figurative language analysis, to understanding the spread, meaning and resilience of a management culture. The analysis of business metaphors applied

to criminal justice activities allowed us to trace how these values and techniques are being put to new uses, uses which may well be unfamiliar to business people themselves. Our analysis also shows some contradictory tensions in the managerial discourse of policy. Where the *deliver* concept promises big things – justice, a successful country, results – the *management* concept works to discourage too much confidence in the state's powers. The conflation of what is being managed – sentences, offenders and risks – also draws our attention to the new accountability structures that managerialism brings: there are expectations not just for the behaviour of offenders, but for the efficacy of their overseers as well.

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# They have to die for the goals

## WAR metaphors in English and German football radio commentary

Elmar Thalhammer

Ludwig-Maximilians-Universität München, Germany

Many central items in football terminology are conspicuously metaphorical, for example *shoot*, *attack* or German *schießen*, *angreifen*. Yet, the role played by metaphor in football vocabulary has attracted little attention so far. This chapter presents a corpus-based investigation of metaphor in football jargon. Two corpora of radio commentaries in English and German (approx. 100,000 words each) were examined for linguistic and conceptual metaphor. The objective of this study was to show that, despite a relatively straightforward relation between English terms and their German equivalents, English and German exhibit striking differences with regard to FOOTBALL IS WAR, especially in terms of productivity. In order to verify this claim, a combination of quantitative and qualitative methods was employed to show how one source domain (WAR) can play different roles in the same specialist target domain (FOOTBALL) across languages.

### 1. Football – A popularised specialist discourse domain

Like all other sports, the game of football<sup>1</sup> has a terminology one needs to be familiar with to understand the game (and people talking about it). This specialist register, however, comprises more than just specialist vocabulary, which one can find in any rulebook. It also includes many other (often metaphorical) expressions which are frequently used by the community of discourse to describe the game and the people involved in it. Although many central specialist terms in football (like *shoot*, *attack* or *defend*) are so conventionalised that they are not perceived as metaphors anymore (either by a specialist or a lay audience), they

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1. By ‘football’ I mean ‘soccer’ (a shortening of the original compound *association football* with its first component referring to the English *Football Association*) and not the American variant of the game, American football.

still constitute metaphorical expressions. However, only little attention has been paid to them in linguistic research.

This observation is especially true for English when compared to Romance languages or German. Studies like Buchloh and Freese (1967) focus on metaphor as a stylistic device in match reports published in British newspapers with English being apparently prone to overly dramatic (and, according to the authors, inappropriate) war metaphors (for an analysis of metaphors in tennis, cf. Schiffer, 1992); a similar, if slightly diachronic, stance is taken in Siefert (2002). Here, (tabloid) newspapers and their use of metaphorical expressions with regard to English-German encounters (e.g. the semi-final of the Euro 1996 or a Champions League game between Arsenal London and Bayern Munich) are at the centre of interest, particularly those WAR metaphors which go beyond conventional (and unavoidable) terminology, such as *battles in the air* or *early strikes*.<sup>2</sup> What these studies have in common is a fervent bias against such expressions and a strong focus on what the authors judge to be ‘extraordinary’ metaphors – a tendency which is also observable in Knobbe (1997).

While interest in the registers of ‘sports’ in general and football in particular has been considerably more pronounced in the German literature (for a vast survey, cf. Schweickard, 1987, pp. 12–23), metaphors have not attracted much attention. For the most part, research has chronologically revolved around three main centres of interest: the ‘Germanness’ of the originally English football terminology (e.g. Bechler, 1914; Koch, 1903; Valk, 1935), the influence of football language on other domains (e.g. Bues, 1939; Haubrich, 1965; Settekorn, 2001) and the style and/or syntactic properties of football reporting (e.g. Brandt, 1983; Dankert, 1969; Fingerhut, 1991; Müller, 2007; Schaefer, 1989).

Studies on metaphor are a comparatively recent development and usually focus on the coverage of single games (e.g. Heidemann, 2007) or the use of particular source domains (e.g. Küster, 1998). The empirical basis for these studies are written sources, mostly newspaper reports. An exception is Vierkant (2008), who uses radio commentaries on three matches of the 2006 World Cup to investigate the distribution of metaphorical expressions across source domains (which he calls “knowledge categories”, Vierkant, 2008, p. 130). Consistent with other studies on metaphor in football language, he suggests that a central role is played by WAR/CONFLICT.<sup>3</sup> However, since Vierkant (2008) is not very specific on technical details

2. The following typographical conventions are applied in this chapter: potential conceptual metaphors and source/target domains appear in SMALL CAPITALS; vehicle terms which are identified in discourse are underlined; meanings are marked by single inverted commas and are taken from either *Macmillan* or *Duden*.

3. Romance languages were the subject of investigation in Gabriel (1998), Michels (2002), Gil (1998) and Döring and Osthus (2001, 2002).

(like corpus size or source of data) and bases his observations on a comparatively small corpus, his suggestions with regard to WAR other influential source domains (like PHYSICAL CONTACT and PHYSICAL WORK) have to be taken with caution.

The aims of the present study are to compare how the source domain WAR is used to talk about football in English and German and to demonstrate the variability of metaphor in this particular register. It should also serve as an example to show how both quantitative and qualitative methods can be combined to yield interesting results in cross-linguistic studies regarding metaphor in specialist registers. To this end, said methods (presented in Section 2) are applied to two purpose-made corpora of approximately 100,000 words each, consisting of transliterated live radio commentaries; their design is illustrated in Section 3. Finally, the results of both the quantitative (Section 4.1) and the qualitative (Section 4.2) analyses will be discussed and compared cross-linguistically (Section 5).

The theoretical framework I used for this analysis is based on Lakoff and Johnson's (1980) Conceptual Metaphor Theory, particularly with regard to its basic definition of metaphor as a *mapping* between *source* (metaphorical language used to describe the target) and *target domain* (pertaining to what is talked about); in this sense, *mappings* are conceived of as connections which are based on the similarity between the literal and the contextual meaning of a word. This, however, does not automatically imply that the study strictly follows all its assumptions concerning metaphorical thought and representation (as they are criticised in Murphy, 1996 and Murphy, 1997); this restriction also applies to the above terms *source domain*, *target domain* and *mapping*, which are used for convenience's sake. While the impact of Lakoff and Johnson's theory certainly cannot be undervalued, it has also attracted some fair criticism (e.g., Ritchie, 2003, 2004; Vervaeke & Kennedy, 1996). Steen (2007, pp. 8–25) provides a comprehensive overview of the various (problematic) areas of metaphor analysis and emphasises the necessity to be clear in which terms one aims to investigate metaphor, since “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” (Steen, 2007, p. 10).

The present study takes such criticism seriously and consequently dedicates itself to a thorough linguistic analysis. The results are interpreted as mere indicators which may point to possible differences concerning mental conceptualisations. In keeping with Steen's (2007, p. 24) classification of areas of research in metaphor, this study clearly approaches metaphor as language (as opposed to thought), symbolic structure (as opposed to behaviour), and examines it in usage (as opposed to grammar), as “they are situated in concrete linguistic and situational contexts which highlight more variable features of their presumed function and effect” (Steen, 2007, p. 267).

Another controversial issue is how to group sets of metaphorical expressions. Vervaeke and Kennedy (1996) and Ritchie (2003, 2004) both argue that metaphorical expressions which were attributed to ARGUMENT IS WAR by Lakoff and Johnson (1980) might equally well be linked to other domains such as CHESS and BOXING (Ritchie, 2003, p. 132) or some general form of conflict (Ritchie, 2003, p. 135). It is precisely this indeterminacy which relativises the seemingly clear-cut structure of a domain like WAR to potentially include expressions which might equally well be associated with interpersonal physical conflicts like brawls or fist-cuffs; this problem also concerns central specialist terms in football, like *attack* or *defend*. As a consequence, the domain WAR should rather be perceived as the onomasiological starting point, i.e. one begins with “extralinguistic objects, referents, denotata or concepts and asks for the names, or words, for encoding such denotata in natural languages” (Lipka, 2002, p. x). In the present study, this is operationalised through thesauri which are used to start with an array of linguistic expressions that are conventionally used to describe a particular domain (WAR) (cf. Section 2.3); this, however, also encompasses expressions which could as well pertain to the more general level of (physical) conflict, such as brawls or tussles.

## 2. Methodology

### 2.1 Metaphor identification

In order to provide a possibly objective and systematic way of identifying metaphorical expressions, the Pragglejaz group (2007) have developed their dictionary-based Metaphor Identification Procedure (MIP) as a tool for identifying metaphorical linguistic expressions in context. This procedure was further applied to various registers and another language (Dutch) by Steen et al. (2010), resulting in an extended version of the original procedure called MIPVU. What is more, reliability tests were successful (Steen et al., 2010, pp. 149–165) so MIPVU “offers a tool for metaphor identification that is explicit and systematic enough to elicit high levels of agreement between individual analysts” (Steen et al., 2010, p. 165), which is why I chose to apply this method to my own research.

Another reason was the fact that intense work with a specialist register can lead the analyst to become ‘professionally blinkered’ in their assessment of the metaphoricity of linguistic expressions in that some metaphors might not be perceived as such by the specialist analyst (and thus missed) while the ‘general language user’ (whose perspective MIPVU and this study both take) might do so. MIPVU was also applied to Dutch (Steen et al., 2010, pp. 127–148) showing that the procedure is not English-specific and can be adapted to other languages. This however, does involve a number of choices, such as which dictionary to employ.

Since the German dictionary used should be comparable to the *Macmillan English Dictionary for Advanced Learners* (Rundell, 2007) as far as scope (representation of current standard of the language), size and the fact that they should be usage-based are concerned, only two major dictionaries of German seemed to be matching, namely *Duden – Deutsches Universalwörterbuch* (Kunkel-Razum, Scholze-Stabenrecht, & Wermke, 2007) and *Wahrig – Deutsches Wörterbuch* (Wahrig-Buhrfeind, 2006). Due to the generally larger number of different and more detailed meanings per entry, *Duden* was established as the first dictionary of choice, while *Wahrig* served as a second opinion for doubtful examples – in the same fashion that *Macmillan* was complemented by the *Longman Dictionary of Contemporary English* (Mayor, 2009) in MIPVU (Steen et al., 2010, p. 16).

With respect to German, the fact that MIPVU had been applied to Dutch proved to be of great help, since the two languages are closely related and exhibit similar morphosyntactic peculiarities, which have to be dealt with when one decides whether one or more items constitute a lexical unit or not. Like Dutch, German displays a wide array of so called ‘particle verbs’ (Eisenberg et al., 2005, pp. 705–714), like G. *aufgeben* (‘to give up’), which consist of the particle (*auf*) and the verb (*geben*); these can be separated in certain syntactic positions: *Maradona gibt auf*.<sup>4</sup> (‘Maradona gives up.’). Since the corpora I work with do not contain part-of-speech information (POS tags), they do not provide additional information to distinguish between a preposition (which *auf* could also be) and a particle. Therefore the dictionary needs to serve as the primary source to decide whether such cases as the above are treated as two lexical units or one. As *aufgeben* has a separate entry in *Duden* (and *Wahrig* as well), it is treated as one lexical unit, since it “relate[s] to one concept and designate[s] one referent” (Steen et al., 2010, p. 133), which also has consequences for the quantitative analysis.

As far as the application of the procedure to the aims of this study is concerned, it is mainly Steps 1–3 which are of particular interest. A detailed account of the full procedure can be found in Steen et al. (2010, pp. 25–42).

1. Find metaphor-related words (MRWs) by examining the text on a word-by-word basis.
  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).
  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). (Steen et al., 2010, pp. 25–26)
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4. Steen et al. refer to them as separable complex verb (Steen et al., 2010, p. 132). The adaptations they made for Dutch are also largely applicable to German.

Since the concordance software used in this study (see below) examines the corpus on a word-by-word basis (and presents the results in form of a ‘word-by-word’ list), this first prerequisite of MIPVU is in principle met; what is more, each token for every keyword was examined for metaphoricity within the respective context. I would like to illustrate the core of this procedure through the examination of a common specialist term, namely *shoot*. In virtually any footballing context (like live radio commentaries), the contextual meaning of this word could be paraphrased as ‘in sport, to throw or kick a ball in an attempt to score points’, which is clearly distinct from its basic meaning ‘to fire a gun’. Steen et al. (2010, p. 35) define basic meanings as “concrete, specific, and human-oriented”. In line with Step 2 of the above procedure, this use of the word *shoot* can be explained by some form of cross-domain mapping due to the similarities between firing a projectile onto a target and kicking a ball very hard towards the goal. Therefore, this use of *shoot* is deemed metaphorical.

## 2.2 Quantitative analysis

The core of the quantitative part of this study is formed by so called keyword analyses with the program AntConc 3.2.1 (Anthony, 2007), which automatically compares a corpus to a reference corpus and calculates which words are comparatively frequent in the corpus (also taking the respective size of the corpora into account) and thus overrepresented, i.e. words which are typical for the corpus under scrutiny. It is thus the aim of the quantitative part of the present study to show how English and German differ with regard to marked WAR-related metaphorical expressions. To this end, corpora of football language were compared to a less specific reference corpus. For English, an untagged version of the spoken part of the British component of the International Corpus of English (ICE-GB; ~ 634,000 words) was used; its German counterpart formed an untagged corpus called *Gespräche im Fernsehen* (‘talks on TV’; ~ 607,000 words; it includes various formats such as chat shows, phone-in shows and (political) debates).<sup>5</sup> It must, however, be borne in mind that, due to their difference in nature, the two reference corpora are comparable only to a limited degree, which is why cross-linguistic comparisons on a purely quantitative basis need to be tentative. Table 1 provides an example of a keyword list for the English corpus, including the five most prominent items.

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5. I am immensely grateful to the *Institut für Deutsche Sprache* in Mannheim, who provided me with this corpus free of charge.

**Table 1.** Sample keyword analysis

Rank	Football corpus frequency / %	Reference corpus frequency / %	LL	Token
1	718 / 0.690%	202 / 0.0318%	1,903.064	ball
2	518 / 0.505%	52 / 0.0082%	1,681.032	nil
3	418 / 0.407%	12 / 0.0019%	1,514.933	Liverpool
4	411 / 0.401%	54 / 0.0085%	1,280.407	goal
5	330 / 0.322%	45 / 0.0071%	1,018.336	game

The Loglikelihood (*LL*) value in the fourth column is indicative of how marked a word is for a particular corpus. That this is based on relative and not absolute frequencies can be gleaned from the comparison between *Liverpool* and *goal*. While the difference in terms of absolute word frequencies and percentages in the football corpus is relatively small (7 / 0.006%), there is a significant discrepancy in the reference corpus (12 vs. 54 occurrences respectively) resulting in a large difference (~ 235) between the respective *LL* values; this indicates that *Liverpool* is in comparison more marked for the football corpus than *goal* is, despite almost identical absolute frequencies.<sup>6</sup> To put these figures into perspective: an *LL* of 3.84 is significant at  $p < 0.05$ , an *LL* of 6.63 at  $p < 0.01$ .

As the corpora used in this study are untagged, all word-forms for each lexeme had to be considered so that (for example) for the verb *attack* the *LL*-values of the word-forms *attack*, *attacks*, *attacked* and *attacking* had to be taken into account.<sup>7</sup> For German, this matter was considerably complicated by the fact that – due to its morphosyntactic structure – it makes extensive use of particle verbs, such as *erobern* and *zurückerobern* ('conquer' and 're-conquer'). What is more, German compounds are usually spelled as one word so that a metaphorically used noun like *Angriff* manifests itself in many compounds (often as hapax legomena) such as *Angriffsbumühungen* ('attacking efforts') and *Angriffschance* ('attacking opportunity'); as they are not lexicalised, their components must be analysed individually with respect to their metaphoricality. Since they may be interpreted as indicative of the same mapping and for convenience's sake, these are merged into and represented by one lexical unit, e.g. *Angriff*, in the results presented below; to test for metaphoricality, MIPVU was applied for each token.

6. This is obviously due to the relatively high number of Liverpool games involved (cf. Table 2).

7. I am aware of the fact that this also comprises forms of the corresponding noun; since this study, however, aims at comparing the importance and productivity of the same source domain in two languages, this lack of differentiation with regard to word class does not affect the overall results.

What is more, the role keyword lists play in this study should be made explicit. They were not used to extract metaphors per se but as a tool to assess the relative importance of the respective metaphorical expressions in a particular area of discourse (football commentaries, in this case). The following section will illustrate which (metaphorical) expressions were picked for analysis and how they were selected.

### 2.3 Qualitative analysis

The central aim of the qualitative analysis is to describe the productivity (i.e. the number of different metaphorical expressions) of the same source domain by looking at the amount of diverse WAR-related metaphorical expressions found in the two corpora. Therefore, the presence and absence of translation equivalents based on the same potential cross-domain mapping is of prime importance, since they exhibit similarities and, more interestingly, differences between English and German. The procedure applied for the qualitative analysis consisted of four steps: compiling a list of WAR-related linguistic expressions, looking in the corpora for occurrences, determining whether an expression is used metaphorically, comparing parallel occurrences and establishing translation equivalents based on the same cross-domain mapping.

In order to cover the source domain under scrutiny as thoroughly as possible, I consulted two thesauri, namely *Roget's Thesaurus* (Davidson, 2004) for English and *Dornseiff – Der deutsche Wortschatz nach Sachgruppen* (Dornseiff, Quasthoff, & Wiegand, 2004) for German, and extracted a list of WAR-related expressions for each language. With respect to the criticism by Vervaeke and Kennedy (1996) and Ritchie (2003, 2004), this step could also be conceived of as a way to be as precise as possible about one's source domain, since expressions which are listed under WAR in a thesaurus (such as *attack*, *defend* and *shoot*) are likely to be conventionally associated with the respective domain. Using AntConc I then looked for occurrences in each corpus, which resulted in two lists of types. MIPVU was applied to each token to make sure that the expression was used metaphorically in the context of football commentaries. Subsequently, I compiled a list of WAR-related metaphorically used linguistic expressions for each language and paired translation equivalents to show where English and German might make use of similar cross-domain mappings, on the one hand, and to illustrate differences in the two languages, on the other hand. The qualitative analysis, which also kept track of low-frequency, statistically non-significant expressions, focuses on metaphorical expressions which are exclusive to either language, since they are indicative of differences with regard to the productivity of the source domain WAR in English and German.

### 3. Corpus design

#### 3.1 Why radio commentaries?

When compared to written sources of sports commentary like newspaper reports (match reports, commentaries, etc.), spoken commentaries are much more spontaneous:

Speaking, though, is not like this [writing; ET]; it is spontaneous, unplanned, responding to events as they happen. The commentators on both radio and television are having to think while they talk, and probably listen to instructions from their headphones too.

(Beard, 1998, p. 79)

Thus, the reporter does not have much time to think about the form of their linguistic output – a factor which has also been acknowledged in Mackenzie (2005) and Müller and Mayr (2007); as a consequence, one can assume the degree of spontaneity for this type of discourse to be very high. Kuiper (1996, p. 24) observes “that in the unscripted commentaries of slow sports like cricket (and I would predict baseball), [...] formulae are likely to be less in evidence than they are in the commentaries of fast sports such as horse racing and ice hockey.” With the exception of some formulaic sequences (cf. also Müller, 2008, pp. 67–69), one can assume that live radio football commentaries are comparatively unplanned, because they are not bound to a rigorous succession of formulaic sequences that leaves little room for variation (such as race calling).

Secondly, it is obvious that the amount of time pressure and the role commentary plays is significantly different between different types of media. While the TV commentator’s role mainly consists of providing background information and an assessment of the players, managers, etc. (Auffenberg, 2003, p. 130), radio reporters are occupied by what Kuiper (1996, pp. 10–15) calls play-by-play commentary, i.e. describing the most important events on the pitch, because they do not have the possibility to rely on transmitted pictures to convey the most important pieces of information. Thus, radio commentators run a higher risk of ‘falling behind’ the actions which need to be narrated to the audience.<sup>8</sup>

Thirdly, TV and radio commentators have different functions. While TV commentators also need to entertain the audience (particularly if the match does not provide a large amount of excitement), their radio counterparts’ task is a continuous description of events with some elements of entertainment, which I would

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8. How TV commentators (subconsciously) influence the audience’s assessment of teams or individual players has been demonstrated by Danneboom (1988); for a more critical view on the commentators’ role, cf. Brandt (1979, p. 171).

argue triggers words which come most naturally to them, e.g. the most central specialist terms (like *attack* or *shoot* rather than ‘extravagant’ paraphrases like *put under siege* or *bombard*), of which they can assume that virtually all listeners are familiar with (this assumption, however, still needs empirical proof). These three factors show the most important characteristics of radio commentaries which led me to choose this particular register, as it is bound to feature the central specialist terms and expressions (and metaphors) and provide stable contextual (situational) factors.

### 3.2 Compilation of the corpus

The empirical basis for this study are an English and a German corpus of about 100,000 words each, collectively referred to as the Munich Corpus of Football Commentaries (MCFC); they consist of transliterated radio commentaries, i.e. they do not contain prosodic information or POS tagging.<sup>9</sup> Although these two types of information are beneficial for studies focusing on syntactic properties of football commentary (e.g. Müller, 2007), it is not crucial for the present study. The raw material for the corpora was recorded off the internet using the program Audacity 1.3 (cf. Anthony, 2007). Table 2 provides an overview of the matches used for the English corpus (MCFC-E):

**Table 2.** Matches used for MCFC-E

Match	Date	Station	Commentators
Everton vs Liverpool (FA Cup)	04/02/2009	BBC 5 Live	John Murray Pat Nevin
Portsmouth vs Liverpool (Premier League)	07/02/2009	BBC 5 Live	David Oates Kit Symonds Nigel Adderley
Roma vs Arsenal London (Champions League)	11/03/2009	BBC 5 Live	Alistair Bruce Ball Mark Bright
Aston Villa vs Tottenham (Premier League)	15/03/2009	BBC 5 Live	Darren Fletcher Robbie Savage
Chelsea vs Manchester City (Premier League)	15/03/2009	BBC 5 Live	Ian Brown Alan Pardew Ian Dennis
Wolverhampton vs Derby County (Championship)	09/12/2008	BBC 5 Live	Dave Woods Darrius Vassell

9. The present study is part of a dissertation project which investigates the different source domains employed in the two languages with respect to football on a larger scale.

**Table 2.** (*continued*)

Match	Date	Station	Commentators
Tranmere vs Huddersfield (League One)	14/03/2009	BBC Leeds	Paul Ogden Kieran Orieagan
Hull City vs Newcastle (Premier League)	14/03/2009	BBC 5 Live	John Murray Danny Mills
Barnsley vs Birmingham (Championship)	09/04/2007	BBC Sheffield	Paul Walker Derek Parker
Roma vs Manchester Utd. (Champions League)	04/04/2007	BBC 5 Live	Simon Brotherton Graham Taylor Alan Green
PSV Eindhoven vs Liverpool (Champions League)	03/04/2007	BBC 5 Live	Mike Ingham Jan Molby Alan Green

The point of this selection is not so much its variety with respect to the teams or competitions included, but rather with regard to the different commentators. Apart from John Murray and Alan Green, each of the commentators is only featured once in order to sample a possibly large number of different speakers. To this end, only one half of each match was transcribed, amounting to a total duration of 08h 51min.

The same principles were applied during the compilation of the German corpus (MCFC-G), for which 10h 01min were used to arrive at the target of 100,000 words:

**Table 3.** Matches used for MCFC-G

Match	Date	Station	Commentators
Wehen vs Mainz (2. Bundesliga)	16/03/2009	90elf.de	Fabian v. Wachsmann
Germany vs England (International friendly)	19/11/2008	WDR 2	Jens-Jörg Rieck Alexander Bleick
M'gladbach vs Hamburg (1. Bundesliga)	07/03/2009	90elf.de	Marko Röhling
Hoffenheim vs Wolfsburg (1. Bundesliga)	15/11/2008	90elf.de	Mario Bast
Leverkusen vs Hoffenheim (1. Bundesliga)	30/08/2008	90elf.de	Jochen Stutzky
Olympiakos vs Hertha BSC (UEFA-Cup)	18/12/2008	rbb	Nikolaus Hillmann Guido Ringel
Real Madrid vs B. München (Champions League)	29/02/2000	B5 aktuell	Günter Koch Hans-Peter Pull
Schalke vs Bayern München (1. Bundesliga)	09/11/2008	90elf.de	Tom Hilgers

**Table 3.** (*continued*)

Match	Date	Station	Commentators
Schalke vs Köln (1. Bundesliga)	06/03/2009	90elf.de	Rolf Lange
Sport. Lissabon vs B. München (Champions League)	25/02/2009	B5 aktuell	Hans-Peter Pull André Siems
Stuttgart vs Bielefeld (1. Bundesliga)	15/11/2008	90elf.de	Ralf Bosse
Bremen vs Stuttgart (1. Bundesliga)	15/03/2009	90elf.de	Thomas Reckermann
Bremen vs Panathinaikos (Champions League)	04/11/2008	Radio Bremen	Henry Vogt Heiko Neugebauer

Upon comparing Tables 2 and 3, it should emerge immediately that the commentary setup slightly diverges on English and German radio, with the main difference being the addition of an expert summariser on English radio (in *italics* in Table 2).<sup>10</sup>

Therefore, one could get the impression that a comparison of the two corpora might be problematic, since they differ considerably with regard to the number of different speakers sampled ( $N=24$  for English vs.  $N=17$  for German), which might shed doubt upon the representativeness of the two corpora – a commonly known problem in corpus linguistics (cf. Deignan, 2005, pp. 92–94). Also, because of the comparatively larger contribution of each speaker to the overall size one could argue that the German corpus is less balanced than its English counterpart, also in terms of idiosyncratic language use. To examine this point I have conducted keyword analyses (cf. Section 2.2) which examined each subcorpus (the linguistic output of each speaker) against the entire corpus to test for possible idiosyncrasies. The results obtained suggest that the vocabulary used in live radio commentaries is fairly uniform across different speakers.

Based on the previously described features of the corpora, it is possible to categorise them in terms of Deignan's (2005, pp. 76–77) classification: it almost goes without saying that the MCFC-E and -G are specialist corpora as opposed to non-specialist, 'general' ones (such as the BNC or ICE-GB, cf. also Stubbs, 2001). The second distinction is made between corpora which are based on text samples and whole texts. On the one hand, one could argue that, due to the selection of only one half of the match, the components of the corpora constitute samples; on the other hand, the size of the components was neither predetermined nor

10. These are usually former or current footballers/managers, whose main function is the providing of 'inside knowledge' and an assessment of the current progress of the game rather than the mere description of the respective events.

artificially shortened (the full first or second half was transcribed) so that one of the sampling effects described by Biber (1993), namely the loss of rarer linguistic forms, is avoided (a point also acknowledged by Deignan, 2005, p. 77); this is particularly important with respect to the qualitative analysis.

## 4. Results

### 4.1 Quantitative analysis

As I pointed out in 2.2, the aim of this quantitative analysis is to compare how marked WAR-related metaphorical expressions are in English and German for the register of football language in general and to observe differences in terms of how typical certain words are within one language and across languages.

Table 4 shows all metaphorically used words which generated positive *LL* values and the corresponding frequencies; this also includes expressions which were statistically not significant.

**Table 4.** LL-Values and frequencies for WAR-related metaphorical expressions in MCFC-E and MCFC-G

MCFC-E	LL	Freq.	MCFC-G	LL	Freq.
shoot	195.688	99	Angriff ‘attack’	472.845	130
attack	148.773	103	Zweikampf ‘du-el’	308.158	80
defend	135.917	47	Schuss ‘shot’	304.830	97
ricochet	34.896	9	Verteidigung ‘defence’	133.726	40
strike	30.510	22	Kampf ‘fight’	55.142	19
battle	25.244	17	Marsch ‘march’	38.520	11
fire (a gun)	13.245	12	Eroberung ‘con-quest’	30.816	8
scrap	8.493	4	Querschläger ‘ricochet’	15.408	4
squad	5.662	5	Truppe ‘troop’	11.556	3
territory	2.756	7	Hinterhalt ‘am-bush’	11.556	3
commanding	1.360	2	Gegenstoß ‘coun-ter’	7.704	2
kill	0.957	4	abfeuern ‘launch’	7.704	2
survive	0.138	3	Luftkampf ‘air combat’	7.704	2
guns	0.120	2	Schlacht ‘battle’	3.852	1
destroy	0.024	1	Kommando ‘commando’	3.852	1
			bombensicher ‘bomb-proof’	3.852	1
			Rakete ‘rock-et/missile’	3.852	1
			Kanonenfutter ‘cannon fodder’	3.852	1
			umzingeln ‘sur-round’	3.852	1

One first, if obvious, observation one can make with respect to Table 4 is the fact that the German corpus produces a wider range of different metaphorical expressions than the English one does; what is more, all of them are statistically significant at  $p < 0.05$ , while the bottom six expressions in English are not, thus seemingly reducing the variability even more. Additionally, upon comparing the raw frequencies for those types which obtained significant *LL* values one can observe a slight preference in the German corpus for **WAR**-related metaphorical expressions.

A closer look at two of the most prototypical metaphorical specialist terms reveals an interesting pattern. While the English lexemes *attack* and *defend* display very similar *LL* values, this is not the case for their German counterparts *Angriff* and *Verteidigung*. In fact, the value of the former is more than three times the value of the latter. This sheds an interesting light on the preferred perspective taken in German, since the data suggest that the attacking, ‘active’ team is focused much more often than the defending, ‘passive’ one, a tendency which is also confirmed by the raw frequencies. One could explain this discrepancy by arguing that this is probably due to a corresponding imbalance in extra-linguistic events, i.e. that simply more attacks are executed in the matches on which the German corpus is based. However, due to the converse semantic relation between *Angriff* and *Verteidigung* it would be equally possible to take the opposite stance and focus on the defending team and its attempts to avoid conceding a goal. What the statistics imply is that the German commentators seem to prefer one particular perspective (attacking) on the very same situation, while there seems to be an almost perfect balance in English between the two.

Apparently, the notion of *Zweikampf* (‘duel’ = trying to obtain the ball from an opposing player) is a very central one in German, which is emphasised by the fact that there is no direct translation equivalent based on the same cross-domain mapping. A possible explanation for the centrality of *Zweikampf* could be that it implicitly involves an attacking element, namely one player trying to take the ball away from an opposing player; without this attacking move, a *Zweikampf* could not exist. Thus, engaging in such a situation is a form of defending, which is, however, rendered as an attack. And indeed, this impression is confirmed by the corpus, which should be illustrated by a few examples:

- (1) Eduardo (a) spielt auf die rechte Seite. Eins-gegen-eins-Situation, Djakpa (b) greift da an.  
‘Eduardo plays it to the right, one-on-one situation, Djakpa attacks’
- (2) Jetzt ist er (a) über die rechte Seite unterwegs. Levels (b) greift da nicht richtig an, immer noch Olic (a)  
‘Now he’s on the right-hand side. Levels does not attack properly, still Olic.’
- (3) von Diego (a) mit der Hacke vorgelegt, kein Stuttgarter (b) greift an.  
‘set up by Diego with a back-heel, no Stuttgart player attacks’

In all of these examples, player (a) belongs to the ‘attacking’ team, i.e. the team which is in control of the ball and tries to score a goal, whereas player (b) is part of the team trying to prevent this; however, (a)’s form of defence is an attack on (b). Thus, this metaphorical expression does not only pertain to attempts to score goals, but also to a means to stop the opposition from scoring. This use of *attack* could not be found in the English corpus, indicating that the scope of this metaphorical expression is wider in German than it is in English, which also ties in nicely with the already mentioned general discrepancy between *Angriff* and *Verteidigung* in the statistics in Table 4, as certain defensive moves are verbalised as attacks. In other words, taken together these converse pairs are more or less equally important and equally frequent in the two languages, but their distribution varies, as the ratio of *Angriff*:*Verteidigung* is at roughly 3:1 while *attack*:*defend* is at only 2:1 (in terms of raw frequencies), thus making the scope of *Angriff* wider than the one of its English equivalent.

If one were to structure this array of metaphorical expressions in terms of prototype categories, the figures in Table 4 suggest a rather clearly demarcated centre and an evenly distributed periphery for each language. With the notable exception of G. *Zweikampf*, the most central items are identical for English and German, namely *shoot*, *attack*, *defend* and *Schuss*, *Angriff*, *Verteidigung*. This uniformity is further confirmed by the cumulated relative frequencies of the top 3 (respectively 4) terms in each language, namely 73.89% for English and 85.26% for German; thus, these metaphorical terms are responsible for the overwhelming majority of the symptomatic WAR-related metaphorical expressions in football language.

However, as the qualitative analysis will show, this is only one side of the coin, since this type of quantitative analysis focuses only on such expressions which deviate significantly from the reference corpus. In order to allow for a more detail-oriented comparison of English and German, it needs to be complemented by a qualitative analysis, which looks at individual examples and can show different degrees of productivity of the same source domain in terms of different metaphorical expressions.

## 4.2 Qualitative analysis

### 4.2.1 Similarities between English and German

First of all, it should not come as a surprise that English and German share quite a substantial amount of metaphorical football language, since many German specialist terms directly descended from English, having been translated into German by the grammar school teacher Konrad Koch (cf. Koch, 1903) when the game was first introduced in Germany. Table 5 provides an overview of the WAR-related metaphorical expressions found in the MCFC-E and the MCFC-G; it first lists

translation equivalents for English and German (in alphabetical order for English) and continues to provide an overview of expressions for which there is no translation equivalent in the corpus of the other language (in alphabetical order for both English and German).

**Table 5.** WAR-related metaphorical expressions in MCFC-E and MCFC-G

MCFC-E	MCFC-G
attack (N, V)	Angriff, angreifen ('attack')
battle (N, V)	Schlacht ('battle')
beaten in the air	Luftkampf ('air battle')
bomb (forward)	bombensicher ('bomb-proof')
command	Kommando ('command')
counter attack	Gegenangriff, Gegenstoß ('counter attack')
defend	Verteidigung, verteidigen ('defence, defend')
defensive	defensiv ('defensive')
fight (N, V)	Kampf, kämpfen ('fight')
fire (V)	abfeuern ('fire')
guns	Offensivkanone ('attacking can-nons')
march	marschieren ('march')
ricochet	Querschläger ('ricochet')
shoot, shot	schießen, Schuss ('shoot, shot')
squad	Truppe ('squad')
campaign	
destroy	
die	
fly the flag	
killer blow/pass	
orders	
scrap	
strike (N, V)	
survive	
territory	
war	
	erobern ('conquer')
	Hinterhalt ('ambush')
	Kanonenfutter ('cannon fodder')
	Rakete (?) ('rocket/missile')
	umzingeln ('surround')
	Zweikampf ('duel')

At first glance, this simple list demonstrates two things: first, the overlap between the two languages covers the most central parts of footballing terminology, to which any talk about the sport automatically has to resort (e.g. *attack*, *defend* and *shoot*). Second and more importantly, however, both corpora exhibit items which are exclusive to either of them, which might point to the fact that the respective mappings differ within the same potential conceptual metaphor FOOTBALL IS WAR.

I would like to begin my analysis with those expressions that have a more or less direct translation equivalent, in order to establish the common ground between the two languages. On a very general level, the game of football is rendered in terms of a physical conflict between opposing parties – a situation which can be divided into (groups of) individuals involved and the actions they take. In a literal war, this would include armies composed of many thousand soldiers. However, it is not the potential metaphorical expressions E. *army* and G. *Armee* that are used in this context to refer to the teams but the terms E. *squad* and G. *Truppe*, which might be due to the relatively small size of the latter compared to the former.<sup>11</sup>

The most central elements of the game of football (trying to score by moving the ball legally into the goal at the opposing end of the field and preventing this from happening) is universally referred to by the verbs E. *attack*, G. *angreifen* and E. *defend*, G. *verteidigen* respectively and derivations thereof. While the expressions in the previous paragraph are certainly not unconventional (their metaphorical meaning can be found in any dictionary), *attack/angreifen* and *defend/verteidigen* are so essential that it is virtually impossible not to use them. Equally central is the main means of scoring, namely kicking the ball very hard towards the goal, i.e. E. *shoot* and G. *schießen* – which is based on the similarity between the dropping of the gun's hammer to discharge the projectile and the swinging of the leg to kick the ball very hard. This is elaborated further by the expressions E. *fire*, G. *abfeuern* and E. *ricochet*, G. *Querschläger*, which again link the hard kicking of the ball with the firing of a gun and a deflected projectile respectively. This can even go as far as personalising the players themselves as strategically used guns used by the manager (who is thus implicitly characterised as an army general), as Examples (4) and (5) refer to players, who have been brought onto the field in order to score goals:<sup>12</sup>

11. This tendency might also be confirmed by the fact that it is common for hooligan firms (for whom football might indeed have a more literal connection to war) to refer to themselves as an *army* (such as *Red Army* or *Yid Army* for Manchester United and Tottenham Hotspur respectively), which would conceive of the football team as a (specialised) branch of the entire army.

12. Incidentally, the nickname of one of the most successful German managers, Ottmar Hitzfeld, was 'the general', which was supposed to reflect his almost military focus on discipline and adherence to his strategy.

- (4) So the big guns on now, firstly Kuyt, then Alonso, then Torres, and obviously that's notice of Benitez' intentions [...]
- (5) Ja, und so richtige Offensivkanonen, wo man mit der Einwechslung auch das Gefühl hat, ja, die werden uns jetzt so richtig weiterbringen [...]  
 ‘Yes, real attacking cannons, where you get the feeling, upon them being subbed in, that they will help you [...]’

The correspondences between English and German have so far been easy to grasp, since the translation equivalents were relatively straightforward. For beaten in the air – *Luftkampf* ('air battle') and *bomb (forward)* – *bombensicher* ('bomb-proof'), however, the matter is not as clear-cut, since there are no direct translation equivalents; nonetheless, they can be said to reflect the same cross-domain mapping. While the former of the two pairs evokes the image of fighter planes (corresponding to two players jumping and trying to reach the ball with their heads), the latter connects dangerous attempts to score a goal to bombs.

Although not all of the commonalities between the two languages could be examined within the limited framework of this chapter, it has become evident that English and German share a large metaphorical common ground with respect to their football terminology. Since we are dealing with two more or less concrete event concepts as source (WAR) and target (FOOTBALL), Ungerer and Schmid predict the mapping to be lean with just “one or a few correspondences” (Ungerer & Schmid, 2006, p. 127). Although they do not elaborate on how many correspondences constitute “a few”, I would argue that Table 5 above suggests that this is not the case here. On the contrary, WAR provides a very influential and productive source for the game of football. This will be further illustrated by the analysis of those items that are exclusive to either of the two languages and thus reveal that there are different degrees of productivity with respect to English and German.

#### 4.2.2 Metaphorical expressions exclusive to German

I would like to take a look at those German tokens for which there is no equivalent in the English corpus, i.e. *Rakete*, *erobern*, *Kanonenfutter*, *Hinterhalt*, *umzingeln* ('rocket/missile', 'bomb-proof', 'conquer', 'cannon fodder', 'ambush', 'besiege').

- (6) Zwanzig Meter, eine Rakete. Ja, Sekt oder Selters, Kevin Kuranyi. Und dann geht der Ball oben in die dritte Etage.  
 ‘Twenty meters, a rocket. Well, champagne or table water, Kevin Kuranyi. And then the ball ends up on the third tier.’<sup>13</sup>

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13. The translations provided here do not necessarily aim at idiomaticity, but should provide an almost literal gloss of the German examples, particularly with respect to the relevant metaphorical expression.

This example demonstrates nicely how important it is to incorporate the context, because it is not attributes like ‘destructiveness’ or ‘firepower’ which are important here. As one can tell from the example, a player (Kevin Kuranyi) attempts to score a goal from 20 meters, but he mis-hits the ball and its trajectory is almost vertical. Although this trajectory also applies to many military rockets (like ground-based missiles), it is the absence of WAR-related attributes such as ‘destructive power’ (i.e. a very powerful shot which is likely to find the back of the net) which makes this metaphorical expression less ‘militaristic’ (hence the question mark behind this item in Table 5). Therefore, this particular use of *Rakete* is likely to be related to a more civilian source domain; one could for example argue that the trajectory resembles that of a skyrocket on New Year’s Eve, which is also supported by the fact that these devices are (normally) completely harmless and do not pose any threat. What is more, skyrockets are usually fired close to buildings, which is why their remains often land on the upper tiers (*Etage*) of houses.

Considerably more clear-cut is the following example, whose relation to the source domain WAR is doubtless:

- (7) Famagusta erweist sich eben nicht als das Kanonenfutter, was alle gedacht hatten im Vorfeld dieser Saison, hält ein zwei zu zwei gegen Inter Mailand [...]  
‘Famagusta proves not to be the cannon fodder which everybody thought they would be before the season, they are holding Inter Milan to a 2–2 [...]’

This metaphorical expression (whose etymology is based on a metaphor) is also consistent with the already established mapping between soldiers and footballers, but adds another layer of significance. Like those soldiers whose lives are considered insignificant in a war, a team (in this case the Portuguese side Famagusta) are not considered strong enough to win any matches in a particular competition. The underlying mapping is quite drastic; the (predictable) death of a group of soldiers corresponds to the fact that a team is very likely to drop out of a contest, which is actually very similar to the mappings present for *survive* (see below). Although the two expressions are in no way translation equivalents, the underlying mapping is identical (DROPPING OUT OF A COMPETITION IS DYING). Therefore, it cannot be considered as particularly typical of a ‘German’ perspective on football.

Example (8) is extremely indicative of the collocates of *erobern*, since all 5 occurrences of this lexeme in the corpus are almost identical:

- (8) Es gibt Einwurf jetzt, da Trochowski den Ball erobert.  
‘It’s a throw now that Trochowski conquers the ball’

Here, the ball is described as a piece of land or a settlement, which is taken control of through military action; this metaphorical expression is probably best described as a small-scale battle. The verb *erobern* incorporates two interesting implicit

mappings: despite the fact that only one player is mentioned explicitly, some sort of opposition defending the attacked property is implied, in this case a player of the other team. What is more, this includes also that the ball originally ‘belonged’ to a player of the other side trying to defend his property. The aforementioned piece of land or settlement is directly mapped onto the ball itself. These three mappings show the consistency involved in the comparison of such a situation to a small-scale battle involving single ‘soldiers’ (cf. above) and a comparatively small piece of property as well as the effectiveness of conveying this fairly complex event through one metaphorical expression.

Another not too dissimilar situation is also concerned with a way to obtain the ball from the opposition.

- (9) Zwei, drei Griechen umzingeln ihn dort, dann ist Diego an der Sechzehnmetergrenze und auch er verliert den Ball.  
 ‘Two, three Greeks besiege him there, and then Diego is at the edge of the penalty area and he also loses the ball.’

Here, the player with the ball (Diego) is surrounded by several opposing players trying to acquire the ball themselves. Within the framework established so far, this situation can effortlessly be compared to a soldier being surrounded by several enemies who use their numerical superiority to their advantage, just as the chances of obtaining the ball and stop the other player from moving forward increase if there is more than just one opposing player (which is indeed what happens in the end). This can be perceived as a viable strategy to obtain possession of the ball much like outnumbering an enemy is a strategy to gain an advantage in battle.

Another tactical device is presented in Example (10):

- (10) hineingeflankt und dann kommt [...] aus dem Hinterhalt Dajan Simac und versucht, den Ball direkt aufs Tor von Dimo Wache zu bringen.  
 ‘crosses and then there is [...] Dajan Simac sniping and tries to get the ball directly on Dimo Wache’s goal.’

Again, the translation into English is not entirely straightforward as another possibility would be ‘ambush’; this, however, does not describe the situation accurately, since all occurrences in the German corpus are connected to a scenario where a player attempts a shot on goal from an unexpected position – usually a tad further away from the goal, while most of the other players are placed in the penalty area. Much like a sniper, who positions himself or herself far away from the centre of attention, a player who attempts to shoot *aus dem Hinterhalt* (‘sniping’) is usually not where the ball is expected to be played (i.e. the penalty area). Apart from ‘shooting’, it is, however, only the attribute ‘unexpected

position' which is mapped from the sniper onto the player, since the position/action described by this metaphorical expression does not include 'precision' and thus a very high chance of success.

Except for *Rakete* (which is a problematic example of WAR-related metaphorical expressions) and *Kanonenfutter* (which is closely related to the potential underlying mapping for *survive*), the German corpus exhibits slight preferences for tactical devices or strategies to gain an advantage in battle, i.e. possession of the ball. As the following analysis will show, the English examples reveal a considerably different pattern.

#### 4.2.3 Metaphorical expressions exclusive to English

In general, Table 5 shows that the source domain WAR seems to be more productive in English than it is in German, since it produces a larger variety of different metaphorical expressions than German does, which might point to two things: first, mappings which are present in both languages are probably more conventional (and less conspicuous) through these 'additional' metaphorical expressions; second, other mappings, which are exclusive to English, are established and thus lead to a closer connection between source and target.

To start with the former of those two effects, the potential conceptual metaphor FOOTBALL IS WAR manifests itself very directly in Examples (11) to (14).

- (11) And down on the floor on the far side is Andy Holdsworth. He's been in a war since halftime.
- (12) I think it is, Paul, it's a scrap, it's definitely a midfield battle.
- (13) Michael Essien's first goal in the Premier League this season after an injury-ravaged campaign [...].
- (14) Remember Manchester City also flying the flag in Europe for the Premier League teams [...].

The expression *He's been in a war* in Example (11) refers to a player (Andy Holdsworth) being tackled very often within a comparatively small amount of time. Here, the picture of small battles within a larger battle or a war is emphasised again to the effect that one player is fighting his own personal war and has to sustain numerous and intense attacks, i.e. tackles. The metaphorical expression *scrap* (designating an intense match where many fouls occur) is very much in the same vein, stressing the physical character of a match and the number of unfair tacklings. In both cases, the correspondences are quite clear: soldiers in battle are mapped onto footballers and (unfair) tacklings onto (unspecified) attacks on the enemy. This, however, incorporates another interesting parallel: while attacks on the enemy are an essential (albeit horrible) feature of a war, unfair tackles constitute a breach of the rules and are punished by the referee. Examples (11) and (12) indicate, however,

that this sort of behaviour is not necessarily condemned by the commentators, but rather seen as a necessary evil, which is an essential part of the game.<sup>14</sup>

Examples (13) and (14) also complement each other, as they both invoke the picture of an army trying to win a war. *Campaign* in (13) implies that a team does not just fight one war or battle, but is involved in several over the course of a season. So in this sense, one could argue that the whole season is mapped onto an entire war with a single campaign corresponding to a particular competition (e.g. league or cup). This is also supported by the context, since it is explicitly specified that a player (Michael Essien) has just scored his first goal in a particular competition (the Premier League), irrespective of possible goals he might have scored in other competitions.<sup>15</sup> So the relation which holds between *war* and *campaign* also holds for *season* and *competition*. For many teams in the top leagues, an international competition (e.g. the Champions League or the Europa League) is an important part of the season both from a sporting and a financial point of view, but also with respect to the overall representation of a country in international club football.<sup>16</sup> So *to fly the flag in Europe* in (14) points to the fact that the respective team (Manchester City) is trying to conduct a successful European campaign not just for their own benefit but also for that of fellow Premier League teams. Therefore, the metaphorical flag mentioned here is not Manchester City's banner, but an English one carried by one of England's 'armies' (metonymically standing for the entire country) in their European 'battle'.

The following example is closely linked to (4) above with regard to the role of the manager (in this case Arsenal London's manager Arsène Wenger) and the actions he can take:

- (15) Seventy minutes, where you start to think about a change and does his orders, Arsène Wenger, believe that the people on the pitch can win the game for him, you know, has a lot of belief in his team and his players.

While the correspondence between an army general and a football manager is rather implicit in (4), this mapping is verbalised directly in (15), where the respective manager *does his orders*, which also reflects the hierarchical relations

14. Other occurrences of *scrap* in the corpus include *right old scrap* and *heck of a scrap*.

15. As a matter of fact, Essien had scored his first goal of the season five days earlier in a Champions League match against Juventus Turin. So for the goal referred to in (13) to be a "first", the respective specification was necessary.

16. Without going into too much detail, this overall performance of a country's representative clubs in international football is central to the number of slots a country is allowed for international competitions in the following years. In other words, the more successful, say, English clubs are in Europe, the more English teams can participate in the following years.

between the players and their manager.<sup>17</sup> Given that the manager is usually also responsible for the line-up and the tactics of his team, there seems to be a clear relation between FOOTBALL and WAR, which strengthens the impression that this potential conceptual metaphor is more productive in English than in German.

In the following paragraphs, I would like to show how this productivity also yields metaphorical expressions which are exclusive to English and have no translation equivalent in the German corpus. Although the figures for *territory* in Table 4 are statistically not significant, Examples (16) and (17) suggest that it seems to highlight a particular perspective taken by the English language.

- (16) They just move it forward inside Barnsley territory [...].
- (17) Liverpool having the lion's share of possession now, and the territory as well. They are virtually camped out inside the Portsmouth half.

The endocentric compound *Barnsley territory* in (16) refers to the half of the pitch in which the Barnsley players line up before kick-off; the use of *territory* instead of *half* has important consequences, since the meaning of the former has implications which are quite different from the latter. While a compound like *Barnsley half* does not necessarily invoke an idea of possession or a very specific context, *territory* does, which can be illustrated by its basic meaning according to Macmillan: 'an area of land controlled by a particular country, leader, or army'. As a consequence, the verbs *attack* and *defend* do not only pertain to a team's own goal but also to the respective half of the pitch, as entering the other team's territory constitutes an invasive act, which the opposition seeks to prevent or at least contain. Again, the correspondences are numerous: just like invading someone else's territory is usually considered an act of aggression, entering the opposing team's half means that the ball is brought closer to their goal with the intention of scoring a goal. The corresponding reaction is to try and at least interrupt this move, just like an army defending their land will try to keep the invaders from making further progress. In more or less balanced matches, these metaphorical invasions are not very long-lasting and go back and forth so that the 'ownership' of each half does not change. As Example (17) shows, this can change if one team is very dominant and does not only have the ball at most times but shifts the main area of play well into the opposing team's half. Here, one team (Liverpool) has *the lion's share of [...] the territory*, which conveys the idea that they have pushed back the other team so far that they cannot leave their own half and have effectively given up possession of a part of

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17. I am aware of the fact that the expression is not very idiomatic, but this may be related to the regiolect of the expert summariser Mark Bright (cf. Table 2), who displays a fairly strong West Midlands accent. However, it becomes clear from the context that it should be *gives his orders* in Standard English.

their ‘original territory’, which has now fallen to Liverpool. So seizing control of ‘foreign territory’ is a central element of success, since it implies that the ball is constantly kept close to the opposition’s goal, which, on the one hand, makes scoring a goal more likely and, on the other hand, prevents the other team from attacking.

The following examples exhibit a pattern, which is exclusive to English and marks a stark contrast to German:

- (18) Arsenal need to find that killer pass.
- (19) [...] the first Spurs goal at this stage of the match would be just about the killer-blow for Aston Villa [...].
- (20) [...] we’ll just have to survive the first ten or fifteen minutes [...].
- (21) [...] who gets relegated and who survives.
- (22) [...] show the fans that they are there ready to die for the goals [...].

What these metaphorical expressions have in common is their (inherent) reference to death. While this is obvious in (18), (19) and (20), *survive* in (21) and (22) implies that death was avoided but had been a possible outcome of the respective situation.

As far as the mappings are concerned, (18), (19) and (20) exhibit clear similarities. In these examples, the concept of killing is linked to scoring a goal; the perspectives are, however, different. Whereas *killer pass* in (18) refers to playing the ball in such a way that it puts a fellow player in a position from where it is likely that he scores a goal and *killer-blow* in (19) to a (decisive) goal itself, (20) takes the opposite point of view in that not conceding a goal is described in terms of surviving, i.e. not dying. So as far as paradigmatic semantic relations are concerned, these examples actually constitute a case of converseness. Although (18) is slightly different, since the metaphorical expression is *killer pass* and not *killer-blow* (19), the notion of scoring a goal is inextricably linked to dying, as the context suggests that the team (Arsenal) has made previous attempts to score but has not succeeded so far due to a lack of passing skills. Thus, the supposed success is metaphorically equalled with a kill. In this respect, (19) is much more straightforward, because scoring a goal is directly (almost like the typical formula for a conceptual metaphor) connected with killing (and thus winning against) the opposition in an armed conflict. In contrast to (20), Example (21) shows that *survive* not only pertains to avoiding goals, but also to avoiding relegation (i.e. having to play in a lower division in the following season). Instead of focusing on a detrimental event in a single game, this expression takes the outcome of an entire season into account; nonetheless the two are closely connected, since being relegated unequivocally involves conceding many goals (and not scoring yourself). Finally, (22) invokes the picture of soldiers go into battle and give their lives for victory. Besides the obvious connection between soldiers and footballers, it is this

form of ultimate commitment which plays the central role here. It is rather striking that these DEATH-related metaphorical expressions occur at various levels of detail: individual players (22), events during a match (18–20) and the (potential) outcome of an entire season (21), which, in my opinion, indicates the general applicability and conventionality of these mappings.

Finally, I would like to turn to two examples, which are indicative of another pattern typical for English:

- (23) [...] it's a tremendous strike into the top corner.
- (24) Indeed I remember him destroying Liverpool one night at Anfield [...].

Here, the element of destruction is of prime importance, as expressed by the noun *strike* and the verb *destroy*. While the latter conveys this notion verbatim, it can also be inferred in (23), as the basic meaning of *strike* shows: ‘a military attack, especially one in which planes drop bombs on an area’.<sup>18</sup> Apart from the fact that military attacks usually involve some sort of destruction, this element seems to be particularly distinctive for *strike* and also corresponds with the action described, since this expression can only be applied to strong kicks of the ball. While (23) describes a single event within a match, *destroy* in (24) refers to the outcome of a game, namely Liverpool losing at the hands (or feet) of a particular player (Patrick Kluivert); again, the intensity of the event is highlighted and the levels at which these two metaphorical expressions operate also display a similar pattern to the DEATH-related examples in the previous paragraph. What is more, I would argue that (23) and (24) are also closely connected in the sense that (completely) destroying something usually takes several strikes – just like a comprehensive win involves several goals.

## 5. Comparison

At first sight, the results of the quantitative and the qualitative analysis in 4.1 and 4.2 might seem somehow contradictory, since WAR-related metaphorical expressions appear to be much more marked and frequent in the German corpus (in

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18. One could object that the contextual meaning of *strike* ('a hit or kick of a ball, especially one with which you score a goal or a point') is just as basic as the military meaning. In such cases, MIPVU advises “to check whether there is any indication of the (original) domain from which the word derives.” (Steen et al., 2010, pp. 36–37) Here, I would argue that the football meaning of *strike* derives from the military meaning; this is also supported by *Longman*, which does not list a particular football meaning at all, thus indicating that the military meaning (which is listed) is more basic.

terms of tokens, i.e. a quantitative point of view), while the English corpus seems to produce a larger variety of different metaphorical expressions (in terms of types, i.e. a qualitative point of view). However, as I pointed out earlier, the difference with regard to the nature of the reference corpora and the fact that the MCFC-E and the MCFC-G are comparatively small makes direct quantitative comparisons slightly problematic, which is why these results should be interpreted tentatively.

What is more revealing are expressions which do not have a direct translation equivalent in either of the two languages; with respect to German, no English equivalents could be found for Examples (6) to (10). Additionally, *erobern*, *umzingeln* and *Hinterhalt* exhibit a particular pattern, as they all denote strategies of gaining an advantage in battle/on the pitch. While *erobern* is certainly not particularly strategic or sophisticated, *umzingeln* and *Hinterhalt* denote tactics which are not characterised by sheer force or destructive power, but by outnumbering an opponent and positioning oneself in an unexpected position to have the element of surprise on one's side. Tactical aspects like these were not found in the English corpus, which may indicate that these elements of the source domain WAR are not subject to mappings onto the target domain FOOTBALL in this particular language. In other words, where English displays different (and also systematic) preferences, this slight but nonetheless existing focus might be unique for the 'German' perspective on the game. Due to the limited data available at the moment, bigger corpora are needed to further investigate and confirm these tendencies.

As Table 5 shows, English produces a larger variety of WAR-related metaphorical expressions; these are, however, not unstructured, since they can also be grouped in certain patterns. First of all, the metaphorical expressions in (11) to (14) exhibit a large amount of detail, as they reflect the division of a war into several smaller parts (*a war since halftime*; *it's a scrap*; *a midfield battle*; *an injury-ravaged campaign*; *flying the flag*). This comparatively high level of detail also highlights the centrality of the potential conceptual metaphor FOOTBALL IS WAR in English in that it is not just a few specialist terms which are based on this, but the perception of the game at all its various levels. What is more, expressions like *scrap* and *war* itself also emphasise the physical (and sometimes violent) character of the game; the use of such expressions inherently condones these features and does not necessarily opt for a foul-free, technically intricate type of play.

Another typically 'English' mapping concerns TERRITORY, as demonstrated by Examples (16) and (17). Here, POSSESSION, which usually applies to the ball, is extended to the two parts of the pitch. The fact that a neutral term (*half*) does actually exist makes the use of *territory* even more marked, since it conceives of the same situation in a considerably different way: the two parts of the pitch are not just associated with the respective sides by mere convention (e.g. to provide better orientation for the listener), the teams are the rightful owners of this

property, which makes entering an act of aggression – thus strengthening the pattern described in the previous paragraph.

Finally, the Examples (18) to (22) and (23) to (24) exhibit clear patterns involving DEATH- and DESTRUCTION-related expressions, which could not be found in the German corpus (*killer pass*; *killer-blow*; *survive*; *die for the goals*). This shows how English exploits the source domain WAR even further by including such (rather drastic) expressions to relate to negative events like conceding a goal, being relegated to a lower division or conveying a particularly high level of commitment. Again, such expressions confirm the general observation that the potential conceptual metaphor FOOTBALL IS WAR is more pronounced in English than in German.

## 6. Specialist terms, specialist metaphor

The aim of this study was to illustrate how the source domain WAR is used in English and German in the specialist register of football and to demonstrate its centrality with respect to the most important specialist terms; it could be shown that virtually any discourse about football will at some point have to resort to well-established, popularised metaphorical expressions to express basic moves and components of the game. Despite the limited comparability of the quantitative results, it was possible to observe a slight preference in the German corpus with regard to WAR-related metaphorical expressions. In general, a considerable overlap with regard to the most indicative items could be detected; a closer look, however, helped to discover an interesting difference with respect to the distribution of the lexemes *attack* and *defend* and their German counterparts. While their use was balanced in English, the German scale tipped in strong favour of *attack*, which could be explained by its wider scope, i.e. the lexeme can also be used to describe actual defending moves. A quantitatively highly relevant metaphorical expression is G. *Zweikampf* ('duel'), for which there is no direct English translation equivalent based on the same cross-domain mapping. From a qualitative point of view, it could be shown that English 'compensates' for not being as prolific by displaying a larger variety of metaphorical expressions. Yet, these are not distributed at random but present patterns whereby English appears to prefer metaphorical expressions which draw on aspects like DESTRUCTION, DEATH or POSSESSION, while German rather focuses on particular strategic moves to gain an advantage on the pitch.

Methodologically, the study presented the purpose-made corpora MCFC-E and MCFC-G as well as an application of MIPVU to German including the subsequent modifications which have to be made to deal with the morphosyntactic peculiarities of German. By combining statistical, corpus-based methods with a

qualitative approach, this chapter attempted to provide a way of charting the landscape of so far unexplored territories of specialist registers.

Consequently, this chapter is also intended to serve as an impetus for further research. Based on the above findings, psycholinguistic methods could be employed to determine whether linguistic differences between the two languages do indeed represent different conceptual structures. What is more, a diachronic perspective could shed some light on how the use of metaphorical expressions might change over time, especially in connection with extra-linguistic events (such as actual acts of war). In particular, a popularised specialist discourse domain like football might be able to serve as an interesting indicator for cultural differences and change.

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# The production line as a context for low metaphoricity

Exploring links between gestures, iconicity,  
and artefacts on a factory shop floor

Simon Harrison

University of Nottingham Ningbo, China

This paper investigates metaphor use in a heavily industrialized context. Using video recordings collected at a salmon factory in France as data, I study metaphor in the gestures that workers perform in technical specialist communication along a noisy production line. Within a framework for describing gesture forms and identifying their underlying conceptual motivations, I analyse the iconicity of the gestures and argue that this stretch of the production line was a context for low metaphoricity. My analyses show that gesture iconicity was motivated by metonymic mappings within concrete source domains but not metaphoric mappings to abstract target domains. This finding emphasises that metaphor activation can depend on aspects of context, including the communicative environment and the artefacts it contains.

## 1. Introduction

In contexts where spoken language may occasionally be difficult, inappropriate or forbidden, people naturally begin communicating with gestures (Kendon, 2004; Morris, 2002). This process may lead to the emergence of kinesic codes:

Kinesic codes of varying degrees of complexity have developed at various times and places in communities of speaker-hearers for use in circumstances where speech either cannot be used for environmental reasons or may not be used for ritual reasons.  
(Kendon, 2004, p. 291)

Kendon (2004) reports research into five different kinesic codes. These codes were observed on a building site, in a sawmill, in a monastery, among the ‘North American Plains Indians’, and finally, within an Aboriginal tribe in Australia (Kendon, 2004, pp. 291–306). Inspired by Kendon’s (2004) comparative study, I

contacted France's largest salmon factory with the goal of exploring gestural communication among workers on one of their shop's floors. I subsequently spent two months at the factory documenting how workers communicated along a stretch of their production line. The kinesic code that I have extracted from the data seems less complex than those described by Kendon. But one feature of the gesturing that I observed sheds light on the current discussion of metaphor in specialist discourse. In particular, when workers needed to communicate technical messages urgently across workstations, the gestures they used showed different semiotic characteristics to gestures they produced as part of social communication at the same workstation. Since one of these differences concerns metaphor, the opportunity arises to examine how situational factors like noise, machinery, and work tasks affect the way conceptual patterns are encoded in language.

In this paper, I take a multimodal approach to communication and examine metaphor in the context of an industrial shop floor. My standpoint is that language use includes gestures, so both speech and gestures in this technical environment can be analysed as 'windows' onto thought processes (McNeill, 1992). Focusing on the forms of the gestures that workers produce on a shop floor offers insights to the way cognitive processes and the environment interact.

I will first describe a distinction I observed between communication for different purposes, including for apparently social purposes and for the specialist aspects of technical communication along the production line. Then I will focus on technical communication and present the different types of gesture forms and functions that I observed. The main goal of this paper is to demonstrate that the gestures involved in technical communication were largely constrained to concrete reference. In the discussion I emphasise how levels of metaphoricity may differ in this highly industrialised specialist context.

My methodology involves analysing the forms of gestures into their main parameters and investigating the concepts that each parameter encodes (Bressem, 2013; Ladewig, 2011; Müller, 2007, 2008a; cf. Müller et al., 2013). I combine the fine-grained analysis of gesture form features with a framework for discerning the relationship between metonymic and metaphoric mappings in gesture form-meaning pairings (Mittelberg & Waugh, 2009). Through my analysis, I demonstrate that the gesture forms I observed in technical communication along the production line exhibit metonymic mappings within the source domains of raw materials, machinery, and production processes, but lack metaphoric mappings to abstract target domains (such as those commonly described in the metaphor literature, e.g. love, theories, discourse, politics, emotion, religion, etc.). I argue that while metaphoric gestures may abound in various contexts (cf. contributions in Cienki & Müller, 2008), the potential metaphoricity of gestures is not always exploited in other contexts. In my discussion, I will relate my findings to several

aspects of metaphor theory, especially the need to consider the speaker's physical environment when examining the metaphoric nature of different domains of (specialist) discourse. First, the next section considers the relationship between gestures, metonymy, and metaphor.

### 1.1 Gestures, metonymy, and metaphor

Communication on the factory shopfloor studied here was multimodal, including both (French) speech and gestures. Gestures are expressive movements of the body that occur during face-to-face interaction and that are driven by the actor's open intent to communicate (Kendon, 2004). In everyday conversations, gestures are co-timed and co-expressive with speech (McNeill, 1992), and they contribute to the speaker's utterance in a variety of ways. For example, gestures may reflect aspects of the speaker's conceptualisation and thereby convey concepts that underpin the co-occurring speech (McNeill, 1992, 2005); gestures may highlight aspects of the speaker's discourse structure, for example by indicating a topic-comment structure and drawing attention to a particular part of speech (Kendon, 1995, 2004; Müller, 2004); gestures also play a role in modulating aspects of interaction, including turn-taking and holding the floor (Streeck, 2009; Sweetser & Sizemore, 2008).

Since the 1980s, much research in cognitive linguistics has demonstrated that conceptual processes motivate verbal linguistic expressions. These processes include conceptual blending (Fauconnier & Turner, 2000), reification (Langacker, 1987; Lapaire, 2007), metonymy (Panther & Thornburg, 2004; Panther, 2007), metaphor (Lakoff & Johnson, 1980), force dynamics (Talmy, 1985), image schemas (Johnson, 1987) and more general cognitive abilities, such as the perception of time and the focusing of attention (Langacker, 1991). At roughly the same time, and following early work on gesture in interaction and nonverbal communication, Kendon (1980) pioneered the field of contemporary gesture studies with his demonstration that gestures and speech were 'two aspects of the process of utterance':

[T]he phrases of that gesticulation that co-occur with speech are not to be thought of either as mere embellishments of expression or as by-products of the speech process. They are, rather, an alternate manifestation of the process by which 'ideas' are encoded into patterns of behavior which can be apprehended by others as *reportive* of those ideas. It is as if the process of utterance has two channels of output into behavior: one by way of speech, the other by way of bodily movement.

(Kendon, 1980, p. 218; emph. orig.)

Since gestures and speech were shown to be two aspects of the process of utterance, gestures became increasingly valuable to the study of language and cognition. Researchers with backgrounds in cognitive linguistics, cognitive science, and

psychology explored gestures for their potential to offer insights to the cognitive processes underlying speech (see Kendon, 2007 for a concise history of gesture studies). One consequential finding was that gestures may symbolise and convey similar conceptual patterns to those identified in verbal linguistic communication, perhaps most evidently in a way that involves iconicity and metaphor (McNeill, 1992, 2005).

Extending groundwork on metaphor in gesture by McNeill and Levy (1982), then Calbris (1990), and McNeill (1992), Cienki (1998) used empirical data to systematically show that “[g]esture, and other nonverbal sources of expression, can serve as independent sources of evidence of the psychological reality of conceptual metaphors” (p. 190).<sup>1</sup> Simply put, the images that gestures present may be used to encode source domains for metaphors in the discourse (e.g. Müller, 1998; Sweetser, 1998). Converging evidence came from the study of metaphoric signs in American Sign Language, with the important addition that metaphoric signs involved the cognitive process of metonymy (Taub, 2001; Wilcox, 2004). Metonymy in coverbal gesture was then established as crucial to metaphor analysis in spoken language (Mittelberg, 2006, 2008).

## 1.2 The relationship between metaphor and metonymy

Although intertwined, metonymy and metaphor are different cognitive processes. Metonymy involves creating a conceptual link between elements within one domain: “Metonymy is a cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target, *within the same domain*” (Kövecses & Radden, 1998, p. 39; italics mine). A classic example is the expression ‘boots on the ground’, which an army official could potentially use to quantify soldiers during a particular military operation. Within the domain of military resources, the boots provide mental access to the soldiers wearing them. The metonymy might be represented as ITEM OF UNIFORM FOR PERSON WEARING UNIFORM.<sup>2</sup> Metaphor, on the other hand, involves mapping elements from one domain of experience onto elements in a different domain: “*The essence of metaphor is understanding and experiencing one type of thing in terms of another*” (Lakoff & Johnson, 1980, p. 4; emph. orig.). To take another classic example, when lovers in a relationship agree they have ‘come to a dead end’, the domain of relationships and love is being understood and

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1. Forceville and Urios-Aparisi (2009) provide a collection of articles addressing metaphor in diverse modalities, including metaphor in advertising, in political cartoons, in comics, manga, and animation, in spoken language and co-speech gesture, in music and sound, and in film.

2. Metonymies are in small capital letters (e.g., PART FOR WHOLE), distinguished by the operator FOR from that for conceptual metaphors, IS (i.e. TARGET IS SOURCE).

experienced in terms of the domain of journeys and travelling. The metaphor being used is LOVE IS A JOURNEY (Lakoff & Johnson, 1980).

Summing up, metonyms are within-domain mappings and metaphors are cross-domain mappings (Barcelona, 2000; Croft, 1993; Mittelberg & Waugh, 2009). Furthermore, while metonymic mappings may occur within concrete and abstract domains, the metaphoric mappings that have received the most scholarly attention are those that occur between elements from a concrete domain, the ‘source’, to elements in an abstract domain, the ‘target’.<sup>3</sup>

These differences in metonymy and metaphor are important for my analysis because they have consequences for the semantic interpretation of iconic gestures. Focusing first on the question of metaphor, McNeill (1992) initially distinguished between ‘iconic’ and ‘metaphoric’ gestures. In his classification system, iconic gestures “bear a close formal relationship to the semantic content of speech” (p. 13), thereby allowing speakers to illustrate propositional content of the utterance they accompany. For example, a person describing a box might simultaneously represent its dimensions with the hands. What McNeill called ‘metaphoric gestures’ differs because any image the hands present will refer to an abstract concept. McNeill’s (1992) example of a metaphoric gesture is a person referring to the genre of a cartoon while performing gesture that portrays “an image of a bounded object supported in the hands and presented to the listener” (p. 14). Gesture provides a concrete image to illustrate an abstract concept.

For Müller (1998), both ‘iconic’ and ‘metaphoric’ gestures are based on iconicity, and both types of gestures present concrete images (hence McNeill’s term ‘imagistic’ to capture this similarity). The difference is that in a metaphoric gesture, the concrete image serves as the source domain for a metaphor. To exemplify this, Mittelberg and Waugh (2009) provide the following example: “a gesture with two hands may trace the frame of a painting or the frame of a theory” (p. 337). Tracing the frame of a painting is a concrete reference, while tracing the frame of a theory is an abstract, metaphoric reference. Both are iconic of a frame, but only the latter is interpreted as metaphoric, with the image of a frame acting as the source domain for a metaphor (THEORIES ARE PHYSICAL STRUCTURES; Mittelberg & Waugh, 2009; Müller, 2008b; Sweetser, 1998). The analyst relies on context and speech to disambiguate the two possibilities (Mittelberg, 2006).

If iconic gestures can either have concrete or metaphoric reference, what about the role of metonymy? Regardless of whether an iconic gesture achieves concrete

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3. Metaphoric mappings may exist between two concrete (or two abstract) domains and the direction of mappings may ‘flicker’ back and forth, but the work cited here from cognitive linguistics has focused on uni-directional metaphoric mappings from concrete to abstract domains.

or metaphoric reference, Mittelberg (2006) has demonstrated that metonymic mappings are involved in selecting which aspect of imagery the gesture will present. Through various methods of gestural representation (i.e. the hand acts, the hand models, the hand draws, the hand represents; Müller, 1998) an iconic gesture always encodes only a portion of salient features to stand in a part-whole relation to the referent, meaning that the encoding process first of all involves metonymy. To use the examples above, by enacting the holding of a box, the hands represent the box's dimensions, which in turn may refer metonymically to the box itself; and by drawing the outline of a frame with the tips of two index fingers, the frame traced in the air may refer metonymically to the whole painting. However, when the gesture is using an image to establish abstract reference, a metaphoric mapping is added onto the initial metonymic one. For instance, to pass from a physical frame to a theoretical one, an additional metaphoric mapping is required (i.e. THEORIES ARE PHYSICAL STRUCTURES).

Mittelberg (2006) studied the interaction between metonymy and metaphor in gestures used by professors in a corpus of filmed linguistics lectures. Her study identified and laid out this sequential nature of metonymy and metaphor for coverbal gesture. Mittelberg (2008) writes: "It is, in certain cases at least, through metonymy (...) that the perceivable manual articulators provide cognitive access to the metaphorically construed objects speakers seem to manipulate when talking about abstract categories and structures" (p. 148). Following this, Mittelberg and Waugh (2009) established that, in the interpretation of coverbal gestures, a metonymic mapping necessarily precedes a metaphoric projection, a principle they call "the general principle of metonymy first, metaphor second" (p. 347).

Similar processes had previously been identified for metaphoric signs in American Sign Language by Taub (2001), who introduced an 'analogue building model of linguistic iconicity' and a 'double mapping system' to explain how signs become iconic and achieve metaphoric reference. Taub shows that for a metaphoric sign, an aspect of an image must first be selected, schematised, and encoded in order to then project metaphorically onto an abstract domain. She highlights that metonymy is part of this initial process, noting that "[s]electing a single image to stand for a complex associated concept is an example of the cognitive process *metonymy*" (p. 45; emph. orig.). For the sign to then acquire a metaphorical meaning, there must be "a metaphorical mapping from concrete to abstract conceptual domains" (p. 97; cf. Wilcox, 2004).

The previous research into metaphoric and metonymic aspects of gestures has primarily focused on the gestures that speakers produce in contexts where calm, unhurried speech is possible (lab settings, coffee shops, classrooms, etc.). The data for the current study originate from a hectic, dense, and noisy industrial environment where interaction and speech proceed in a different way. The noise,

layout, and production constraints of a factory shop floor provides a unique context for studying multimodal language. In this data set, the workforce is multilingual so the language of communication may vary depending on the linguistic backgrounds of the speakers. Noise levels from rumbling machinery and whirling ventilators are constantly above 90 decibels. Workers wearing earplugs and facemasks have to shout to be understood. Despite the difficulties inherent to communicating across spaces filled with machinery and raw materials, high productivity demands force the workers to communicate messages related to work flow regularly and urgently.

By studying the forms and functions of gestures performed as a part of technical communication along this production line, and analysing gesture iconicity with the approaches to metonymy and metaphor outlined above, the goal is to examine how levels of metaphoricity differ along a stretch of production line. Specifically, when deconstructing the gesture forms and spelling out the conceptual mappings that motivate their iconicity, I have identified metonymic mappings within concrete domains but there is less evidence of metaphoric mappings to abstract domains. Since the gestures exhibit forms that could potentially be used metaphorically though, another goal is to highlight the role played by the context and its artefacts in the activation of metaphoricity. To explain this context in more detail, the next section introduces the salmon factory and briefly explains the project I conducted there.

## 2. The salmon factory

I contacted the director of a salmon factory in France and proposed a communication project. The director agreed and I received permission to work in the factory in July and August 2009. The goal of the project was to observe how workers along the production line communicated with each other and provide the factory with an analysis of their communication practices. Another goal was to examine the role of gestures in the communication system and explore the possibility of standardising and developing a gesture code as a potential means to facilitate factory communication (cf. Harrison, 2011). The current paper will only focus on data gathered during the observation period, i.e. before any meetings took place with the workers to discuss gesture and gesture codes explicitly.

The factory is one of France's largest producers of smoked salmon. Out of its 350 workers, linguistic backgrounds include French, Portuguese, Arabic, and Turkish. This rich communication condition is rendered challenging by the constant background noise from machinery, the presence of earplugs and facemasks, and the large distances between workers who need to communicate with one other.

The work reported here concerns communication along the production line in the factory's conditioning zone (one of four zones). At the head of the line in this zone, a worker referred to as the Slicer feeds frozen salmon fillets into the slicing machine. As the slices of fillet whiz down the line on a conveyor belt, several Line Workers collect them up and place them neatly onto trays. These workers then put the trays back on the line which moves them on to a weighing station, where a Weigher checks that the trays are the right weight. If they weigh correctly, they are put back on the line and moved on to the Loader. The Loader feeds the trays into a vacuum wrap machine, where they disappear until emerging packed and sealed in the next zone ready for dispatch. In addition to these different workers, a Line Pilot oversees the operation and moves between work stations to take productivity measures and tackle problems when they arise. Figure 1 is a drawing of the part of the production line recorded for this study. The drawing is made looking up the line, so the person in the background is the Slicer and the person in the foreground is the Loader. All the stations are labelled.

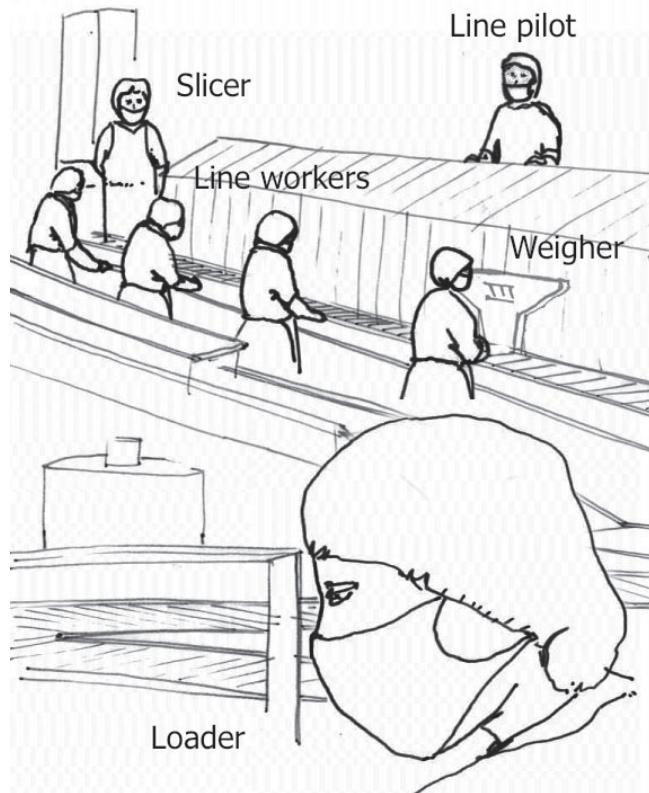


Figure 1. The part of the production line under study

### 3. Methods

When I arrived at the factory, I spent two weeks familiarising myself with each workstation in the conditioning zone. I paired up with a worker at each of the stations and shadowed them as they worked. Once I had learned the operations, I worked for a few hours at each station independently. This first step was a preliminary measure to ensure at least some level of familiarity with the work process and communication when analysing the data collected later.

With a general feel for the environment and now acquainted with the workers, I spent the second two weeks of the project collecting empirical data. Using traditional methods of ethnography, including participant observation, informal interviews, and filming, I documented the way information flowed up and down the production line. For each station, this involved gathering answers to the following questions: When does the worker at this station communicate? With whom does the worker communicate? Why does the worker communicate? And how does the worker communicate? When filming each station, I paid particular attention to moments when interactions occurred, watching carefully, taking notes, and always seeking to check my interpretation of the interaction with relevant workers once off the shopfloor.

To collect video recordings, I used a standard digital camera placed on a tripod that I situated at various points along the line. For some recordings, I held the camera and placed myself near to the station I was filming, while for others I attached the camera to a machine with the lens facing one of the workstations. I collected approximately five hours of video data that covered all the workstations in the zone and captured a range of interactions at various stages during the shifts. I then watched these films in ELAN annotation software, which allowed me to analyse moments of interaction in slow motion and annotate the video in tiers below for information about when the workers were communicating, with whom, why, and using which gestures.<sup>4</sup>

To annotate the forms of the gestures I observed, I used the annotation system for form features presented by Bressem (2013). Bressem's (2013) system provides instructions and vocabulary for coding hand shape, orientation of the palm, position in gesture space, and movement pattern. The background noise in the videos was unfortunately too loud to pick up most of the speech. However, the workers often shouted, which I was able to hear and transcribe using conventional orthography. While detailed recordings of the speech would have been useful, I was able to interpret the meanings of the gestures from the context in which they were being used, and check these interpretations were accurate with workers off the shopfloor.

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4. ELAN annotation software can be downloaded for free at <http://www.lat-mpi.eu/tools/elan/>.

#### 4. Types of gestures at the salmon factory

Along this factory's production line, I have found it useful to distinguish between two main types of gesturing. I shall call the first type 'conversational gesturing' and I shall call the second type 'technical gesturing'.

##### 4.1 Conversational gesturing

Conversational gesturing occurred when a pair of workers at the same work station, either standing side-by-side or opposite each other, began to have a conversation and as part of that conversation they used gestures. Since only some work stations required two workers, conversations were not as frequent along the line as in more social settings, such as in the cafeteria during lunch or in the factory car park before and after work shifts. But when these conversations did occur, the workers performed gestures to accompany their speech.

These gestures look like those we observe when people engage in normal, everyday conversations. Indeed, the workers too were performing these gestures as they engaged in friendly chit-chat. As I documented in my fieldnotes, this chit-chat included discussions about weekend activities, social life, and also gossip about other workers in the factory. The workers were not discussing information directly related to work in this situation. And they were not engaging with each other as if to give and receive orders, to troubleshoot, or to point out problems with workflow.

The gestures in this context involved relatively small excursions into the space immediately in front of the speaker (the 'gesture space'; cf. McNeill, 1992, p. 89). Figures 2 and 3 show workers using typical conversational gestures. Note that the workers are in close proximity at the same station, either facing each other or working side-by-side.

Conversational gesturing like this is rich in both metonymy and metaphor (cf. contributions to Cienki & Müller, 2008). A study of such gesturing on a noisy shop floor, however, might show interesting differences in terms of gesture frequency and types of conceptual motivations, especially considering the linguistically complex environment. Without the accompanying audio data, such analysis can unfortunately not be carried out here. Equipping the workers with portable microphones was not allowed due to a health and safety regulation that forbids the introduction of small objects like jewellery onto the shop floor.

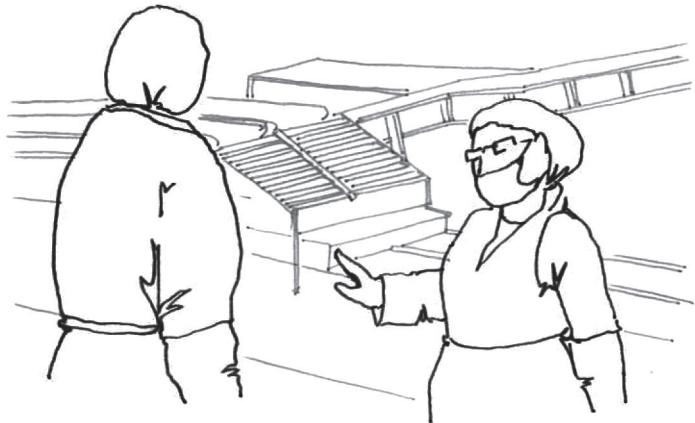


Figure 2. Conversational gesturing on the shop floor (a)



Figure 3. Conversational gesturing on the shop floor (b)

## 4.2 Technical gesturing

Borrowed from Morris (2002), the term ‘technical gesturing’ refers to gesturing that was part of specialist communication that occurred between workers at different work stations and that specifically related to work.<sup>5</sup> In this type of communication, the workers were not side-by-side but separated by machinery and conveyor belts. They needed to communicate because some problem had arisen to do with an aspect of the job and this needed to be dealt with urgently. This included on-the-job communication about production processes, raw materials, workflow, and problems with machinery. In this situation, the workers communicated by shouting and gesturing to each other. The messages they needed to communicate were linguistically simple (e.g. ‘stop’, ‘more’, ‘number one’, etc.), and were often communicated with gestures alone.

The gestures must have undergone some degree of conventionalisation and their meanings were discernable from context. Within this category of technical gestures, I distinguish between three types of gestures. The first two types are what I will refer to as ‘gestures of orientation’ and ‘gestures of measurement’. The third type will be termed ‘highly conventionalised gestures’.

### 4.2.1 *Gestures of orientation*

Streeck (2009) identifies a type of gesturing practice that he calls ‘gestures of orientation’. He defines ‘gestures of orientation’ as “gestures that aid the parties in working out a shared perspective upon the situation, a shared focus of attention or aspect under which objects are to be attended or featured” (p. 60). This terminology is suitable to describe aspects of the workers’ gestural behaviour along the production line. If a problem occurred along the production line, the Slicer (who could not leave her work station) would spontaneously have to inform the Weigher (who was more mobile) about the problem that had arisen, instruct her to fix it, and guide her toward the location where it was occurring. Because the two participants in the communication were at stations occupying opposite ends of the production line (cf. Figure 1), they would communicate by shouting and performing gestures to establish joint attention and solve the problem successfully.

In a pertinent example of this, the Slicer had noticed a problem with the small shutters letting out the salmon trays further down the line. The second shutter was malfunctioning and not releasing the trays. Since the Slicer could not leave her station, she needed to communicate this problem to the Weigher urgently. The

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5. I have adopted the term ‘technical gesturing’ from Morris (2002). Morris analyses some uses of gesture in occupational settings and writes that “[f]iremen, crane-drivers, airport-tarmac signalmen, gambling-casino croupiers, dealers at auctions, and restaurant staff, all have their own special Technical Gestures” (p. 40).

Weigher was a suitable addressee since she was nearer to the problem and more mobile. To get the Weigher's attention, the Slicer first shouted "Oil!". In the video, when the Weigher turned around in response to this shout, the Slicer performed a series of gestures. In Figure 4, the Slicer pointed with an extended index finger at the Weigher, then drew or traced an arc with that finger around the machines to the broken shutter. With her gesture, the Slicer was effectively showing the Weigher the trajectory that she had to take to get to the problem. Immediately after this, in Figure 5, as the Weigher began to move toward the problem, the Slicer then extended her index and middle fingers to indicate the number two, simultaneously shouting "la deux" ('the two').



Figure 4. Gestures of orientation between workers at different stations (a)



Figure 5. Gestures of orientation between workers at different stations (b)

Although basic and common, concrete pointing and number signs like these are difficult to analyse from the perspective of metonymy and metaphor. In previous work on pointing, Kendon (2004) has described a similar example where, through pointing, a speaker “both indicates an object (...) and provides a description of the activity of something (... )” (p. 202). In my example, the Slicer first uses pointing to designate the Weigher, and then continues to use the gesture to trace the trajectory that she wishes the Weigher to take. The actual path that the Weigher must take is littered with obstacles and more of a zig-zag than the smooth curve traced by the finger. In reducing the complexity of the actual path to the schematic curve traced by the gesture, a part-whole relationship is established between the curve and the actual path, evidencing a metonymy that could be formulated as OUTLINE OF PATH FOR PATH. For the number sign, the machine is being referred to by the number that machine occupies in a series of machines both in speech and gesture. This indicates the metonymic relation NUMBER OF OBJECT FOR OBJECT (cf. a similar metonymy in the discourse domain of football commentaries, where players can be referred to by the number on the back of their shirts).

#### *4.2.2 Gestures of measurement*

Gestures of measurement relate to the size and shape of raw material as well as to basic operations with machinery. The following sequence of technical gestures exemplifies this type of gesturing. The sequence began when the Weigher informed the Line Pilot that the slices of salmon she was receiving on the production line were too big. As a consequence, the Line Pilot instructed the Slicer at the top of the line to increase the slicing machine by two degrees, an operation that would decrease the thickness of the slices. This communication was mediated with gestures that indicate sizes and measurements. First, the video shows that the Line Pilot came under the conveyor belt. He emerged directly at the station opposite the Weigher, who established eye contact with him and performed a gesture. The gesture she performed consisted of two flat hands that began close together with the palms facing each other in front of the body. For the main part of the gesture (the stroke), the hands moved rapidly far apart along the horizontal axis where they stopped about a meter apart (Figure 6). The gesture means ‘too big’ and refers to the salmon slices, the increasing space in between the palms exaggerating the length of an oversized slice of salmon. To understand the Weigher’s gesture, the Line Pilot needed to see the space between the hands as referring to a slice of salmon. The opposite endpoints of a horizontal slice of salmon are selected as a salient measure of size and represented by the hands, so that as the hands move apart, they indicate the increasing size of the slices being referred to, albeit with exaggeration. As with many such measuring gestures, the metonymy involved may be stated as DISTANCE BETWEEN ENDPOINTS OF OBJECT FOR SIZE OF OBJECT.



Figure 6. Gesture of measurement: TOO BIG

Next, the Line Pilot needed to instruct the Slicer to increase the salmon slicing machine by two degrees. This operation would raise the fillet nearer to the blades in the jaws of the machine and consequently decrease the thickness of the slices. The Slicer was approximately 10 meters away at the head of the line. To attract her attention, the Line Pilot raised his hand high in gesture space with a flat shape and with the palm oriented toward her (Figure 7). In France as in many other countries, this gesture is a conventional way of requesting somebody's attention (Morris, 1994, p. 1), situating the open palm in the visual field of the desired addressee.



Figure 7. Vertical palm gesture to attract attention further up the line

When the Line Pilot was sure that the Slicer was looking, he performed a gesture where he extended his thumb from a closed fist and made two upward movements. This gesture means 'increase the slicing machine by two' (Figure 8).



**Figure 8.** Gesture of measurement: increase by 2

The relationship between an upward movement and an increase is often cited in the literature as evidence for the metaphor **MORE IS UP** (cf. expressions like ‘my income *rose* last year’ and ‘his draft number is *high*; Lakoff & Johnson, 1980). However, when the slicing machine being referred to here is increased by two, the salmon fillet is raised vertically in the jaws of the machine by two degrees of measurement. The iconic mapping process appears to be from the mechanical operation to the gesture form. By protracting from the fist, the thumb represents a verticality scale. Since the thumb protracts upwards and not downwards, the direction ‘upwards’ along this scale is encoded. The two upwards movements indicate the number of degrees by which the intended movement must be applied to the machine. The gesture tells us nothing either about the salmon fillet being manipulated or about the actual action that the slicer must perform (pushing a button). Only a portion of the intended process is being selected. Through a metonym that could be termed **PART OF ACTION FOR ACTION**, the gesture highlights the most salient feature of what is required, in this case upward movement.

In this interaction, increasing the machine by two leads to the salmon slice literally moving upward so that it may be sliced thinner. There is no metaphoric movement to report. However, it is easy to imagine the same gesture being used to increase a machine where the resulting operation would exhibit no literal upward movement. For example, if the same gesture were performed to either increase the slicing speed of the machine or to increase the output of salmon being produced, the domain of literal action (**UP**) would serve as a source domain for a metaphoric mapping to the abstract target domain of volume (**MORE**). In such cases, rather than mapping onto a literal action performed by the machine, the iconicity of the gesture would exhibit a mapping onto the source domain of the metaphor **MORE IS UP**. Since this metaphor is so pervasive in language, thought, and experience (Lakoff

& Johnson, 1980), it might also be a motivating factor in the current context, even though the increase operation here corresponds to a literal upward movement. The ‘increase by two’ example might constitute a special case, with metaphoricity being activated regardless of the specifics of the operation corresponding to an ‘increase’.

When gestures of orientation and gestures of measurement are performed in contexts away from the production line, they may be used to achieve metaphoric reference to abstract paths, sizes, and movements. This emphasises the role of context in the interpretation of such gestures. As Kendon (2004) has written, “[a]ny given gestural form may, according to context, function now in one way, now in another” (p. 225). Along the production line, the presence of machinery and raw materials with concrete shapes and sizes, as well as the need to communicate about machine processes involving concrete movement, seems to influence the levels of metaphoricity that are likely to be activated in this precise domain of discourse. The iconic gestures studied so far are constrained to concrete reference, which appears to be a product of the role of the workers in this context and their relations to the artefacts it contains.

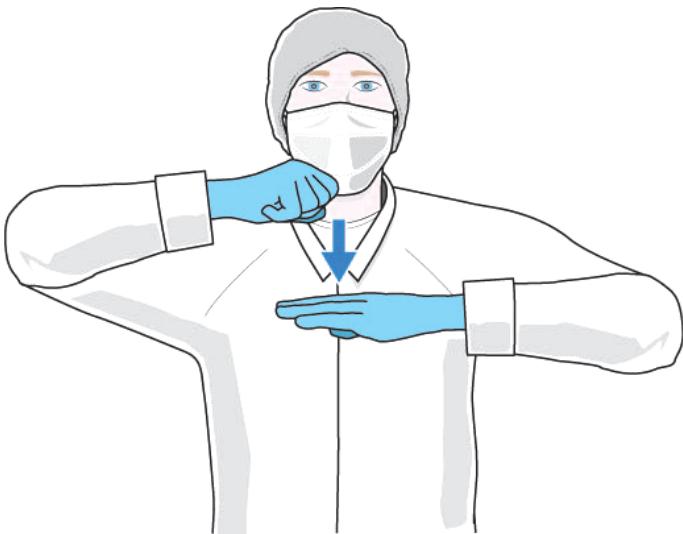
#### *4.2.3 Highly conventionalised gestures*

One set of gestures used in technical communications along the production line exhibited a high degree of conventionalisation. Although the gestures of orientation and the gestures of measurement were also conventionalised to some extent, their meanings were transparent and deducible from context. For this highly conventionalised set of gestures, however, the meanings were more opaque. The gestural forms were clearly articulated and looked similar to either emblems – conventionalised gestures shared by a community and glossable with a verbal counterpart (Ekman & Friesen, 1969) – or isolated lexical signs from a sign language.

To illustrate this type of gesturing, I will analyse the gesture in Figure 9, which means ‘fillets too hard’.

In this factory, the fillets of salmon are first frozen, and then sliced. If fillets spend too long in the freezer, they become too hard to be sliced properly. I observed that when this happens, the Slicer is first to find out, at which point she shouts to get the attention of the Fillet Supplier. When the Fillet Supplier is looking, the Slicer performs the gesture ‘Fillets too hard’. How does this gesture come to mean and be understood as ‘Fillets too hard’? To answer this question, I will adopt a method developed to account for precise relations between gesture form and meaning. According to Müller (2008a), this method involves:

Rather than generally stating that a gesture depicts or embodies this or that concept, it is spelled out exactly what aspects of the gesture’s form depicts or embodies which concept or which aspect of a concept. (p. 225)



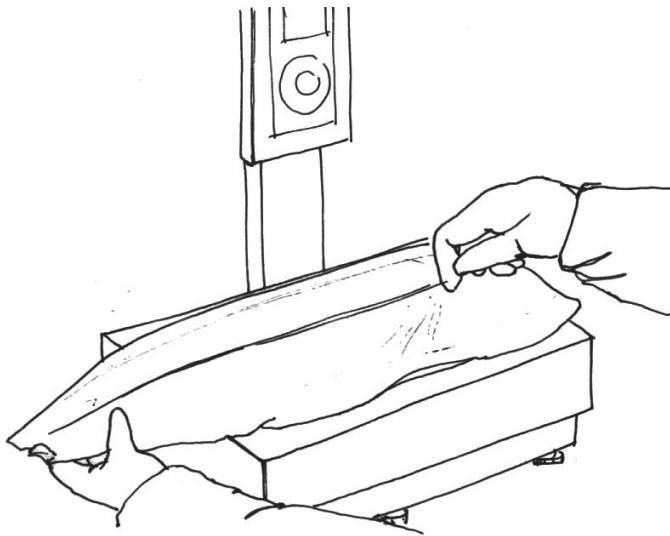
**Figure 9.** A Highly conventionalised gesture that means ‘fillets too hard’

To describe gesture form, we follow the approach of saying which hand is being used and then describing the four parameters of gestural action: the shape of the hand, the orientation of the palm, the position in gesture space, and the movement characteristics of the gesture (cf. Bressem, 2013). For the gesture ‘Fillets too hard’, the speaker uses both hands, the right hand is shaped in a fist and the left hand is held flat i.e. the fingers and thumb are all extended and adducted. Both palms are oriented downward. The left hand is located in central gesture space, and the right hand is located in upper central gesture space i.e. above the left hand. There is straight, downward movement of the fist onto the back of the flat hand. When the fist makes contact, the movement is repeated.

Which aspects of the gesture form depict which aspects of the concept ‘Fillets too hard’? The worker holds his right hand flat with the palm oriented downward in upper central gesture space. The shape of this form is ideal to refer to a fillet, just like the one in Figure 10.

Fillets have many properties: a colour, a smell, a texture, a taste, a temperature, a shape, a function, and so on. The gestural form – a flat hand palm down in central gesture space – represents the fillet’s shape, which indicates a metonymic mapping. One aspect of a concept (the shape) is selected to represent the concept as a whole (the fillet). We may call this conceptual metonymy SHAPE OF OBJECT FOR OBJECT.

The right hand is in a fist shape with the palm oriented downward. Positioning the right hand fist above the left hand flat, the speaker embeds the fist in a straight and repeated downward movement to make contact with the back of the left hand.



**Figure 10.** A frozen fillet from the salmon factory

By enacting hitting, this part of the gesture supplies the meaning ‘too hard’. To show that the fillet is too hard the speaker could make reference to numerous properties, such as stiffness, texture, temperature, or malleability. The repeated movement of the right fist onto the back of the left hand indicates the object being hit is resistant to pressure from a fist, and this portrays the concept of stiffness. This metonym may be referred to as RESISTANCE TO PRESSURE FOR HARDNESS.

To sum up, via metonymy, the left hand represents the concept ‘fillet’, while the corresponding action of the right hand represents the concept ‘too hard’. This establishes through a step-by-step procedure that the gesture signifies ‘Fillets too hard’. Separating the different aspects of form and meaning in this way only makes sense if we piece them back together afterward. While the step-by-step approach helps to analyse the gesture, in context the gesture is perceived as a gestalt and the meaning of the different parts is constructed simultaneously.

To explain how this gesture acquires meaning, there is no need to spell out a metaphoric mapping between a concrete source domain and an abstract target domain. Other instances of technical gesturing also do not need a metaphoric analysis to account for how their forms become meaningful. In my specific data set, this type of gesturing – gestures of orientation, gestures of measurement, and the highly conventionalised gestures – exhibits metonymic mappings within concrete domains but not metaphoric mappings to abstract domains. Figures 11 and 12 show two more of the factory’s highly conventionalised gestures along with their verbal counterparts.



Figure 11. Highly conventionalised gestures in the factory: 'salmon overflow'



Figure 12. Highly conventionalised gestures in the factory: 'fillet too soft'

If boxes containing salmon falling off the line began to overflow, the Line Worker nearest to the box would perform the ‘salmon overflow’ gesture to the Slicer. The two hands are flat, open and turned palm down. Beginning together in the upper centre of gesture space, the hands move up, out, then downward on an arced trajectory. In this gesture, the hands represent slices of salmon falling out of an imaginary box situated in front of the speaker. The shape of the slices and their trajectory are salient aspects of the event that receive metonymic representation in the gestural form. When the fillets were too soft to be sliced correctly, the Slicer would perform the ‘Fillets too soft’ gesture. Here, the hands are opposite each other with the palms up and thumb tucked in, and then oscillated up and down the vertical axis. This enactment of bending a soft fillet shows one feature of softness, namely malleability, being metonymically selected and encoded in the gesture.

## 5. Discussion

When we survey definitions of gestures that relate to metaphor, we observe at least one criterion in common: for a gesture to be metaphoric, it must signify some abstract concept. McNeill (1992), one of the first researchers to formally define gestures that express metaphors, writes that in metaphoric gestures, “*abstract* content is given form in the imaginary of objects, space, movement, and the like” (p. 145; italics mine). Later, Cienki (1998) concurs that “the criterion for establishing a gesture as (at least partially) metaphoric is that the gesture characterizes an *abstract* domain... in terms of the concrete” (p. 190; italics mine). Analysing videos of professors lecturing in American English, Sweetser (1998) provides further evidence that “gesture [...] shows a rich and regular set of spatial metaphors whereby *abstract* concepts are ‘embodied’ by being viewed in terms of concrete ones” (p. 2; italics mine). More recently, McNeill (2005) reaffirms that “[i]n a metaphoric gesture, an *abstract* meaning is presented as form and/or space” (p. 39; italics mine). Such definitions indicate that for a gesture to be metaphoric, it must be expressing some abstract concept. According to these definitions, the technical gestures that I observed in specialist communication on the production line at the salmon factory, which all relate to concrete domains of experience – raw materials, measurements, machinery, and production processes – appear to be constrained to concrete reference and may not be defined as metaphoric gestures.

In order to interpret the iconicity of the gestural form features and show how they encode meaning, a metonymic mapping occurring within a concrete domain of experience is sufficient. An iconic gesture is always created and interpreted through a metonymic process, but whether or not metaphor is subsequently involved, depends on whether or not the image is then used metaphorically i.e. to

refer to some abstract concept (Mittelberg & Waugh, 2009; Taub, 2001). With the gestures observed along this production line, such as repeatedly banging a fist onto the back of a flat hand to mean ‘Fillets too hard’, we have iconic gestures created via metonymic mappings (for example, SHAPE FOR OBJECT and RESISTANCE TO PRESSURE FOR HARDNESS), all of which relate to some concrete domain of experience. What we do not seem to have, at least in the salient technical gestures that I captured at this factory, is the extension of the concrete image to refer metaphorically to an abstract domain.

The apparent constraint to concrete reference could be due to several factors. First, Cienki (2008) has emphasised that the genre of the discourse influences how many metaphors will be observed. An elicited retelling of a highly imagistic animated cartoon, for instance, “reduces the amount of thought and talk on abstract topics, which might be accompanied by metaphoric gestures” (p. 21). Conversely, analysing discussions of topics like love (Müller, 2007, 2008a), honesty and morality (Cienki, 1998, 2008), spiritual experiences (Evola, 2010), and linguistic theory (Mittelberg, 2008; Sweetser, 1998) yields a high rate of metaphors both in speech and gesture. The technical gestures analysed here were specifically related to aspects of manual labour along a production line. In this type of discourse, the same messages recur to deal with the same issues day in day out, and these issues involve concrete artefacts like machinery, mechanical operations, and raw materials. The context in which this genre of specialist discourse unfolds, in addition to the types of artefacts it contains and how the workers relate to those artefacts, may be limiting the need to project from concrete source domains to abstract target domains.

A second factor might be the short duration of the communications documented along the production line. When technical gesturing occurred between workers, it was not part of elaborate and lengthy utterances. The specialist work-related communications were short, taking place during brief and hectic exchanges. Studying educational discourse domains, Cameron (2003) has highlighted that metaphor develops over a stretch of discourse. Her work encourages linguists to look beyond the utterance level when analysing metaphors. Müller (2008a) extended Cameron’s finding to gestures and showed that “metaphoricity is not restricted to single clearly bound entities – be they linguistic expressions, gestures, or concepts” (p. 219). She found that “metaphoricity may be active and maintained over stretches of discourse and it may be subject to successive foregrounding over units of talk and discourse” (*idem*; also Müller, 2008b; Müller & Tag, 2010). Perhaps the staccato style of utterances involved in the specialist technical gesturing at the salmon factory was an additional factor imposing limits on the potential for abstraction and consequent activation of metaphoricity.

Third, the technical gestures observed along this production line appear only to be used for communications relating strictly to concrete aspects of work. In other industrial environments that have been studied, workers used highly conventionalised gestures to communicate messages that were not necessarily related to work. For example, in discussing the study by Meissner and Philipott (1975a), Kendon (2004) reports that the gesture system had “expanded to permit exchanges on a variety of topics unrelated to work” (p. 294). An example he gives of this expansion is metaphorical extensions of the signs for ‘good’ and ‘bad’ which he says could then be performed “in relation to the stomach to indicate states of well-being and physical illness” (p. 296). If the gesture system at the salmon factory were to ‘expand’ in this way, then analysing the iconicity of their forms might uncover metaphorical projections to abstract domains. The gesture for ‘Fillets too hard’, for instance, could extend to the abstract domain of ‘difficulty’, coming to mean something like ‘Management too hard’, ‘Workload too hard’, or ‘Week too hard’. If difficult weeks became understood and referred to as hard objects, this would be revealing of a conceptual metaphor like DIFFICULTY IS HARDNESS and ASPECTS OF WORK ARE OBJECTS. The images already encoded in the iconic gestures via metonymy would serve as source domains for metaphoric projection to abstract domains. This type of process could apply to the other highly conventionalised gestures at the salmon factory, which all relate to some basic and concrete domain of experience. These domains of experience are reminiscent of ‘image schemas’ (Johnson, 1987, 2005), including containment (‘Salmon overflow’; Figure 11), contact and blockage (‘Fillets too hard’; Figure 9). Since these gestures do exhibit image schematic properties, their potential to be the basis for future metaphoric gestures in the factory could be a reality. As Mittelberg (2008) has written, “[m]ediators between the concrete and the abstract, image schemas are assumed to provide basic conceptual structures for metaphorical projection” (p. 145; on image schemas in gesture, see also Cienki, 2005 and Mittelberg, 2010).

Bringing these points together, I propose that, in addition to the genre of discourse, the length of utterances, and the restriction of communication to topics related to technical aspects of work, levels of metaphoricity in a discourse domain are also affected by the type of environment in which that discourse unfolds. More specifically, the frequency of metaphor may be influenced by the type of artefacts that populate the speakers’ environment and the role those artefacts play in the types of communication taking place. Looking back at the images from gestures on the shop floor (Figures 1, 4, 5, 6, 7, and 8), the presence of machinery and raw material distinguishes these images from images of other environments depicted in papers on metaphor and gesture. For example, in Cienki (1998), the speakers are seated in a calm office environment where they are asked to give opinions about topics quite unrelated to the objects in their immediate environment. Müller’s

(2007) study of metaphor is based on speakers sitting comfortably in a lounge setting, surrounded by objects such as chairs, coffee tables, and even wine glasses, but discussing topics like previous romances and producing metaphoric gestures accordingly. Along the production line, the referents of the gestures are present and play a central role in the topics being communicated, reducing the need for elaborate abstractions and metaphoric projections. The relation between the speakers and their environment has an effect on the level of metaphoricity in the discourse.

In studies of metaphor and gesture in classroom environments, we see a different way in which objects in the environment play a role in frequency of metaphors. In the metaphor studies by both Mittelberg (2008) and Williams (2008), the speakers are referring to artefacts in their environment (such as blackboards and other learning apparatus), but in contrast to the workers along the production line, the classroom speakers are referring to these artefacts as a support to reach the abstract concepts they are trying to teach (such as aspects of linguistic structure and theory in the case of Mittelberg's study, or aspects of time-telling in the case of Williams'). Along the production line, the artefacts are themselves serving as the object of reference, being referred to for their physical properties or aspects of their function.

Making this distinction may not always be possible, for example if metaphor is underlying the design of the machine or object being referred to. In this case it would become problematic to discern whether an iconic gesture exhibits mappings from the artefact to gesture form or from the source domain of the artefact's inbuilt metaphor to the gesture form. Since presence of the artefacts being referred to in discourse could be a significant factor that leads to higher or lower levels of metaphoricity, further exploring the role that artefacts in the speaker's environment play in activation of metaphoricity should contribute to a fuller understanding of metaphor in different domains of discourse.

Although I have argued for the lack of activated metaphoricity in the shop floor gestures studied here, I am aware that distinguishing strictly between metonymy and metaphor is problematic. Referring back to Jakobson (1956/1990), Mittelberg and Waugh (2009) emphasise that metaphoric and metonymic modes are not mutually exclusive. They follow Jakobson in arguing that "the nature of a given sign is dependent on the preponderance of one of the two modes over the other" (p. 335). Müller (2008a) has also stressed that metaphor "activation is not an on-off process; it holds on over time and it comes in degrees" (p. 240). For the gestures analysed here, I do not wish to exclude that metaphor could be present to some extent in the metonymies I mapped out. As I suggested, pointing up to mean 'increase' could be inherently metaphoric. And a gesture that encodes a path could exhibit metaphoricity. Nonetheless, I hope to have shown that in the specific instances of their performance along the production line, these gestures referred

to literal movements along the vertical axis and literal paths that were part of the artefacts and processes being referred to on the shop floor. Because of the role these technical gestures play in this unique environment, the potential to project to abstract domains and activate metaphoricity was unexploited.

Furthermore, without detailed transcriptions of the co-occurring speech, I cannot rule out the presence of metaphoricity in these gestures. Metaphors may occur in spoken discourse mono-modally or multi-modally (Cienki, 1988, 2008; Müller & Cienki, 2009; Sweetser, 1998). Moreover, it is not only speech and gesture that may indicate activated metaphoricity. In Müller's dynamic theory of metaphor (2007, 2008b), it is important to take into account other kinds of 'metaphor foregrounding strategies', which may include head gestures, body postures, eye gaze, and prosody (see Müller & Tag, 2010). This is something that the quality of the videos taken in this industrial environment has not allowed me to do. Another constraint on the data is the scope of the recordings. This study is based only on video data of the workstations in the conditioning zone and focuses on single, utterance-level interactions around those stations. Other studies of factory communication, such as Stubbe (2000), emphasise that "communication in this setting involves a complex joint negotiation of meaning which may extend well beyond the boundaries of a single interaction" (p. 1). Video data of team meetings, coffee breaks, and canteen interactions would be undeniably useful in interpreting the moments of interaction extracted and analysed above.

## 6. Gesture, metaphor, and language

Finally, in his discussion of gesture codes, Kendon (2004) writes "there is no clear boundary that divides something we wish to call a 'language' from systems that do not seem to merit that term" (p. 306). The gestures along the production line studied here are clearly related to language. They draw on the resources of verbal and gestural communication in ways similar to the linguistic systems used outside the factory. Language is being adapted to the specialist industrial environment in which it momentarily finds itself. If metaphor is not a salient feature in this adapted form of language, it could indicate that language has become momentarily constrained in this environment.

Sweetser's (1990) diachronic study of the modal verbs in English taught us that, over time, linguistic meanings tend to extend from concrete meanings to more abstract ones. Later research into sign languages suggested that signs undergo a similar evolutionary process (e.g. Wilcox & Wilcox, 1995; Wilcox, 2005). The technical gestures observed along the production line studied here might present a rudimentary gesture system, one whose signs are frequently constrained

to concrete reference only. The noise of the environment, the space between the workers, the high productivity demands – these factors could momentarily restrict the necessity to refer to abstract domains of experience.

As Kendon (2004) writes, “there are continuities between gestural expressions improvised on the spot by speakers who find themselves, for a moment, in circumstances where they cannot use speech, and the gestural expressions found in complex sign languages” (p. 306). This study offers a snapshot of another use of gesture to be situated along that continuum, and highlights the need for further investigation of metonymy, metaphor and gesture in such specialist discourse settings.

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## SECTION IV

### **Metaphor in science writing**



# High on metaphor, low on simile?

## An examination of metaphor type in sub-registers of academic prose

J. Berenike Herrmann

Göttingen University, Germany

Recent corpus studies found that academic prose is particularly rich in metaphor, but exhibits an unexpectedly low proportion of forms of ‘direct metaphor’, such as simile (cf. Steen, Dorst, Herrmann, Kaal, & Krennmayr, 2010a; Steen et al., 2010b). One explanation is deliberate metaphor use: in opposition to indirect forms (*he attacked my argument*), direct forms of metaphor (*the leaf is shaped like a minaret*) are normally explicitly signaled and often appear more vividly ‘metaphorical’. To control precision of linguistic reference, and to abide by an overarching stylistic maxim of academic prose that regulates marked figurativeness, writers of academic texts may thus try to delimitate deliberate metaphor use in the form of direct metaphor.

However, recent advances in the study of English for Academic Purposes have stressed that the analysis of academic discourse cannot ignore ‘disciplinary specificity’ (cf. Hyland, 2009). Using an exploratory approach, the present chapter hence transgresses the rather broad unit of ‘register’ to zoom in on academic prose as specialist discourse of distinct ‘sub-registers’. Using the academic text sample (some 49,000 words) of the VUAMC (Steen et al. 2010c), it analyzes three metaphor types (indirect, implicit, and direct) across four different academic sub-registers (humanities arts, natural sciences, politics law education, social sciences). I report variation of metaphor type across the sub-registers, with the highest proportion of direct metaphors in natural sciences, followed by humanities arts. My findings on variation of metaphor type advances a finer-grained view of metaphor use in academic prose, taking into account distinct communicative functions of metaphor types.

## 1. Introduction

From the perspective of general language use, academic discourse is specialist discourse, with writers and readers sharing a substantial amount of specific knowledge and linguistic items not easily accessible to people from the outside. What is more, generally speaking, writers of academic prose adhere to specific stylistic guidelines, in particular, those of the ‘plain style’ first demanded by Bacon, Hobbes, and Locke during the Scientific Revolution in the 17th Century (see e.g., Semino, 2008). This stylistic maxim, which is still in use today (cf. Giles, 2008) has propagated the production of precise and exact prose – and devalues figurative language use. At the same time, recent advances in EAP (English for Academic Purposes) have stressed that there is not one stylistic convention for academic writing, but many, with ‘disciplinary variation’ being one of the crucial defining factors of academic prose (e.g., Hyland, 2006). Hence, the question arises whether and how actual samples of the register ‘academic prose’ use metaphor: not only in comparison with other main registers such as fiction, news, and conversation (cf. Steen et al., 2010a,b) – but also *within* the academic register. Taking seriously the call for a discipline-dependent examination of academic prose, I take a first, exploratory, step by extending the corpus-linguistic analysis of metaphor type to academic *sub-registers*.

Today, popular ideas about academic style ‘in general’ are reflected in general notions of linguistic registers: for example, many people see academic prose as largely metaphor-less in contrast to a register like fiction, which is seen by many as marked by frequent and vivid use of metaphor (cf. Semino & Steen, 2008; Biber, Johansson, Leech, Conrad, & Finegan, 1999). Academic prose hence looks like the prototypical informational register that applies ‘literal’ language with the aim “to present information as concisely and precisely as possible” (Biber, 1988, p. 105). Along the same lines, typical textbooks on academic (and technical) writing advise students to use metaphor “sparingly” (e.g., Day & Sakaduski, 2011, p. 38), given the apparent risk of “losing the comprehension of our readers” whenever “a word or phrase is used in other than its literal meaning” (2011, p. 37). Yet, from the perspective of discourse specialization adopted in this paper, it seems important to note that despite general patterns, academic writing conventions are not monolithic, but vary across academic disciplines, sub-registers, and schools (cf. Hyland, 2009).

At the same time, in the last few decades, metaphor has been increasingly recognized as a pervasive phenomenon of basically any natural discourse (e.g., Lakoff & Johnson, 1980; Paprotté & Dirven, 1985), based on the (contrary!) assumption that “[m]uch subject matter, from the most mundane to the most abstruse scientific theory, can only be comprehended via metaphor” (Lakoff, 1993, p. 244). This can be seen as a direct contradiction of the stance taken by scholars like

Day and Sakaduski, assuming that metaphor *impedes* comprehension. Today, a wealth of cognitive- and increasingly corpus-linguistic literature documents metaphorical language use in diverse domains of natural discourse, including conversation (cf. Kaal, 2012; Pasma, 2011), literature (cf. Dorst, 2011), and news (cf. Krennmayr, 2011; Pasma, 2011). As far as academic discourse is concerned, it is widely accepted that across the distinct academic fields, including science, metaphor is a basic epistemological, discourse-organizational, and pedagogical device (e.g., Boyd, 1993; Brown, 2003; Gentner, 1982; Gentner & Jeziorski, 1993; Giles, 2008; Kuhn, 1993; Rigney, 2001).

Most recently, Steen et al. (2010a, b) examined the actual frequency of metaphorical word use in four main registers of English. They found that academic prose has the highest number of metaphors of the four, followed by news, fiction, and conversation (in that order). What is more, 99% of all cases of metaphorical word use in the corpus examined (the VU Amsterdam Metaphor Corpus VUAMC, cf. Steen et al. 2010c) belong to a particular type of metaphor, ‘indirect metaphor’ (e.g., *attack* in *he attacked my argument*). In addition, they found that ‘implicit metaphor’, which picks up potential metaphorical mappings from indirect metaphors (e.g., *it* in *it is a small step – but you still have to take it*), is a very small category in terms of frequencies, and its distribution follows the main pattern of indirect metaphor across the main registers. Interestingly, this general pattern is opposed by ‘direct metaphor’, which is as a rule lexically signaled (e.g. as simile) and establishes reference to the metaphorical source domain directly (e.g., *Poplar leaves have an elegant outline resembling that of an Arab minaret*).

Although direct metaphor turned out to be a very small category in terms of frequencies as well, variation was significant across registers. Quite surprisingly, academic prose exhibits one of the lowest proportions of direct metaphors. One promising explanation for this lies in the usage of deliberate metaphor (cf. Steen, 2011): Direct forms of metaphor are more likely to be processed as overtly ‘metaphorical’, activating cross-domain mappings in the reader (that may under certain circumstances involve a relatively unconstricted search for linguistic reference). To control the precision of linguistic reference, and to abide by a general stylistic maxim of academic prose that regulates marked figurativeness, writers of academic texts may thus try to delimitate deliberate metaphor use in the form of direct metaphor.

The perspective on ‘main registers’ (academic prose, news, fiction, and conversation) adopted in prior research invokes a rather broad generalization over the many different specialized disciplines of academic prose. EAP scholars like Hyland emphasize that language use in particular academic disciplines is a communicative action that requires “specialized discourse competencies” (Hyland, 2009, p. 8) that are shaped by “particular ways of doing things” in the discourse community, both communicatively and epistemologically:

Each subject discipline constitutes a way of making sense of human experience that has evolved over generations and each is dependent on its own particular practices: its instrumental procedures, its criteria for judging relevance and validity, and its conventions of acceptable forms of argument. In a word, each has developed its own modes of discourse. (Wells, 1992, p. 290)

Writers of academic prose hence need to master the stylistic conventions of their disciplines for at least two reasons: to do justice to their subject matter (e.g., use precise wording where attention to intricate details is indispensable) and to show they are versed in the mode of discourse (e.g., use particular constructions, but not others, to signal valid approaches and argumentation). Assuming that there is indeed variation in subject matter and discourse modes for distinct academic sub-registers, I suggest that the stylistic conventions across sub-registers will hence vary as well: this will include the way in which metaphorical language use is regulated.

In order to explore finer degrees of metaphor variation in an intra-register perspective, the present paper adopts an exploratory approach to examine how three different types of metaphor (indirect, implicit, and direct metaphor) are distributed across four distinct sub-registers of academic prose (humanities arts, natural sciences, politics law education, social sciences). The approach is exploratory for two reasons: Firstly, because the selection of text fragments under scrutiny cannot claim full representativeness of the particular sub-genres (or disciplines), and secondly, because assumptions about discourse functions of the particular metaphor types in the specific sub-registers will be pending further analysis. In the following, I will first define the key terms and contextualize the present study by recourse to the preceding work on metaphor use across registers, before moving on to the corpus study of metaphor type across academic sub-registers.

In the present chapter, I examine metaphor as a lexico-semantic phenomenon, linking corpus-linguistic register studies (Biber, 1988; Biber et al., 1999; Conrad & Biber, 2001) to metaphor analysis (see also Herrmann, 2013). This framework accounts for linguistic variation among registers with recourse to the nonlinguistic basis of register variation, with an emphasis on the functional aspects of both the nonlinguistic and the linguistic levels of analysis. ‘Register’ is here 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). In the following, findings on metaphor can hence be interpreted with reference to the main communicative purposes of the academic register – information, argumentation, and explanation (Biber et al., 1999) – but also to aspects that are more closely tied to lexico-grammar, such as abstraction of information and explicitness of reference (cf. Biber, 1988).

In order to capture a greater degree of specificity than that covered by register, I apply the term ‘sub-register’. This term corresponds with the descriptive classification used in the British National Corpus, the BNC Index (Lee, 2001), which groups the academic texts included in the VUAMC into the categories *humanities arts*, *natural sciences*, *politics law education*, and *social science*. With its differentiation into four sub-categories of academic prose, the BNC Index allows finer grained hypotheses about quantitative variation in metaphor type use in a highly specialized register such as academic prose. One important reason for choosing this particular classification scheme was that it is part of the markup of the BNC, and thus the VUAMC. Although the BNC Index calls the unit of classification ‘genre’, the present paper treats the same unit by the term ‘sub-register’, treating the four descriptive categories as language varieties documented by the co-occurrence of particular linguistic features and influenced by contextual factors. Here, I find support in the BNC Index, which operates on the assumption that “*register* and *genre* are in essence two different ways of looking at the same object” (Lee, 2001, p. 46, emphasis his).<sup>1</sup>

I will examine metaphor at the level of language use, not the level of concepts or conceptual domains, using a variant of the Pragglejaz procedure for metaphor identification MIP (Pragglejaz group, 2007), called *MIPVU* (Steen et al., 2010b). In my study, linguistic metaphors are understood as related to potential “mappings across conceptual domains” (Lakoff, 1993, p. 245), but there are crucial differences in terms of (in)directness and implicitness of word use between the three particular types of metaphor that I will examine. In the following section, I will introduce the three metaphor types, together with a short summary of the quantitative results obtained by Steen and colleagues for each type and some exploratory hypotheses about their distribution across academic sub-genres. Section 3 will then offer a first approach to metaphor type distribution in academic discourse in intra-register comparison.

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1. The basic difference between register and genre, according to Lee, is that register is used “when we view a text as language: as the instantiation of a conventionalised, functional configuration of language tied to certain broad societal situations, that is, variety according to use” (2001, p. 46). Genre, by opposition, is used when a text is approached as “a member of a category: a culturally recognised artifact, a grouping of texts according to some conventionally recognised criteria, a grouping according to purposive goals, culturally defined” (2001, p. 46). Where Lee’s classification of the BNC puts an emphasis on the unit of analysis as culturally defined (genre), I choose the perspective of the (sub-)register as the one more strictly oriented towards variation of linguistic forms due to situational constraints.

## 2. Metaphor types

*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. For example, in (1) the contextual meanings of *distinguish* ('to recognize the differences between things') and *between* ('used for stating which two people or things are similar or different') are used for denoting an abstract act of discrimination between two legal categories (*murder* and *manslaughter*) which is even more abstract by being assigned to an inanimate entity (*English law*).

- (1) English law distinguishes between the offences of murder and manslaughter  
[...]. (ACJ, pol)<sup>2</sup>

Both words have, however, more basic meanings that relate to physical properties of objects; *distinguish* refers to a capacity to use the five senses ('to be able to hear, see, smell, or taste something clearly') and *between* denotes a spatial position/situation ('with someone/something on each side or end'). Thus, both are metaphorically used. Indirect relation to metaphor in academic texts occurs across all word classes (cf. Herrmann, 2013).

In their corpus-study of the VUAMC, Steen and colleagues found a high overall proportion of indirect metaphor for the whole corpus (13.3% of all lexical units in the corpus;  $n = 24,817$ ), especially in comparison with the other two metaphor types (that each make up .2%). Academic prose even has a substantially higher proportion of metaphorically used words (18.2% of all lexical units in this register are related to metaphor), followed relatively closely by news (16%) – at the ‘metaphorical end’ of the scale – whereas conversation (7.6%) is at the ‘non-metaphorical end’, and fiction (11.4%) takes rather the middle position. Academic prose, despite popular views on this register, is thus the variety that relies most extensively on (indirect) metaphorical word use. However, this does not mean that academic prose is more ‘lyrical’ than previously thought. Rather, inspection of the corpus revealed that the indirect metaphors used are backgrounded and conventional, denoting exact and field-specific assignment of linguistic reference

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2. Linguistic examples cited in the text (grammatically part of the text) that are related to metaphor are italicized and underlined (e.g., *an elegant outline resembling that of an Arab minaret*). Metaphorically used words within independent linguistic examples headed by a number are underlined. For example, “(1) English law distinguishes between the offences of murder and manslaughter.” The code in brackets indicates the BNC-fragment (e.g., ECV), as well as the particular academic sub-register to which the fragment was assigned ('humanities, arts' = hum; 'politics, law, and education' = pol; 'natural science' = nat; 'social sciences' = soc).

and linking the units of abstract and densely structured discourse (Herrmann, 2013). This seems to accord both with what could be expected on the basis of stylistic conventions of prototypical academic prose and from the point of view of the cognitively informed paradigm of metaphor studies.

The results reported in Steen et al. (2010a, b) predict that indirect metaphor is the most dominant metaphor type across all academic sub-registers. In the same way, all sub-registers should share the basic features of academic prose as an ‘informational’ register, with ‘no interactivity and online production’, a ‘specialist audience’, and a ‘global dialect domain’ (cf. Biber et al., 1999, pp. 15–17), with a high proportion of ‘abstract contents’, and need for ‘textual structuring’ (cf. Biber, 1988). Applying Biber et al.’s (1999, pp. 41–43) interpretation of Halliday’s meta-linguistic functions to the analysis of academic metaphor, I proposed elsewhere (Herrmann, 2013) that the predominant functions of indirect metaphor in academic prose are ideational (establishing of abstract reference) and textual (structuring of dense and abstract discourse). Further discourse functions that can be identified in indirect metaphors are personal (evaluation), interpersonal (persuasion and instruction), and aesthetic functions. I assume that even if indirect metaphor use may not vary much between sub-registers in terms of word frequency, considering the impact of ‘disciplinary variance’, there is good reason to assume qualitative differences in the way indirect metaphor carries out the five discourse functions across disciplines (sub-registers).

In contrast to indirect metaphor, *direct metaphor* is normally identified when lexis is “incongruous” with the rest of the text (Cameron, 2003; Charteris-Black, 2004) but can be integrated with the overall referential or topical framework by means of some form of (cross-domain) comparison. In other words, direct metaphors are normally types of ‘literal’ word use, typically comprising a (lexical) signal for comparison and directly expressing the source domains in the discourse, such as in the two following examples (2) and (3):

- (2) [...] Cystosoma, which also has enormously expanded eyes, looking like headlamps [...]. (AMM, nat)
- (3) Poplar leaves have an elegant outline resembling that of an Arab minaret. (AMM, nat)

Here, *headlamps* (2) and *Arab minaret* (3) are pieces of incongruous lexis in the context of paleontology that can however be successfully integrated by means of a nonliteral comparison between the two domains ‘body parts’ and ‘car parts’ and ‘leaves’ and ‘architecture’, respectively. The comparison is signaled by a so-called *metaphor flag* (a lexical signal indicating a potential cross-domain mapping, cf. Goatly, 1997; Steen et al., 2010b), and here conveys visual features of the two fossils (‘enormously expanded’, ‘round’; ‘elegant’, ‘slender’, ‘thickening towards the top’).

Since direct metaphors are frequently signaled by means of linguistic markers, and their source domains are directly established, it has been proposed that they may be often used deliberately for particular communicative purposes (e.g., Steen, 2011; see also Beger, this volume).

Steen et al. (2010a, b) found that direct metaphor is surprisingly infrequent in general (just 1% of all metaphor-related words in the corpus;  $n=336$ ). What is more, they found a specifically low proportion of direct metaphors in academic prose (.1% of all lexical units) and in conversations (below .1%), but higher ones in news (.3%) and in fiction (.4%). This finding was related to potential deliberateness, with direct metaphor “intentionally and explicitly instruct[ing] addressees to set up a cross-domain comparison between the referents designated in the discourse” (Steen et al., 2010b, p. 786). In the present example (2) and (3), taken from an introductory textbook on paleontology, the goal underlying a deliberate metaphor seems to be resorting to shapes of known objects for the elucidation of the shapes of newly introduced fossils – a pedagogical (interpersonal), but also ideational (epistemological) function. In other contexts, direct metaphors may have predominantly personal (expressive, evaluative) functions. In addition, with its marked stylistic status, it may perform specific aesthetic functions as well, such as highlighting novelty of linguistic form. Assuming disciplinary variance captured by the sub-registers, and reckoning that the stylistic ideal of ‘plain style’ may be stronger in the natural sciences and maybe the social sciences (which were in part modeled on the natural sciences), I hypothesize that in the subsequent study, frequencies of direct metaphor will vary across sub-registers. Moreover, with regard to functions, I suspect that the particular communicative usage of direct metaphor will vary as well.

The third type of metaphor examined in this study is *implicit metaphor*. Implicit metaphor works by means of lexico-grammatical substitution, either in the form of pronouns (or other pro-forms) or in cases of ellipsis and some form of coordinating constructions where non-existent words may be inserted into grammatical gaps picking up potential cross-domain mappings established elsewhere in the text. In general it thus relies on ‘cohesion’, 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).

Steen et al. report a relatively low total frequency of implicit metaphor ( $n=291$ , 1% of all metaphor-related words). In cross-register comparison, academic prose is the only register that significantly overuses implicit metaphor ( $n=121$ ).

- (4) If we agree that in that case women should be embraced by the liberty principle  
then so should children. (ECV, hum)

In sentence (4), the modal verb *should* refers back to the metaphorically used verb *embraced*, which means that co-reference is established within the sentence, and the conceptual mapping between physical acceptance ('to put your arms around someone in order to show love or friendship') and mental acceptance ('to completely accept something such as a new belief, idea, or way of life') set up by *embraced* is extended across the whole sentence. The higher frequency of implicit metaphor in academic prose seems to be related to its higher general proportion of indirectly used metaphor-related words in concert with its particular co-reference structure, which needs to incorporate long and densely integrated sentences within the discourse (cf. Biber et al., 1999). In terms of a hypothesis about implicit metaphor use in the sub-registers, this suggests that those sub-registers with longer and more densely integrated sentences should depict more implicit metaphors – not least because sentence length is a textual feature regulated by disciplinary stylistic conventions.

In all, the empirical question asked in the present study concerns the variability of metaphor type use across the more specialized sub-registers of 'academic discourse':

*How is metaphor distributed across the main metaphor types (indirect, direct, implicit) in four sub-registers of academic prose (humanities arts, natural sciences, politics law education, social sciences)?*

The discussion will relate findings to possible discourse functions (ideational, textual, personal, interpersonal, and aesthetic, cf. Biber et al., 1999, pp. 41–43).

### 3. Method

The data on which the present study is based was gathered within the VU Amsterdam metaphor project. In the project, attention was paid to a catalogue for good metaphor research practice proposed by the Pragglejaz group (2007, p. 14). Very few of the questions raised by Pragglejaz were not applicable in the present study (for example, the question whether contemporary meanings of historical texts were retained, as our texts are from the late twentieth century). In the following, I will spell out details about the materials used, the resources applied and the analysis details, including an iterative discussion procedure.

### 3.1 Materials

The materials were taken from VUAMC, which has been published as a public resource (Steen, et al., 2010a; for detailed descriptions see Steen et al., 2010b). This corpus drew its materials from the four-million-word sample BNC-*Baby*, itself an excerpt from the 100-million-word British National Corpus (BNC). Selected fragments were taken from the beginning, middle, and end of the complete BNC-*Baby* files. Table 1 shows details of the academic sample, which is the basis for the current analysis. It comprises four samples from the sub-registers humanities & arts ( $n=16,431$  valid units), natural science ( $n=6,554$  valid units), politics, law & education ( $n=9,934$  valid units), and social science ( $n=16,395$  valid units), totaling  $N=49,314$  valid units (words).

**Table 1.** Distribution of academic sub-registers in the VUAMC

Sub-register	Frequency	No. of fragments
Humanities & arts	33.3% ( $n=16,431$ )	5
Natural science	13.3% ( $n=6,554$ )	2
Politics, law, & education	20.1% ( $n=9,934$ )	3
Social science	33.2% ( $n=16,395$ )	6
Total	100.0% ( $N=49,314$ )	16

The academic sample comprises  $N=16$  text fragments with an average of 3,082 words per fragment (see Appendix B). Given the relatively small sample size and the rather unequal sampling in terms of number of fragments per sub-register, the following analysis has a rather exploratory character. 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. Furthermore, the chi-square analysis itself is able to compensate for varying sample sizes and numbers.

The BNC Index (Lee, 2001) accounts for the specialization within academic discourse by differentiating between six sub-categories: *humanities arts*, *natural sciences*, *politics law education*, *social sciences*, as well as *medicine* and *technology & engineering*. Of the six units, the first four appear in the VUAMC sample. Lee explains that the categories used in the BNC Index were “chosen after a survey of the genre categorisation schemes of other existing corpora (e.g., LLC, LOB, ICE-GB).” He stresses that these genre labels were carefully selected “to capture

as wide a range as possible of the numerous types of spoken and written texts in the English language, and the divisions are more finegrained than the domain categories used in the BNC itself" (Lee, 2001, p. 56).

### 3.2 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 reason for using this type of dictionary, and Macmillan in particular, is that it is a contemporary as well as corpus-based (cf. Pragglejaz group, 2007) resource. The *Longman Dictionary of Contemporary English* was referred to for a second opinion. *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.

### 3.3 Procedure

Metaphor identification was carried out by the *MIPVU* procedure (Steen et al., 2010b; for details on metaphor identification in academic prose, see Herrmann, 2013), with MIP (Pragglejaz group, 2007) as a starting point. Here is an abbreviated version of *MIPVU* (for more information please consult the respective sections in Steen et al., 2010b):

1. Find metaphor-related words (MRWs) by examining the text on a word-by-word basis.
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).
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).
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).

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

The use of the phrase ‘potentially explained by a cross-domain mapping’ is intentional and emphasizes the problematic connection between linguistic and conceptual metaphor identification. Among other things, the sections on metaphor type (direct and implicit metaphor), novel compounds, and signals for metaphor (‘MFlags’) are genuinely new in MIPVU in comparison to MIP.

### 3.4 Reliability

Reliability tests were conducted throughout the entire period of annotation of the VUAMC. Reliability was good (Fleiss’ kappa had a mean value of about .85). On average, the analysts achieved unanimous agreement before discussion for some 92% of all cases (see Steen et al., 2010b for more details). A significant analyst bias was alleviated by the overall protocol of analysis (described next). The analysis of the reliability of the annotation as 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 et al., 2010b).

### 3.5 Protocol

The annotation protocol involved an iterative procedure, with individual annotation of a separate fragment by one annotator in charge, followed by on-line peer review and group discussion, which led into final annotations (for details see Steen et al., 2010b). This protocol guaranteed further increase of consistency against the background of the systematic and explicit set of instructions introduced as *MIPVU*.

After post-hoc troubleshooting and correction (for details, see Steen et al., 2010b, Chapter 9), files were converted into an SPSS database. Where applicable, separated lexical units (compounds, phrasal verbs, and polywords) were merged into single cases. The total number of cases that remain in the SPSS database for the sample of academic prose is  $N=49,314$ .

#### 4. Analyses and discussion

In the following, I will report on variation of metaphor type across the four academic sub-registers. To obtain a general impression of how metaphor behaves across the different sub-registers, I will first compare ‘MRWs’ vs. ‘non-MRWs’ (disregarding the distinct metaphor types for the moment). Following this, I will report the actual analysis of metaphor, interpreting findings per sub-register.

##### 4.1 Bulk analysis of relation to metaphor across academic sub-registers

A two-way frequency table was constructed crossing the variables of ‘metaphor’ (with the two categories MRW; non-MRW) with that of ‘sub-register’ (with the four categories ‘humanities, arts’ = hum; ‘politics, law, and education’ = pol; ‘natural science’ = nat; ‘social sciences’ = soc). A chi-square analysis showed that there is a significant association between the two variables of metaphor and sub-register:  $\chi^2(3) = 14.02, p < .003$ ; Cramer’s  $V = .02, p < .003$ . No cells had an expected frequency lower than 5. However, the association is only significant at  $p < .003$ , which means that the probability of falsely rejecting the null hypothesis (i.e. assuming that there is an association whilst there is in fact none) is below .03%, but not below .01%. This observation is relevant since chi-square tests allow one to obtain significant associations easily when dealing with a relatively high number of cases. Thus, there does not seem to be a great deal of variation in metaphor type use across sub-registers.



Figure 1. Proportion of MRWs and non-MRWs across academic sub-registers

Steen et al. reported that 18.5% of all words in academic prose are related to metaphor (regardless of metaphor type). For intra-register variation, Figure 1 shows that the proportion across sub-registers indeed does not deviate much from this average, with percentages ranging from 17% (nat) to 19% (soc). However, a look at the standardized residuals in Table 2 shows that there is at least one significant difference, namely for nat, where the proportion of MRWs (17%) deviates negatively from what could be expected by chance (std. res. -2.8). Standardized residuals express the presence and magnitude of the deviation that each cell count has from an expected count. They are used to determine whether differences between the particular relative frequencies observed are statistically relevant (the null hypothesis being that lexical units are evenly distributed across metaphor types and registers).<sup>3</sup>

**Table 2.** Metaphor across sub-registers: standardized residuals

Metaphor	hum	nat	pol	soc
MRW	+8	-2.8**	-.8	+1.6
Non-MRW	-.4	+1.3	+0.4	-.7

\*\*significant at  $\alpha = .01$

Hence, three out of four academic sub-registers are on par with each other as well as with the average proportion of MRW in academic prose. Just the nat sub-register uses fewer metaphorical words (the standardized residual indicates that this is a significantly lower proportion). This pattern accords with prototypical ideas about academic disciplines and stylistic maxims, with natural sciences being the academic domain that has traditionally had the strongest suspicions of (unconstrained) metaphorical language. It may thus be the case that ‘warnings’ against metaphor issued in style guides of natural sciences have such an effect that in comparison with other academic sub-registers, metaphor is here indeed slightly less frequent. However, one has to keep in mind that with 17% words related to metaphor, the examined sample of nat is still ‘more metaphorical’ than the registers of news (16%), fiction (11.4%), and conversation (7.6%). It may thus be presumed that the bulk of indirect metaphors is used for reference and text structuring. In order to obtain a more fine-grained picture of metaphor types in academic sub-registers, factoring in direct and implicit metaphor, I will now report the analysis of metaphor type.

3. As large frequencies in corpora may often lead to significant results too easily, in the present analysis,  $\alpha$  was set at the .01 level of confidence. This was done in order to reduce the possibility of a Type I error. The critical value for standardized residuals is 1.96 at the level of significance at  $\alpha = .05$ , and 2.58 at  $\alpha = .01$ .

## 4.2 Analysis of metaphor type across academic sub-registers

A two-way frequency table was constructed crossing the variables of ‘metaphor type’ (with the four categories indirect; direct; implicit; non-MRW) with that of ‘sub-register’ (with the four categories ‘humanities, arts’; ‘politics, law, and education’; ‘natural sciences’; ‘social sciences’). Metaphor flags are included with the non-MRW category. A chi-square analysis showed that there is a significant association between the two variables of metaphor type and sub-register:  $\chi^2(12)=58.01$ ,  $p<.0001$ ; Cramer’s  $V=.02$ ,  $p<.0001$ . No cells had an expected frequency lower than 5. Since high counts lead to significant associations easily when chi-squares are computed, the present analysis will explore the results with due caution.

**Table 3.** Distribution of metaphor types across academic sub-registers

Sub-register		Indirect	Direct	Implicit	Non-MRW	Total
Humanities & arts	Count	3,005 (18.3%)	21 (.1%)	59 (.4%)	13,346 (81.2%)	16,431 (100%)
	Std. res.	+.4	+2.2*	+2.9**	-.4	
Natural science	Count	1,087 (16.6%)	12 (.2%)	17 (.3%)	5,438 (83.0%)	6,554 (100%)
	Std. res.	-3.0**	+3.0**	+.2	+1.3	
Politics, law & education	Count	1,780 (17.9%)	0 (.0%)	22 (.2%)	8,132 (81.9%)	9,934 (100%)
	Std. res.	-.6	-2.8**	-.5	+.4	
Social science	Count	3,089 (18.8%)	6 (.0%)	23 (.1%)	13,276 (81.0%)	16,395 (100%)
	Std. res.	+2.0*	-1.9	-2.7**	-.7	
Total	Count	8,961 (18.2%)	39 (.1%)	121 (.2%)	40,192 (81.5%)	49,314 (100.0%)

\*significant at  $\alpha=.05$

\*\*significant at  $\alpha=.01$

Note. Raw frequencies in brackets.

As could be inferred from the results of the VU Amsterdam group, all four sub-registers rely mainly on indirect metaphor (as reported, academic prose has an average proportion of indirect metaphors of 18.2%, equaling  $n=8,961$  of all  $N=49,314$  lexical units). Table 3 shows that percentages range from 16.6% MRWs in nat to 18.8% MRWs in soc. Inspection of standardized residuals confirms that indirect metaphors are underrepresented in nat, but overrepresented in soc. Meanwhile, hum and pol are close to the proportion of the average count (18.2%). This is the same pattern as observed for sub-registers in the binary metaphor analysis above.

As can also be anticipated from Steen et al., direct and indirect metaphors are scarce overall. Implicit metaphors show an average distribution of .2% ( $n=121$ ) in academic prose, ranging across sub-registers from .1% ( $n=23$ ; soc) to .4% ( $n=59$ ; hum). The pattern however does not directly mirror that of indirect metaphor (as could have been expected): hum has an average proportion of indirect MRWs, but shows the highest proportion of implicit metaphor (.4%,  $n=59$ ), whereas soc has the highest proportion of indirect MRWs, but the lowest proportion of implicit MRWs (.1%,  $n=23$ ). Nat, which has the lowest proportion of indirect MRWs, has an average one for implicit MRWs (.3%,  $n=17$ ). Only pol (.2%,  $n=22$ ) has an average proportion in both indirect and implicit MRWs. This overall irregular pattern requires more interpretation, and analysis.

Lastly, the  $n=39$  words identified as direct metaphors in academic prose equal an average occurrence of .1% of all lexical units in academic prose, ranging across sub-registers from .0% ( $n=0$ ; pol) to .2% ( $n=12$ ; nat). Here, sub-registers are grouped roughly in pairs: Very low frequencies can be observed in soc ( $n=6$ ) and pol ( $n=0$ ), with the standardized residual for pol significantly below chance, and that of soc bordering significance. Slightly higher frequencies, which are also significantly above the estimated count, can be found in hum ( $n=21$ ) and nat ( $n=12$ ). In all, although the observed frequencies for direct and implicit metaphors are very low, the three metaphor types depict an uneven distribution across the sub-registers, which is supported by the significant chi-square test. In the following, I will interpret the findings per sub-register.

#### 4.3 Humanities & arts

The reason why *indirect* metaphors have an ‘average’ distribution in the domain of hum may be related to the fact that texts produced in this domain are ‘typically academic’, with abstract topics that require indirect metaphorical referencing, and the discourse itself in need of structuring by metaphorically used words across the word classes. For example, in sentences like *The attacks are based on empirical observation*, verbs and prepositions such as *based* and *on* are used to link phrases and clauses, and nouns such as *attack* are used to establish reference to abstract discourse units. Highly conventional MRWs such as *part* in *make up a part of the totality* are used to shape the identity of the referents, and spatial adverbs such as *here* and *below* are used to establish intra-textual reference (cf. Herrmann, 2013, Chapter 6). At the same time, (inter)personal functions such as evaluation and persuasion may be inferred for conventionally MRWs like *attack* as well, since they carry particular connotations that may affect readers’ reaction to the presentation (in this case, aspects of ‘violence’ and ‘causing damage’ may be transferred from

the bodily-oriented basic meaning to the contextual meaning of ‘strong criticism’). With their potential for carrying connotations and creating possible deliberateness (e.g., through textual collocation), indirect metaphors are also candidates for carrying out aesthetic functions (e.g., highlighting or backgrounding stylistic choices made by the author). Given stylistic conventions that allow for some flexibility in hum, indirect metaphors may be used not only for shaping reference and cohesion, but also for persuasion and expression of stance, and for stylistic reasons. A closer examination of stylistic variation in indirect metaphors in terms of the different discourse functions carried across distinct academic disciplines is an empirical question that should be answered in future studies.

Meanwhile, the comparably higher proportion of implicit metaphors in hum may be explained with regard to the textual function: hum texts may have longer, and probably even more densely integrated, sentences than the other sub-registers. Where sentences are long, and MRWs make up a substantial part of the prose, the probability of co-referential devices related to metaphor may rise (e.g., *it* which co-refers to *view* in *This view, as we shall see, has been attacked on the grounds that it rests on the false assumption [...]*). 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:  $\chi^2(9)=1790.523, p < .001$ ; Cramer’s  $V=.10, p < .001$ . No cells had an expected frequency lower than 5.

**Table 4.** Percentages of sentence length across academic sub-registers

Sentence length	Sub-register				Total
	Hum	Nat	Pol	Soc	
<b>Very short:</b>					
1 to 10 words	4.0%	9.4%	4.0%	2.7%	4.3%
<b>Short:</b>					
11 to 20 words	15.4%	26.4%	19.2%	18.8%	18.8%
<b>Medium:</b>					
21 to 30 words	24.3%	27.1%	30.3%	36.9%	30.1%
<b>Long:</b>					
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%

Table 4 shows that hum indeed has relatively few sentences that are very short, short, or of medium length, whereas more than half of all sentences have 31 words or more (56.3%). By contrast, the other sub-registers have proportions of long sentences that lie clearly below 50% (nat has 37.1% long sentences; pol has 46.5%; soc has 41.6%). The higher frequency of long sentences in hum may thus help to explain its higher proportion of implicit metaphors, with implicit metaphors probably catering to a need for establishing coherence in long sentences. 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.

As far as *direct* metaphors in hum are concerned, the comparably higher proportion (again, this means just  $n=21$  lexical units) may be due to flexibility of conventions in terms of stylistic variance in the humanities. Direct metaphors as a rule highlight the presence of figurative comparisons, which makes them often appear more ‘metaphorical’ than indirect or implicit metaphors, allowing for imagery and possibly for some degree of ambiguity in meaning.

In sentence (5), which originates from an article on Frida Kahlo that appeared in the *Oxford Journal of History of Art*, reference is made to a particular definition of art by the surrealist artist Breton, who described art as ‘ribbon round a bomb’, whereas sentence (6) compares Frida Kahlo’s body and appearance directly to ‘the canvas’ and ‘art’, respectively.

- (5) 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 as a ‘ribbon round a bomb’.
- (6) It is her body as the canvas, her appearance as art. (A6U, hum)

Both examples suggest that the writer uses direct metaphor to convey a relatively rich and atmospheric meaning. This may be attributed to a particular academic writing style in a hermeneutic discipline that (among other things) strives to convey the experience of viewing a piece of art. However, hum as a sub-register is diverse in itself, which means that the particular forms and functions of direct metaphors may vary. For example, take a historiographical text:

- (7) Their [the soldiers’, JBH] value in battle, as shields 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, hum)

In opposition to the text from the history of art, (7) conveys a meaning that is less ambiguous and seems to pursue an educational/expository goal, directly

comparing soldiers to ‘shields’ in battle. It also carries a slightly evaluative meaning, vividly bringing before the eyes what was done to human beings in war. There may thus be divergent communicative goals of direct metaphors (within the humanities), with some catering more to aesthetic objectives (5 and 6) and other more to educational or evaluative ones (7). This of course is a tentative suggestion which needs to be investigated across the various fields of the humanities and eventually other sub-registers on a data basis broader than the current one.

#### 4.4 Social science

Social science has a relatively high proportion of indirect metaphor and a relatively low proportion of direct metaphor, while displaying a proportion of implicit metaphors that is below the expected count. The comparatively high proportion of indirect metaphor may be explained in the following way: Firstly, there is the bulk of typically academic metaphors that can be assumed to be constant across sub-registers (ideational and textual functions). Secondly, in social science, with an important tradition of ‘socially responsible’ and interventional science, some disciplines may tie observations to programmatic claims and the relatively overt evaluation of social facts and structures. For example, consider sentences (8) and (9) from a book called “Tackling the inner cities: the 1980s reviewed, prospects for the 1990s”.

- (8) The essays in this book do not amount to a programme: but they are intended to provide a springboard for one.
- (9) The aim is to analyse a problem which economic growth alone has failed to cure – and to consider possible new forms of public action. (AS6, soc)

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-MRWs (e.g., the positively connotated noun *programme*) and of MRWs (e.g., the positively connotated words *springboard* and *cure* with the respective contextual meanings of ‘something that helps you to become successful’ and ‘to solve a problem’ (Macmillan); the negatively connotated verb *failed* which is used with an inanimate agent, *economic growth*, and thus a personification). However, as stated above, more research is needed to examine how indirect metaphors behave in terms of persuasive and evaluative functions across disciplines and sub-registers.

*Direct* metaphors in soc are underrepresented, with all  $n=6$  appearing in just one text within one sentence:

- (10) This is the so-called Chinese postman problem, which provides a Hamiltonian circuit through the arcs (as compared with the travelling salesman problem which is a minimum route through the network nodes). (B1G, soc)

This sentence (10) is from a book on “handling geographical information”; with the ‘Chinese postman’ and the ‘traveling salesman’ being graphic examples that illustrate in an iconic way abstract tasks of combinatorial optimization. The computational processes to be modeled are thus illustrated by analogy to the particular and very specific kinds of paths of the ‘Chinese postman’ and the ‘travelling salesman’, respectively. This example is an exact use of direct metaphor, with precisely established reference in the source domain, and ideational and pedagogical functions.

As elucidated above, implicit metaphors are underrepresented in soc to their relatively high proportion of short sentences that may require fewer co-referential devices (see above), which in turn may be related to metaphor by implicitness.

#### 4.5 Natural sciences

Natural sciences seem to be the ‘least indirect’ sub-register, with a significantly lower proportion of indirect metaphors and a proportion of direct metaphors that is significantly higher than could be expected on the basis of statistical chance (the proportion of implicit metaphor is close to the expected count). The comparatively lower frequency of indirect metaphor (and the highest proportion of non-MRWs of all sub-registers) may be motivated by the highly exact and explicit style of the natural sciences (which could be seen in the direct tradition once established by Bacon, Hobbes, and Locke). However, as stated above for the analysis of MRW vs. non-MRW, the overall proportion of indirect MRWs in nat is still higher than in the other main registers of English (news etc.). On the other hand, the relatively frequent use of simile and other forms of direct metaphor may seem irregular, at least if relating it to overt evaluation and persuasion. Yet, as mentioned above, direct metaphor seems to comply very well with the more strictly scientific ideals of precision and logic, being after all ‘literal’ language use.

The comparatively high frequency of direct metaphors in natural sciences may thus be related to this feature, especially when taking into account that these direct metaphors seem to be largely restricted in terms of referents to be compared (e.g., eyes – headlamps). In fragment (11) below from a physics textbook, two nouns are identified as direct metaphors, *sausage* and *kink*. Both words pre-modify the noun *instability* and are preceded themselves by the adjective *so-called* that works as a flag for metaphorical word use.

- (11) If the cross-section happens to be smaller at a certain place, then the forces are larger there than at the neighbouring cross-sections, so the beam will be further constricted, etc., leading to the so-called sausage instability (Fig. 3.3(a)). If the magnetic field happens to be larger at one side than at the other side, then the beam will be deflected towards the weaker field which makes the field even weaker, etc., leading to the so-called kink instability (Fig. 3.3(b)).

(FEF, nat)

These are hence no direct metaphors in the form of simile, but cases in which irregular referents stick out from the discourse and are integrated by a lexical device. Here, *so-called* also has the function of hedging the indirect comparison between magnetic fields and objects of the mundane world. It is clear that no (poetic) identity between the two referents is assumed; rather *kink* and *sausage* work as heuristic or memnotechnic dummies for approximating an explanatory model of particular constellations in magnetic fields. Moreover, the educational function of direct forms of metaphor is well attested, and may be responsible for the observed results. This impression is reinforced when taking into account that the natural science sample is constituted from fragments from textbooks, genres with a clear educational purpose (cf. Appendix A). Here are two further examples from the textbook on palaeontology:

- (12) Canals within the algae stand out as rods in this kind of preservation, which is common in Ordovician rocks.
- (13) Protagonists of the warm-blooded theory will show some of the horned dinosaurs charging over the Cretaceous plains like furious reptilian rhinoceroses!

Especially in (13) the style is engaging, with a clear interpersonal function best exemplified by the exclamation mark. In both examples, direct metaphors are used to illustrate the description: in (12) *canals* are compared to *rods*, in (13), the movement of *horned dinosaurs* is likened to that of a fictive type of *rhinoceros*. Further analysis is needed to validate and test these ideas about metaphor types in the natural sciences.

#### 4.6 Politics, law, and education

The sub-register pol does not deviate from expected counts in indirect metaphor, implicit metaphor and in non-metaphorical words. In contrast to the other sub-registers, direct metaphor however does not occur at all. The sample is composed of three fragments, one from the domain of law, one from educational psychology, and one from educational policy, and all of them are taken from chapters of books (see Appendices A and B). Interestingly, the metadata in the BNC assign the label

'social sciences' to all three fragments, and indeed, in terms of metaphor distribution, pol is relatively similar to soc (social science however shows relatively more indirect metaphors). From the present perspective (despite my decision for sticking with the classification of the BNC Index), this particular sub-register seems a bit arbitrary, and 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.

Finally, Table 5 shows the raw numbers for all metaphor types, ordered by text fragment, and sub-register. It is notable that the two types direct and implicit metaphor behave differently in terms of their distribution across text fragments: while implicit metaphor appears in all fragments, direct metaphor appears in just  $n=6$  of the total  $N=16$  fragments. The hum fragment A6U shows most instances of direct metaphor ( $n=19$ ), followed by fragment AMM from nat ( $n=10$ ) and fragment B1G from pol ( $n=6$ ).

**Table 5.** Metaphor types across fragments and sub-registers: raw numbers

Sub-register			Metaphor type				Total
			Indirect	Direct	Implicit	Non-met	
Hum	Fragment	a6u-fragment02	488	19	5	2,258	2,770
		cty-fragment03	635	1	23	2,752	3,411
		ea7-fragment03	416	1	3	2,320	2,740
		ecv-fragment05	746	0	20	3,057	3,823
		ew1-fragment01	720	0	8	2,959	3,687
	Total		3,005	21	59	13,346	16,431
Nat	Fragment	amm-fragment02	484	10	11	3,361	3,866
		fef-fragment03	603	2	6	2,077	2,688
	Total		1,087	12	17	5,438	6,554
Pol	Fragment	acj-fragment01	685	0	6	3,479	4,170
		clw-fragment01	777	0	7	2,946	3,730
		crs-fragment01	318	0	9	1,707	2,034
	Total		1,780	0	22	8,132	9,934
Soc	Fragment	alp-fragment01	405	0	2	1,838	2,245
		as6-fragment01	655	0	5	2,688	3,348
		as6-fragment02	576	0	4	2,250	2,830
		b17-fragment02	256	0	3	1,344	1,603
		b1g-fragment02	619	6	5	2,373	3,003
		clp-fragment01	578	0	4	2,784	3,366
	Total		3,089	6	23	13,277	16,395
Total			8,961	39	121	40,193	49,314

Inspection of the fragments shows that words identified as direct metaphors often cluster in sentences, such as *piñata*, *above*, *teeming streets*, *city*, *decorative*, *potentially*, and *explosive* in (14):

- (14) Dislocated from its political context, it [Frid Kahlo's dress, JBH] hangs like a piñata above the teeming streets of the city; decorative yet potentially explosive.  
 (A6U, hum)

At first glance, this clustering of direct metaphors in particular texts may suggest that direct metaphor use is a function of idiosyncratic style of particular authors. However, it needs to be kept in mind that idiosyncrasies of this kind are actually regulated by disciplinary discourse. This means regulation in terms of frequency, as well as of communicative function (and the degree of exactness of reference and overt metaphoricality). In other words, the disciplinary discourse may typically leave room for an author's idiosyncrasies in terms of stylistic choices and thus metaphor use – or not. Here, the scope of stylistic freedom may depend on the degree to which the rules of writing styles are 'institutionalized' (e.g., through writing programs and style manuals) and/or controlled (e.g., peer review). The present study, with its limited number of cases from just a few disciplines, needs to leave a more definitive exploration of this question for future research.

## 5. Conclusions

This exploration of metaphor types across sub-registers has raised a number of questions that may inform future research. It suggests that the "particular practices" (Wells, 1992, p. 290) of academic disciplines that concern subject matter and philosophical setup, but especially stylistic conventions (including sentence length) are likely to influence the distribution of metaphor types across sub-registers. All sub-registers rely largely on indirect metaphor, but implicit and direct metaphors vary significantly across sub-registers. It was suggested that indirect metaphors are used to cater to the establishment of exact, specialist, and often abstract linguistic reference, as well as to provide links between units of complexly structured discourse. The prototypical indirect metaphor of academic prose is highly conventional, and has clearly demarcated meanings, while allowing for the construction of abstractness and complexity of content. Further uses of indirect metaphor have been mentioned as well, with personal and interpersonal functions, as well as possibly aesthetic ones. Future research is needed to examine systematic disciplinary variation (Hyland, 2009) in indirect metaphor use and its particular communicative functions.

Meanwhile, the distribution of implicit metaphors appears to depend on high frequencies of indirect metaphors, but also on sentence length (and structure). For direct metaphors, the sub-registers natural sciences and humanities & arts show a higher proportion than the other two sub-registers, but probably for divergent reasons; while natural sciences may restrict direct metaphor use to educational and ideational functions, humanities & arts may also apply it to create aesthetically rich and possibly entertaining prose. The comparisons conveyed by direct metaphor seemed more open-ended in humanities & arts, and more restricted and exact in the natural sciences (and the social science fragment). It seems that 'deliberate' use of metaphor (both in direct and indirect metaphors) may cater to a different range of goals in each of the distinct sub-registers. Further research, both qualitative and quantitative, is needed to explore these ideas in more detail. One promising venue is to extend the study to spoken genres of academic discourse, whose stylistic conventions, in concert with their communicative functions, may allow for more direct (and deliberate) metaphor (cf. Beger, this volume).

In the present study, I started out from the assumption that despite general defining features, academic prose is a heterogeneous register whose analysis can be easily split up into a range of specialist discourses. My findings have suggested that metaphor use in academic prose indeed depends on sub-register and, ultimately, discipline: The specialist discourse with its internal setup has an influence on metaphor type in terms of word frequency, and also seems to regulate its particular communicative functions.

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## Appendix A

**Table 6.** Overview of excerpts from BNC Files: academic prose\*

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).
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 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.), Macmillan 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).

Notes. \* From the 'List of works excerpted' in the BNC user reference guide, <http://www.natcorp.ox.ac.uk/corpus/baby/thebib.html>, retrieved 23 March 2015.

## Appendix B

**Table 7.** Overview of annotated files from BNC-baby

File ID	Sub-register	Domain*	Total no. of words in BNC file	Total no. divisions in BNC file	ID no. of file division coded	No. of lexical units in data
A6U	Humanities arts		27,329	6	2	2,814
ACJ	Polit law edu	social science	37,678	2	1	4,189
ALP	Soc science	social science	25,632	4	1	2,253
AMM	Nat science	natural sciences	39,563	2	2	3,866
AS6	Soc science	social science	30,938	4	1	3,366
AS6	Soc science	social science	id	id	2	2,840
B17	Soc science	social science	34,305	3	2	1,608
B1G	Soc science	applied science	38,559	2	2	3,006
CLP	Soc science	applied science	40,742	2	1	3,368
CLW	Polit law edu	social science	38,714	1	1	3,748
CRS	Polit law edu	social science	40,250	3	1	2,044
CTY	Humanities arts	world affairs	43,131	5	3	3,434
EA7	Humanities arts	world affairs	25,531	3	3	2,771
ECV	Humanities arts	belief and thought	40,343	7	5	3,847
EW1	Humanities arts	world affairs	41,695	2	1	3,708
FEF	Nat science	applied science	26,854	4	3	2,703
Total	NA		522,264	NA	NA	49,561

Notes. \* From the 'List of works excerpted' in the BNC user reference guide, <http://www.natcorp.ox.ac.uk/corpus/baby/thebib.html>, retrieved 23 March 2015. There are two divergent ways in which excerpts are classified in the BNC Baby: as sub-registers (originally termed 'genres' by the BNC Index; cf. Lee, 2001) in the meta-data embedded in the xml codes, and in terms of domains in the bibliography. With regard to the domain 'social science' and the sub-register 'politics law education', classification is not always straightforward. I report both classifications to provide the full picture.

# A mere metaphor?

## Framings of the concept of metaphor in biological specialist communication

Sanne Knudsen

Roskilde University, Denmark

This chapter presents a discourse analytical study of explicit reference to the concept of metaphor within a broad range of biological disciplines. The aim of the analysis was to study in what capacity the term ‘metaphor’ was conceptualized and framed in actual scientific research writing, and whether the different framings were related to the specific discipline or genre or even stage of scientific development. Though the concept of metaphor is generally valued as a scientific heuristic resource, two distinct positions on the specific values of metaphor in science are represented in the material. The dominant position criticizes metaphor for its open-endedness and aims at either empirically sanitizing or discarding the metaphor. A less dominant and more social-constructive position embraces the open-endedness as a valuable and dynamic scientific driving force suitable for scientific communication as well as heuristics. In either case, the explicit reference to metaphor functions as a rhetorical strategy for promoting and positioning the author’s own research.

### 1. Conflicting frames of biological metaphor: An example

The concept of metaphor is equally acclaimed and feared in science and scientific discourse. In the broadest of senses, metaphor represents the process of seeing or understanding something in terms of something else (Burke, 1945). Traumatic social relations of a psychiatric patient may be understood as a black hole with a deadly gravitational pull (Pecotic, 2002) and constrained engineering design processes can be understood and expressed as similar to processes of division of labour performed by ants producing complex ant colonies (Bilchev & Parmee, 1995). The metaphorization process enhances certain structural similarities (usually relations and descriptions) while ignoring others (often object characteristics). The ‘ant colony metaphor’, for instance, enhances the specific patterns of

cooperation between ants and the complexity of the result, while ignoring most differences between engineers and ants. This process of metaphorization invites new and sometimes unexpected perspectives by redescribing and reframing a given phenomenon to create new hypotheses, explanations and predictions. As such, metaphor and metaphorization not only communicate established knowledge, but are capable of generating new knowledge as well.

However, this power of metaphor is two-sided. As much as metaphor can innovate and fuel scientific understanding, it may just as easily produce confusion by allowing for unintended mappings, causing ambiguity or misunderstanding. The risk of ambiguity is a source of concern for scientists and at the core of the resistance against the use of metaphor in scientific writing and communication (see among others Baake, 2003; Keller, 2002; Lewontin, 2000; Maasen et al., 1995; Van Rijn-van Tongeren, 1997). On a broad scale, natural science is known to embrace empiricist ideals which emphasize the role of experimentation and the idea that genuine scientific processes involve bit by bit accumulation of valid knowledge through empirical examination. Consequently, scientific language used in specialist research communication and articles should accommodate those values by being as specific, unambiguous and thus as literal or transparent as possible – an ideally transparent container of scientific knowledge and empirical findings. As a result, metaphors in scientific discourse should be thoroughly sanitized before publication; that is they should be analysed, tested empirically and clarified in order to avoid ambiguity (Gentner & Jeziorsky, 1993; Leatherdale, 1974; Nerlich, Elliott, & Larson, 2009). Since metaphors are open to the reader's interpretation, scientific metaphors may run the risk of being interpreted in ways that are different from what the authors intended.

Avoiding the issue of metaphor altogether is, however, easier said than done, not least because metaphor can be valued and framed in different ways. The following example illustrates a clash between two divergent framings of the concept of metaphor published in *Science* in 2003. Two biologists, Matthew Chew and Manfred Laubichler, opened the debate by publishing an essay titled “Natural Enemies: Metaphors or misconceptions” (Chew & Laubichler, 2003a). The aim of the essay was to warn against undue use of metaphors in scientific communication in general and against the use of the metaphor of *natural enemies* in particular, because of its imprecision in describing aspects of ecology. Furthermore, they argue that such metaphors in fact can be replaced by more literal terms and are thus ornamental. The authors acknowledge the presence of metaphors in science, but argue that scientists should be cautious or even refrain from using them in scientific writing and communication, because of “dangerous or even deadly misappropriation” (p. 52). They suggest several alternatives to the metaphor of *natural enemies* to prove their point:

Throughout the ecological literature, natural enemies refer to relationships that can be more precisely described as herbivory, predation, parasitism, parasitology, or pathogen infection. Therefore, it is hard to see what the persistent use of the term natural enemies technically contributes to any ecological discussion. [...] we are concerned about the implications of the frequent use of bellicose metaphors such as *natural enemies* in the ecological literature. [...] Simplicity and intuitive appeal are also the main reasons why scientific language has never succeeded in “cleansing” itself from metaphorical “impurities,” despite several attempts to do so.

(Chew & Laubichler, 2003, p. 52; my emphasis)

There were several responses to the essay; three of them were published as letters to the editor in the very same issue, accompanied by a response by Chew and Laubichler themselves (Brümmer, 2003; Chew & Laubichler, 2003b; Maslansky, 2003; Perry & Schueler, 2003). These articles framed the concept of metaphor in a different light. For one thing, it was argued that metaphors were not simply ornamental, but deeply entangled with or even precursory of the very construction of scientific ideas. As such they could not be avoided or replaced without loss of meaning. Secondly, they pointed out that the essay itself was heavily laced with metaphor (such as the *cleansing of scientific language*). A closer look at the scientific epistemology of the concept of *natural enemies* illustrates that *natural enemies* itself in fact is a generative, knowledge-producing metaphor, and not a pedagogical addition (Atkinson, 1909). Furthermore, historical analysis of the suggested alternatives reveals at least some of them as equally metaphorical in origin. The term *herbivory*, for instance, is infiltrated by metaphorical thought and language, originating from a text heavily relying on war-metaphors (see Paris & Sikora, 1965).

This example illustrates the construction of different frames of what a metaphor is and in what forms it may be considered legitimate in specialist scientific communication and texts. Approaching scientific articles as a genre of specialist discourse, this chapter will combine genre and register analysis, investigating the different framings of metaphor by means of a corpus-based method. The working hypothesis is that the most dominating framing will probably be the traditional framing which views scientific metaphor as potentially imprecise, but alternative framings may co-exist within the discourse.

## **2. Metaphor as a heckler at the back, a Trojan horse or sonorous harmonics**

Although there are different positions on the use of scientific metaphor, most agree on one thing: metaphor is generally acceptable in the scientific realm as a cognitive and heuristic tool. The mental process of understanding a phenomenon in terms of another is generally accepted as having produced many an interesting

hypothesis. This position can be linked to a mentalist perspective on science in which scientific innovation is described as a purely cognitive or heuristic process solely dependent on the characteristics of the phenomenon to be studied and mental abilities and knowledge of the researcher. This heuristic perspective of metaphor resonates with an internalist and empiricist philosophical position on science in which hypotheses – and related metaphors – are verified or falsified through empirical and experimental testing. This perspective normally does not perceive of science and scientific knowledge production as situated, social and communicative (Lopez, 2007).

Within such an internalist and empiricist understanding, despite their heuristic function, linguistically expressed metaphors can become a sore point, because they are considered indefinite, polysemic and generally open to more interpretations than the ones intended by the researcher: Ideally they should be replaced by technical, non-figurative vocabulary. This linguistic ideal rests on the assumption that scientific knowledge in fact can be reduced to a system of literal sentences (cf. Gibbs, 1994, p. 170), and that the original cognitive metaphors initiating the research can be tamed and better yet, removed and replaced by more clear and accurate formal propositions in an “invented technical language” (Lewontin, 2000, p. 3). Within this linguistic and scientific ideal, metaphor is an uncontrollable potential disruption: “Metaphor is the subversive, the heckler at the back, the reprobate, the fly in the ointment of literalism [...]” (Gwyn, 2002, p. 120)

The argument that discursive metaphors can be avoided or replaced without loss of meaning has been met with critique from scholars from various disciplines, because it fundamentally rests on a naïve view of language and discourses. In fact, the very idea of the literal is problematic, since many so-called literal concepts are also at least potentially open to interpretation and in need of contextual cues in order to maintain a stable meaning. This goes in particular for abstract scientific concepts, since semantic ambiguity has always been an inescapable prerequisite of language and language use (Burke, 1945). Secondly, scientific ambiguity is not necessarily a problem, since it may invite further exploration and new insight (Burke, 1945; Journet, 2005, 2010; Monteiro & Keating, 2009). At the same time, metaphors in scientific texts are rarely used in scientific writing without a number of discourse markers guiding readers’ understanding of author intentions and specific meanings of the metaphor (Knudsen, 2005; Skorcynska Sznajder & Piqué-Angordans, 2005). Linguistic misrepresentation is more often due to a lack of co- and contextual messages than to the articulation of the specific concept itself.

Another concern to many is the ideological nature of metaphor. Within this frame, metaphors are rarely reproached for being empirically under-researched, but rather for being theoretically and ideologically under-analysed. Scientific metaphors are considered ideologically and culturally charged and persuasive. Maasen

and Weingart (2000) argue that metaphor is particularly persuasive, since it travels between domains and cultures as a “wandering nomad” smuggling cultural connotations and implications into science. For example, certain biological phenomena have been described and categorized via militaristic metaphors, such as the phenomenon of ‘invading species’. Sometimes such militaristic metaphors prove to be counterproductive to the un-biased understanding of the phenomenon (see Larson, 2005, 2007, 2008). As a result, such types of metaphor have been labeled in a negative way (Hellsten, 2000; Nerlich, Clarke, & Dingwall, 1999; Larson, 2005, 2007, 2008; Zinken, Hellsten, & Nerlich, 2008). The concept of metaphor is here seen as a potential Trojan horse: on the surface it may appear qualified and valuable, but below this surface all sorts of potentially damaging and unwanted connotations of mappings may be hidden. Their activation may take place whenever a given metaphor is used outside scientific discourses; that is, in public and political discourses (see for instance Goatly, 2007; Keller, 2002; Maasen & Weingart, 2000; Nelkin, 2001; Nerlich, Elliott, & Larson, 2009).

Metaphors in scientific language have hence been framed as potential disturbances to orderly discourse, carrying unintentional and wrong connotations. Baake’s (2003) understanding of scientific metaphor as allowing intentional as well as unintentional interpretations, which researchers choose relatively freely (according to personal preference or culture/ideology) is similar, but more neutrally expressed:

Musical harmonics are tones that sound in addition to the fundamental tone when a note is played. [...] These tones, known as ‘partials’ or ‘overtones’ fall at various frequencies above the main tone, meaning that each note is a blend of musical intervals. [...] The implications of this way of explaining metaphor is that some meanings resonating from a word will sound consistent with the listener’s expectations of sounds and others may not. (p. 8)

In summary, two main frames of metaphor in science emerge from the literature relating to two philosophical positions on the production of science. On the one hand, we have the classic, internalist framing of metaphor in which linguistic metaphor should either be avoided or empirically and conceptually sanitized. In contrast, a more externalist discursive framing focuses on metaphor as an integral part of scientific thought, discourse and communication dependent on cultural and rhetorical circumstances as well as experimental and scientific ones. The construction of a metaphor is seen here more as the working of an individual mind, but also as culturally and socially influenced. Thus, metaphor is the bearer of more or less intentional ideological connotations, which may influence scientific innovation as well as public opinion and policies.

The ways in which the concept of metaphor is ascribed values and functions in scientific discourse indeed appear to vary in the scientific texts themselves. ‘Metaphor’ is categorized and textually framed in different ways. Several sociologists of science (see for instance Goatly, 2007; Keller, 2002; Maasen & Weingart, 2000; Nelkin, 2001; Nerlich, Elliott, & Larson, 2009) claim that scientists themselves generally favor the internalist cognitive frame, while most ignore the more discursive and externalist ones. However, studies of actual rhetorical practice in performing these frames are scarce.

In the remainder of this chapter, I present an analysis of how the concept of metaphor is framed in specialist scientific writing. The analyses focus on scientific writing explicitly referring to the term *metaphor* in a corpus of biological texts. My first aim is to investigate what characteristics this term is explicitly associated with. Secondly, I also want to see whether it is possible to detect a pattern of context associated to the particular framings: that is, whether one particular framing of metaphor was more established in a particular sub-discipline or sub-genre.

### 3. Analyzing scientific metaphor: Method and material

This paper approaches scientific articles as a specialist genre of discourse. However, in examining texts not as separate units, but quantitatively screening a corpus of texts for indicators of metaphor framings, it is also a register analysis (cf. Biber & Conrad, 2009). Interpretation then relates the findings back to discourse communities and stages of argumentation, hence again resorting to aspects of genre analysis.

The corpus of scientific articles was built by searching the interdisciplinary database *Biological Science* for explicit references to the term *metaphor*. It consists exclusively of peer-reviewed articles, because not only do these texts reflect the positions of the individual authors, but they also have to be socially and rhetorically acceptable to the various gatekeepers of the community such as editors and reviewers in order to be “granted license to speak in a recognized forum” (Sullivan, 2000). Had the use of metaphor in some way been considered questionable or socially unauthorized, the process of peer-reviewing would most likely have ‘silenced or de-authorized’ the trespassing of norms. In this respect, my corpus can thus be considered typical of scientific discourse.

The *Biological Science* database (Pro Quest, 2011) includes papers and abstracts covering a wide range of biological scientific sub-disciplines including biomedicine, biotechnology, botany, zoology, anatomy, medical and pharmaceutical sciences, and ecology/environmental resources and conservation as well as some aspects of psychiatry and cognitive sciences, agriculture and veterinary science. It includes texts from more than 6,000 journals.

The search resulted in 50 research articles published in a variety of research journals of several disciplines in which the word ‘metaphor’ was explicitly used. The 50 articles represent about 600 pages of text. These texts were published during a period of 39 months – from June 2006 to September 2010. The word *metaphor* was not explicitly drawn into the scientific discourse very often. On average, an explicit reference to metaphor turns up in the database during the examined period 1.5 times per month. In comparison, *analogy* occurs about 12 times every month and *model* 3,178 times per month.

The 50 extracted articles were published in 40 different journals. A common denominator between the journals seems to be quality, because 83% are in the top two (of four) categories according to the journal ranking portal *SciMago Journal and Country Rank* ([scimagojr.com](http://scimagojr.com)) and are as such among the most influential journals in their field (63% in the first, and 20% in the second category). Another common denominator could be metadisciplinary membership. About 90% of all the articles can be analyzed as falling into just four broad biological sub-disciplines: *environmental studies* (including resource conservation and ecology), *microbiology* (including genetics and cell biology), *cognitive science/neuroscience* and *health & society* (see Table 1). What traditionally might be considered core-disciplines within biology – botany and zoology – do not show up in this corpus.

**Table 1.** Disciplines and journals

Discipline (count)	Journals
Environment (19)	<i>Human Ecology, Ecological Economics, Water Resources Management, Human Ecology Review, Ecology and Society, Frontiers in Ecology and the Environment, Ecological Complexity, Gulf and Caribbean Research, Agriculture and Human Values, Biological Conservation, Restoration Ecology, Ecology Letters, Nature, Hydrobiologica, American Naturalist, Trends in Ecology &amp; Evolution</i>
Microbiology (11)	<i>New Genetics &amp; Society, Polymer Degradation and Stability, Human Gene Therapy, Cancer Science, Trends in Immunology, Trends in Ecology and Evolution, Bioinformatics, Genome Research, &amp; Annual Review of Microbiology</i>
Neuroscience / Cognitive Science (10)	<i>Science China, International Journal of Physiopsychology, Neuroscience (38), PLoS Computational Biology, PLoS One, Neuron &amp; Journal of Integrative Neuroscience</i>
Health and Society (5)	<i>History of Psychiatry, Journal of Drug Policy, AIDS and Behavior, Health, Risk and Society &amp; Journal of Developmental and Physical Disabilities</i>
Other (5)	<i>New Ideas in Psychology, Mammal Review, Science, &amp; Mechanisms of Aging and Development</i>

Note. Q1-rated journals in italics.

At first glance, these broad sub-disciplines may appear unrelated, but they do in fact share certain features of research topic and perspective. *Microbiology/genetics* and *neuroscience/cognitive science* share a preoccupation with the study of sub-cell biology, while *ecology/environmental biology* and *health and society* share a preoccupation with large scale abstract relations. In particular, phenomena which cannot be observed with the naked eye – the very small such as atoms and viruses, the very big such as the universe and the very abstract complex such as economy and psychology – contain issues that lend themselves easily to metaphorization. Moreover, these disciplines are specifically concerned with what it means to be a human being and cohabit and manage a socio-biological world. As such, these particular sub-disciplines are very much in the public eye, and at the centre of social and ethical debates on the role of science in society. Particularly *environmental biology* and *health & society* are closer to the social sciences than most natural sciences.

The experimental research article following the traditional IMRD-structure (Introduction-Methods-Results-Discussion) is the most dominant form of specialist scientific communication in these areas, and it is also valued as the most genuinely scientific one. Though the experimental article may generally be understood as *the prototypical research and knowledge producing genre in the natural sciences carrying the highest scientific status*, it is in fact not the only one (Tarone, Dwyer, & Gillette, 1998). My corpus proves as much, since only 25% of all the research articles in the corpus are exemplars of the traditional IMRD-structured experimental sub-genre. The remaining 75% perform research communication in other ways. This distribution is similar in all four sub-disciplines (see Table 2). Thus, it would seem that research articles explicitly using the word *metaphor* are more likely not to be traditional experimental research articles.

**Table 2.** Genres

	Eco/Env	Microb/Gen	Neurosc/Cogn	Health & Soc	Other	Total
EE	26% (5/19)	18% (2/11)	20% (2/10)	20% (1/5)	40% (2/5)	25% (12/50)
TC	37% (7/19)	55% (6/11)	40% (4/10)	60% (3/5)	40% (2/5)	40% (22/50)
RA	37% (7/19)	27% (3/11)	40% (4/10)	20% (1/5)	20% (1/5)	35% (16/50)

Note. Key:

EE: Empirical and experimental; TC: Theoretical critical; RA: Review articles; Eco/Env: Ecology/Environmental studies; Microb/Gen: Microbiology/genetics; Neurosc/Cogn: Neuroscience/Cognitive science; Health & Soc: Health and Society

Lukka and Granlund (2002) have identified two additional genres applied within accounting studies communicating respectively consulting research, and critical research. A very interesting point in their research is that the three genres seem

estranged in the sense that they rarely refer to or take up upon arguments from each other, resulting in seclusion of knowledge rather than in constructive dialogue between different perspectives.

At the same time as these new scientific specialist genres have been brought to light, the review genre has been rehabilitated as an equally valuable form of scientific communication (Noguchi, 2006). Myers (2003) and Sinding (1996) have demonstrated that review articles do more than simply reproduce existing knowledge. Review articles actively recontextualize and reshape the past into new narratives and do in that sense actively produce new knowledge as much – though differently – as the more formalized and experimental articles.

The genre here categorized as *review paper* is typically marked by this name by the journal, though *perspective*, *concepts & questions*, *idea and perspective* occur as well. Review articles generally work by shaping a narrative of a concept, a field or a phenomenon, often by indicating changes over time as well as a current status. *The theoretical/critical article* include the argumentative and comparative style of review articles, but they are often particularly inscribed as texts being in some way normative or subjective: *Viewpoint*, *commentary*, *opinion*, *insight*, *an essay-like study*, *concept paper*, *methods*, *letters*. Where review articles may conclude by basically describing or constructing the various roads to a present situation, the theoretical/critical papers more openly set out to pinpoint which of these roads is preferable.

#### 4. Analysis: Framing metaphor

The rhetorical identification of a concept or an idea as a metaphor is linked to the central argument, either as part of claiming centrality or in occupying the niche (cf. Swales, 1990). If a metaphor is explicitly identified as such, this is done in the research framing parts of the article: the abstract, the introduction and often the concluding section as well. Whenever the concept of metaphor is evoked, certain defining characteristics or demarcations are articulated as well. This is done by including verbs specifying how the particular metaphorical actions may be considered scientifically legitimate or illegitimate, as adjectives defining characteristics or as nouns expressing categories.

In the corpus, ‘metaphor’ is framed in five different ways, each frame producing a narrative of metaphor in science including legitimate and illegitimate aspects. These frames are presented in Table 3 in order of dominance where Number 1 is the least dominant and Number 5 is the most frequently applied frame.

**Table 3.** Frames

<b>1 Metaphor as inferior and commonsensical knowledge</b>	
Definition	Metaphors are commonsensical and belong as such on the illegitimate side of the boundary. Metaphor may in practice inspire scientific understandings, but are not scientific themselves. They can be heuristic and pre-theoretical.
Boundary	<i>Illegitimate metaphors</i> : wrong or open-ended metaphors. Metaphors in need of testing. <i>Legitimate metaphors</i> . After testing they cease to be metaphors.
<b>2 Metaphor as a visualization tool</b>	
Definition	Metaphors solve internal representational problems in relation to the description of complex phenomena.
Boundary	<i>Illegitimate metaphors</i> do not solve the problem of representation or visualization. <i>Legitimate metaphors</i> visualize specific and relevant complexities of abstract phenomena, solve the problems of description and understanding.
<b>3 Metaphors as communicators of complex ideas outside of scientific discourses</b>	
Definition	Metaphors are highly pedagogical, explanatory and persuasive. They serve as a bridge between science and the public. Two versions are represented: One in which metaphors are linguistic surface phenomena simply explaining science but not playing a role in production (this aspect is related to frames 1 & 4) – and another in which metaphors are generative and scientific and may even be influenced by non-scientific contexts (related to frame 5).
Boundary	<i>Illegitimate metaphors</i> : are wrong, misrepresenting or distorting science, hindering understanding <i>Legitimate metaphors</i> : represent science well, enabling comprehension and understanding of science and scientific ways. Legitimize science. and/or <i>Illegitimate metaphors</i> : disempowering the audience by being opaque, wrong, scaring, limiting, framing ideologically. Simplify. <i>Legitimate metaphors</i> : empowering the audience by making science transparent and understandable provides tools for change of practice. Can include complexities.
<b>4 Metaphor as pre-theoretical, heuristic devices</b>	
Definition	Metaphors are tentative, suggestive scientific ideas, thus playing a significant role in producing scientific knowledge.
Boundary	<i>Illegitimate metaphors</i> are untested – and potentially misleading. <i>Legitimate metaphors</i> are tested, thus controlled and stable in meaning.
<b>5 Metaphors as scientific/ideological frames and perspectives</b>	
Definition	–
Boundary	–

#### 4.1 Frame no 1: Metaphor as inferior and commonsensical knowledge

The concept of metaphor is never drawn into the discourse in order to be simply rejected as having no relation to science at all. However, a few texts do construct a rhetorical wall between metaphor and core scientific activities, defining the metaphor as a heuristic tool, helpful in generating pre-scientific ideas, but scientifically lacking since it is representing commonsensical and un-scientific knowledge. Science is here seen as beyond metaphor, as is demonstrated by the two excerpts below:

- (1) The aim of this paper is to explore the relevance of a systematic application of resilience thinking to questions of pastoralist policy, a task that requires taking the concept of resilience *beyond the level of metaphor* and operationalizing it.  
(Robinson & Berkes, 2010; my emphasis)
- (2) Internal models are a key feature of most modern theories of motor control. Yet, it has been challenging to localize internal models in the brain, or to demonstrate that they are *more than a metaphor*. (Lisberger, 2010; my emphasis)

From this perspective, the word *metaphor* signifies an idea that has not been thoroughly analysed nor empirically researched and defined. Metaphors may be useful as an early stepping stone in the construction of scientific knowledge. The rhetorical function of using the word *metaphor* in the excerpts above is to present the given phenomena as in need of further empirical research. Empirical research would repair the metaphor and transform it into a non-metaphorical scientific concept.

#### 4.2 Frame no 2: Metaphor as a visualization tool within scientific discourse

In the second frame metaphor is constructed as a rhetorical visualizing tool or model mediating aspects of and relations between complex scientific phenomena to other specialists of the field. The metaphor is not in itself related to the innovative or empirical production of knowledge, but is simply a vehicle of describing these concepts as transparently and as non-simplistically as possible:

- (3) Sucrose and yeast influenced survival in a complex manner *that was best visualized using a phenotype landscape metaphor* [...] The previous results indicated that the survival of normoxic flies was dependent in a complex manner on dietary yeast and dietary sucrose. To better visualize how nutrient interacted we used a 3D-plot in which mean survivals were plotted as a function of the concentrations of dietary sucrose and yeast. This representation for normoxic flies yielded a landscape characterized by a large dome surrounded by deep valleys.  
(Vigne & Frelin, 2007; my emphasis)

- (4) However, due to experimental resolution limits, detailed protein folding pathways remain unknown. [...] the need arises for a good visualization tool that gives both a global view of the pattern space and the interacting of the patterned clusters as they evolve over time. [...] *Here we use the metaphor of a terrain (Chalmers, 1993) to represent our pattern space.* [...] The frequency of the pattern is represented by the height of the mountain whose base is the assigned territory in the plane. Thus by a quick visual inspection of the heights of the mountain, one gets a fair idea of the major states at play.

(Zhou, Parida, Kapila, & Mudur, 2006; my emphasis)

This particular frame is primarily found in microbiological texts, since this is a discipline whose subject rarely is visible to the naked eye. The source of inspiration is primarily spatial, landscapes are capable of portraying phenomena and relations between phenomena in a complex and three-dimensional manner, while at the same time facilitating comprehension by relying on our intuitive knowledge on how to navigate in landscapes and cities.

Boundaries between legitimate and illegitimate metaphors are rarely explicitly addressed, since these articles simply promote their own metaphor-model as particularly helpful in solving the current problem. Thus, metaphors are primarily safeguarded by having their particular qualities highlighted. Addressing a boundary between legitimate and illegitimate metaphors would focus on the ability of some metaphors to solve representational problems without loss of complexity, to highlight central correspondences and to integrate huge and divergent amounts of data. By contrast, illegitimate metaphors would be overly obscure, difficult to understand, unable to represent complex and diverging data, and likely to misrepresenting or ignoring central elements. The type of metaphor mentioned in (3) and (4) is primarily recognized as a means for communicating knowledge, although it may in theory be open to conceptualizing metaphor as knowledge producing. The fact that visualizing metaphors actively interact with data by interpreting some aspects as more central than others is suppressed.

#### **4.3 Frame no 3: Metaphor for communicating science outside scientific discourse**

The third frame also recognizes metaphor as a communicator of scientific knowledge, though in this case to a non-specialist audience. As a result, the double agenda of metaphors as potentially enlightening as well as misleading is central. However, the concerns expressed here are not as much about ambiguity and polysemy or to what degree an audience is capable of truly understanding a scientific concept in the same way that scientists do; instead the majority of texts here

discuss whether a given metaphor is valuable to the audience as a means of producing policies and promoting sustainability.

In this discussion, a legitimate metaphor is useful outside of the university or laboratory. It may help in empowering people to act, to use science in communities and in making policies without being trapped in more or less hidden ideological connotations. So, the more imperative problem of metaphor seems to be a form of entrenchment; audiences might be caught up in and blinded by the more or less intentional ideological subtext of a given metaphor. The persuasive powers of metaphor, and the idea that metaphors influence general perspectives and practices, pervade these texts. Metaphors are cast as rhetorical and argumentative tools in framing particular perspectives and presenting values on the particular phenomena in competition with other perspectives, frames and values. Consequently, boundaries between legitimate and illegitimate metaphors generally concern Trojan horse issues of ideology or perspective. Excerpt (5) below presents the case of a helpful and positive metaphor, whereas the killer-metaphor of Excerpt (6) is criticized for carrying problematic connotations:

- (5) Conservation biologists, joining with the environmental economists, also saw this metaphor as a way to help us describe our relation to nature and help build support for conservation [...] There was a strong sense that, however revolting for those who intrinsically value nature, the use of market metaphors were necessary to awaken a public deeply embedded in a global economy and distant from natural processes. (Norgaard, 2010)
- (6) Many authors have focused upon mass media representations as a key site where the representational, metaphorical and communicative work related to scientific phenomena and risk takes place. Wallis and Nerlich (2005) have examined the metaphorical framing of SARS as a 'killer' [...].  
(Crawford, Brown, Nerlich, & Koteyko, 2008)

Whereas metaphors in the previous frames are considered as specific concepts or constricted models, the metaphors in this frame are often cast as entire metaphorically based world-views, as networks of metaphors or super-metaphors in competition with other networks or super-metaphors. Metaphorical conflicts or clashes are often highlighted. Excerpt (7) below reports on a study of changes in public perceptions of methicillin resistant *Staphylococcus aureus* (MRSA), and on how the metaphorical framing of doctors changed from doctors-as-heroes to doctors-as-villains:

- (7) We have attempted to demonstrate here the value of attending to metaphors in the stories of risk presented in the public sphere where MRSA is concerned. [...] *The representations can be seen as being played out in the form*

*of metaphorical scenarios.* In the first act, the *dramatis personae* are personified forces of nature as well as personified forces of nature as well as earthly creatures fighting them, namely doctors and hospitals, engaged in a battle of evil against good. The microbes are also endowed with an anthropomorphic degree of ‘intelligence’. In the second act, the victims of the personified bacterial forces are introduced and the doctors, hospitals and microbes themselves emerge as perpetrators of crimes, as criminological metaphors predominate. These may be crimes of omission (cleaning hands or wards), or part of the very discursive fabric of the infection itself, which ‘stalks’, ‘lurks’ or is ‘at large’ in hospitals. (Crawford et al., 2008)

The demarcation between legitimate and illegitimate metaphor is drawn between ‘good’ perspectives that liberate and enable the public to use science and understand complexities, and ‘bad’ perspectives which blindfold and confine the public, and which simplify knowledge of the world. Connotations should not be fought, but they should point in the right liberating directions, since scientific metaphors have the power to genuinely influence the practices and sense-making of society, government, and the general public and local communities in a number of ways. The various castings or metaphorical scenarios will have different consequences on the actions and practices of the public:

- (8) Our critique leads to an alternative way to address the paradox, one in which a moral justification for wilderness preservation supports a healing metaphor for wilderness restoration. *The healing metaphor provides an argument for restricting volunteer participation and long-term restoration projects in wilderness areas. It also identifies the general conditions in which a damaged wilderness should be allowed to “heal itself”.*

(Throop & Purdom, 2006; my emphasis)

#### 4.4 Frame no 4: Metaphors as pre-theoretical heuristic devices or hypotheses

This frame is the second most common one, and very similar to the first one, except for the fact that metaphor is not so explicitly excluded from the scientific realm. It may not always be strongly included, but it is more openly assigned a role in scientific inquiry. The scientific process is drawn up more or less as within the first frame: metaphors are by nature hypothetical, they *suggest* or *seem to predict*. Metaphors are not as commonsensical as in the first frame, but refer generally to more scientific ideas and concepts than common-sensical ones. The hypothetical metaphor is in need of being empirically tested and described. The aim of the empirical testing is to verify but also to analyze the implications of metaphor

in more detail and to freeze the potential metaphor in one position. One article asks for instance: "If viruses race each other, then how fast, which ones win and why?" A legitimate metaphor, then, is a well-tested, stable figurative expression of a concept, while an illegitimate one is abstract, suggestive and either not tested or tested as incorrect and wrong. The aim of science is to sanitize these metaphors:

- (9) The race metaphor for infection would seem to predict that slowly growing pathogens should be more easily controlled by the immune system. However, many slow pathogens seem, paradoxically, to be associated with chronic persistence of infection. For example in monkey models of HIV and in hepatitis C virus (HCV) infection, the virus doubles only every 10h. In hepatitis B virus (HBV) infection, growth is even slower, because the virus doubles as slowly as every 2–3 days. Growth of tuberculosis (TB) and trypanosomes is similarly slow, with doubling time of 28 h and >18 h respectively. Because these pathogens divide much more slowly than lymphocytes are able to, why does the immune system not just 'outrun' these pathogens. [...]

(Davenport, Beltz, & Ribeiro, 2009)

A crucial point in these articles seems to be to rescue these tentative metaphors by providing empirical evidence. It is interesting to note that the attitude to metaphors are actually quite positive. Metaphors are generally not conjured up in these texts to be challenged or discarded, but rather to be repaired and fortified, and subsequently established in scientific vocabulary.

#### 4.5 Frame no 5: Metaphor as a general frame of reference/ scientific-ideological perspective

The fifth and final framing is by far the most dominant one, since it is represented in more than half of the texts. Whereas most of the framings discussed previously (particularly frames 1, 2 and 4) deal with quite constrained concepts (such as *biopolymer-bonding* or *eye movements*) which can be tested by experiments in a laboratory, this frame incorporates entire networks of related metaphors describing abstract complex biological and social phenomena and activities, which cannot be researched in full at all. These phenomena include *metapopulation dynamics*, *autism*, *wilderness preservation* or *sustainable development*. This frame sees metaphor as a conceptual, communicative / rhetorical device as much as – or even more than – a heuristic one. A metaphorical concept is not a more or less true hypothesis, but a concept which can be used, shared, analyzed and negotiated. We might call these metaphors meta-metaphors, supermetaphors or hyper-metaphors, because they are so inclusive and capable of operating on several dimensions at once, denoting entire worldviews or theoretical perspectives.

Such hypermetaphors cannot easily be proved or disproved experimentally. This does not entail that these metaphors are independent of data or empirical studies. The articles do, however, not set out to test the biological reality of these metaphors and they rarely produce empirical data themselves. Instead, interpretation or re-interpretation of existing data is used to analyze and evaluate the metaphor. As a consequence, a given metaphor is no longer discarded with reference to being experimentally insufficient or even wrong, but to whether or not it is better at explaining and expressing massive and multifaceted sets of complex data or to include new data. The focus of these metaphors is not verification or falsification, but inclusion and complexity, as well as openness to complication and change. A popular metaphor for qualities of the more highly regarded hypermetaphor is that they should be fluid and dynamic.

Excerpt (10) below illustrates the relation between data and metaphor. The conflict constructed in the excerpt takes place between a traditional trite understanding of the topic and a newer, more lenient one:

- (10) *The metapopulation metaphor* is increasingly used to explain the spatial dynamics of animal populations. However, metapopulation structure is difficult to identify in long-lived species that are widely distributed in stochastic environments, where they can resist extinction. *The literature on mammals may not provide supporting evidence for classic metapopulation dynamics*, which call for the availability of discrete habitat patches, acynchrony in local population dynamics, evidence for extinction and colonization processes, and dispersal between local populations. *Empirical evidence for metapopulation structure among mammals may exist when applying more lenient criteria. [...] We examined the literature for empirical evidence in support of classical criteria set by Hanski (1999) and for the more lenient subset of criteria proposed by Elmhausen & Angerbjörn (2001).* (van Aarde & Jackson, 2007; my emphasis)

These metaphors are fundamentally different from the ones of the first, second and fourth frame since they are neither experimental, nor internalist in their construction of science and metaphor. Within this frame, the resonating powers of metaphor are always acknowledged, but the degree to which social influences are explicitly included varies. As in the third frame, this framing emphasizes the understanding that metaphor is ripe with cultural resonance, and that it provides a certain perspective, a framing of its own. Metaphors frame a conflict or cast phenomena in certain roles. Metaphors are loaded with hidden meanings, in need of uncovering, debate and perhaps change.

- (11) Consequently, while recognizing the heuristic value of the pendulum metaphor, this paper agrees with Sadowsky's concerns that it conceals continuity within psychiatry, exaggerates difference, reduces change in research and practice to fashion, and lacks explanatory power. (Pickersgill, 2010)

- (12) Researchers Heflin and Simpson (1998a, p. 202) use the words “behavioral output” to describe the sections of a student with autism. Hurth et al. (1999, p. 25) use the word “input” to describe the actions of parents and family that are directed toward the young person with autism. Charman et al. (1997), Koegel et al. (1999) and Horner et al. (2002) use the word ”production” as a synonym for the behavior of a student with autism. *Do these researchers literally mean that a person with autism is a mechanized system that processes input of energy and material into productive outputs?*

(Danforth & Naraian, 2007; my emphasis)

These metaphors are used in reference to empirical data of some sort, but the stronger emphasis is definitely on theory and theoretical analysis, exploration and discussion. Rather than aiming at closing or empirically clarifying the metaphor, the aim here is to theoretically open, analyze and evaluate the metaphor. This framing of metaphors and of science is much more externalist, in the sense of including an explicit social-constructive analysis of the production of the particular metaphor. Most texts are, however, more implicitly externalist, in the sense that external influences of the construction of scientific knowledge and metaphor are voiced as simply recognition of how metaphors are ideological of nature and that different aspects of a phenomenon are highlighted by different metaphors. Consequently, these texts acknowledge the existence of conflicting metaphors accentuating different mappings and aspects of a given phenomenon. They also acknowledge that these metaphors represent different disciplinary or theoretical positions – and that each metaphor is primarily valid within its own disciplinary or theoretic context. Metaphorical knowledge and theory is context-dependent and fluid. Since science is constructed as a collaborative practice, less preferable or even discarded metaphors are recognized as co-producers of the new ones, as fertilizer of new knowledge. Certain well-established or stale metaphors may be considered “enshrined” and “an impediment” (Bromley, 2007), but the analysis and repair of such metaphors may invigorate them. If that is not possible, the metaphors are rejected in favor of new ones. Problematic metaphors are usually identified as too *simplistic*, too *neat*, too *callable* or *reductionist*. Legitimate metaphors are rich or plastic enough to encompass new data.

To give an example, Danforth and Naraian (2007) present a metaphor-conscious analysis of the value and particularly the limitations of the machine metaphor in autism research. The authors resort to the analysis of this metaphor in order to identify what they consider to be shortcomings of present perspectives. The machine metaphor is heavily criticized in all its forms and is in the end rejected since it no longer pushes the field forward. A new and more organic perspective is called for now, but the value of the machine metaphor in former research is not considered a total failure. It made sense in the time it originated, and it served as a central frame of reference in designing new and better metaphors:

- (13) Any metaphor used within an endeavor of medical, psychological, or educational science should serve to push the field forward towards models, theories and further inquiry that generate more useful knowledge. [...] The problems we have explored briefly in this final section provide indications of usage of a machine metaphor supporting a science effectuating limitation more than expansion, redundancy more than discovery, technical precision more than useful human understanding. This is not to say that machine metaphors cannot make productive contributions to theory development in useful lines of research. But with regard to these three specific areas of machine metaphor use within autism research, however, the generative and practical capacities of the metaphor driven theories seem insufficient to the challenges of the science.

(Danforth & Naraian, 2007)

The more explicit externalist framings typically include a historical analysis and explanation of the sonorous paradigms as well as emphasis of the resonating powers of metaphor. Gülerce (2010) for instance, specifically constructs his paper and his concept of metaphor in opposition to “mainstream psychology”, which is classified as: “ahistorical, apolitical, acultural, acontextual, aphilosophical and atheological” (p. 210). Rotheram-Borus, Swendeman, and Flannery (2009) open their article on how to frame disease-specific programs and health communication in African villages by analyzing the circumstances leading to and shaping existing HIV-prevention programs, and offering a *family wellness*-metaphor as a less stigmatizing metaphor, thus remedying the problems created by the old perspectives on such programs.

General historical circumstances are seen as influencing scientific metaphor – and more external political, administrative and communicative contexts have their go at scientific metaphor and research as well. This framing of metaphor merges with the previously discussed third frame, casting metaphor as a communicative device for communication not merely between scientists but also between science and public. In fact, these two frames are closely connected, in their understanding of metaphor as explicitly discursive, and as shaped by communicative purpose. This is so because this sphere of influence is seen as cyclical – public discourses influence science and scientific discourses influence public discourses. Metaphors are more than stable ideas – they are shared between scientists, students, the public, policymakers and back again. Crawford et al. (2008) demonstrate how metaphors are used as linguistic symbolic representations in newspapers to frame deceases and public health systems. Bromley (2007) takes his study a bit further and argues how scientists have framed their metaphors to suit public or political tastes and preferences.

- (14) In an effort to communicate the delusion of economic growth and the essence of environmental sustainability, ecological economists helped advance the metaphor of nature as a fixed stock of capital that can sustain a limited flow of ecosystem services [...]. Conservation biologists [...] also saw this metaphor as a way to help describe our relation to nature and build support for conservation. *There was a strong sense that, however revolting for those who intrinsically value nature, the use of market metaphors was necessary to awaken a public deeply embedded in a global economy and distant from natural processes. The eye-opening metaphor, however, soon rose to become a central frame for scientifically assessing ecosystem change.* (Noorgard, 2010; my emphasis)

The final sentence illustrates that this particular metaphor was in fact designed to make it more acceptable to the public, which it also was – so much so that it migrated back and influenced scientific discourse and knowledge production. Conservation biologists did not appreciate the economic resonances, but the public and policymakers apparently did.

## 5. Conclusion: Rhetorical de- and re-metaphorization

This analysis has demonstrated that the concept of scientific metaphor can be framed in different ways – each frame operating its own version of what is considered legitimate and illegitimate scientific language. The concept of metaphor is far from a stable and clear-cut in scientific communication as a whole and it manifests itself in various versions in biological specialist communication.

The study has brought five frames to the surface, but they are mainly variations of two basic, and expected, frames: internalist/experimental and externalist/critical. Specifically the empirical internalist frame was expected to dominate the literature, with metaphor seen as a primarily cognitive or heuristic tool in developing hypotheses on a given subject. However, my study has also revealed that besides the experimental internalist frame, there is a third one: a critical/analytical frame, in which both internal as well as external influences are recognized. This frame does not exclude the cognitive/heuristic aspects of metaphor, but the emphasis is rather on the application of metaphor as a discursive, communicative and culturally situated phenomenon open to theoretical analysis of content, emphasis and resonance. Within this perspective, metaphor is visibly a concept moved by historical and paradigmatical external changes (cf. Kuhn, 1963/1996) as well as empirical testing and characteristics of the phenomenon alone.

This latter framing of metaphor is the most dominating one, since it – in different versions – is represented in about two thirds of the texts. This finding cannot, however,

be taken to mean that the biological sciences have gone social-constructivist, since explicit reference to the concept of metaphor in a biological specialist article is still a rare event: Overall, most texts refrain from explicit usage of the term *metaphor*. Instead, it seems more significant that the explicit naming and framing of metaphor is strongly related to genre and more vaguely to discipline.

The rhetorical activity of explicit identification of metaphor seems to be somewhat discipline-specific, since so many biological disciplines did not come up in the search. Suffice to say that some disciplines may be more open to using metaphors, as well as to explicitly debating metaphors, than others. Furthermore, it seems as if certain topics related to public interest and topics closer to social sciences provide a more fertile ground for this particular rhetorical activity. The fact that social sciences can be slightly less rigid according to genre structure and less uniform in relation to philosophical perspectives on science may partly explain this. Another partial explanation may be the ethical and public interest of the topics, since they basically concern research and discussion of certain essences of being human as well on human relations to nature. It may be that issues open for debate are equally more open to include metaphor.

The relation between genre and the two framings of metaphor seems to be strong. Both the empirical framing and the internalist framing of metaphor are closely related to the traditional research article and some critical-theoretical articles, particularly the ones adhering to the traditional IMRD-structure. The empirical studies are generally computational and not strictly empirical. The analytical/critical framing of the metaphor is found in review articles as well as in theoretical articles. Thus, the two framings are related to two distinct rhetorical practices dependent on the argumentative purpose of the author. Kuhn (1963/1996) identified three phases in scientific development: The first phase is 'the pre-paradigmatic' or 'pre-scientific' phase in which theories are manifold, without scientific consensus, suggestive and hypothetical. They represent the brainstorm of the theories, so to speak. During the second phase, the phase of 'normal science' central components of the theory or paradigm has been agreed upon and empirical research is ongoing. The phase of normal science is the phase of verification. Finally, 'the revolutionary phase' identifies and focus on anomalies ignored by the central paradigm, and thus re-opens a given theory to renewed scrutiny resulting in repair or replacement of the theory. The development of a given scientific metaphor may be said to follow a similar pattern (Knudsen, 2005). During the pre-scientific phases of metaphor-development, metaphors are suggested though not empirically tested, verified or in consensus yet. Gradually metaphors are either discarded or conceptually and empirically verified, and thus gradually move to the phase of normal science. Sometimes, certain established (or ignored) aspects of a given metaphor are taken up again in a revolutionary phase.

This study suggests that the empirical framing of metaphor represents metaphors at a pre-scientific phase, identifying novel metaphors in need of verification. The clarification of the metaphor is seen as a part of building and stabilizing knowledge about a given phenomenon. In contrast, the more externalist and analytical framing of metaphor is more connected to a revolutionary phase in metaphor development. This type of framing is used to identify malfunction, conceptual failures and lack of scope, complexity and explanatory power. Metaphor here is ascribed a scientific as well as a social/cultural function as an analytical and critical device, which is open to repair. Sometimes alternative metaphors are presented, but at other times the critique of existing metaphors stands alone. This framing assists general critique of the paradigm – and emphasizes the value of change.

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# Dynamical systems metaphors

Thomas H. Smith

Boulder, Colorado, USA

In order to explore the role that ‘dynamical systems theory’ plays as an overarching conceptual source domain in the genre of educational scientific texts covering six distinct subject areas (cognitive psychology, linguistics, transportation studies, social psychology, evolutionary biology and business management), I examined the lower-level metaphors underlying this complex source domain. Corpus analyses of professional education literature revealed underlying metaphors of force dynamics, movement, object manipulation, and personification. Novel metaphors or novel extensions of conventional metaphors were few. Findings document a proliferation of extensions and elaborations of conventional metaphor groupings. The identified conceptual metaphors were linked by (a) lexical co-occurrences and (b) metaphoric implications not lexically expressed. Figurative context appears to aid the learner’s understanding, although some metaphors and combinations confound explanations of key aspects of dynamical systems. Suggestions are made that could enhance the overall pedagogical usefulness of the metaphors found.

## 1. Introduction<sup>1</sup>

This chapter uses conceptual metaphor theory to investigate scientific discourse, in particular, professional education literature intended to teach about applications of dynamical systems theory to various scientific disciplines. Dynamical systems theory (sometimes called ‘nonlinear dynamics’ or ‘chaos theory’) was first used in the later nineteenth century to analyze systems of differential equations describing the movement of celestial bodies. Differential equations express how things change, and solving them yields predictions about the course of change. At first, solutions to these equations expressed the resulting motion over time in terms of geometry and topology – just as understood by Newtonian mechanics (Holmes,

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1. A preliminary version was presented by the author at RAAM8 – Researching and Applying Metaphor, Amsterdam, 30 June–3 July 2010.

2007) – so the familiar Newtonian conceptual scheme and associated language structure seemed to be adequate, suggesting that the register of the affected scientific discourse could remain unchanged.

It would be important to retain this language structure because understanding is easier and more intuitive. Lakoff and Johnson (1999) gave a metaphoric interpretation of the Newtonian conceptual scheme when they observed that change is conventionally understood as movement caused by the application of physical force to an object, moving it from one location to another in space. This metaphoric understanding of how change works has strong intuitive appeal. It is grounded in subjective human experience: conceptual mapping of the subjective bodily experience of spatial orientation, movement, and mechanics is used metaphorically to understand a wide range of abstract target domains. For astronomy the target domain was the movement of celestial bodies that were metaphorically understood to behave very much like the source domain of ball-shaped objects one might manipulate on earth.

But would this conceptual mapping remain adequate? Many observed phenomena were still puzzling and further developments in dynamical systems analysis would soon focus on celestial behavior that exceeded what Newtonian metaphors could easily describe and explain.

Metaphors have long been relied upon in scientific discourse (e.g., Brown, 2003; Ortony, 1993, p. 15) and in writing scientifically and technically accurate documentation (Giles, 2008). Where scientists and the population in general have used Newtonian metaphors grounded in experience of bodily movement, as dynamical systems analysis evolved, those specialists working with it might be learning a new source domain. Would they augment their metaphor repertoire by using new or different metaphors – perhaps metaphors grounded in mathematics and computer simulations?

### 1.1 Further history of the development of dynamical systems analysis

In the late nineteenth and early twentieth centuries astronomers and mathematicians advanced dynamical systems by applying them to very perplexing celestial events that seem to violate Newtonian principals – non-stable orbits, bodies that wander, that develop chaotic motion, or form bifurcated trajectories. Study of these multiple possible outcomes and erratic, disproportionate or chaotic behaviors led to various new forms of nonlinear differential equations iterated over time. This work not only made dynamical systems theory capable of accurately predicting such celestial complexity, but also showed how to study other as yet unexplained chaotic tendencies found in electronic oscillators, geodesic flows, billiards, radar, meteorology, fluid turbulence, and wave propagation (Holmes, 2007).

It was soon observed that sub-parts or agents will, following very simple rules of interaction, self-organize and display highly complex overall behavior in the absence of any overarching control mechanism. Dynamical systems analysis was extended to explain these findings and also the logic of network and flow diagrams through multiple iterations, including agent-based models of collective behavior over time. This required advanced computer simulation techniques to solve sets of differential equations that could not be solved analytically. In the late twentieth century, these methods were applied to chemistry, physics, neuroscience, cell physiology, plant and animal evolution, medicine, population dynamics, and a number of challenging engineering problems (Abraham, 2009; Aubin & Dalmedico, 2002).

Insofar as it allows us to better understand hugely complex global systems on which our lives depend, as is widely argued (e.g. Capra, 1996; Slingerland & Kump, 2011), intelligent use of these advances by those who are to participate in making decisions may be crucial in assuring terrestrial wellbeing.

## 1.2 Purposes of this chapter

The following list renders the purposes of this chapter and particular questions posed:

1. To explore science education discourse and reveal the basic metaphors used by authors applying the dynamical systems paradigm across a range of subjects: *What kinds of conceptual metaphors are present? Do we find reliance on conventional, conceptual metaphors of the sort typically found in other texts (e.g., Cameron, 2003; Charteris-Black, 2004, 2005; Eubanks, 2000)? Might they be characterized as Newtonian? Or, are there other source domain structures chosen to explain dynamical systems innovations? Are the metaphors, their extensions, combinations or linkages conventional or novel?*
2. To see if dynamical systems specialists, in describing and explaining their work, choose or form metaphors especially useful to non-specialists in understanding these systems: *Are their metaphors adequate to frame and guide accurate and meaningful interpretation, thus contributing to effective pedagogy?*

## 2. Study of metaphors describing dynamical systems in six fields

A corpus of texts that apply dynamical systems theory to six separate disciplines is examined qualitatively, scrutinizing extensions and elaborations of, and conceptual as well as lexical linkages between, conventional metaphor groupings.

Methodology and interpretive guidance come from contemporary metaphor theory (Lakoff, 1993), along with linguistics and cognitive psychology that is partially but not entirely aligned with this theory (Cameron, 2003; Charteris-Black, 2004; Eubanks, 2000; Fernandez-Duque & Johnson, 1999; Goschler, 2007).

The study proceeds to identify both conventional and novel metaphors that describe and explain six different subject matter areas or fields, all of them presented in terms of dynamical systems (cognitive psychology, linguistics, transportation studies, social psychology, evolutionary biology and business management). Of particular interest is to look for various qualitative elaborations and sub-mappings of metaphors that are found. This is done by grouping and analyzing words and terms found. Also investigated are interrelationships among principal source domains, such as MATERIAL OBJECTS, JOURNEY, and BUILDING/CONSTRUCTION, and among their respective sub-mappings. The study pays close attention to such qualitative aspects and examines interrelationships or linkages to see if they support pedagogically an advanced, technical understanding of the topic.

## 2.1 Method

A body of text initially containing  $N=61,525$  words was assembled from published and currently available literature of cognitive psychology, linguistics, transportation studies, social psychology, evolutionary biology and business management. They consisted of book chapters published between 2003–2008, ranged in size from 14–34 pages, were written at a professional level for advanced students and well-informed members of the general public, and all had a distinctly dynamical systems orientation.<sup>2</sup> The author then pre-processed, reading through the texts, eliminating all discussions except those that described what dynamical systems are and how they work (as related to the specific fields), selecting a total of  $N=495$  extracts. The corpus then contained  $N=13,986$  words.

Next, words used metaphorically in the extracts were found. Much work has been done to establish methodologically sound and theoretically relevant metaphor identification procedures (Cameron, 2003; Charteris-Black, 2004; Pragglejaz group, 2007; Semino, 2008). The method used here abides by documented successes from this literature. It focuses entirely on lexical evidence and, while I

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2. See [http://www.metaclara.com/Corpus\\_citations.htm](http://www.metaclara.com/Corpus_citations.htm) for citations of corpus texts. This corpus in its entirety (not selected extracts, as reported here) was analyzed alone and reported by the author in *Do the Experts Mean What Their Metaphors Say? An Exploratory Study of Complex Metaphor Structure Within and Between Schools*. Paper presented at RAAM V – Researching And Applying Metaphor V 3–5 September 2003 – Université Paris 13, Villetaneuse, France.

confess interest in the thought processes that underlie the words selected by the authors, I have no independent data on their cognition (cf. Steen, 2007); from concepts linguistically expressed and from the declared communications goals stated for the texts, one can do no more than conjecture how the authors think about their subject matter. The method consists of the following five steps:<sup>3</sup>

1. An entire extract was read for its overall meaning. Here is an example:  
Once an attractor for destructive conflict has been established, relatively small provocations may move the system into the basin of this attractor, thereby dragging the whole system into full-blown conflict.
2. The author manually identified figuratively used words or groups of words (indicated with italics in the example in step 1), the strictly literal meaning of which is incongruous or outside the given context of the target of conflict and dispute resolution; such figurative words are usually less vague, less abstract, more concrete or physical.
3. These were reviewed by the author to see if in fact each was a metaphor, some other figure of speech, or actually literal usage.<sup>4</sup> Words judged metaphoric were highlighted and then the sentences or segments of text containing metaphoric words were grouped into conceptual metaphors which were given names. Any word within an extract was identified as no more than one metaphor; if two or more metaphors were suggested the one judged most prominent was chosen.
4. While the domains of conceptual metaphors each seem conceptually coherent, most are divisible into related but more narrowly defined sub-domains; these are subordinate metaphors or metaphorical expressions that inherit aspects of the overall metaphor, further structuring the ideas in play (Musolff, 2004).

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3. Detecting conventional, usually unnoticed, metaphors in textual discourse depends to some degree upon judgment and hence cannot preclude some coding errors. Researchers are advised to use multiple coders and to calculate inter-coder reliability statistics to verify reasonable agreement as to what constitutes evidence of metaphor (e.g., Cameron, 2003). Here, for practical reasons, only one coder (the author) was used, but analyses were reexamined in an iterative procedure. Although reliability of my results could hence be optimized, my approach of using a single coder is still a common procedure in metaphor studies. Since the present study takes good care to be maximally specific and transparent in data used and methods applied, results are by definition open for re-examination by other scholars.

4. Cameron and Deignan (2006) evaluate the conventionality of metaphors by comparing their instantiations in a particular corpus of interest with those found in very large, representative and general-purpose corpora such as the 59 million-word Bank of English corpus. Such comparisons have not been made here, yet comparisons with published work substantiate this classification.

The targets of these sub-domains may vary, but their sources group together, according to conventional knowledge of the broader conceptual domain. Guided by documented methods of relating sub-mappings to a specific conceptual metaphor source (Cameron, 2003; Charteris-Black, 2004; Eubanks, 2000; Musolff, 2004), the author subdivided each conceptual metaphor into two or more sub-domains (here called sub-mappings). Continuing the example four sub-mappings are identified (metaphoric words underlined, conceptual mappings in **S**mall **C**aps):

- (1) CONFLICT IS FORCEFUL MOVEMENT; CONFLICT IS BASIN: relatively small provocations may move the system into the basin of this attractor [...].
  - (2) CONFLICT IS SELF-PROPELLED MOVEMENT; CONFLICT IS INFLATABLE CONTAINER: thereby dragging the whole system into full-blown conflict.
5. Interpretation in terms of sub-mappings: In the above examples metaphoric use of *move* and *dragging* can be seen as aspects of the CONFLICT IS MOVEMENT sub-mapping of the CONFLICT IS JOURNEY conceptual metaphor. By themselves, such lexical examples are however only minimal evidence of this conceptual metaphor's cognitive potency for an author or community of authors. A single use of a particular metaphoric expression may evoke a symbolic structure, but not provide enough conceptual structure to indicate a conceptual metaphor or reveal how an author is actually thinking or reasoning about the target domain in question. Neither does repeated use of one or two particular metaphoric words.

When a corpus shows a range or assortment of sub-domains or mappings of the same metaphoric source domain, all with correspondences in the target domain – that is, conceptually unified yet lexically diverse realizations – this, while by no means definitive, will increase our confidence that the community of authors may be reasoning (or suggesting ways for learners to reason) about the target domain in terms of that overarching source domain.

While grouped metaphors are conceptually coherent, there are differentiations within them that form two or more sub-domains each, here called sub-mappings. As before, in each sub-mapping the lexical examples (segments of text ranging from short phrases to longer sentences) containing metaphoric words were listed.

## 2.2 Results

No quantitative comparisons are made; qualitative results are focused upon. Ten metaphoric source domains were found (see Table 1), each with two to ten sub-domain mappings.

**Table 1.** Conceptual metaphors and sub-mappings found

Conceptual metaphor	Sub-mappings
DYNAMICAL SYSTEM IS ATTRACTOR	DYNAMICAL SYSTEM IS LATENT/MANIFEST; REPELLOR; FIXED POINT; CHAOTIC; PERIODIC; TIPPING POINT
DYNAMICAL SYSTEM IS POINTS/POSITION	DYNAMICAL SYSTEM IS STATES; CONDITIONS/CONTEXT; SPONTANEOUS STABILITY; BASIN
DYNAMICAL SYSTEM IS TERRAIN	DYNAMICAL SYSTEM IS LANDSCAPE; TRAJECTORY
DYNAMICAL SYSTEM IS MULTIPLE PARTS	DYNAMICAL SYSTEM IS INGREDIENTS/ENTITIES/ELEMENTS; INTERACTIONS
DYNAMICAL SYSTEM IS MOVEMENT	DYNAMICAL SYSTEM IS PERTURBATION; RANDOM; OSCILLATION/PERIODICITY; CHAOTIC; PHASE SHIFT; RECURSIVE; DYNAMIC OVER TIME; NON LINEAR; FORCEFUL; BALANCE
DYNAMICAL SYSTEM IS STRUCTURE	DYNAMICAL SYSTEM IS INSIDE/OUTSIDE; NETWORKS/FORMS; LOCKED IN; LEVELS; RULES; OPEN ENERGY FLOWS
DYNAMICAL SYSTEM IS CONSTRAINTS	DYNAMICAL SYSTEM IS SUPPRESS/REDUCE; RESIST; (FIXED) SEQUENCES
DYNAMICAL SYSTEM IS FEEDBACK	DYNAMICAL SYSTEM IS POSITIVE LOOPS; NEGATIVE LOOPS
DYNAMICAL SYSTEM IS LIFE(-LIKE)	DYNAMICAL SYSTEM IS HIGHER ORDER; ADAPT/EVOLVE; SELF ORGANIZE
DYNAMICAL SYSTEM IS SOCIAL	DYNAMICAL SYSTEM IS COMPETITION; GAMES; CO-DEVELOPMENT

None of these conceptual metaphors would be called novel or creative, but some of the sub-mappings innovate to explain features of dynamical systems, as discussed below. No metaphors were categorized as ‘other’ because all were readily grouped within the ten listed. Numerous particularized allusions, similes, and analogies were found illustrating several of the sub-mappings in Table 1. Among them are:

- Growth from positive feedback analogous to a forest forming when flora, fauna, climate, and soil interact; exponential growth as with adoption of fax machine and web browser.
- Energy flow as random energy; temperature, physics, chemical kinetics, sunshine.

- Emergence analogous to the flavor of sugar not the sum of its constituent elements; child learning to reach and grasp; jazz pianist improvising; visual gestalts coalescing.
- Self-organization analogous to a person's self-control, willpower, dogmatism.
- Coordinated interactions analogous to people 'in synch', fractal patterns, tailoring, arms races, utility calculations.
- Change and movement understood as ebb and flow, wandering, roaming, walking, climbing, escaping on rugged, tower-shaped landscapes, noise, fuzziness, unfolding; catastrophe, avalanche, washing away, circadian rhythm, menstrual cycle, pathology, contagion.

Some of these analogies are familiar but others may not be well understood by readers of these texts. Although potentially evocative of aspects of the ten conceptual metaphors listed in the first column of Table 1, most appeared only once, were simply named without clear correspondences, making it difficult to assess aptness or structural parallels.

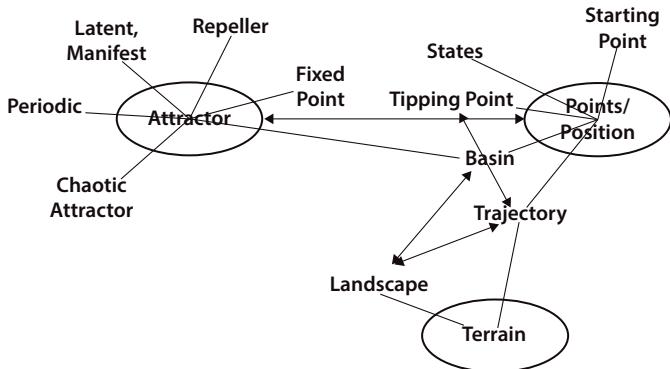
### **2.2.1 TERRAIN, ATTRACTOR, and POINTS/POSITION as three linked metaphors**

All sub-mappings in the present analysis starting with Figure 1, below, were produced based on text examples from the corpus. Most sub-mappings are not conceptually exclusive – some share metaphoric vocabulary (from which one might infer shared reasoning), particularly with other sub-mappings in the same metaphor, and often with those of other metaphors.

First, some explanation of the figures:

- Metaphor Labels: The labels in ellipses were chosen by the author to name the conceptual metaphors.
- Sub-Mapping Labels: The sub-mapping labels that appear as satellites to the metaphors are based on lexical examples and linked with simple lines.
- Co-Occurrence Links: The links with arrows on either end, connecting sub-mappings, indicate that they share lexical co-occurrences (sharing of metaphoric vocabulary, as described later).

The three linked metaphor sources in Figure 1 show the conceptual metaphor DYNAMICAL SYSTEMS ARE TERRAIN, POINTS/POSITION, and ATTRACTOR; these are the first of several metaphoric descriptions resulting from this analysis by which we may comprehend the technical target domain of dynamical systems. Together these are a considerable elaboration of parts of the JOURNEY metaphor (a generic schema of starting point, path or trajectory, destination or goal; see Charteris-Black, 2005; Gibbs, 2006; Johnson, 1987; Lakoff & Johnson, 1999) that authors within this corpus have consciously or unconsciously chosen. Even more



**Figure 1.** Three linked conceptual metaphor vehicles describing space

specialized elaboration appears when this metaphor is placed in the context of other metaphors found in this corpus (see particularly MOVEMENT, below).

As sub-mappings of POINTS/POSITIONS we find various metaphoric states or static locations. In the following examples some co-occurrences (sharing of metaphoric vocabulary, as discussed more fully later) are shown with sub-mappings in MOVEMENT and MULTIPLE PARTS.

- (3) STARTING POINT: set of conditions and initial states; sensitive to initial conditions.
- (4) STATES: traits are determined by specific sites, denoted 'loci'.
- (5) TIPPING POINTS: abruptly switch in response to seemingly minor provocation; grain of sand that could produce the avalanche.
- (6) BASINS: (also linked to LANDSCAPE) the basin of attraction; state to which the system spontaneously returns.
- (7) TRAJECTORY: (also linked to TERRAIN) different paths along which systems may move; map the trajectory of the changes, across thresholds.

TERRAIN metaphors are grouped as LANDSCAPE and TRAJECTORY sub-mappings, characterizing metaphorically the kind of space upon or within which states and locations are arrayed.

- (8) LANDSCAPE: underlying attractor landscape; drawn as two or three dimensional landscapes.
- (9) TRAJECTORY: (this sub-mapping is part of two metaphors; see above).

A separate metaphor shown in Figure 1 is DYNAMICAL SYSTEMS IS ATTRACTOR. In everyday terms the idea of an attractor – a basin or gravity hole into which objects will fall – might be a sub-mapping of TERRAIN or even of STRUCTURE. ATTRACTOR

is shown here as a separate metaphor because it is so frequently mentioned in dynamical systems texts, and the need to distinguish well-known (among systems theorists) types of attractors.

- (10) FIXED POINT: multiple fixed-point attractors captures the idea [...] person may have more than one self.
- (11) CHAOTIC: strange or chaotic attractors ...unpredictable [...] sensitive to initial conditions.
- (12) PERIODIC: temporal pattern is referred to as a periodic or limit-cycle attractor; [...] such as circadian rhythms.
- (13) REPELLOR: repellors; [...] basins of repulsion.
- (14) LATENT/MANIFEST: a latent positive attractor can promote a rapid de-escalation; the latent attractor may become manifest [...].

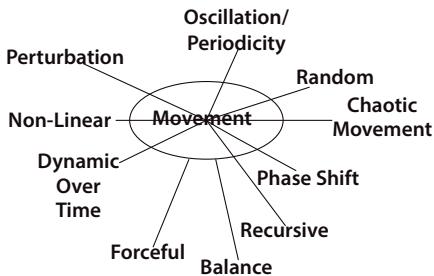
Reviewing the evolution of a business enterprise that was wildly profitable and then suddenly bankrupt, business management theorists describe this dynamic as *a pathological state for an organization at the edge of chaos* – how a system behaves erratically when near a chaotic attractor. Evolutionary biologists frequently speak of *fitness landscapes*, corresponding to the LANDSCAPE sub-mapping of the TERRAIN metaphor. This relates to ATTRACTOR, depicted as valleys and fitness landscapes, as one or more peaks or optima of fitness that an evolving organism may attain: *A fitness landscape with peaks and valleys, also called metaphorically a 'rugged landscape'*, or a single smooth peak.

With only these three conceptual metaphors one may already benefit from metaphorically understanding the unfamiliar, technical topic of dynamical systems in terms of a familiar and concrete Euclidian space with topological features. When combined with the MOVEMENT metaphor (below) this metaphoric space resembles our terrestrial environment in which things move in understandable ways.

### **2.2.2 Conceptual metaphor of MOVEMENT**

As with most sub-mappings the ten sub-mappings shown in Figure 2 are not conceptually exclusive – some share the metaphoric vocabulary of movement. They extend and elaborate simpler metaphoric notions (such as bodily movement) to portray particular actions that dynamical systems theorists evidently require to describe how their systems work. Although the usage found in these sub-mappings often is not the most commonplace, the terminology is familiar enough to project rich metaphoric meaning for non-specialists.

It is often these special, even striking, movements that distinguish dynamical systems from simpler mechanisms. Evolutionary biologists need to explain how a



**Figure 2.** Vehicle domain of DYNAMICAL SYSTEM IS MOVEMENT metaphor with ten sub-mappings

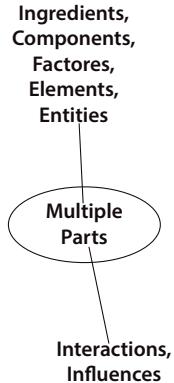
species' mutation rate does not predictably result in increased fitness; social psychologists must more accurately describe the point at which positive self-regard is changed by peer pressure to unstable negative thoughts, then later re-stabilizes as positive. Examples of two of these MOVEMENT sub-mappings follow:

- (15) PERTURBATION: If such a state is perturbed from the outside, a self-critical coevolutionary avalanche may follow.
- (16) CHAOTIC MOVEMENT: tend to move near to, but not ...into chaotic attractors ...edge of chaos state ...different possibilities [...] Vygotsky's 'zone of proximal development'.

### 2.2.3 Conceptual metaphor of MULTIPLE PARTS

With MOVEMENT and TERRAIN metaphorically understood, one easily infers some notion of parts or objects that move. Metaphoric segments in this corpus name the ingredients, elements or components of a system (see Figure 3) but not often as prototypical objects that are easily separable, manipulable, contained, added to or subtracted from. There are two sub-mappings: INGREDIENTS/ELEMENTS/ENTITIES and INTERACTIONS/INFLUENCE. The latter shows ways in which elements of a system interact and mutually influence each other, allowing transportation analysts, for example, to explain the dominance of the internal combustion engine resulting from complex interactions over time rather than simply from car-maker policies. Other examples of sub-mappings follow.

- (17) INGREDIENTS/ELEMENTS/ENTITIES: even simple systems consisting of a few elements often exhibit behavior of enormous complexity; A set of inheritable traits, the genome, is passed from parent to offspring.
- (18) INTERACTIONS/INFLUENCES: individual contributions to the event are adjusted as the interaction proceeds; 'epistasis'[...] the presence of a given allele in a given locus may depend on which alleles are present in some other loci.



**Figure 3.** Vehicle domain of DYNAMICAL SYSTEM IS MULTIPLE PARTS metaphor has two sub-mappings

These elements and entities are not the objects that implicitly move from point to point on a terrain in everyday thinking and this common idea can confuse understanding as discussed later.

*Explanation of links between metaphor sub-mappings.* As shown in the textual examples already given, each sub-mapping is indicated by sentences or fragments from the corpus containing metaphoric words identified as conceptually part of the sub-mapping. Within those fragments are other words, some of which may be the same or similar to those in one or more other sub-mappings; that is, they 'co-occur' across sub-mappings. Note in such instances that a link with arrows on each end is drawn. In several of the textual examples above we find such co-occurrences, and in presenting the remaining metaphors below, co-occurrence links are emphasized.

#### 2.2.4 *Links found from MULTIPLE PARTS to MOVEMENT and TERRAIN*

The conceptual metaphors presented separately above are shown together in Figure 4 with co-occurrence links drawn in. Although the links are difficult to follow in detail, the main result is the profusion of interrelatedness of these conceptual metaphors in the specialized literature that this corpus represents. Here are examples:

- (19) INGREDIENTS/ELEMENTS/ENTITIES linked with NON-LINEAR MOVEMENT: the nonlinear interactions of parts in a system ...cannot be explained by breaking the system into its parts; regularities ...that transcend their own ingredients ...color ...cannot be traced into any particular component.

In Extract (19), linguists use dynamical systems to re-formulate reductionist theories that relate thinking to speaking, offering an analogy to color vision.

- (20) TIME linked with INTERACTIONS/INFLUENCES: spontaneous activation and turn-over of cognitive and affective elements in the stream of thought.

In (20), social psychologists theorize about the combined intellectual and emotional ‘stream’ changing over time, modulating the effect of external demands.

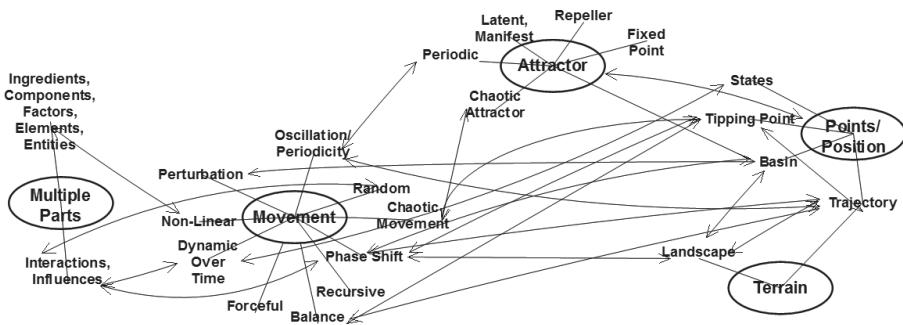


Figure 4. Profusion of links among several conceptual metaphors

In (21) below, social psychologists infer the dynamics of self-regulation, whereas in (22), business management scholars present the logic for the surprising course of one corporation’s development:

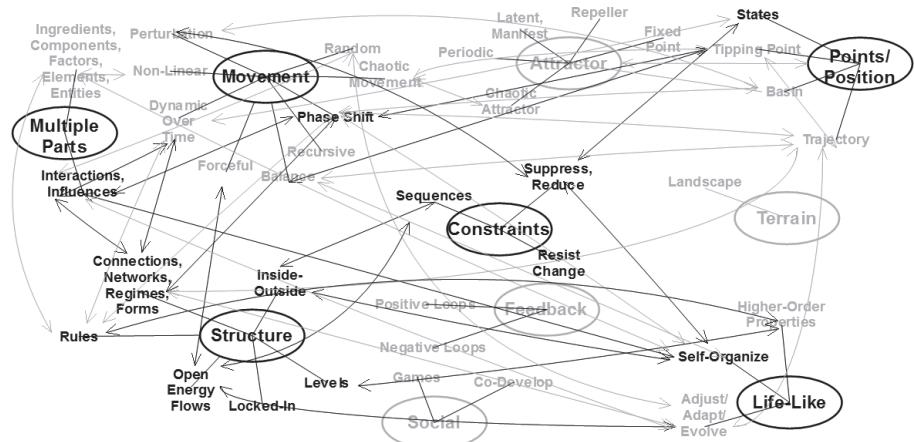
- (21) BALANCE linked with TRAJECTORY: the flow of thoughts, feelings, and behavior ... converges on specific states.
- (22) TRAJECTORY linked with PHASE SHIFT: an exponential curve that accelerates over time. Early parts may look fairly linear and predictable. But without changing its basic form, it bifurcates into a qualitatively different form: ‘spiral[ing] out of control’.

### 2.2.5 Conceptual metaphors of STRUCTURE and CONSTRAINTS

Structure, here metaphorically understood in physical terms, both includes and goes beyond common sub-mappings of CONSTRUCTION, FOUNDATION, LEVELS, STABILITY, and CONNECTIONS. The DYNAMICAL SYSTEM IS CONNECTIONS sub-mapping here also includes networks, regimes, and forms. Examples of linked sub-mappings shown in Figure 5 follow.

- (23) INTERACTION and PHASE SHIFTS linked with REGIMES: Epistatic interactions introduce a phase transition to a non-adapting regime once the mutation rate becomes too high.

An evolutionary biologist describes the passage of some species to a static structure in (23), whereas in (24), evolutionary biologists note limits on dynamics, offering a physics simile.



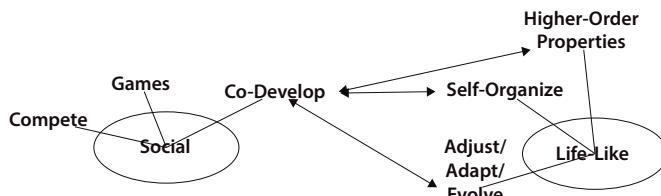
**Figure 5.** Vehicle domains of DYNAMICAL SYSTEM IS STRUCTURE and DYNAMICAL SYSTEM IS CONSTRAINTS metaphors linked with STATES, OBJECTS, MOVEMENT, LIFE-LIKE Note: muted domains and links are provided to put STRUCTURE, CONSTRAINTS, etc. in their metaphoric context.

- (24) ENERGY FLOWS linked with SEQUENCES: the quantity  $W(s)$  is defined up to a proportionality constant ...much like the energy in physics.
- (25) STATES and SELF-ORGANIZATION linked with SUPPRESS/REDUCE: self-control ...self-organized critical states ...reduce degrees of freedom for action ...to suit the ...set of circumstances in which the action is situated.

In (25), a cognitive psychologist deals with environmental constraints on cognitive and emotional expression.

### 2.2.6 Conceptual metaphors of LIFE-LIKE attributes and human SOCIAL interactions

Dynamical Systems are often said to have a 'life of their own'. Personification metaphors, including complex machines, are widely recognized (e.g., Kövecses, 2002). In this corpus certain characteristics of dynamical systems are described metaphorically as behavior of living beings, including people and occasionally computerized machines. Examples from the DYNAMICAL SYSTEM IS LIFE-LIKE metaphor found in the social psychology and transportation sections of the corpus follow:



**Figure 6.** DYNAMICAL SYSTEM IS LIFE-LIKE and DYNAMICAL SYSTEM IS SOCIAL metaphor vehicle domains

- (26) HIGHER ORDER PROPERTIES: emergence of global properties and higher-order processes.
- (27) SELF-ORGANIZATION: adapt and evolve as they organize themselves through time.

A separate, conceptually related metaphor called DYNAMICAL SYSTEM IS SOCIAL SYSTEM was also identified, with sub-mappings of COMPETITION, GAMES and CO-DEVELOPMENT. Interestingly these sub-mappings were seldom found in the social psychology or business management sections of the corpus, where such terms might be used literally, but primarily from evolutionary biology were primitive entities and even genomes are described figuratively as competing for habitat, playing games against each other and co-evolving as entire organisms do. The following examples are from SOCIAL and LIFE-LIKE metaphors.

In (28), evolutionary biologists use mathematically rigorous game theory (that tracks behavior of payoff-maximizing humans) to explain the dynamics of two species' co-evolution in a shared environment. In (29) biologists depict mutating genes of evolving species as rational beings, and in (30), linguistic forms are seen as co-adapting and co-evolving as living beings.

- (28) GAMES: the introduction of reproductive capabilities for the participants turns the hawks-and-doves game into an evolutionary game.
- (29) COMPETITION: this simple evolutionary game tries to model competition in terms of expected utilities.
- (30) ADJUST/ADAPT/EVOLVE linked with CO-DEVELOPMENT: change each other in a continual process of co-adaptation.

In Example (31) an evolutionary biologist offers a social psychology analogy to describe the co-evolution of genetic material depending on memory-like functions, just as opinion- and value-formation depend on memory of social interaction:

- (31) EMERGENCE OF HIGHER-ORDER PROPERTIES linked with CO-DEVELOPMENT: interactions with one's neighbors are responsible for the emergence of public opinion, altruistic values, and other group-level properties.

Metaphors of people and other animate beings are widely used across various domains of specialized and non-specialized discourse (e.g., Charteris-Black, 2004; Kövecses, 2002) perhaps because when we hear our own mental, adaptive, reproductive or social capacities and traits described, they sound especially plausible, even when projected to primitive entities. These metaphors access the complexities of dynamical systems in familiar terms.

### 2.2.7 Metaphor links to FEEDBACK

Dynamical systems theorists often describe positive feedback as forming attractors, increasing the movement, growth, or power of a system, sometimes disequilibrating it or making it erratic, while negative feedback slows or dampens the system, possibly equilibrating it. Interestingly, the term feedback is found in this corpus only in the texts of transportation studies and business management. The other fields have alternate terminology: Evolutionary biology speaks of hypercycles and catalysts. Cognitive psychology, social psychology, and linguistics refer to non-linear interactions and rules among system elements that produce change in the absence of external influence.

The analysis of lexical co-occurrence among metaphor sub-mappings uncovers a limited number of links from POSITIVE AND NEGATIVE LOOPS (see Figure 7, just right of center) that invoke specific kinds of MOVEMENT; here are examples from transportation studies and business management:

- (32) FORCEFUL MOVEMENT and CHAOTIC MOVEMENT linked with POSITIVE FEEDBACK: Positive feedback increases the rate of change, pushing systems closer to the edge of chaos.
- (33) LOCKED-IN STRUCTURE, RECURSIVE MOVEMENT and BALANCE linked with FEEDBACK: patterns of inertia reinforce established patterns through processes of positive feedback ...takes the system away from equilibrium; negative feedback loops that restore the functioning ...circular causality ...re-establishing equilibrium.

In some dynamical systems texts feedback seems essential, yet is never defined as to what it is, only as what effects it has. The word *feedback* itself is metaphorical by projecting the idea of some substance moved or fed to fuel or control subsequent action. Such metaphorical meaning is essential to making sense out of the notion of feedback, as the examples demonstrate.

In the Example (32), above, positive feedback is (paradoxically) associated with inertia that projects an idea of encumbered movement holding a pattern in place, yet moving the system out of balance. The second example above has negative feedback looping, effects becoming causes, and returning the system to balance.

- (34) RECURSION linked with FEEDBACK: The simplest hypercycle. A and B are self-replicating molecules. A acts as a catalyst for B, i.e. the replication rate of B increases with the concentration of A. Likewise the presence of B favors the replication of A.

Example (34) uses the dramaturgical term *acts*, in this context no different than 'feedback,' combined with the chemical term *catalyst*, clarified as *presence [...]*

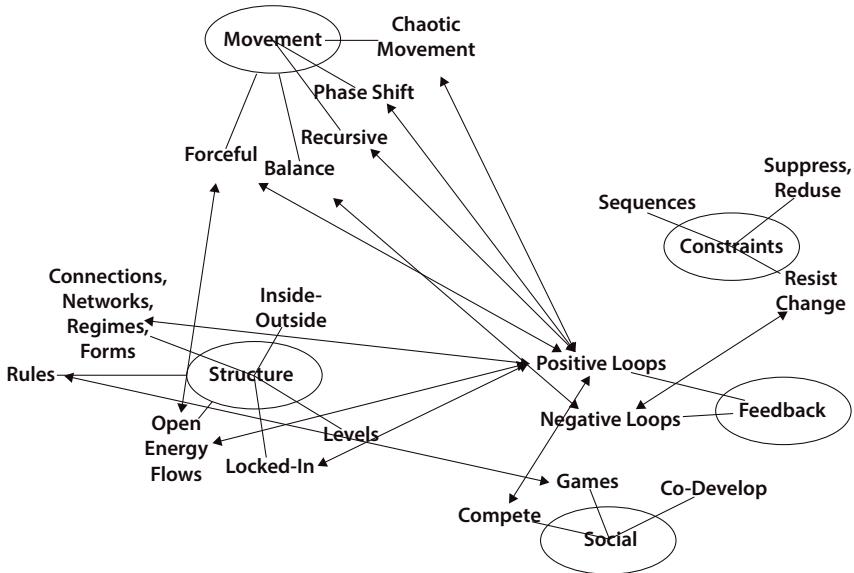


Figure 7. Links with conceptual metaphor DYNAMICAL SYSTEM IS FEEDBACK LOOPS

favors, giving us essentially a positive feedback loop combined with a negative one, together regulating a recursive growth process. The mathematical formulations for generation of pre-biotic life accompanying this example in the corpus are precise to the mathematician, but for other readers the feedback and movement metaphors supply most meaning.

- (35) PHASE SHIFT linked with POSITIVE FEEDBACK: Small chance events become magnified by positive feedback; butterfly effect [...] small changes in driving variables or inputs – magnified by feedback – can produce disproportionate system outcomes.

A movement, metaphorically understood to be small and arbitrary as that of a *butterfly wing*, is *fed, magnified* or *made much larger*, and when *put into* the system, *drives* the whole system forcefully. The metaphoric terms seem to make understandable Example (35), yet the way feedback works is only weakly suggested – that something becomes purposefully bigger (*magnified* as by a lens) but without any actual force, substance, or direction applied.

- (36) REGIME (Structure) and FORCEFUL MOVEMENT linked with POSITIVE FEEDBACK: certain fluctuations [...] may be amplified, and invade the entire system, compelling it to evolve towards a new regime.

Again, seemingly chance movements, *fluctuations*, are *amplified*, as happens with positive feedback, but in this text they *invade* the system and *compel* it towards new *regime* structure. The present corpus, despite the degree of forcefulness implied in this example, has very few other such examples, and no ‘war/struggle’ metaphor was judged to exist.

DYNAMICAL SYSTEM IS JOURNEY metaphors (POINTS/POSITIONS, TERRAIN, MOVEMENT, MULTIPLE PARTS) along with STRUCTURE, CONSTRAINT, SOCIAL, and LIFE-LIKE metaphors draw on human traits and experience of bodily movement to make them real and familiar. But sub-mappings of the FEEDBACK metaphor seem abstract. Their several links with MOVEMENT, and occasional allusions to chemistry, optics, sound reproduction and mechanical force lends them familiar meaning. However such meaning is fragmentary and, to the extent the non-specialist is dependent on metaphor as a bridge from the known to the unknown regarding dynamical systems, incoherent understanding seems likely. This is noteworthy since *feedback* seems essential for a proper understanding of dynamical systems.

### 3. Discussion and conclusion

A metaphor is capable of projecting onto a (relatively) little-known target much of its structure – ideas already formed by virtue of prior experience with the source – and thereby promote understanding of the target. At the very least, the metaphors used in the literature on dynamical systems should build properly upon, and overcome the limitations of, literal statements (as suggested by Lakoff & Johnson, 1999). In the introduction I asked two questions about metaphors used in educational scientific writing about dynamical systems and, to address these questions, I described a study of a corpus of professional education literature, particularly that dealing with aspects of dynamical systems; the questions posed are summarized as follows:

1. Given that dynamical systems are abstract and far-removed from everyday experience (and from conventional source domains), what metaphors do specialists use when they apply these systems to various subject areas? Are these metaphors, their extensions, combinations or linkages conventional (e.g., Newtonian) or novel? This question is addressed in Subsections 3.1 and 3.2, below, that appraise the metaphors found and their degree of novelty; it is qualified in Subsections 3.3 and 3.4 that describe metaphor extensions and linkages.
2. Keeping in mind that dynamical systems analysis has been very successful in modeling the increasing complexity of dynamical global systems on which human wellbeing depends, are the conceptual metaphors used in descriptions

and explanations of these models adequate to frame and guide accurate and meaningful interpretation by students and non-specialists? This question is addressed below in Subsection 3.5.

Whether dynamical systems specialists have learned a new and overarching conceptual metaphoric source domain is discussed in the concluding section, 3.6.

### 3.1 The conceptual metaphors used

The study reported here found metaphors rich with sub-mappings and abundant realizations in language. This indicates their conceptual nature, integral to the authors' communications. The source domains are conventional like those found in a variety of discourse, for example, in journalism, politics, education, and sacred texts (Cameron, 2003; Charteris-Black, 2004, 2005; Eubanks, 2000). Some of these conventional source domains resemble those of the primary conceptual metaphors, or combinations of these, as identified by Grady (1997) and elaborated by Lakoff and Johnson (1999).

TERRAIN, ATTRACTOR, and POINTS/POSITION taken together seem conceptually related to what might be termed DYNAMICAL SYSTEM IS JOURNEY metaphor, especially when combined with MOVEMENT. MULTIPLE PARTS found here evokes DYNAMICAL SYSTEM IS MATERIAL OBJECTS; STRUCTURE resembles DYNAMICAL SYSTEM IS BUILDING/CONSTRUCTION; and LIFE-LIKE plus SOCIAL resembles the DYNAMICAL SYSTEM IS PERSON[IFICATION].

Identifying and naming conceptual metaphors is admittedly a process that will retain some degree of subjectivity and, if devised independently and coded in a reliability analysis, might vary somewhat. The metaphors show more subject matter specificity that, along with sub-mappings, promote comprehension of the dynamical systems texts, as reviewed below.

### 3.2 Innovative or novel metaphors

No metaphors were coded as 'other' but a number of interesting analogical terms or semantically rich allusions were noted. These metaphoric terms offer tacit suggestions for creative metaphors that might be robust and useful if developed. However, none of the conceptual metaphors themselves were innovative.

### 3.3 Specialized sub-mappings fine-tune the metaphors

The study found a wide array of sub-mappings, many of them keyed to dynamical systems, such as the ten sub-mappings of MOVEMENT, numerous special states, terrains, trajectories, and several elaborated life-related mappings. Also JOURNEY, instantiations of which are more often of the generic source-path-destination form, here appear as four aspects that highlight key features of dynamical systems.

This diversity of language hints at, but does not reach the level of the novel extensions or elaborations of metaphors found by Lakoff and Turner (1989) in admired poetry, but are inventive nonetheless. Dynamical systems formulations are mathematical and intricate and go beyond the education or experience of most people. The various extensions and elaborations found in the sub-mappings are useful, if sometimes imprecise, in describing and explaining technical aspects of dynamical systems to non-specialists.

### 3.4 Linkages among sub-mappings

One could not very often talk about one of the conceptual domains or sub-mappings found here in isolation from others. Consequently, linked sub-mappings were investigated fully and found to contribute substantial meaning to the texts. As reported above, text segments containing combinations of metaphoric words belonging to more than one metaphor were designated as co-occurrences, diagramed with double-arrow links in the figures, and shown through examples to be metaphoric combinations or blends that extend, elaborate, or enhance metaphoric understanding of this highly technical topic. Absent these blends and elaborations the metaphors have quite limited explanatory power.

Metaphoric implications without lexical evidence were also very important. From everyday experience the interrelatedness of source domains of the metaphors found are common knowledge, so the co-occurrence of terminology makes sense to the reader. Such conceptual knowledge operates broadly and the co-occurrences found here are only a portion of those possible in larger corpora.

This conceptual knowledge provides a figurative context and a further basis for inferences to be made. Some examples have already been discussed such as the conventional logic about movements of bodies and objects in space, from point to point, along paths or trajectories. A terrain or territory, per conventional knowledge, may be mapped, revealing relative distances that allow visualization of trajectories. This is actually done in evolutionary biology texts that show three-dimensional fitness landscapes with peaks; there is an implied trajectory to a peak, and alternative ones that are suboptimal. But in social psychology the

corresponding attractor diagrams are two-dimensional, discouraging a visualization of trajectories other than simply sliding into a hole; however the figurative context enables the reader to infer additional trajectories.

Another example is that attractors are a type of container, open at the top but impermeable elsewhere; when periodic oscillation or chaotic movement is said to occur at its opening, this implies surface conditions or forces that have not been described but which can be assumed to influence ranges or patterns of movement. Consider also the DYNAMICAL SYSTEM IS LIFE-LIKE metaphor, evoked when something is said to have wants or needs, to develop physically, or to give rise to (procreate) something else; it then becomes easy to infer interrelationships with like entities and regimes or strategies for conducting them.

Although authors may occasionally be aware of the figurative context they create and use, there is minimal indication here of the sub-mappings being deliberately tailored to better frame or improve descriptions of dynamical systems.

### 3.5 Adequacy of metaphors and epistemic mystification

While metaphor can help express intended meaning more fully and clearly, it has equal potency to distract from, confuse, oversimplify, or obscure it. Metaphorically expressed theory enables representation of abstract ideas in a more familiar, concrete, even sensory form which makes it more comprehensible (Carstensen, Tibell, & Bernhard, 2003). Metaphors may actually help specialists think, develop a model, and communicate it among themselves (being ‘theory constitutive’) and facilitate learning by non-specialists (being pedagogical) or could serve both functions (Semino, 2008). If deployed for both indiscriminately, which seems the case here, their use and reuse may make it impossible to know when they are intended to offer a precise, even literal description and when an accessible, figurative one. While providing the needed simplification and familiar representation as a pedagogical tactic, the learner may confuse the epistemic model (or metaphor) for the ontological reality. The text intended to reveal a theory may end up making it ambiguous, or could contribute to forming an appealing but inaccurate ideology, imparting “regimes of truth” (Goatly, 2002, p. 266).

This can be illustrated by returning to two metaphors frequently used in the corpora studied here: JOURNEY and MATERIAL OBJECTS. Systems take figurative journeys on *trajectories*, encountering *tipping points*, entering *basins of attractors* and achieving *equilibrium*. These metaphors imply that a multivariate dynamical process is as simply organized as a ball rolling into a basin.

This renders a highly complex reality familiar and coherent while promulgating a decidedly materialistic ideology (Smith, 2009). Such metaphors, chosen

unconsciously, reify sequences and processes into objects located in time-space where (as Lakoff and Johnson, 1999, assert) every change is conceived as a physical action. But when dynamical systems are studied in depth they may not be as the metaphors describe them.

The MATERIAL OBJECTS metaphor is actually misleading when linked to the JOURNEY metaphors where elements or objects (such as a *ball on a hilly landscape* as repeatedly expressed by social psychologists in the corpus) might be construed to travel from point to point in the metaphoric fitness landscape or to roll into attractor basins. What dynamical theorists are trying to explain is the changing state of the system. It is this state that is traveling, and it has no conventional object attributes. Sensing this inconsistency between metaphoric superstructure and literal meaning, readers are deprived of the expected frame and may become frustrated, confused, or regard dynamical systems as incomprehensible.

On the other hand, sophisticated readers already familiar with dynamical systems find such metaphors useful and appealing because they are conceptual blends rendered in a compressed package (Fauconnier & Turner, 2002; Grady, Oakley, & Coulson, 1999). The metaphoric aspects recap and portray the results of mathematical or computer models of dynamical processes, foregrounding what authors wish to emphasize and backgrounding other matters (including what they themselves may not understand). Again consider system stabilization in a fixed point attractor neatly depicted as a ball rolling into a depression.

The ideas of a system reaching stability over time and an object moving over terrain to a destination can become confounded. The ball is metaphorically understood as a tangible, material object, pushed and pulled from point to point on a terrain (understood in the generic journey metaphor (Lakoff, 1993) as the affected entity to which force is applied). What in fact ‘moves’ is the dynamical system itself, metaphorically understood as a ball. The system changes state in successive moments in time, and this series is metaphorically understood as a trajectory of points over a spatial terrain. The succession of changes in system state, or relative instability, is contrasted with the stability of the system at rest, metaphorically portrayed as a depression or valley in the terrain where the ball stops. Why the system moves towards stability and enters a stable state is metaphorically understood in terms of the shape or contours of the terrain and propulsion of the ball by gravity.

Metaphorically substituting movement for change, space for time, rest for stability, and gravity for force or propulsion – portrays a comprehensive and lucid dynamic. However, what is obscured or lost in this metaphoric depiction is the complexity that constitutes the state of the system, the dynamical interaction, adaptation, feedback, and self-organization processes that operate over time (all of which are concealed within the rolling ball metaphor) and the internal and external sources and flows of force or energy (metaphorically abridged as gravity).

ENTITY/OBJECT, MOVEMENT, TERRAIN, STATE/POSITION, and ATTRACTOR sub-mappings have thereby over-simplified dynamical systems. In actual fact the state of the system has its own dynamics. Somewhat effective in restoring portions of the lost dynamical complexity, the LIFE-LIKE metaphor linked to MOVEMENT personifies and animates the system with an implied sense of balance (perhaps disrupted or perturbed), able to proliferate, grow, thrive, and develop; linked to SOCIAL, changes emerge through mutual adaptations and games played for pay-offs. MOVEMENT sub-mappings link back to FEEDBACK, to steer by directing and regulating force applied to the metaphorically moving system.

Again there is both metaphoric extension and conceptual incoherence. The FEEDBACK LOOP metaphor both violates and complements the JOURNEY metaphor. The resulting blend evokes a quantifiable, virtuous material substance, information, or energy being fed physically through a tube or conduit, as fuel might be fed to an engine, then consumed or processed in a way that perpetuates or increases system movement. The blended metaphor lacks specific detail but portrays the system as adaptive, as a living organism adapts to its environment.

Neither literal nor figurative language in the corpora wholly substantiates this account but it might seem a valid inference from the figurative context. Not knowing what is actually fed or how such 'feeding' must be done, one could speculate further from the overall figurative context that feedback proceeds as game-like behavior – somehow calculating payoffs, optimizing strategies, taking turns choosing from a rule-bound repertoire of actions that may evolve the system or spiral it out of control.

To sum up on the question of metaphor adequacy: the metaphors help understanding yet fall considerably short. While they are attractive and enable one to begin to think through the technical aspects of dynamical systems, they are not generalizable nor do they enable us to extend this thinking logically or reason inferentially with very much confidence. It is doubtful whether, when metaphors are blended in an effort to provide access to this technical topic, the authors have carefully enough considered the conceptual efficacy and robustness of the result. They have engaged the reader and given alluring hints much as when advertisers use metaphors (Forceville, 2008). Without more careful construction and explanation, wrong-headed interpretations are a distinct possibility.

### 3.6 Conclusions and suggestions for better use of metaphor

Once metaphors are introduced for their initial explanatory function their shortcomings can be mitigated, even exploited. The differences between a metaphor and the reality it is meant to represent can be explicitly identified (Sticht, 1993).

This brings metaphor into conscious awareness and prevents the metaphor from becoming the sole means for depicting the phenomenon.

Pedagogical metaphors can be deliberately selected for their capacity to illustrate specific target phenomena and explaining the unfamiliar (Brown, 2003; Cameron, 2003; Giles, 2008). They can sensitize students to a source domain concretely, encouraging them to borrow from it in reasoning about the target, to examine each parallel and inquire about discrepancies. This will reveal more explicitly the strengths and limitations of a metaphor, including its potentially illuminating or misleading aspects. As such it is a ‘stepping-stone’ or ‘creative falsehood’, for use in teaching concepts that are well understood by specialists but unfamiliar to others, then discarded once the teaching function is complete (Steinhart, 2001, p. 7).

In the texts from which the corpus comes there were no attempts to identify or point out the deficiencies or limitations of the metaphors being used. What if source domains were consciously and deliberately accessed for their greater descriptive and explanatory power, and enhanced to elucidate aspects of dynamical systems puzzling to non-specialists? This may involve looking for suitable analogies (perhaps developing the “innovative sub-mappings” reported above), and combining metaphors that separately have some but not all needed features. In this way stronger frames could be provided to clarify what dynamical systems are and the logic of how they work, so that inferences are more usefully drawn and reasoning enhanced.

To conclude, the metaphors found were overwhelmingly conventional ones that included personification but predominantly were Newtonian in character – metaphors of force dynamics, movement, and object manipulation. Very few novel metaphors or novel extensions of conventional metaphors were found that might have been used to describe and explain non-conventional aspects of dynamical systems theory. Instead, a proliferation of extensions and elaborations of conventional metaphors were found and co-occurrence linkages documented. Despite regrettable distortions, I have described how these bolster pedagogy by providing more adequate figurative context and helpful conceptual structure for students and non-specialists than would have been the case without them. In the absence of any new metaphors, these extensions and elaborations probably do not suggest the existence of a sub-genre of dynamical systems scientific writing.

Furthermore the evidence presented here shows no indication that dynamical systems theory forms a distinct metaphoric source domain for specialists. This may be assumed on the basis of their intimate and long-term experience with the subject matter, with case studies, non-linear mathematics and reiterative computational simulations assumedly providing a grounding for inference structure and

for forming and guiding their thinking much as metaphor source domains do in conceptual metaphor theory. Yet, despite some similarity with the source domains of primary metaphors mentioned above, I was unable to detect lexical evidence of this in the discourse studied here.

I have mentioned that adequate metaphors are needed to explain dynamical systems to non-specialists because of the importance of the problems to which dynamical analysis seems uniquely applicable. The metaphor detection procedure used here resembles that often used in corpus-driven metaphor study: A genre is defined, extracts of the discourse are sampled in line with the purposes of the study, and then metaphors are identified. This approach tells us what metaphors are used but does not tell us which metaphors work well or are particularly suited to explain difficult matters. I began the study reported here expecting to find some metaphors that work much better than others, but did not. Perhaps, instead of examining the discourse of numerous, diverse experts, it would help to look for individual experts whose pedagogy is judged outstanding and to investigate how they use metaphor.

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## SECTION V

### Metaphor and popularization



# Metaphor, news discourse and knowledge

Julia T. Williams Camus  
University of Cantabria, Spain

The aim of this study is to analyse the role of metaphor in the dissemination of specialised knowledge through the discourse of newspaper articles. A bilingual English and Spanish newspaper corpus of 100 science popularisation articles on cancer (*The Guardian* and *El País*) was used to analyse and examine the metaphorical expressions employed to describe cancer aetiology and three pathological cellular processes involved in the disease. Metaphors were identified according to the Metaphor Identification Procedure (Pragglejaz group, 2007). The analysis showed that different source domains are required for the recontextualisation of cancer, with certain source domains being preferred. The selection of source domains appears to depend on the cancer-related aspect (target) and, to some extent, on the language of the newspaper.

## 1. Introduction

Both metaphor and popularisation discourse have had a somewhat turbulent relationship with scientific knowledge. The positivist tradition, which influenced science for a long time, held that true scientific thought should be expressed through literal language, and hence, metaphor, although (inadvertently) used, was perceived as unsuitable (Gwyn, 2002, p. 120). Popularisation has been considered as a translation at best and as a degradation of authentic scientific knowledge at worst (Myers, 2003, p. 266). Recent research has described the relationship of metaphor (Brown, 2003; Chew & Laubichler, 2003; Giles, 2008; Kuhn, 1993; Reynolds, 2007; van Rijn-van Tongeren, 1997) and popularisation (Hilgartner, 1990; Myers, 2003; Väliverronen, 1993) with scientific knowledge from a different perspective, and they have both been credited with a role in the creation and dissemination of scientific knowledge independently. In science popularisation in particular (Knudsen, 2003; Semino, 2008; Williams Camus, 2009), a prominent role has been ascribed to metaphor.

The aim of this chapter is to determine how metaphor helps to recontextualise scientific knowledge in popularisation articles in the press. To this end, this

study explores the role of metaphor in relation to the dissemination of specialised knowledge in a corpus of 100 popularisation articles on cancer in the English broadsheet *The Guardian* and in the Spanish newspaper *El País*. The study also sought to identify differences in the use of metaphor in this specific discourse between the English and Spanish newspapers included in the analysis. By metaphor in the dissemination of knowledge, I refer to the different roles and functions exhibited by metaphors in the recontextualisation of cancer research in the press. In particular, this chapter is concerned with those metaphorically used words that help to elucidate complex cancer processes: the formation of cancer (aetiology) and three processes included among 'The Hallmarks of Cancer' – metastasis (the spread of cancer from the primary site to another part of the body), evasion of apoptosis (cell death) and angiogenesis (the formation of blood vessels) (cf. Hanahan & Weinberg, 2000).

Cancer was chosen as the subject matter of all the articles in the corpus for a number of reasons. Firstly, the scientific community is not yet clear as to the origin and evolution of the disease, making cancer a fairly abstract and unknown phenomenon (van Rijn-van Tongeren, 1997, p. 15). As such, cancer is a fruitful target for metaphorical exploitation because abstract and poorly delineated phenomena are especially prone to metaphorisation. Secondly, a vast amount of texts were available because scientific research in the field of oncology frequently attracts the attention of the media (Minelli de Olivera, 2008, p. 114). And thirdly, there is considerable debate within public and academic circles over the ways in which cancer is conceptualised through metaphor (Clow, 2001; Montgomery, 1993; Sontag, 1978).

With the advent of new media, the amount of cancer information readily available for the lay public has increased considerably in the last twenty years. In spite of the growing role played by the Internet, the print media are still considered to be an influential source of information for health-related topics (Wilson, Booth, Eastwood, & Watt, 2008, p. 126). In fact, health information on the Internet is rated as less reliable than print media by American adults (Fishman, Have, & Cassarett, 2010). Nevertheless, scientists generally believe that journalists misrepresent their work (Suleski & Ibaraki, 2010) and, in the case of cancer treatments, flawed accounts have been documented in the press (Fishman et al., 2010; Martínez Jambrina & Peregrín, 2004; Revuelta, 1998; Wilson et al., 2008).

In all, despite critical voices, reliance upon print media for health-related information is still the norm for health professionals and the public, and information from these sources has been found to influence decisions about treatment choices and medical care (Wilson et al., 2008, p. 126). It has been claimed that the most suitable model for decision making in healthcare is the shared/informed decision-making paradigm, in which health decisions about treatment are made jointly by doctors and patients (Arora et al., 2008). In this context, despite the

advances in other news media, the print media gain significant importance as a primary source of information particularly for patients, to help them in the decision-making process. Journalists, in turn, acquire a crucial role in the task of recontextualising science for the public.

In the present study of metaphor in press popularisation articles, I aim to delve deeper into the source domains employed to describe particular processes or characteristics of the cancer cell in order to clarify how metaphors help to present cancer-related knowledge in the press. In doing so, I will point to relevant connections between technical scientific metaphors and their popularised counterparts.

## 2. Theoretical framework

Metaphor has for a long time been perceived as an unsuitable figure of speech in the domains of science. According to the traditional Aristotelian definition, metaphor is the application to one thing of the name belonging to another. This approach also assumed that metaphor could be expressed in literal terms (Gwyn, 2002, p. 120). Following this definition, philosophers such as Hobbes considered metaphor inappropriate for scientific discourse, which should be concerned with the objective and trustworthy description of reality (Semino, 2008, p. 131). However, in recent decades several authors have shown that metaphor does play an important role in the making of science (Kuhn, 1993; Giles, 2008) and in scientific discourse (Brown, 2003; Reynolds, 2007; van Rijn-van Tongeren, 1997; to name just a few). Such contributions are the result of the shift from traditional accounts of metaphor – whereby metaphor was conceived as an ornamental or literary figure of speech – towards a cognitive conception of the trope (Lakoff & Johnson, 1980). This paradigm, advanced most prominently by Conceptual Metaphor Theory, has stressed the ubiquity of metaphor in language, and language as evidence for an underlying metaphorical cognitive system. In Lakoff and Johnson's own words:

Metaphor is pervasive in everyday life, not just in language but in thought and action. Our ordinary conceptual system in terms of which we both think and act is fundamentally metaphorical in nature. (1980, p. 3)

Also crucial to Conceptual Metaphor Theory is the fact that metaphor shapes our understanding of the target domain in a particular way, as the mapping of two entities is always partial and certain aspects will be highlighted and others will remain obscured. Thus, the metaphors used to popularise science can have an effect on the ways in which knowledge about the target domain is constructed by the lay audience and even by the scientists themselves (Chew & Laubichler, 2003).

Since Lakoff and Johnson's seminal work, studies of metaphor in different genres have proliferated and Conceptual Metaphor Theory has undergone constant revision and refinement (Deignan, 2010, pp. 44–56; Steen, 2007). From the perspective of linguistics, scholars have emphasised the need for a close examination of metaphorical language in naturally occurring data (e.g., Deignan, 2005) and the importance of investigating the actual behaviour of metaphor in specific texts and genres (e.g., Semino, 2008). For the purpose of this study, I embrace the premise that the study of metaphor needs to take into consideration the genre under analysis and to provide a detailed account of the metaphorical expressions in the texts.

Popularisation discourse can be very broadly defined as scientific writing for the general public, and includes a variety of spoken and written genres. This study focuses on the genre of newspaper popularisation articles, which typically take as their starting point the publication of new scientific discoveries in a journal article. In this setting of the presentation of specialised knowledge through the medium of the newspaper, it is first necessary to consider the relationship between science, journalism and the public.

Since the 1980s, sociologists of science (Hilgartner, 1990), media researchers (Väliverronen, 1993) and, more recently, linguists (Myers, 2003) have been challenging and refining the dominant cultural view of the three-dimensional relationship that is often assumed by scientists and researchers from the social sciences and humanities.

In the 'dominant' or 'canonical' view, popularisation is seen as a unidirectional process whereby scientists create true scientific knowledge, which is then 'translated' and simplified by journalists for the lay audience, who are passive receivers of scientific facts. However, there is growing evidence that this view of the relationship between science, the media and the public is an oversimplification that distorts the actual state of affairs which is far more complex in nature (Myers, 2003).

In the first place, science and journalism constitute two different cultures, each with its own institutions and language use, and also with its own legitimisation needs and interests (Väliverronen, 1993, p. 26). Therefore, the ways in which science is represented in each of these broad contexts will necessarily vary, and should not be seen in terms of a binary opposition of genuine scientific truth against a distortion or simplification.

Secondly, within these two cultures, it is difficult to present a clear-cut distinction between scientific and lay text types. On the one hand, the development of a scientific claim involves a range of genres (Myers, 2003), and on the other, scientific facts are presented in many contexts (Hilgartner, 1990, p. 524). Hilgartner (1990, p. 528) views popularisation as a matter of degree ranged along a continuum with an "upstream" side, where scientists address a specialist audience including other

scientists and/or experts, and a “downstream” side, where a scientist or a journalist addresses a wider audience. The “upstream” case is prototypically a scientific paper published in a journal but also covers grant proposals, conference communications, and lab shop talk; in contrast, the “downstream” case covers such genres as text books (scientists to students/trainees), press releases (scientists to journalists), newspaper articles (journalists to lay readership), and TV documentaries or radio interviews (scientists/journalists to general public). If knowledge is assumed to be presented through discourse, it is thus difficult to locate the boundary between scientific knowledge and popularised accounts.

Thirdly, the idea that popularisation involves a unidirectional process is also problematic. The relationship between scientists and the media is of a symbiotic nature. The mass media constitute a forum where science competes with other institutions to justify the activity it carries on and to attract funding. In turn, the mass media also need the presence and active participation of expert sources to legitimise their claims and raise their own prestige (Välijeronen, 1993).

Finally, the view that popularisation constitutes an oversimplification, and hence a distortion of a scientific truth is also misleading. Simplification is not necessarily undesirable. Clearly, scientific facts need to be rendered comprehensible for the public, which inevitably will involve a reduction in complexity. But simplification can also be used by researchers as a strategy in order to persuade their audiences and to attract funding to pursue their research or as a face-saving act when controversial issues are involved (Hilgartner, 1990).

Against the background of these general assumptions, the general framework that I will adopt for the purpose of this study is the approach proposed by Calsamiglia (1997, 2003), which is more discursive and pragmatic in nature. The point of departure in this approach is that popularisation involves a recontextualisation of knowledge, which has been previously constructed in specialised contexts, and is recreated in another communicative situation for a wider more general audience. Within this perspective, it is the communicative context that determines the register in which scientific knowledge is discursively represented. In this study, I will follow van Dijk's sociocognitive theory of context, where contexts are seen as a “kind of mental model of everyday experience” (2008, p.71). Context models shape discourse production and comprehension according to the communicative situation and are subjective representations of an event. Thus, in the case of press popularisations, the communicative context will be influenced by participant roles, their purposes, beliefs and knowledge, including the relevance of such knowledge in the public's everyday lives (Calsamiglia & van Dijk, 2004, p. 371). Crucial to the present study is the knowledge component of context models which “are constructed around a special knowledge-device or K-device which examines which knowledge may or should be expressed in discourse” (van Dijk,

2006, pp. 171–172). On the one hand, journalists ‘calculate’ the amount of information that their public have, taking for granted and leaving implicit what they deem to be unnecessary details. On the other hand, they explicitly elaborate the new scientific information together with any relevant background knowledge that the public are not expected to be readily familiar with.

The very nature of metaphor involves the conceptualisation of a typically abstract notion which is rendered more accessible or is explained by the use of a more concrete domain of experience. In the task of popularising science, it comes as no surprise that metaphor is often exploited in communicating to a lay audience the essence of unfamiliar and inaccessible scientific knowledge through source domains that construct the target “in terms of visible, concrete processes involving objects and human activities” (Semino, 2008, p. 142).

In a now classical essay on scientific metaphors, Boyd (1993) proposed a distinction between two different ‘categories’ of metaphors in scientific genres: theory-constitutive and pedagogical/exegetical. The former includes metaphors that “play a role in the development and articulation of theories in relatively mature sciences” (1993, p. 482); as such, they are temporarily “an irreplaceable part of the linguistic machinery of a scientific theory” (1993, p. 486). Metaphors in the latter category have a role in the explanation of theories and may well be reformulated by non-metaphorical language (1993, pp. 485–6). However, it has been noted that Boyd’s distinction really applies to different “functions” of metaphor rather than establishing two distinct “categories” (Knudsen, 2003; Semino, 2008, p. 134). It has also been argued that the same metaphor can be used with either a theory-constitutive or pedagogical function depending on the context (Knudsen, 2003; Semino, 2008, p. 134). For instance, Knudsen (2003) has shown that the metaphor of the genetic ‘code’ is used with a theory-constitutive role in scientific genres but also with a more pedagogical function in popular ones. It is also important to mention that “these two main functions of scientific metaphors can co-exist with other functions, such as argumentation, persuasion, vividness, humour and so on” (Semino, 2008, p. 134).

Another important aspect concerning metaphors used in scientific discourse is that their role can change over time as the scientific community gains greater and better knowledge of the target domain. In this way, technical metaphors acquire specialised senses. For instance, a metaphorical term initially introduced to describe some abstract or scantly understood phenomenon (e.g. genetic ‘code’) might become an established concept within a discipline and, in time, it may no longer be regarded as metaphorical by specialists once the abstract target has been understood and defined (Semino, 2008, p. 133). In this respect, Semino points out that whereas scientists tend to rely less on the source domain as knowledge of the target domain increases (2008, p. 154), the lay public depend on their knowledge

of the source domain to make sense of the target (2008, p. 139). Finally, scientific metaphors, as with all metaphors, only partially account for the target domain. This results in the foregrounding or backgrounding of some of its aspects, and can have consequences in the development of scientific theories in terms of the formulation of research questions and hypotheses, the explanations provided for findings and the conclusions which are drawn from them (Semino, 2008, p.140). For instance, Boyd (1993) argues that computer metaphors have had an influence in the field of cognitive psychology, not only by providing the field with lexis but also by shaping the predictions to be made and the hypotheses to be proposed. So if the brain is seen as a computer, then thought becomes some kind of ‘information processing’. The metaphor suggests that certain cognitive processes may be ‘preprogrammed’ and it makes predictions about the ways in which things are memorised since information may be ‘encoded’ or ‘indexed’ in a ‘memory store’ by ‘labeling’ and certain types of information may be ‘stored’ in ‘images’. In addition, the analogy raises issues concerning whether an internal ‘brain language’ exists or whether consciousness is a ‘feedback’ phenomenon (Boyd, 1993, p. 486). Finally, the metaphor downplays other aspects – emotional, social and bodily experience – that may affect human cognition but that are not included in the computer domain (Semino, 2008, p. 136).

Functions of metaphor have also been addressed by a number of scholars, usually contrasting the use of metaphor in scientific and popular writings. As mentioned above, Knudsen (2003) in her analysis of metaphors for genetics in scientific and popular articles (*Science* and *Scientific American*, respectively) provided evidence of how a particular metaphor can perform different functions depending on the context and communicative purposes of the text. In this way she has shown how metaphors that have a theory-constitutive function, i.e. that have become and established concept in a given discipline and are thus ‘closed’ (e.g. ‘translation’, ‘messenger RNA’ and ‘code’, in biology), are ‘re-opened’ in popularisation articles, where they have a pedagogical function. This ‘re-opening’ may involve the use of scare quotes to mark the expression as metaphorical or an elaboration of the metaphor by using other related expressions which would be unconventional in the scientific discipline (e.g. ‘letters’, ‘read off’, ‘dictionary’) (Knudsen, 2003, pp.1254–1256). Skorczynska and Deignan (2006) compared economics metaphors in three economics journals and three business periodicals to suggest that metaphor choice is influenced by the social context and purpose of the text. Therefore, it seems that the particular characteristics of the genre motivate which metaphor is used and how. This idea is also put forward by Semino, who says that “the use of metaphor in science popularizations resembles that of media reporting generally rather than that of specialised scientific genres” (2008, p. 145).

### 3. Materials and methods

#### 3.1 The corpus

The corpus of this study consists of two subcorpora, each containing 50 newspaper articles: an English subcorpus with texts from *The Guardian* (26,948 words) and a Spanish subcorpus with texts from *El País* (35,405 words). The corpus used for this study is a random selection drawn from a larger corpus of 300 newspaper popularisations. In the latter, the articles were drawn from the electronic sites of the newspapers and span the eight-year period from 2002 to 2009. They figured in the sections on science, scientific research and cancer, in the case of the English broadsheet, and in the section on society in the case of the Spanish newspaper. Both are elite newspapers addressed to a similar target audience, typically belonging to a well-educated, centre-left aligned readership.

#### 3.2 The target domains

The analysis focused on the identification of metaphorically used words employed for four target domains. These are (1) the description of the origin of the disease (*aetiology*), as well as three cancer-related biological processes, (2) *metastasis*, (3) *apoptosis* and (4) *angiogenesis*.

Given the complexity and vast amount of scientific literature on cancer, I have taken as a starting point Hanahan and Weinberg's landmark essay "The Hallmarks of Cancer" (2000) for the classification of my source domains into different groups depending on the cancer-related aspect (i.e. target domain) that is being popularised. In their article, the authors established the six special attributes which cancer cells acquire through genetic mutations and which make them different from normal cells: namely, evasion of apoptosis, self-sufficiency in growth signals, insensitivity to antigrowth signals, tissue invasion and metastasis, limitless replicative potential and sustained angiogenesis. Much current cancer research addresses these processes seeking a better understanding and attempting to identify molecules involved so that therapeutic solutions can be developed. In the following, I will provide a general characterisation of the four categories that constitute the target domains in the analysis, *aetiology of cancer*, *metastasis*, *apoptosis* and *angiogenesis*.

*Cancer aetiology* is a difficult category to define in strictly scientific terms. Firstly, it is clearly naive to present cancer as a single pathological condition. In addition, it is more than likely that a given cancer is caused by a number of different factors, and even if we were to focus on a single "type" of cancer, e.g. breast

cancer, it would be necessary to consider the different causation pathways which are linked to the different subtypes. In what follows, I will provide a summary of the general aspects that are mentioned in the articles in relation to the causes of cancer. The articles in the corpus make clear that cancer develops through genetic mutations. These mutations may be caused by the environment or may occur within the genes when cells divide. Scientists distinguish between two kinds of genes which are susceptible to mutations: *tumour suppressor genes* and *oncogenes*. Tumour suppressor genes synthesise or produce the proteins which inhibit cell proliferation (Lodish et al., 2004, p. 946). By contrast, oncogenes synthesise the proteins which promote cell proliferation (Lodish et al., 2004, p. 944). When mutations cause a loss of function in tumour suppressor genes or an increase in oncogenes, a cancer may develop. In the analysis, I will be focusing on the different metaphors that are associated with the two types of genes mentioned above.

*Metastasis* is a highly complex process and yet to be elucidated by scientists. However, it can be broadly defined as the spread of cancer: that is, the growth of a secondary tumour in an organ different from the one first affected. Metastasis is of crucial importance given that metastatic cancers are the cause of 90% of the deaths from this disease (Hanahan & Weinberg, 2000).

*Apoptosis* is a kind of cell death. Under normal conditions, the body's cells are in constant renewal: Normal cells live for a limited time span and then go into the process of apoptotic cell death. The problem with cancer cells is that they do not die when they should. Thus, by avoiding this process, cancer cells become immortal. According to Hanahan and Weinberg (2000), what happens in apoptosis is as follows:

Cellular membranes are disrupted, the cytoplasmatic and nuclear skeletons are broken down, the cytosol is extruded, the chromosomes are degraded, and the nucleus is fragmented, all in a span of 30–120 min. In the end, the shrivelled cell corpse is engulfed by nearby cells in a tissue and disappears, typically within 24 hr.

(Hanahan & Weinberg, 2000, p. 61)

Evasion of apoptosis is believed to be an important aspect of tumour formation and resistance to anticancer drugs. As a result, much of current cancer research aims at initiating apoptotic death in cancer cells or at devising ways to overcome the cell's resistance to this process (Okada & Mak, 2004, p. 592).

Finally, *angiogenesis* is a physiological process which involves the formation of blood vessels from pre-existing ones. However, this natural process can be converted into a pathological one when vessels are formed to provide cancer cells with oxygen and nutrients.

### 3.3 Metaphor identification

The metaphors were identified according to the metaphor identification procedure (MIP) designed by the Pragglejaz group (2007), but it should be noted that the aim was not to provide a meticulous description of all instances of metaphorical expressions in the corpus. The interest lay in the use of metaphor as manifested in the selected newspapers in the recontextualisation of the above-mentioned aspects of cancer. In general, the identification of linguistic metaphors did not present the potential pitfalls of metaphor identification found in more technical and specialised genres. If the genre under study had been specialised, it is possible that problematic cases would have arisen, given that it would have been necessary to decide whether well established technical terms with a metaphorical origin (e.g., ‘tumour invasion’) should be treated as metaphorical within the particular specialist discourse. Still, problematic expressions were encountered. For instance, in the analysis of the metaphors for apoptosis, it was necessary to decide whether the notion of ‘cell death’ should be treated as metaphorical. Although one can consider a cell to be a living organism and understand that they cease to exist at some point, I have finally labelled the term as metaphorical because the death of a cell is different from that of any other living organism, be it a human, an animal or a plant, in that cell regeneration and replacement are taking place continuously as other cells cease to function (die) and are removed. Furthermore, in the scientific literature on cell death, the term ‘cell death’ is considered metaphorical, although its metaphoricity is rarely highlighted in any way, and the implications and limitations of the use of this term have been pointed out (Melino, Knight & Ameisen, 2010, p. 5).

Given the manageable size of the corpus, it was possible to perform a detailed analysis of the texts to ensure that no relevant metaphorical expression was omitted. But in addition to the manual analysis, a corpus software program was used to operationalise the procedure (Scott, 1999), which was carried out as follows:

1. Identification. Reading of the corpus to locate relevant metaphorical items.
2. Concordances. Concordance lists were generated for each of four categories in the analysis. The searches were conducted for the specific scientific terms (e.g. metast\*, metást\*, second\*, secund\*, and spread\*) to identify texts that specifically dealt with the topic.
3. Compilation of definitive lists. Definitive concordance lists of the relevant metaphorical expressions for each language were then compiled in order to carry out the quantitative and qualitative analyses.

## 4. Results

In a previous study (Williams Camus, 2009) of cancer metaphors carried out on a smaller corpus of 37 articles from *The Guardian*, I found a range of different metaphors used to render cancer intelligible to the lay audience. It appeared that a number of source domains are required and used in combination to recontextualise new cancer discoveries in the media. Although that study succeeded in identifying relevant metaphorical expressions, these were not classified in relation to pertinent target domains, and were presented under the broad categories of cancer and cancer research. In the present study, breaking down the general notion of cancer into specific target domains makes it possible to delve deeper into the types of source domains instantiated by different metaphorical expressions in the recontextualisation of cancer knowledge.

### 4.1 Aetiology

As mentioned earlier, the articles in the corpus explain that cancer is caused by mutations in both tumour suppressor genes and oncogenes, which produce proteins that inhibit or promote cell proliferation, respectively. In both the English and Spanish media, the overactivity of oncogenes or lack of activity of tumour suppressor genes is often expressed through the metaphor of machines, more specifically, as if genes were some kind of appliance which could be *switched on* and *off* (see Table 1). The linguistic metaphors used to express this notion in the English media include *switch on* and *off* (9 instances), *flip on* and *off* (2 instances), *turn on* and *off* (2 instances) and *activated* (1 instance). In the Spanish press the linguistic metaphors included *activación* ‘activation’ (9 instances), *activados* ‘activated’ (7 instances), *activar* ‘activate’ (7 instances), *inactivar* ‘inactivate’ (3 instances), *inactivado* ‘inactivated’ (1 instance), *reactivar* ‘reactivate’ (3 instances), *reactivación* ‘reactivation’ (1 instance). Examples (1)–(3) illustrate some of these cases:

- (1) All cancers are genetic in origin, because tumours cannot grow until a series of genetic safety catches are flipped to “off” and a series of genetic switches are flipped to “on”. [...] The genes can be switched on and off by environmental factors and by copying errors made naturally when cells divide. (gu05)
- (2) Some of these are bits of genetic machinery which might normally prevent cancer, but which get switched off by some accident of the environment, or cell division. (gu09)
- (3) La razón es que los genes extra no están activados continuamente, sino que conservan sus interruptores habituales, y por tanto sólo se activan cuando son necesarios, es decir, cuando la célula se ve sometida a estrés o está empezando a acumular daños peligrosos. (ep10)

'The reason is that the extra genes are not activated all the time, but they retain their normal switches, so they are only activated when they are needed, that is, when the cell is under stress or when it begins to accumulate dangerous damage.'<sup>1</sup>

**Table 1.** Mechanistic metaphorical expressions

Newspaper	Metaphorical expression	Occurrences
<i>The Guardian</i>	switch on/off	9
	flip on/off	2
	turn on/off	2
	activated	1
<i>El País</i>	activación	9
	activados	7
	activar	7
	inactivar	3
	reactivar	3
	inactivado	1
	reactivación	1

In reality, to say that a gene is switched on or off, means that the gene is synthesising or not synthesising a protein. However, in both the English and Spanish press, genes are far more predominant in the texts (224 and 212 instances, respectively) than proteins (44 and 62 instances, respectively).

It is also common to portray cancer-related genes through personification. The metaphorical expression of switching genes on and off also has an anthropomorphic equivalent in the linguistic metaphor of gene silencing and expression (see Table 2). The use of this metaphor is rare in the English corpus: silencing (1 instance), silenced (1 instance) and expression (1 instance). In the Spanish press, although silenciado appeared only on one occasion, the linguistic metaphor expresión and expresarse occurred 18 and 6 times respectively. Whilst the switch metaphor is documented in a study on metaphors of cancer in scientific journals (van Rijn-van Tongeren, 1997, p.73), the gene expression and silencing metaphor is not commented on. Nevertheless, the existence of a scientific journal named *Gene Expression* points to the use of this term in scientific fields. Furthermore, expresión and expresarse figured in quotes from scientists on 7 occasions. Only in one of the texts was the linguistic metaphor expresión explained:

- (4) Se perfila como un gen clave en la metástasis, ya que es necesario que se exprese (esté activo y dé lugar a la proteína correspondiente). (ep40)  
 'It is viewed as a key gene in metastasis, since it must be expressed (be active and give rise to the corresponding protein).'

1. All the translations of the examples from the Spanish subcorpus are mine.

**Table 2.** Personification of genes

Newspaper	Metaphorical expression	Occurrences
<i>The Guardian</i>	silencing	1
	silenced	1
	expression	1
<i>El País</i>	expresión	18
	expresarse	6
	silenciado	1

Another type of personification identified in the data would correspond to Zinken's intertextual metaphors which are culturally grounded and "are originated in semiotic experience: stereotypes (1), culturally salient texts, films, pieces of art (2), school knowledge (3) and so forth" (2003, p. 509). Although this kind of metaphor was not numerous, it did involve a high degree of creativity and helped to recontextualise the topic under discussion in an original way. The intertextual metaphors identified evoked fiction characters or social archetypes. When the genes presented lead to the formation of cancer, they are vilified and said to be *mafia chiefs*, or *Scaramanga*, James Bond's evil adversary:

- (5) Un gen 'mafioso' controla al menos otros 1000 genes en el cáncer de mama.  
 (ep40)  
 'A mafioso gene controls at least another 1,000 genes in breast cancer.'

The P53 gene is involved in the prevention of cancer because it is responsible for correcting genetic alterations. The gene is popularly known as the *guardian* of the genome. Finally, in one Spanish text a gene is presented as a *traffic warden*:

- (6) El gen actúa como un guardia de tráfico de dos tipos de genes: los que estimulan la aparición de tumores [el cáncer] y los que inhiben sus mecanismos de corrección.  
 (ep22)  
 'The gene acts like a traffic warden for two types of genes: those stimulating the development of tumours [cancer] and those inhibiting its correction mechanisms.'

The function of genes is to synthesise the proteins that do all the work in the body. However, as shown above, the instances of genes in the texts outnumber those of the genetic products, the proteins, by 3 and 5 to 1 in the Spanish and English subcorpora, respectively. The actions of the proteins are attributed to the genes, which have a resonance in popular culture. Since Crick and Watson's discovery of the helical structure of DNA, and especially since the launching of the Human Genome Project, genes, and not proteins, have become a popular icon in the social imaginary (Nelkin & Lindee, 1995). This metonymic shift simplifies the representation of the biological process. Thus, genes are attributed many different actions:

tumour suppressor genes *control* cell division, and other genes *govern* cell growth, *regulate* cell division, *repair* damage, *trigger* apoptosis, *work* against cancer, *do* different *jobs* in the body, *prevent* bad things from happening in the body, *cooperate* with other genes, *detect* cell damage and *organise* the genome. On the other hand, oncogenes *drive* cancers, *help* cancer enter the brain, *bestow* tumour cells with functions to cause metastasis. The following examples illustrate the agency of genes more clearly:

- (7) Cuando la célula está sometida a varios tipos de estrés o ve dañado su ADN, estos genes lo *detectan* y *disparan* el proceso de apoptosis (suicidio celular programado) o bien el camino a la senescencia. (ep08)  
 ‘When the cell is under various kinds of stress or when its DNA is damaged, these genes *detect* it and *trigger* the process of apoptosis (programmed cell suicide) or the path to senescence.’
- (8) The scientists believe that the healthy form of the gene *helps to repair* damage to genes within breast cancer cells that, uncorrected, can lead to cancer. But when damaged itself, this gene, like two other faulty genes already identified, will not *do the job*. (gu04)

The data in this section show that the explanation of the origin of cancer in the press relies heavily on the coverage of tumour suppressor genes and oncogenes. Their activity, the production of proteins, is presented primarily through their portrayal in both newspapers as mechanistic devices that get *switched on* and *off*. An alternative way of presenting this was through personification. In the Spanish press, in particular, genes were said to *express themselves* or to *be silenced*, although the latter linguistic metaphor was less frequent. Personification also took place through creative examples of intratextual metaphors and through the direct attribution of the functions of proteins to the genes by means of a metonymic relation.

## 4.2 Processes

### 4.2.1 Metastasis

Metastasis is dealt with to a lesser extent in the articles in the English subcorpus (13 texts) than in the Spanish popularisations (26 texts). In the former, the process is normally explained through non-metaphorical language, and is said to be the ‘spread’ (25 instances) or ‘movement’ (6 instances) of cancer cells, or metastases are simply referred to as ‘secondary cancers’ (6 instances). Only 3 of the 50 texts that make up the English subcorpus contained the technical term ‘metastasis’, or other derived forms (‘metastasise’, ‘metastases’), and it was then clarified through non-metaphorical language. In only one text was this process presented in terms

of metaphor. Metastasis, which was in fact the topic of the article, was described as a mechanism and then explained by means of the personification of molecules involved in the process.

- (9) Cancers spread thanks to a protein called Mena, which is found in excessive amounts in all tumours. A second protein, Tes, stops this movement by attaching itself to Mena but normally there is so much Mena in cancer cells that Tes cannot do its job properly. In the new research, published today in the journal Molecular Cell, scientists describe the molecular mechanism by which Tes locks on to Mena. If they can design a drug to mimic this action, it will allow doctors to give Tes a helping hand. (gu38)

Later in the same article, the only metaphors for metastasis identified in the English corpus were seen to come from a scientist involved in the research, who described the movement of cancer cells as crawling or as a migration, thus conceptualising cancer as an animal or person.

- (10) Way said: "Our findings represent a new way to regulate a key family of proteins involved in cell crawling that will change the way researchers see current models of cell migration – an important aspect of the spread of cancer." (gu38)

In the Spanish corpus, the concept of metastasis is dealt with extensively (in 26 of the 50 articles). The scientific term and its variants are used throughout the subcorpus. In four of the texts, metastasis is mentioned and is taken to be understood by the readers as it is not explained in either non-metaphorical or metaphorical language. The period in which the news articles were written does not seem to have an influence (one might suppose that cancer knowledge in 2004 was less than in 2009) as the articles were written in 2004, 2006, 2007 and 2009 and by four different science correspondents. In three of the texts the term was not mentioned but the process was referred to – though not explained or developed – through non-metaphorical language ('progression' and 'propagation'). The substitution of the scientific term 'metastasis' with a metaphor also occurs, albeit more rarely. Thus, in 19 of the 26 text dealing with the process, metastasis is mentioned and predominantly explained through metaphorical language and through non-metaphorical in some isolated texts. So in contrast to the English subcorpus, metastasis in the Spanish press is presented using a wide range of images. The source domains used are characteristic of both scientific discourse – INVASION AND COLONISATION and PLANTS (see van Rijn-van Tongeren, 1997) – and popularisations – JOURNEY, personification, MIGRATION and MACHINE (see Williams Camus, 2009 for English). Table 3 shows the variety of images employed, the number of instances in the corpus and provides prototypical examples.

**Table 3.** Metastasis in the Spanish press

Metaphor	Occurrences	Example
Invasion and colonisation	31	La metástasis ocurre cuando las células del tumor maligno primario invaden otros órganos y se multiplican en ellos formando nuevos tumores. (ep37) ‘Metastasis occurs when cells from the primary malignant tumour invade other organs and multiply in them forming new tumours.’ La metástasis, el proceso por el cual un tumor coloniza otros órganos a través de los vasos sanguíneos, es responsable del 90% de los fallecimientos en enfermos de cáncer. (ep45) ‘Metastasis, the process by which a tumour colonises other organs through blood vessels, is responsible for 90% of deaths in cancer patients.’
Dissemination	25	La lucha contra la metástasis, la diseminación del cáncer a otros órganos diferentes del originalmente afectado, se ha convertido en el frente de investigación oncológica más activo. (ep45) ‘The fight against metastasis, the dissemination of cancer to other organs different from the one originally affected, has become the most active front in oncologic research.’
Journey	9	Los intrincados mecanismos celulares se interrogan en detalle para ver cómo se puede frenar el peligroso viaje de las células por el torrente sanguíneo para colonizar otros lugares del cuerpo. (ep45) ‘The intricate cellular mechanisms are interrogated in depth to see how to stop the dangerous journey of the cells in the bloodstream to colonise other places in the body.’
Migration	5	Una vez en el torrente sanguíneo, las células tumorales deben estar suficientemente preparadas para resistir la embestida del sistema natural de defensas y, en un momento dado, salirse del sistema circulatorio para anidar en un órgano distante. (ep31) ‘Once in the bloodstream, the tumour cells need to be sufficiently equipped to resist the charge of the natural defense system and, at some point, to get out of the circulatory system to nest in a distant organ.’
Mechanism	4	Un equipo dirigido por Joan Massagué publica el mecanismo de propagación de los tumores. ‘A team supervised by Joan Massagué has published the propagation mechanism of the tumours.’

The most common images used – *invasion* and *colonization*, and *dissemination* – are metaphors that can be traced back to scientific models of cancer developed by Halsted and by Paget (cf. van Rijn-van Tongeren, 1997). In those texts where metastasis is extensively dealt with, the above-mentioned metaphors are combined, perhaps to help readers visualise the process and also to avoid repetition:

- (11) Un tipo de células madre extiende el cáncer de mama

Las células madre podrían desempeñar un papel importante en las metástasis, el proceso por el cual un tumor se disemina por distintos órganos. [...] “Las metástasis son vistas a menudo como el paso final de la progresión del tumor”, explicó Weinberg, un proceso complejo que exige que las células tumorales se vuelvan invasivas, viajen por el sistema linfático y los vasos sanguíneos a órganos distantes, generen micrometástasis y finalmente se reproduzcan y se asienten en el nuevo destino, colonizándolo. (ep34)

‘A type of stem cell spreads breast cancer

Stem cells could play an important role in metastasis, the process by which a tumour is disseminated to other organs. [...] “Metastases are often seen as the final step in the progression of the tumour,” explained Weinberg, a complex process that requires tumour cells to become invasive, travel through the lymphatic system and blood vessels to distant organs, generate micrometastases and finally reproduce and settle in their new destination, colonising it.’

When delving deeper into the explanation of the metastatic processes, other more creative images emerge. Example (12) is drawn from an article reporting on a study in which a Spanish researcher was investigating the role of microRNAs (molecules) in metastasis. In this example tumour cells are criminalised and said to make *pirate copies* of the microRNA molecules. It could be argued that the use of this metaphorical expression compares the microRNA molecules to illegally recorded creative products such as songs and films that are spread in places like the Internet (the body), in competition with the authentic products (normal microRNA):

- (12) La labor del equipo de Massagué se centra en identificar el conjunto de genes, y ahora también microARN, que las células de un tumor piratean para desarrollar metástasis. (ep37)

‘The work of Massagué’s team focuses on identifying the set of genes, and now also microRNA, of which the tumour cells make pirate copies in order to develop metastasis.’

Overall, the analysis of the presentation of metastasis in the English and Spanish press shows a marked variation in terms of both its presence in the corpus and the images used for its explanation. In the English texts metastasis is dealt with to a lesser extent and in non-metaphorical terms predominantly (except for the

quote from the scientist). In contrast, in the Spanish press the process of metastasis often features in the articles and journalists make use of a number of images which involve the movement from one place to another, the most prevalent being those derived from scientific discourse.

#### 4.2.2 Apoptosis

The coverage and explanation of apoptosis is frequent in both the English and Spanish subcorpora. However, since apoptosis is a rather obscure concept that would require at least some knowledge of cell structure and the cell cycle, journalists resort to the popularisation of cell death in metaphorical terms.

The scientific term ‘apoptosis’ appeared in three English articles and in six Spanish texts. The metaphor used to explain this particular term in the English press was that the cells *commit suicide* while the Spanish articles employed the more technical *programmed cell death* (4 instances) as well as *suicide* (2 instances). Overall, *cell suicide* was mentioned up to six times in the English press and three in the Spanish texts. Its metaphorical nature was only typographically signalled in one of the English texts:

- (13) AITC seems to prevent cancer cells becoming “immortal”, the property which makes them different from healthy cells which “commit suicide” instead of dividing infinitely. (gu13)

Hidalgo Downing & Kraljevic Mujic claim that the metaphorical expression of *cell suicide* provides a popularised version of *programmed cell death*, which is the theory-constitutive counterpart (2009, p. 66). However, the *suicide* image may be problematic, as it obscures the fact that apoptosis is an essential process that regulates healthy cell proliferation. Since readers rely on knowledge about the source domain to make sense of the target (Semino, 2008, p. 139), it may be a misleading as well as a shocking image, as it is in sharp contrast with what happens with humans. A suicide puts an end to life and is not normally perceived as beneficial (Williams Camus, 2009, p. 473). From a scientific point of view, it has also been pointed out that apart from the obvious anthropomorphic associations, it obscures the fact that “both the ‘decision’ to kill itself and the implementation of the death process” depend on interactions of the cell and the body, and not on the cell itself (Ameisen, 2002, p. 368).

According to specialised literature on cell death, the terms ‘programmed cell death’, ‘apoptosis’ and ‘cell suicide’ are not synonymous and the use of these terms interchangeably has given rise to confusion (Ameisen, 2002, p. 368). Of course, in popular texts the use of this terminology need not be entirely precise; in fact, the three terms sometimes appear alongside one another in the same text (as happens with ‘metastasis’ and its related terms), perhaps as a necessary variation to avoid constant repetition but also to help to explain the process:

- (14) La investigación [...] demuestra que el cáncer puede revertir el proceso natural que lleva a las células a su muerte. Los científicos [...] llevaron a cabo artificialmente con tres sustancias químicas distintas su proceso de apoptosis (una forma de muerte celular, que está regulada genéticamente). Hasta ahora, era un hecho contrastado que las células normales a las que se conduce de forma artificial hacia su suicidio alcanzan un punto de no retorno tras el cual tienen que morir, incluso en el caso de que se detenga la apoptosis artificial. Las células recuperaban su tamaño y función, y seguían dividiéndose, y sólo perecían una vez que el núcleo que contiene la mayor parte de su ADN comenzaba a desintegrarse, algo que ocurre sólo en la fase final del proceso de la muerte celular. (ep43)

'The investigation [...] demonstrates that cancer can reverse the natural process which leads cells to their death. The scientists [...] artificially carried out the process of apoptosis (a form of genetically regulated cell death) with three different chemical substances. Until now, it was a proven fact that normal cells which are driven artificially to their suicide reach a point of no return after which they have to die, even if artificial apoptosis is stopped. The cells recovered their size and function and continued to divide, and only perished once the nucleus, which contains most of their DNA, started to disintegrate, something which only happens in the final phase of the process of cell death'.

In two examples, apoptosis was presented as a mechanism that could be readily deactivated by the tumour cells themselves, thus extending the machine metaphor but also omitting the fact that programmed cell death is genetically mediated:

- (15) Tumour cells survive by switching off the apoptosis mechanism (gu42)
- (16) La célula cancerígena tiene seis capacidades adquiridas [...]. Desactiva [...] la apoptosis, es decir, el mecanismo de muerte celular programada por el que se produce la regeneración tisular (ep08)  
 'A cancer cell has six acquired abilities [...] it switches off apoptosis, that is, the mechanism of programmed cell death by which tissue regeneration is produced.'

The process of apoptosis is mediated by a complex interaction between different biological components in and outside of the cell membrane. There are various signalling pathways which ultimately 'activate' a type of enzyme called caspases that start the apoptotic death of the cell. In the corpus these pathways are rarely mentioned. Only one text partially describes the end of the process. In the lead of the article the process is metaphorically conveyed through the use of the mechanistic expression molecular safety catch which activates a natural executioner, mixing the source domains of machine and personification. Further down in the text, the process is explained using scientific terminology but with the help of metaphorical expressions from the source domain of machines (mechanism, activated, kickstart):

- (17) Scientists find molecule that tricks cancer cells into dying

Scientists have found a way to trick cancer cells into committing suicide. The new synthetic compound, which removes a molecular safety catch that activates the natural executioner in the body's cells, could lead to better treatments. [...] The body has several defences against cells growing out of control and into tumours – one is to cause defective or dangerous cells to commit suicide. This natural process of cell death, called apoptosis, involves a protein called procaspase-3. When activated, procaspase-3 changes into an enzyme called caspase-3, which begins the cell death. In cancers, this mechanism is often faulty and cells can grow unchecked. But Paul Hergenrother [...], has found a way around the natural biological process that kickstarts apoptosis – a synthetic molecule that directly activates procaspase-3. (gu24)

In the remainder of the texts, the intricate processes that take place inside and outside the cell are simplified and explained through metaphors of verbal expression. In this way, the different biological/natural and artificial substances that are being tested to determine whether they can initiate apoptosis are presented as if they were in direct verbal or physical interaction with the cancer cell. Essentially, genes tell cells to live or die. In other examples, molecules are attributed a degree of cunning or a capacity for mischief: they are said to deceive (ep33) or to trick cancer cells into dying (gu24). Other verbs imply certain persuasive strategies since cancer cells are induced (3 instances), prompted or made (2 instances) to kill themselves. In these examples, therefore, metaphorical personification through the attribution of human traits and speech helps to reduce the complexity of the process by bringing together the relevant 'participants' of the investigation.

Overall, the data suggest that programmed cell death is presented through conventional metaphors drawing from the machine and personification source domains. However, there are two creative examples involving comparison that come from scientists' quotes and were found to characterise cancer cells (18) or to explain how apoptosis takes place (19):

- (18) In this sense, you can think of cancers as the living dead: they are made up of cells that should have been killed off but which somehow have not and which pass through the body with deadly consequences (gu49)

- (19) La apoptosis es una destrucción poco a poco. Es como si se cogen unas tijeras y se van cortando las cadenas una a una (ep48)  
 'Apoptosis is a gradual destruction. It's like taking a pair of scissors and cutting the chains one by one'

Other forms of non-apoptotic cell death were also mentioned in the articles and explained metaphorically. Thus, senescence was said to be the hibernation of cells and autophagy represented as a process in which cells self-digest.

Metaphor is crucial in the complex process of apoptosis, not only in its terminology (*programmed cell death, cell suicide*) but also in its explanation. Although the terms ‘apoptosis’, ‘programmed cell death’, and ‘cell suicide’ are not synonymous in scientific literature, in popularisations they are used interchangeably and in combination. The complex interaction of biological components which takes place in apoptosis was omitted by the use of metaphor, by presenting the process as a mechanism which could be *switched on* and *off* by tumour cells and by personifying biological and artificial substances and showing them in direct verbal interaction with the cancer cells persuasively *telling, deceiving* or *making* them die.

#### 4.2.3 Angiogenesis

In the English subcorpus, the technical term for this process does not appear in any of the texts and the process is referred to in only one of the articles. Two metaphorical expressions are used. In the first example, the expression *recruits* conceptualises the formation of blood vessels. Thus, tumour and healthy cells are personified and the term evokes the militaristic frame. In the second, the expression *starve* is employed to explain the action of a drug that prevents this process from taking place:

- (20) The vaccine acts only on healthy cells which the tumour *recruits* to build up its blood supply. (gu22)
- (21) The vaccine was developed following the discovery in 1990 of angiostatin, a drug which stops tumours from growing new blood vessels, in effect *starving* them of oxygen and nutrients. (gu22)

Angiogenesis features more prominently in the Spanish texts. The technical term appears up to 21 times in the subcorpus and is usually explained in non-metaphorical terms. However, in a number of texts angiogenesis is explained through the metaphor of *nourishment*.

- (22) Angiogenesis (la fabricación de vasos sanguíneos que deben *alimentar* las células cancerosas). (ep17)  
'Angiogenesis (the manufacture of blood vessels to *nourish* cancer cells)'

Journalists also draw on the metaphorical expressions that appear in the English subcorpus (*recruit* and *starve*):

- (23) Y otros cambios [genéticos] permiten que las células cancerosas *recluten* tejido para que las apoye y las *alimente*. (ep21)  
'and other [genetic] changes allow cancer cells to *recruit* tissue to support them and *nourish* them.'

- (24) un estudio publicado en la revista Cancer Research muestra cómo una variante de las proteínas [...] puede matar de hambre a los tumores. Normalmente estas proteínas estimulan la creación de los vasos sanguíneos que los tumores necesitan para recibir sangre. (ep07)

'a study published in the journal Cancer Research shows how a variant of the proteins [...] can starve tumours to death. Normally these proteins stimulate the blood vessel formation that tumours need to receive blood.'

Overall, angiogenesis is a process that is dealt with less in the English than in the Spanish press. The scientific term does not figure at all in the English subcorpus and the process is transmitted to the audience through metaphor in terms of a recruitment of healthy cells and the action of the drugs to halt the angiogenesis as starving the tumours. The Spanish texts include the technical term and, when explained through metaphor, the process is presented as the nourishment of cancer cells. The metaphors employed for the conceptualisation of the formation and treatment of angiogenesis are the same as in the English press.

## 5. Conclusions

This study may contribute to the body of knowledge on the use of metaphor in newspaper popularisations. In particular, it provides data on the ways in which metaphor helps to convey complex cancer knowledge in an intelligible form to the general public in two different cultures. The analysis has shown that the popularisation of cancer in the press relies on the use of common source domains to bring abstract and complex phenomena closer to the readers in a familiar way. Both personification and mechanistic metaphors are predominant in the corpus and help to structure nearly all of the targets covered in this study: aetiology (oncogenes and tumour suppressor genes), metastasis and apoptosis. In particular, in the case of aetiology and apoptosis, personification is used in interesting ways to condense complex biological pathways.

Creative and original examples were scarce in the data. In the case of cancer aetiology, the genes under study were presented in a few texts through intertextual metaphors, and for apoptosis only two quotes from the scientists themselves presented this process in a novel way. Thus, it appears that journalists prefer to draw on metaphors characteristic of scientific texts when popularising cancer knowledge.

In addition, the contrastive analysis showed variation in the popularisation of cancer across languages. In the English press, technical words – metastasis, apoptosis and angiogenesis – are less frequent than in the Spanish media. There is also a tendency in the English press to avoid the use of metaphors which are

characteristic of scientific discourse since the *switch* metaphor is preferred to the *gene expression* linguistic metaphor and *cell suicide* is preferred to *programmed cell death*. Coverage of metastasis showed a marked difference between the languages. Whereas in *El País* metastasis was extensively dealt with and illustrated with 6 different source domains evoking frames that captured the movement from one place to another, *The Guardian* preferred the use of non-metaphorical language to convey this important process in the evolution of cancer.

Although the size of the corpus used in this study has proved sufficient for a detailed analysis of the metaphorical expressions associated with the different target domains under study, a follow up examination using a larger corpus would be desirable. It would be interesting not only to increase the amount of texts from the two newspapers analysed, *The Guardian* and *El País*, but also to examine other quality newspapers from England and Spain to determine whether the tendencies observed apply to other print media or are idiosyncrasies of the two newspapers above mentioned and to corroborate the validity of the cross-linguistic differences that have been identified.

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# **Metaphor as tools of enrolment**

## A case study exploration of the policy press release genre in regards to the Alberta SuperNet

Amanda Williams

Mount Royal University, Canada

The main claim of this chapter is that metaphors ought to be taken seriously by researchers and policymakers alike as a means to both understand policymaking and contest an existing dialogue around a particular issue. In order to support a richer appreciation regarding the multifaceted roles metaphors can and do play in the policy world, this discussion investigates the metaphors within the specialist discourse genre of policy press releases in relation to a real world initiative within the province of Alberta, Canada: the Alberta SuperNet. In total, 24 documents are examined using the following questions: (1) what metaphors are present, and (2) how are metaphors used to advance certain images of technology, citizens, government and industry?

### **1. Introduction**

Policymaking is a specialist discourse that often relies heavily upon the use of metaphor to persuade (Williams, 2010, see also Deignan & Armstrong, this volume). Metaphors in the policy domain are chosen consciously and unconsciously to create a compelling narrative in order to reach a specific group of users: the voting public. A preliminary exploration of the existing empirical literature on metaphor in the policymaking process credits these devices with accomplishing many things including but not limited to the following: the creation of an early understanding of a policy problem (Schön, 1979); the shaping of an endorsement of certain policy solutions over others as an initiative progresses (Kövecses, 2006; Schön, 1979; Wiggins & Pauley, 2005); and, the provision of counter discourses to an existing approach (Hardy-Short & Short, 1999; van Hulst, 2008). The capacity for metaphor to direct policy in all phases of its development (creation, implementation and assessment) calls not only for the identification of particular conceptual metaphors but also a critique of those revealed (Williams, 2009). More specifically,

knowing what metaphors are deployed in a particular context but also questioning how they might be used differently is a beneficial process. The value of exploring policy metaphors with a more critical eye is nicely captured by Rigney (2001) who states that

those who practice metaphor analysis [...] perform a single service by helping to raise cultural awareness to a new level, giving us a subtler understanding of the poetry and rhetoric of our public discourse. It is one thing to create and use metaphors. This is something we all do. It is another thing entirely to reflect carefully on our metaphors and to probe their deeper implications. This, a much rarer skill, is the essential task of metaphor analysis. (Rigney, 2001, p. 212)

Inspired by the desire to ‘probe’ deeper, the main claim of this chapter is that metaphors ought to be taken seriously by researchers and policymakers alike as a means to understanding policy dynamics in greater detail.

On theoretical grounds, the idea of genre and genre type analysis figures prominently in this study. Genres, as the introduction to this book suggests, can be defined as “classes of communicative events which typically possess features of stability” (Swales, 1990, p. 9). Moreover, genre analysis can be understood as an examination of the internal organization of whole texts, with crucial parameters being ‘discourse community’, ‘purpose’, and ‘stage’ (cf. Swales, 1990). While it is recognized that policy can and does function at many different levels within government (with potentially divergent audiences), this discussion is a preliminary exploration of metaphor use within one specialist discourse genre (policy press releases) with the hope of provoking future dialogues about the multifaceted roles metaphors can and do play in the policy world.

One way that policies are communicated publically to a key audience (the voting public) with a specific ‘purpose’ is through official documents such as government reports, press releases, websites, and other promotional literature. In fact, in Canada, the country upon which this case study is based, government budgets on communication products such as these are increasing in magnitude triggering the move from simple information provision to a more complicated form of policy promotion (Kozolanka, 2006). Since official documents provide a way to communicate with citizens, the present chapter investigates the metaphors within the press release corpus of a real world initiative within the province of Alberta, Canada: that of the Alberta SuperNet. In total, 24 press releases were examined for this particular investigation (for details of press releases, see Appendix), asking the following questions of the SuperNet corpus:

1. What metaphors are present?
2. How are metaphors used to advance certain images of technology, citizens, government and industry at the expense of others?

The objective of the present chapter is to illustrate what empirical work on a specific initiative can teach us about the role of metaphors in the policy world.

What follows in this chapter is background information on the project being investigated, clarification regarding the method deployed, a discussion the metaphors found most often in the corpus, a consideration of the significance of these metaphors in the context of existing literature, and a reflection on the overall value of this study to an appreciation of the policy initiative in question and to investigations of policy making as a specialist process more generally.

## 2. Background notes to the initiative under investigation

The Alberta SuperNet was a publicly and privately funded \$295 CAN million initiative that connected 422 communities across the province through 13,000 km of fiber optic and wireless infrastructure from 2000 to 2006. A variety of different social services (schools, libraries, government offices and hospitals) were connected directly to this infrastructure at points of presence within each of these 422 locales. Moreover, internet service providers (ISPs) if they so chose (i.e. had an adequate business case) were able to connect at these points of presence and buy bandwidth at a standardized and favourable rate in order to link commercial and residential users to the SuperNet. Primary partners in the initiative included: (1) the Government of Alberta who through an investment of over \$193 million funded the building of the publicly owned extended network which links 395 smaller communities province-wide, (2) the industry partner, Bell Consortium (Bell) who invested over \$102 million to build the privately owned base network linking 27 of Alberta's larger communities, and (3) Axia SuperNet Limited (Axia) who manages and operates the network on behalf of the province (cf. Axia Net Media Corporation, 2007).

According to those involved with the management of the SuperNet, this project was the “world’s best IP regional broadband network” and “opened up an entire world of new opportunities for Albertans, in how they live, work and play” (Axia Net Media Corporation, 2007). Moreover, outside observers positioned the initiative as a success story that could be viewed as a broadband model for jurisdictions around the globe (Cherry, 2004; Dutton, Gillett, McKnight, & Peltu, 2004). Overall, such promises and praise encouraged a view of the SuperNet as a revolutionary policy initiative of unusual vision and scope that would ultimately transform the lives of rural citizens in Alberta. However, these accolades did not provide insight into the complex interplay of actors (the technology itself, government officials, industry representatives and rural communities) who gave the ubiquitous notion of a SuperNet meaning; nor did such endorsements acknowledge

the different types of understandings of the SuperNet that emerged at the outset of this project and how metaphors played a pivotal role in constructing a limited understanding of the project in question.

### 3. Method

The press releases selected for consideration were drawn from the promotional material developed as the SuperNet was completed and before it became fully operational within rural communities. The documents, which cover the time frame of 2000–2006, can be interpreted as an attempt on the part of government representatives and their industry partners to provide an accepted vision for the project. In other words, these press releases help transmit the precarious policy consensus (Bakardjieva & Williams, 2010) that emerged in the early phases of this project.

Drawing primarily on the contributions of the cognitive linguistic tradition to metaphor (Lakoff & Johnson, 1980) an analysis of the press release corpus for this initiative ( $N=24$ , see Appendix) was conducted. The significance of using Lakoff and Johnson's work means that metaphor is understood as consisting of three parts: the source domain, which is often a concrete object, basic schemata, or semi concrete entity based on a sensory or bodily experience; the target domain, an abstract concept not easily expressed in literal terms; and the mappings, or the bridge in between the target and source domains, which permits individuals to cognitively appreciate the juxtaposition of the two domains (Kövecses, 2006, pp. 115–120). Lakoff and Johnson always capitalize the metaphor they are discussing to help illustrate they are referring to an overall conceptual system. They define the general structure in which the mappings occur as the 'conceptual metaphor', and suggest that accompanying linguistic words or phrases be described as 'metaphorical linguistic expressions'. Thus in the example LOVE IS A JOURNEY the target domain is 'love' and the source domain is 'journey'. The conceptual correspondences, or mappings, between the source and target domains include: the travelers as the lovers; the vehicle as the love relationship; the destination as the purpose of the relationship; the distance covered as the progress made in the relationship; and obstacles along the way as the difficulties encountered in the relationship. Put another way these conceptual mappings (i.e. the travelers, vehicles, destinations and obstacles) all contribute to making the metaphor of LOVE IS A JOURNEY into a concept we can understand (Kövecses, 2006).

The overall definition adopted of metaphor for this investigation was as follows: "a linguistic representation that results from the shift and use of a word or phrase from which it is expected to occur to another context or domain where it is not expected to occur" (Charteris-Black, 2004, p. 241). Consequently, the first

step to the metaphor analysis used for this chapter included the isolation of all metaphorical linguistic expressions, or utterances, in the corpus. In this instance the press releases were reviewed line-by-line and each sentence was evaluated with the following question in mind: is another, more basic, meaning possible? If the answer was 'yes', the whole sentence was considered to be a metaphorical linguistic expression (as long as this principle was fulfilled, no difference was made between metaphor, analogy or simile).

The second step involved an examination of the SuperNet more specifically as a target to be understood using more concrete sources (experiential or otherwise). Anytime the word *SuperNet* appeared, or pronouns/references to the SuperNet were apparent, the question that was posed was: what is this specific word being understood as? In this instance the primary concern was to identify more concrete sources being connected to this target (i.e. words with a more basic meaning in some other context). Grouping of words within a sentence that helped describe the SuperNet were thus also treated as metaphorical linguistic expressions (if they were metaphorically oriented).

After identifying the occurrences of metaphorical linguistic expressions in the corpus, the sentences isolated were grouped together, and 'possible' conceptual metaphors were distinguished. The word 'possible' is used to acknowledge that the selection of these categories is the choice of the analyst and thus might be interpreted otherwise (Schmitt, 2005; see also Ritchie, 2003, 2004). The suggestions by Schmitt (2005) to minimize concerns associated with this step in the coding process are: (1) to consult the literature to look for previously identified conceptual metaphors, (2) to document as explicitly as possible the coding decisions made, and (3) to publish of one's findings to promote dialogue about your choices. All of these recommendations were followed for this analysis to help ensure that another researcher could replicate the coding of the press release documents. For example, when looking at all of the coded metaphorical examples of the SuperNet concept it became clear that it was consistently given human like qualities. Consequently, the SUPERNET AS A PERSON/SUPER-HUMAN seemed liked an obvious conceptual metaphor for a large number of the specific metaphorical linguistic utterances isolated from the corpus (representing 35% of the total utterances evaluated). The presence of TECHNOLOGY AS A PERSON/ SUPER-HUMAN was also quite apparent in the existing literature (as the discussion below will illustrate).

Finally, an effort was then made to determine what sorts of roles metaphors played in the policy discussions and which conceptual metaphors could be associated with these functions (as per the recommendations of Schmitt, 2005).

In reviewing the press releases, a total of 316 metaphorical linguistic expressions were isolated. These metaphors made up 27 pages of data, or approximately

25%, of the 109 pages analyzed (this relatively high proportion, however, has to be seen before the background of the method, which used whole sentences as the basic unit of analysis).

Several methodological stipulations are relevant to how the materials analyzed were both evaluated and presented:

- Some sentences contained more than one conceptual metaphor and were thus coded multiple times bringing the overall number of metaphorical coded utterances to 350. For example the sentence *The SuperNet is shak[ing] things up, inspir[ing]* the *knowledge economy* contains two metaphors about the SuperNet explicitly (this is because both the SuperNet cannot literally shake things up and the knowledge economy cannot literally be inspired).
- Since it would be a challenge to discuss and evaluate all of the metaphors isolated, those metaphors that appeared most frequently were the focus of this particular analysis.
- Because this work draws on the cognitive linguistic tradition, the reconstructed conceptual metaphors are capitalized, and the specific words or phrases within a linguistic expression that show evidence of this metaphor are highlighted [see as examples Charteris-Black (2004), Hellsten (2002), and Santa Ana (1999)].
- Any time a rich source of linguistic material is subjected to attempts to group it into wider categories (for example as a conceptual metaphor) some of the subtle nuances of both the text and the specific linguistic expressions are lost.

#### 4. Findings

While there were a variety of unique and novel metaphors in the corpus, three key conceptual metaphors (or metaphorical groupings) figured prominently. In terms of judging prominence the criterion deployed was that the metaphor had to occur in multiple press releases (not just a one-off public relations deployment) and play a key role in telling the story of this particular policy initiative when the entire corpus was read as whole. The three most prominent metaphors associated with this initiative were: the SUPERNET AS A PERSON/SUPER-HUMAN, the SUPERNET AS A HIGHWAY, and TECHNOLOGY POLICYMAKING AS A COMPETITION.

A general description of how these metaphors appeared in the press release corpus is provided below. Some attention is also given to the precise roles these metaphors constructed for government, industry, technology and citizens. This consideration of roles helps evaluate the choice and nature of the metaphors dominating the construction of this specific policy issue, thus commencing this chapter's goal of policy critique.

#### 4.1 SUPERNET AS A PERSON/SUPER-HUMAN

The personification of the SuperNet (i.e. the metaphor of the SUPERNET AS A PERSON/SUPER-HUMAN) occurred frequent within the corpus. Out of the 350 metaphorical linguistic expressions coded, 124 of these embodied this metaphor in some shape or capacity. For instance, there was a tendency throughout the press releases to award the SuperNet human or even super human abilities. This specific technical connection (an inanimate grouping of wires and towers) was presented as being able to do quite humanlike things. Some precise examples of statements from the press release corpus include (1)–(10):

- (1) shak[ing]
- (2) things up, inspir[ing] the knowledge economy (GOA, November 2000)
- (3) serve more than 86 percent of Alberta's population (GOA, July 2005a)
- (4) help provide rural access to the global marketplace (GOA, July 2005b)
- (5) work[] for Albertans (GOA, September 2005)
- (6) open the door to the development of innovative high-speed applications (GOA, September 2005b)
- (7) [provide rural communities with] a little help... [as]
- (8) it's ready and waiting (GOA, October 2006)
- (9) remove technological barriers and
- (10) enable access (GOA, February 2002)

The SuperNet was also described as having a body part: a *backbone* (GOA, September 2003; GOA, October 2003; GOA, December 2003; GOA, March 2004) and the network itself was understood in interpersonal terms, comprised of both *points of presence* (the physical access point of how the network to the internet) and *meet me facilities* (GOA, September 2003; GOA, October 2003; GOA, December 2003; GOA, March 2004; GOA, April 2004), which did not actually involve the process of people being present or meeting in a physical space.

As the statements above reveal, within the press releases, technology was personified as a powerful person with the 'potential' to do a variety of things in Alberta. This metaphor also presented the telecommunication provider (Bell) as the metaphorical life source responsible for *bring[ing] to life the capabilities of this world-class network* (GOA, September 2005) and the entity who would *help Albertans find ways to embrace the SuperNet* (GOA, October 2006). Furthermore, Axia (a private organization) was described, via a metonym, as the one to *manage* its development (GOA, November 2000; GOA, July 2005a). Finally, within this metaphorical conceptualization citizen/users were positioned as *eagerly awaiting the arrival of SuperNet* (GOA, February 2002), and *looking forward to Alberta SuperNet going live and coming into* their homes (GOA, August 2005; February 2005a).

In sum, within the press release corpus, the conceptual metaphor of the SUPERNET AS A PERSON/SUPER-HUMAN endowed the broadband network itself with agency (though it is in fact not human); it positioned industry as the provider of life while also personifying it; and, it constructed citizens as eager recipients of this human or super-human presence. A notable absence within this particular metaphorical conceptualization was a role for government within the phases of the SuperNet's life cycle. Though it was a major funder of the project it was not talked about in the context of the birth, growth, and/or death of the broadband network itself.

#### 4.2 SUPERNET AS A HIGHWAY/TRANSPORTATION

Another conceptual metaphor that was prevalent within the corpus was that of the SUPERNET AS A HIGHWAY/TRANSPORTATION. This metaphor was apparent in 92 of the 350 utterances coded. The highway metaphor was easy to isolate, as it was often deployed to make the broadband network itself more comprehensible via direct comparisons. The press releases where this metaphor was found often stressed the need to get on the SuperNet, just as you would a roadway. Moreover, this conceptualization tended to highlight two things: (a) the speed of travel this route permits, and (b) the physical distance covered. Comparative examples from the corpus which illustrate such usages include the following assertion (11):

- (11) on dial-up, data can be uploaded and downloaded at a maximum speed of 56 kilobits per second... the upgrade [to SuperNet]... is equivalent to trading in your car that goes 160 kilometres per hour for one that goes 172,200 kilometres per hour... (GOA, October 2006)

In another text, the SuperNet was compared to the central highway that runs through Canada (GOA, July 2005b). The highway metaphor was also sometimes employed to make this particular infrastructure seem significant. For instance, the SuperNet was characterized as: *a new information highway* (GOA, February 2002), and *a broadband superhighway* (GOA, October 2006). Furthermore, this metaphor simplified the various technical components associated with broadband. In fact, this aim for simplification is nicely demonstrated in the following description (12) provided of the SuperNet's protocol:

- (12) The Alberta SuperNet uses MultiProtocol Label Switching<sup>1</sup> – MPLS. It's a technology that works like a traffic cop, prioritizing the information that moves through it, like cars in lanes of traffic. (GOA, October 2006)

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1. Multiprotocol Label Switching (MPLS) is in technical terms the mechanism that directs data from one network node to the next. It is based on short path labels rather than long network

Likewise, the overall design of the network was explained by drawing analogical attention to just how similar this project was to constructing a highway, as is highlighted in statement (13):

- (13) Building Alberta SuperNet is a lot like constructing a major roadway system. Entrance and exit ramps are needed in each community to direct the flow of traffic of the system. Local roads are required within communities to take traffic to specific places. And major highways must be built between communities to link them together [...]. (GOA, August 2003)

Finally, this metaphorical conceptualization specified what sort of *traffic* (GOA, August, 2003; GOA, October 2003; GOA, February 2005) the SuperNet would carry along its transportation *corridors* (GOA, October 2002). In sum, when the highway metaphor occurred in the press releases it accomplished the following: emphasized the speed and impressive coverage of the SuperNet and clarified the subtleties of how the network ought to be used.

In addition to highlighting these deployments, it is also possible to identify the sorts of roles that the SUPERNET AS A HIGHWAY/TRANSPORTATION metaphor circumscribed for the various actors within this policy network. Within the corpus, the broadband network itself was positioned as a route for the movement/transmission of data. Moreover, the various parts (particularly the MPLS) of this broadband network were presented as integral to ensuring the SuperNet could successfully transport information. Additionally, it was data (another non-human agent) that was expected to travel on the SuperNet. Interestingly, Albertans were not the ones talked about as expecting to travel on the SuperNet but rather as the ones to start the data's journey; however, how precisely they could do this remained quite unclear. Finally, government and industry players were both identified as essential to building this network; with the government as the funder and industry as both a source of financial support and charged with overseeing the general construction and connection of the broadband network itself (for example, Bell was recognized as the actor that will build [...] *Alberta SuperNet's point of presence* and build lanes in communities [GOA, August 2003]).

#### 4.3 TECHNOLOGY POLICYMAKING AS A COMPETITION

The final dominant metaphor that was present within the corpus was that of TECHNOLOGY POLICYMAKING AS A COMPETITION. This metaphor was not nearly as popular, or even as clearly evident the supernet as a person/super-human or the SUPERNET AS A HIGHWAY/TRANSPORTATION conceptualizations, since it was only

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addresses, in doing so it avoids complex lookups in a routing making the network more reliable and faster.

apparent in 34 out of the 350 metaphorical utterances coded. Nevertheless it was an essential part of promoting the project as both progressive and essential. Statements (14)–(16) illustrate examples of the competition conceptualization in use:

- (14) This is us planting our stake in the ground to say ‘we’re players’ – we get it and we will be leaders in the rapidly changing economy... it puts Alberta ‘on the map’ (GOA, November 2000)
- (15) Alberta SuperNet will have one of the most extensive fibre optic networks in the world, and we are proud to be part of the team bringing it to Alberta... this is going to make the world stop and look at what we are doing here in Alberta. (GOA, July 2001)
- (16) [The SuperNet will] offer broadband services... that would be the envy of Tokyo, Helsinki or New York... and makes Alberta one of the most tech savvy locations in the world. (GOA, July 2005b)

While there is certainly some additional complexity to the metaphorical understandings apparent within utterances (14)–(16) (such as TECHNOLOGY POLICY-MAKING AS GARDENING and PROVINCES/NATIONS AS PEOPLE or HUBS), however when taken collectively these expressions are promoting a narrative of technological competition which includes references to competitors (*players* and the *team*) and strategy (*positioning oneself*). The central assumptions being advanced in the examples listed above, which support a general storyline of competition, include: broadband is required to be successful in the economy of the future; Alberta is the ‘first’ in achieving the comprehensive connectivity permitted by the SuperNet; and, in building the SuperNet the province is now a place that other locales *look at* and *envy* thus earning them an international reputation as *tech savvy*. In doing so, these statements support an overall understanding of technology policymaking as a competition, or race, with various locales all vying to catch up and surpass one another. Additionally, within the corpus, the SuperNet was noted not only to benefit Alberta in this global competition but Canada as a whole, as the following press release claim suggests: “This project reflects the Government of Canada’s commitment to position our nation as a world leader in developing and applying technologies of the 21st century” (GOA, March 2004).

Most of the roles for the different players associated with this metaphor were well articulated within the corpus. As the statements above reveal, the technology was supposed to give Alberta a *leading edge* by making others *stop and look* and *take note* of what Alberta was doing. More specifically, it was hoped that technology would help rural communities *catch up* with their urban counterparts and other nations so as not to be caught *lagging behind* (GOA, October 2006). Moreover, Albertans quite generally, and rural citizens more particularly, were

assumed to want to catch up as they were expected to “grow their businesses and better compete in the new economy” (GOA, July, 2001). Additionally, Bell was to be depended upon to set up this world-class network; and ISPs facilitate its delivery to rural communities. Finally, the government promised to help “harness the private sector and ensure that rural communities have competitive access” (GOA, February, 2005).

To summarize, within this conceptualization technology was a pivotal actor circumscribed to secure leadership for Alberta and Albertans; citizens were expected to take advantage of these opportunities in order to contribute to the general economic well-being of the province; industry actors would make the SuperNet available to Albertans; finally, the government was responsible for equipping private industry with a ‘competitive’ environment to make this strategy possible.

As these findings reveal the metaphors which dominated the corpus offered distinct roles for the different players in the SuperNet project which are summarized in Table 1:

**Table 1.** Summary of the SuperNet press release metaphors

	SUPERNET AS A PERSON	SUPERNET AS HIGHWAY	TECHNOLOGY POLICYMAKING AS A COMPETITION
Government as...	unclear	funder and supervisor	planner competitor ( <i>the province</i> )
Industry as...	parent ( <i>Bell</i> ) guardian ( <i>Axia</i> ) piggybacker ( <i>ISPs</i> )	builder ( <i>Bell</i> ) enforcer ( <i>Axia</i> ) connector ( <i>ISPs</i> )	facilitator ( <i>Bell</i> ) manager ( <i>Axia</i> )
Citizens as...	friend	initiators of travel/voyeur	spectator
Technology as...	helper/saviour	route for the movement of data (broadband network)	strategy (i.e. will provide the leading edge) Travellers (data)

While the mappings in Table 1 are useful for appreciating the nature of the corpus, they become more interesting when positioned as tools that both reveal and conceal certain dimensions of the policy narrative being advanced. Consequently the next section of the chapter considers the advantages and disadvantages of each of these metaphors drawing upon existing literature and assessing how constructive they are for advancing the goals of this policy initiative, which was to get citizens to use this network.

## 5. Significance

### 5.1 SUPERNET AS A PERSON/SUPER-HUMAN

The idea that individuals often understand technology as a person or deity has been demonstrated in a variety of literature including experimental work (Nass & Moon, 2000; Reeves & Nass, 1996), corpus based studies (Izwaini, 2003; Johnson, 1991; Palmquist, 1996), and field research (Carroll & Eifler, 2002; Denny & Sunderland, 2005). In addition, the benefits and drawbacks to understanding TECHNOLOGY AS A PERSON/SUPERHUMAN have also been indirectly or directly discussed by a variety of scholars (Carroll & Eifler, 2002; Denny & Sunderland, 2005; Fineman, 2004; Latour, 1996; Law, 1992; Marakas, Johnson & Palmer, 2000; Marsh, Meech, Dautenhahn, & Nowell, 2002; Pannabecker, 1991; Ryall, 2008; Sussman, 1997). Among the more convincing benefits of personifying technology, is the argument that this metaphor creates a more compelling and complete account of how socio-technical networks work (Latour, 1996; Law, 1992). The technology as person metaphor provides a structured and rich source domain that can be easily deployed because it capitalises on a fundamental understanding: the experience of being human (Fineman, 2004). In doing so, this conceptual metaphor offers tremendous potential when thinking about how technology can be designed to be more “socially adept” (Marsh et al., 2002). Some instances of more socially adept technologies might include: cell phones that do not ring in socially inappropriate venues; interfaces capable of adapting to your mood; a technological presence that facilitates interactions with people in various cultures; and devices that are able to respond to your situation without being told what is right (Marsh et al., 2002). Moreover, because the TECHNOLOGY AS A PERSON/SUPERHUMAN conceptualisation is such an automatic, almost default, trope for users (Nass & Moon, 2000), when engaged thoughtfully and purposefully this metaphor has the potential to greatly enhance training and educational efforts (Marakas et al., 2000). For instance, using animated pedagogical agents that exhibit life-like behaviors may be incredibly motivating to some learners (Marakas et al., 2000). Finally, by making technology “personally positive” it becomes easier for people to “tolerate” and integrate this presence as a natural part of their daily practices (Denny & Sunderland, 2005). As an example, ethnographic work in this area suggests seeing a computer as ‘good’, a ‘friend’, and/or a ‘helper’, can help people move from viewing technology as an external force over which they have little power to one that becomes much more personal and comfortable in terms of use (Denny & Sunderland, 2005).

While the conceptual metaphor of TECHNOLOGY AS A PERSON/SUPERHUMAN offers the potential for creating compelling narratives of socio-technical network formation, provides a rich source of entailments that may improve design

and outreach, and makes technology more tolerable for people, it is not without drawbacks. Among the limitations associated with this specific metaphor is that by endowing technology with human qualities of even super-human potential it becomes very easy to create a misleading perception of what this presence can and will accomplish (Ryall, 2008). TECHNOLOGY AS A PERSON/SUPERHUMAN requires critical consideration of what it means to have agency. For example, the type of criteria that defines agency might include an agent's capacity to do the following: (1) act on behalf of others, (2) be responsive and capable of learning; display competence by demonstrating contextual knowledge about the user, and (3) exhibit some form of social intelligence (Fineman, 2004, p. 21). Unfortunately, most technologies (including the SuperNet) do not meet these conditions of agency. Moreover, while the conceptual process of personifying technology often highlights the similarities between technology and humans, it tends to conceal the dissimilarities (Marakas et al., 2000). Further, by providing technology with human attributes, this presence can appear as a "discrete force" with "its own discernible direction and influence" (Pannabecker, 1991, p. 43); in doing so it deprives users/citizens of their own capacity to direct technology in certain ways. Finally, some critics have gone so far as to suggest that the tendency to anthropomorphise technology contributes to the process of commodity fetishism. This critique's main contention is that by personifying technology people risk replacing their personal relationships with object oriented interactions; in doing so this metaphor also blurs the dynamics of consumption and production. For instance, such a metaphor encourages those responsible for production (be it designers, industry actors, or policy planners) to be attentive to the objects they construct over the needs of the user. Moreover, consumers risk becoming so fixated on the object itself (in this case the technology) that they do not interrogate the political and economic dimensions associated with how the technology was produced, or the benefits that this technology supplies for some people at the expense of others (Sussman, 1997, pp. 28–29).

As illustrated, the conceptual metaphor of TECHNOLOGY AS A PERSON/SUPERHUMAN has inspired both praise and criticism. In the case of the SuperNet many of the benefits and limitations associated with this metaphor are quite relevant. Clearly, this metaphor permits an appreciation of the SuperNet as an integral actor needed to solidify this particular initiative. In addition, it can be contended that such a metaphor makes this broadband network more appealing and tolerable to citizens, precisely because the SuperNet is endowed with the ability to radically transform communities by *helping, supporting, working for, serving* and *enabling* them. However, policy promoters should be careful of the metaphors they choose, since metaphors create expectations that may not be realistic. Among the questions that the presence of the SUPERNET AS PERSON/SUPER-HUMAN metaphor raises include: how feasible is it for the SuperNet to actually accomplish what is being assured;

has the SuperNet been given a form of agency that this presence does not possess; finally, are the similarities and dissimilarities between the broadband network and people adequately explicated? Additionally, it is also striking that most of the expressions within this corpus linked to the personification of the SuperNet circumscribe an extremely passive role for citizens; it focuses not on people's ability to direct technology but rather on the technology's facility to direct them. The press release corpus also offers no mention of how the government ought to relate to this technological presence suggesting they need not be accountable for this initiative. Finally, this focuses only on the positive capacity of the human-techno relationship, ignoring many of the negative dimensions involved with introducing this presence into rural communities (for example its impact on existing social relations) that could be considered and addressed in a persuasive manner (making policymakers appear proactive in regards to concerns associated with technology as opposed to reactive).

## 5.2 SUPERNET AS A HIGHWAY/TRANSPORTATION

The deployment of transportation metaphors as a way to understand technology has been well documented. For instance, several corpus-based studies have highlighted the presence of such metaphors (Berdayes & Berdayes, 1997; Isomursu, Hinman, Isomuru, & Spasojevci, 2007; Izwaini, 2003; Johnson, 1991; Palmquist, 1995; Ratzan, 2000; Wyatt, 2004). There are also a variety of historical explorations that stress the importance of transportation metaphors for understanding the emergence of other technologies such as Mander (1984) and Sawhney (1996). Finally, several discussions of the highway metaphor take its presence as a given and aim for critique (Gozzi, 1999; Menzies, 1996; Meyer, 2005; Stefik, 1997). Taken collectively, this literature indicates that the presence of transportation metaphors generally, and/or the highway metaphor specifically, in the discussions about the SuperNet should be no real surprise; the conceptual metaphor of TECHNOLOGY AS A HIGHWAY/TRANSPORTATION has been demonstrated to be prevalent in different discursive contexts (i.e. popular representations, technical communication, discipline specific discussions and in policy dialogues) over time.

The advantages and limitations to the TECHNOLOGY AS A HIGHWAY/TRANSPORTATION metaphors have also been considered within the aforementioned scholarship. Among the more compelling benefits elucidated, is that this particular conceptualization encourages an appreciation of communication as a linear process with multiple routes; this is because highway systems do not permit simply one way of journeying from A to B but rather offer a diversity of travel options in terms of vehicles, speeds and possible routes (Meyer, 2005). Consequently, the highway metaphor has also been noted to provide a powerful visual representation of what communication can be (Isomursu et al., 2007; Markham, 2003; Stefik,

1997). Moreover, driving on, or even being surrounded by a highway, is an experience that most people can relate to. As a result, this metaphor is viewed as 'accessible' since it offers a series of highly structured positive and negative mappings to draw upon which include but are not limited to:

- road blocks (in terms of access, construction, traffic jams),
- maps (manuals, search engines, etc.),
- activities/skills (passing, speeding, staying, exiting, merging),
- pricing structures connected to toll booths (for example clarifying whether it is a private or public roadway),
- vehicles (in terms of applications),
- danger (i.e. 'highway robbery' such identity theft and copyright violations),
- and pollution, from factors such as data overload, physical damage, and/or noise. (cf. Gozzi, 1999; Meyer, 2005; Palmquist, 1995; Ratzan, 2000).

Furthermore, more often than not highways are funded and even maintained by government, thus encouraging an active 'public' role for subsidising access, ensuring the proper upkeep, and providing enforcement for telecommunication networks (Sawhney, 1996).

Despite such advantages, some limitations associated with the highway metaphor have been acknowledged. Among them is the observation that transportation systems have become a symbol of modern expansion, thus by associating the highway metaphor with the construction of telecommunication infrastructure, communication practices become linked to economic growth, though they are simply one of many competing policy priorities that can achieve this (Berdayes & Berdayes, 1997; Mander, 1984). Highways are of course also something that tends to be publicly funded, as building these routes is believed to promote the expansion of commercial activities in a given jurisdiction. Consequently, this metaphor simultaneously tends to encourage two goals that may not always be compatible: government support for building the infrastructure and the growth of the private industry to build such and industry (Berdayes & Berdayes, 1997). As well, some believe that the highway metaphor provides an illusory sense of access since the internet is not a public resource in the same ways highways are; after all the terms and conditions of on-line infrastructures are controlled to some degree by commercial carriers, in terms of pricing, data access and length of contracts (Berdayes & Berdayes, 1997; Solomon & Walker, 1995; Wyatt, 2004). Moreover, the highway metaphor has been identified as problematic by some since it focuses on the particularities associated with the route itself, as opposed to thinking about the needs and wants of those who must initiate the travel of data including their skills, comfort levels and knowledge (Menzies, 1996). Finally, the highway metaphor tends to focus on point-to-point transmission, with its primary concern on promoting

quick, far-reaching exchanges; in doing so it focuses on the technical specifications and thus may avoid exploring the cultural and social-networking opportunities potentially facilitated by new technologies (Carey, 1988; Isomorsu et al., 2007; Menzies, 1996; Sawhney, 1996). Put another way, since the highway only ever stops at your driveway, it becomes easy to view it (and subsequently technology) as instrumental, functional and external to the user, rather than something that can be integrated successfully into peoples' daily practices as something they deploy within their homes (Sawhney, 1996).

As the previous paragraphs show, the conceptual metaphor of TECHNOLOGY AS A HIGHWAY incites both positive and negative responses. In the case of the SuperNet many of the ideas above are relevant. Clearly, the SUPERNET AS A HIGHWAY metaphor is particularly useful for illuminating the overall scope of the project (i.e. they are connecting over 400 communities across the province) in a visually appealing way. It is also evident that the press release corpus drew upon many of the mappings encouraged by a highway conceptualization: both in trying to simplify the structure of the broadband network (via references to *transportation corridors, entrance and exit ramps, having dedicated lanes, directing traffic flows, and traffic cops*, as well as differentiating between *local roads* and *major highways*); as well as, in justifying the government as a logical source of funding for the project. However, Albertans are seemingly given little choice but to accept the dynamics of how the SuperNet is being built including: who will be building it, where it will go in their communities, and whether ISPs may or may not be interested in providing business and or residential connectivity (potentially leaving them abandoned at the side of this telecommunication pathway). In other words, the utilization of this metaphor within the corpus perpetuates a view of citizens as users who must trust the government, industry and the technology, to represent their best interests and are not required to do much else. Additionally, while many of the positive mappings encouraged by the highway metaphor are showcased (in terms of emphasizing both speed and scope), the negative dimensions of such transport systems (noise, pollutions, roadblocks, etc.) are not acknowledged or addressed (for example, with specific strategies of mitigation) within the press release corpus. Finally, it also appears that this concern with speed and scope have overtaken any serious reflection about the skills, activities or vehicles required to make the SuperNet a well-used transportation route for all Albertans.

### 5.3 TECHNOLOGY POLICYMAKING AS A COMPETITION

The conceptual metaphor of TECHNOLOGY POLICYMAKING AS A COMPETITION has received some attention in the existing literature as well. For instance in a comprehensive categorization of the key conceptual metaphors within politics, Beer & De

Landtsheer (2004) highlight the importance of the POLITICS AS A GAME category in which POLITICS AS A COMPETITION, A CONTEST and/or A RACE, are all included (p. 18). Moreover, Herbeck (2004) provides a compelling account of the significance of sports and competition metaphors more generally in curtailing public policy debate on contentious issues such as Desert Storm. Additionally, Krugman (1994) argues that in recent years both policymaking and politicking have become quite reliant on competition rhetoric; so much so that few people would think to question the assertion that a nation's economic fortune is largely determined by their technological success within the global economy, despite the paucity of evidence supporting such an assumption. Moreover, Gozzi (1999) identifies the 'technological race' as one of the many metaphors that have come to dominate the present age of electronic media. Finally, Hill (1989) suggests that coupling technology and international competitiveness together has redefined our metaphorical understanding of 'progress' today.

The idea that nations can be imagined as competing in a metaphorical race against each other is neither a new, nor a particularly surprising conceptualization. For example, during the 1950s both the 'arms race' and the 'space race' came to occupy popular consciousness (Gozzi, 1999). Hill (1989) provides a convincing explanation as to why it is that technology became so easily understood as something worth competing for in our present age. According to Hill, since the 1980s there have been several distinct shifts in attitudes towards technology, which have encouraged it to become conceptually linked to competition and the metaphorical symbol of national 'progress'. Such factors increased the appeal of technology as something that could potentially provide nations with a strategic position over others and provide a plausible explanation as to why the metaphorical conceptualization of TECHNOLOGY POLICYMAKING AS A COMPETITION continues to be popular.

Many of the aforementioned works (Gozzi, 1999; Hill, 1989; Krugman, 1994) are useful in assessing the advantages and disadvantages of the TECHNOLOGY POLICYMAKING AS A COMPETITION metaphor. In fact, at least three benefits to this metaphor have been identified, none of which are mutually exclusive. First, this metaphor helps organize the complexities associated with technological innovation, national policy approaches, and general success in the global economy, in a way that nicely orients people towards "what seems to be going on" (Gozzi, 1999, p. 130). For example, it is quite feasible to design measures regarding who is ahead and who is behind in terms of the progress being made with the development of any given technology. This metaphor also encourages the creation of predictive measures and even 'best practices', which permits picking potential winners and continuously measuring a jurisdiction's achievements against the accomplishments of other recognized leaders. A second related advantage to this metaphor is that it is highly accessible. Competition, and especially competition in business,

is something most people have had some experience with, or at least feel they can relate to (Krugman, 1994). This is why according to Krugman (1994) this metaphor can be described as offering an apparent level “of sophistication without the pain of hard thinking” (p. 39). Finally, the competition conceptualization generates excitement precisely because everyone loves the thrill of a good race (Gozzi, 1999) or competition (Herbeck, 2004); in doing so this metaphor tends to makes an issue that would not normally be of interest to the public, such as telecommunications policy, seem all the more engaging.

Despite these positive views of the TECHNOLOGY POLICYMAKING AS A COMPETITION metaphor, some limitations to this metaphor have also been identified. For instance, it has been claimed that the competition conceptualization is far too simplistic for understanding the dynamics of policymaking (Gozzi, 1999; Herbeck, 2004). As Hill (1989) notes, it is important not only to focus on the result of a competition (i.e. the win or loss) but also on the process itself, which can be encouraged by considering the following sorts of questions: “if progress is marked by competitiveness what do we mean by it”; “how can we achieve it”; “how might seeking to become more competitive effect our lives and our society?” (p. 33). Nevertheless, most of the time when the competition metaphor is deployed such considerations are overlooked (Krugman, 1994). In addition, Gozzi (1999) claims that sometimes the thrill of the race appears so gripping that we fail to consider why it is important to win. He contends that there are instances where being in the middle of a group is in fact more advantageous than being the actual leader. Moreover, he suggests that the ‘winner’ in the short term may be the ‘loser’ in the long term. A second potential drawback to the competition metaphor is that it has the capacity to minimize substantive public debate on important policy issues. This is not only because the end goal of the competition is rarely questioned, and it reduces outcomes to either a win or lose situation, but also because this metaphor typically positions citizens as subservient observers who are expected to be passive and loyal spectators; as opposed to active participants in the competition itself (Herbeck, 2004). Thirdly, the competition metaphor is considered dangerous to policymaking because it encourages a seemingly never-ending logic of producing more and more, thus making it hard to determine when enough is simply enough (Gozzi, 1999). Such a techno-centric logic also makes it difficult to imagine spending resources on those policy areas where a technological focus is neither required nor appropriate (Krugman, 1994).

Obviously, many of the general benefits and limitations to the TECHNOLOGY POLICYMAKING AS A COMPETITION metaphor just discussed are quite relevant to thinking about the use of this particular metaphor within the SuperNet press releases. Based on the review of the press release corpus, it appears that this metaphor did in fact nicely orient the reader to the necessity and urgency of this

project. For example, as remarked upon in the opening paragraph of this section, the core narrative of competition advanced was one which implied broadband was now a requirement to compete in the global economy and Alberta was one of the first jurisdictions to recognize and act upon this need. Additionally, this metaphor was seemingly deployed to garner some excitement for this initiative and make telecommunication policymaking decisions seem accessible; as was reflected in the press release claims that because of the SuperNet Albertans now had something that other jurisdictions would *look at* and *envy* (an emotion that most people can relate to). Nevertheless, it was also apparent that the primary use of this metaphor in the corpus was simply to highlight the nature of this overall accomplishment; or, put differently, to emphasise Alberta's potential to be viewed as a winner. Consequently, among the substantive policy concerns associated with this metaphor that were not addressed within the corpus included: why is the competition for building a broadband infrastructure of this scale and scope so urgent; is being the first to build such an infrastructure a true benefit to all Albertans, particularly when the SuperNet's current business model does not guarantee business or residential users access; what would the 'new economy' or 'knowledge economy' look like in Alberta; furthermore, why is the expenditure of public taxpayers' dollars on building a technological infrastructure a better policy decision than committing these resources to other areas of concern in Alberta? Finally, it was evident based on the role circumscribed for citizens by this metaphor (to make use of the SuperNet), that they were being expected to accept the this race as a legitimate policy priority, since "it is not something that Alberta can wait for"; after, all no Albertan would want to be held responsible for blocking the general economic progress of the province.

As this section has shown each of the metaphors used in the corpus have advantages and disadvantages as summarized in Table 2.

**Table 2.** Summary of the SuperNet metaphors usages

	SUPERNET AS A PERSON/ SUPER-HUMAN	SUPERNET AS HIGHWAY	TECHNOLOGY POLICYMAKING AS A COMPETITION
Advantages to its use in the press release corpus	acknowledges technology as an integral actor in this socio-technical network  makes the SuperNet relatable and appealing	illuminates the scope of project  provides a rich source of entailments to help explain the complexities of the initiative	promotes a sense of pride and urgency associated with the SuperNet makes telecommunication policymaking exciting

**Table 2.** (*continued*)

	<b>SUPERNET AS A PERSON/ SUPER-HUMAN</b>	<b>SUPERNET AS HIGHWAY</b>	<b>TECHNOLOGY POLICYMAKING AS A COMPETITION</b>
Limitations to its use in the press release corpus	<p>provides too much agency and responsibility to the SuperNet</p> <p>passive role for citizens</p> <p>absent role for government</p> <p>focuses only on positive elements of this presence (i.e. avoids consideration of its impact on existing social relations)</p>	<p>concern with speed and scope dwarfed discussions of skills, activities, vehicles</p> <p>passive role for citizens</p> <p>focuses only on the positive elements (avoids discussions of noise, pollution, danger etc.)</p>	<p>focuses on the outcome and not on the competitive process itself</p> <p>fails to address substantive policy concerns associated with broadband development (i.e. why do we need broadband over other policy priorities?)</p> <p>passive role for citizens</p>

To conclude, while there is value in exploring these metaphors and critiquing how they are being deployed individually the final section of this chapter evaluates the holistic picture that the presence of these sorts of metaphors creates and considers how an analysis of the dominant metaphors associated with a precise empirical example (i.e. those that collectively represent just over 70% of the metaphorical material analyzed) can help us critique the technical process of policymaking.

## 6. Summary and concluding remarks

When looking at the metaphors that dominate the specialist discourse genre ‘policy press release’ (the SUPERNET AS A PERSON/SUPER-HUMAN, the SUPERNET AS A HIGHWAY, and TECHNOLOGY POLICYMAKING AS COMPETITION) several interesting observations can be made. The first is that such metaphors suggest that the policy actors that truly mattered in the context of this initiative were the technology itself and industry representatives since government and citizens were positioned as actors of minimal importance in the context of the most frequent metaphors deployed. For example, these metaphorical conceptualizations all at once presented technology as the *saviour* and *helper* that would radically transform Alberta, the primary route for the transmission of electronic data, and the competitive edge that would ensure Alberta’s leadership in the global race for technological victory. As well, within these metaphorical articulations industry

representatives (Bell, Axia, and ISPs) simultaneously became those who brought this technology to life. They were those who would build the communication infrastructure and make it available to the communities across the province. They were also part of the *team* that would secure Alberta's triumph in the global competition of technology policymaking. Paradoxically, despite being the initiators of this project the government granted themselves a far less significant role in official discussions about the initiative. They were either absent, or occupied non-interventionist positions, as funders, supervisors and/or planners. It is difficult to determine whether this detached stance was a conscious strategy, since it helps absolve the government of responsibility if the project does not succeed. Nevertheless, this positioning can also be interpreted as a reflection of the government's general discomfort with intervening in the telecommunications sector; since it is a policy arena, like so many of the communications industries, that has become increasingly commercial, private, liberalized, and global in nature (Mosco, 1996). However, the most troubling pattern within these metaphorical circumscriptions is the generally passive role allotted to citizens. In the SUPER-NET AS A PERSON/SUPER-HUMAN metaphor, the broadband network remained a force external to them, requiring minimal citizen involvement to ensure a radical transformation within their communities. Furthermore, when the network was imagined as a highway, it was something that citizens could only *get on* with private industry assistance. Moreover, the underlying assumption of the competition metaphor was that citizens ought to accept broadband development as an urgent policy priority if they endorsed Alberta's efforts to do well in the global economic environment. Writ large, according to the press release metaphors, citizens were expected to simply observe, as opposed to participate in the stabilization of this particular socio-technical network. It is indeed ironic that although the prime users of this network were supposed to be rural citizens, they were presented with a representation of this project that discouraged their direct and active engagement with technology.

In addition to offering guidance of who should count and who should not in the context of this policy initiative, a sense of the overall vision of both technology and technological change being advanced is apparent. From this perspective, when evaluating the press releases conceptualizations holistically, it is evident that the dominant metaphors being deployed offered an extremely limited appreciation of both these areas. For instance, only the positive characteristics associated with technology were emphasized. Additionally, none of these metaphors managed to highlight the social or cultural possibilities connected to broadband (such as podcasting community events, video conferencing initiatives, and other live streaming practices that meet educational and tourism needs); instead, they drew almost exclusive attention to the technical and economic capacity of this infrastructure.

It was the speed, reach, prestige, and general transformative capabilities that the SuperNet offered rural communities that were highlighted over the creative potential for sharing, collaborating, and communicating that could have been stressed if different, or even additional metaphors, were incorporated into the corpus. The press release metaphors, perhaps deliberately, also failed to acknowledge that using a new technology often requires a cognitive and behavioural shift, which can be facilitated with specific training and skill development. These omissions in the public representation of this initiative are a result not only of the metaphors that were frequently deployed but also in the types of mappings that were actually elaborated upon in those metaphors that were selected. For example, the highway metaphor tends to encourage a “transmission” view of communicative exchanges (as a point to point process), as opposed the “ritualistic” components where communication is embedded in peoples’ everyday practices (Carey, 1988). Nevertheless, the SUPERNET AS A HIGHWAY metaphor could have permitted a consideration of the new learning required to use broadband by discussing the sorts of roadmaps that would be provided to Albertans for this data transport route; yet such a mapping was not included within the press release corpus.

The aim of this chapter has been to highlight the important role metaphors can play in the realm of policy a very particular kind of specialist discourse genre designed to persuade and enroll citizens (press releases). This was accomplished by identifying the dominant metaphors of a real world initiative and by questioning the way these particular metaphors were being deployed. In the case of the SuperNet initiative a systematic analysis of a project’s metaphors revealed a great deal about who was thought to count and who was not within this project. Additionally, an evaluation of the initiative’s key metaphors helped to demonstrate which policy priorities were being emphasized and which were overlooked. In the end it is hoped that this discussion will encourage analysts and policymakers alike to consider the specialist language of the policy world carefully and be open to questioning whether or not there are more effective or powerful ways to communicate with the audience(s) they aim to reach.

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## Appendix

List of press releases explored (taken from Alberta SuperNet website: <http://alberta.ca/home/news.cfm>)

1. The Rural Connection – Alberta Venture Special Insert (October 2006)
2. Northeast Alberta communities to learn about Alberta SuperNet (October 2005)
3. Alberta SuperNet now operational throughout the province (Sept 2005a)
4. Southeast Alberta communities to learn about Alberta SuperNet (Sept 2005b)
5. Calgary Region communities to learn about Alberta SuperNet opportunities at September 14 workshop (Sept 2005c)
6. Local communities invited to learn about Alberta SuperNet (August 2005)
7. New Alberta SuperNet agreements will better serve Albertans (July 2005a)
8. Alberta SuperNet: Klondike Day Presentation (July 2005b)
9. Alberta SuperNet meets April 30 milestone for rural communities. (May 2005)
10. Government of Alberta, Axia, and Bell Canada announce SuperNet completion plan. (February 2005a)
11. Alberta SuperNet Interactive Community Map Launched (February 2005b)
12. SuperNet Update (April 2004)
13. SuperNet benefits northern students via RACOL Project (March 2004)
14. Alberta SuperNet Update Newsletter (October 2003)
15. Zoning in on Accelerated Construction (September 2003)

16. Build fact sheet (August 2003)
17. Alberta SuperNet Update Newsletter (December 2003)
18. SuperNet's progress boosted by TELUS contribution Edmonton (April 2003)
19. SuperNet build on track for 2004 completion (March 2003)
20. SuperNet construction advances along the Lethbridge-Calgary Corridor (October 2002)
21. SuperNet is linking Alberta to the e-world (February 2002)
22. Alberta SuperNet is closing the digital divide (December 2001)
23. SuperNet approach set to take Alberta to new heights (July 2001)
24. SuperNet to connect communities to the 21st century at warp speed (November 2000)

## SECTION VI

# Conclusion



# **Metaphor in specialist discourse**

## **Insights and implications for metaphor studies and beyond**

Jeannette Littlemore

University of Birmingham, United Kingdom

The present chapter attempts to draw together some of the main ideas that have been developed in the volume. It focuses on the ways in which metaphor use has been found to vary across the different types of specialist discourse, and relates this to: disciplines, intended audience, positioning on the scientific-popular continuum, mode of delivery (written, spoken, textual or multimodal), immediacy of the communication, and relationship between interlocutors. The chapter relates these findings to current issues and controversies in the metaphor literature, discusses the need for more informant data, and suggests ways in which the impact of metaphor on its intended audiences might be studied. In all of these areas, proposals for further study are made.

### **1. Introduction**

In this volume we have seen a wide ranging set of studies, each exploring different aspects of metaphor in specialist discourse. The studies have shown how genre and register work together to shape ways in which figurative language is used in different types of specialist discourse. The authors have provided coverage of an array of different types of specialist discourse, including written and spoken, linguistic and gestural, ancient and modern, formal and informal, academic and non-academic. The focus has not only been on the metaphors themselves, but also, in some cases, on the attitudes of the people working in fields where those metaphors are being used. The studies have also covered related forms of figurative language such as metonymy, hyperbole and irony. One of the real strengths of this volume is that all the authors have used real-life data to explore the roles played by metaphors in everyday language and other forms of communication. This gives extra validity to the conclusions reached and makes them more meaningful to people working outside the field of metaphor studies.

Many of the authors have employed corpus-based methodology and then complemented this with a detailed discourse analytical approach in order to explore the reasons why particular metaphors are used in particular contexts. Metaphor use has been found to vary considerably across all the different types of specialist discourse under discussion. We have seen variation in terms of: the disciplines in question, the intended audience of the texts, their positioning on the scientific-popular continuum, their mode of delivery (written, spoken, textual or multimodal), the immediacy of the communication, and the relationship between those involved in the production and interpretation of the texts. The chapters have, to varying extents, explored the impact of these contextual variables on a number of different research topics. Among these are: the range of different functions that metaphor is used to perform, the different ways in which metaphor emerges in discourse, the ways in which metaphor awareness can vary, some of the ways in which metaphors are processed and understood, aspects of interaction between different metaphors and between different levels of metaphorical meaning, the relationship between metaphor and other tropes, such as metonymy and hyperbole, and varying attitudes towards metaphor. We have also seen something of a cline of metaphorical features, stretching from those features of metaphor that hold true across a range of different contexts to those that are entirely context-dependent.

In this final chapter, I begin by looking at where the volume has taken us in terms of the data studied, the methodologies employed and the conclusions reached. I then go on to explore the implications of this work and propose a number of areas where it would be worthwhile conducting further studies. I also evaluate where this book has taken us in terms of its ability to bring together the cognitive and applied/discourse approaches to the study of metaphor, and discuss how this drawing together of the two approaches strengthens the applicability of metaphor studies to real-world issues.

## **2. Where this volume has taken us**

We have seen in this volume an extension of metaphor theory into a wide variety of real-world contexts, and it can safely be concluded that context of use has a significant impact on the metaphors that are used. Differences in genre and register clearly have an effect on the range and types of metaphors that are employed. These differences reflect the characteristics of the different groups involved, whether or not they are 'experts' in a particular field of study, and their different communicative goals.

Some of the chapters in this volume have explored the role of metaphor in unplanned naturally-occurring spontaneous discourse where the speaker does not have a great deal of time to think about what they are going to say or communicate. Both Thalhammer's chapter on radio football commentary and Harrison's chapter on the use of gestural metonymy in a fish packing factory, where the environment is too noisy to permit spoken interaction, have shown us that when there is a need for people to communicate rapidly, with very little time to plan, this has a significant effect on the relative amounts of metaphors and metonyms produced and their degree of conventionality or novelty. This is important, as much of the extant literature on figurative language does not address contexts such as these.

The volume has also made a significant contribution to the literature in terms of the variety of methodologies that have been employed. We have seen the value in taking a rigorous, systematic approach to metaphor identification, including conceptual metaphor identification. The MIP (Pragglejaz group, 2007) and MIPVU (Steen et al., 2010) have been trialled on a number of languages, extending their application to languages other than English, and the use of the keyword analysis feature in Wordsmith Tools (Scott, 2007) and AntConc (Anthony, 2007), used by Thalhammer in his chapter, has been shown to be yet another powerful way of introducing a degree of objectivity into the analysis. Many of the chapters in this volume have combined quantitative with qualitative approaches to the study of metaphor, and the value in combining these approaches is made apparent throughout the book. We have seen many cases where one particular view of a phenomenon is provided by taking a quantitative approach and this view needs to be radically refined or in some cases overturned when we add a qualitative approach. We saw for instance how in Thalhammer's chapter on football-related discourse in English and German, findings from the quantitative study suggested that the source domain of WAR appeared to be much more marked and frequent in the German corpus but that when a qualitative analysis was conducted it was revealed that the English corpus in fact contained a wider variety of terms from this particular source domain.

The methodology employed in Berber Sardinha's chapter is particularly innovative in its attempt to use Biber's (1988) multidimensional framework to identify the metaphor-related features that distinguish spoken English, written academic English, fiction, and newspaper text. Within this framework, Berber Sardinha explores a number of metaphor-related variables, such as metaphor frequency, signalling, metaphor type (direct, indirect and implicit), clustering, conventionalization, semantics, and word class. The findings from the study show that metaphor constitutes a form of linguistic variation, across text types, which is statistically independent from the other types of variation that have already been identified

by Biber and his co-workers. Berber Sardinha thus convincingly argues that metaphor should be explicitly factored into multidimensional analyses.

Berber Sardinha is therefore able to suggest some concrete metaphor-based additions to Biber's framework which strengthen the framework considerably, giving it more explanatory power in terms of its ability to identify the linguistic features of different genres. He then goes on to quantify this phenomenon and finds that in the BNC 'Baby' corpus, metaphor accounts for a significant amount of the variation across the different genres. He is able to separate register-defining metaphor from general and shared patterns. He also finds that distinctions between information, literacy, non-narrative and reference genres involve differences in the use of metaphor. Finally, the chapter makes a good case for 'unpacking' straightforward metaphoric density measures and looking at the types of metaphors that characterise individual text types.

Despite the variation in metaphor use that is found across different genres and registers in this volume, we still see similar metaphors emerging again and again, although they are used in very different ways. There is a significant amount of evidence for Cameron's (1999, p. 129) three levels of metaphor systematicity. We have instances of 'local systematicity of metaphors within a particular discourse event' (for example, Beger's discovery of the systematic use of a specific, one-off metaphor throughout a psychotherapy session), 'discourse systematicity of metaphors within use in specific discourse communities' (for example, the use of machine metaphors identified by Williams Camus in popular journalistic accounts of cancer), and 'global systematicity of metaphors across a range of discourse types and content'. Having said this, the focus in most of the chapters has been on *discourse* systematicity and on the ways in which this reacts with both local and global systematicity according to the communicative purposes of the genre. In terms of the relationship between discourse and local systematicity, fine-grained studies such as the one discussed in Herrmann's chapter have shown how even within the broader register of 'academic writing', specific features of academic sub-registers, such as subject matter, the ontological make-up of individual disciplines and stylistic conventions influence the distribution of different metaphor types. In her study of the VUAMC, a subcorpus of the BNC 'Baby' corpus, Herrmann finds evidence for variation of metaphor type across four academic 'sub-registers', with for example 'direct metaphors' (such as similes) being most common in natural sciences, followed by humanities/arts. Interestingly, form appears here to invite varying functions in different sub registers: for example, similes may be predominantly used for pedagogical reasons in natural sciences, but mostly for aesthetic and interpersonal reasons in humanities/arts. Another study of discourse systematicity is Deignan and Armstrong's chapter which shows how 'management' metaphors are introduced in discussions of public services, by means of a series of

individual documents framing justice and penal policy in the United Kingdom. As for the relationship between discourse and global systematicity, Thalhammer shows how the largely universal SPORT/COMPETITION IS WAR conceptual metaphor is exploited in different ways in British and German football reporting.

The chapters in this volume also discuss at some length *why* people use different metaphors in different types of specialist data. Some of the studies show how the metaphors that people employ allow them to frame abstract concepts in particular ways, and the authors explain the practical, tangible benefits that this can bring by showing how people approaching the same phenomenon from different perspectives need to use metaphor in different ways. For example, in her comparison of counselling discourse and academic psychological discourse, Beger shows that while lay people tend to view love as something that simply 'happens' to people, as can be seen in expression such as: *it just tore us apart*, the types of metaphors that are used by counsellors when giving advice indicate that they view it more as something which people have control over, as can be seen in expressions such as: *The best things in life depend on our ability to create and maintain great relationships*. Thus in counselling sessions, relationships are usefully seen as something that needs to be built and then taken care of. By using these metaphors, counsellors manage to convey a much more active view of love, in order to counteract the passive views displayed by the laypersons. The active metaphors used by the counsellors clearly reflect the goal of relationship counselling, which is to encourage people to work at their relationships and not to let them 'die'. It is not clear whether the counsellors actually 'believe' these metaphors or whether they see them as useful counselling tools.

In comparison with academic lecturers, the counsellors in Beger's study rely much more on metaphors that construe love as a 'structured object' or as a 'living organism'. The academic experts tend to talk much more about love as a 'business transaction', in combination with the container metaphor. For them, love is something that needs to be 'invested in'. Similar findings emerge from Beger's analysis of anger metaphors. Whereas the laypersons in her study appear to view anger as an uncontrollable phenomenon, such as an explosion or a form of insanity, the analysts reframe it as something more controllable i.e. a weapon, or heat that can be turned up or down. There is therefore a very strong relationship between metaphor and one's perspective on the event being described.

Another theme which emerges from this volume is the effectiveness of mixed metaphors. In Beger's chapter, the counsellors talk about love as a building, a machine and a living organism, which requires building and maintenance, as we can see in the extract: *like anything in life, relationships must be tended to and renovated to be kept at full capacity, call it love spring cleaning*. The apparent effectiveness of this metaphor lends support to Kimmel's (2010) contention that people

mix metaphors and “mix them well”. Beger’s chapter is also interesting in that it draws attention to the *absence* of certain conceptual metaphors in some settings. For example, she notes that the universally-attested conceptual metaphor ANGER IS FLUID IN A CONTAINER is completely missing from the counsellor’s language. She argues that this is probably deliberate as it would be counter-productive for a counsellor to use this metaphor as it implies a lack of control. The notion of ‘deliberate metaphor’ is discussed in detail below.

The theme of cross-linguistic variation in metaphor use is taken up in the study by Williams Camus, which compares the popularisation of medical discourse in two Newspapers, the British *Guardian* and the Spanish *El País*. She is able to show how metaphor is used in the popularisation of medical research into cancer, taking as a starting point the fact that popularisation is not unidirectional, and that science and journalism constitute two different cultures, each of which has its own legitimate needs and interests. They thus have a symbiotic relationship with one another and popularisation is considered to involve recontextualisation of knowledge which has previously been constructed in specific contexts. Both corpora are found to contain mechanistic metaphors, such as the ‘switching on’ and ‘switching off’ of processes, and a considerable amount of emotive metaphor is found in the Spanish press, for example, where cancer genes are described as mafia chiefs or even *Scaramanga*, one of James Bond’s evil adversaries. There is also a great deal of personification in the Spanish press, with the spread of cancer genes being described as *crawling* or *migration*. The three most common images employed for this process in the Spanish press are ‘invasion’, ‘colonization’ and ‘dissemination’. There is a small amount of creative evaluative metaphor, such as the reference to making *pirate copies*. In contrast, there is very little reference to this process in the English texts and it is generally expressed in non-metaphoric terms.

Williams Camus shows how the use of metaphor in these texts has the potential to be misleading. For example, she discusses the fact that ordinary cells are described as *committing suicide* underplays the interaction between the cells and the rest of the body and the fact that this death is a necessary part of the continuing health of the body. She also points out that although the terms *apoptosis*, *programmed cell death* and *cell suicide* are used to mean different things in medical discourse, in the popular press, they are used interchangeably and in combination in popularisations. These findings add a nuance to Boyd’s (1993) work on “theory-constitutive” and “pedagogical” metaphors. This work, which has since been developed by Semino (2008), focuses on the different functions of metaphors within educational discourse. Williams Camus shows how “theory-constitutive” metaphors can be re-shaped in popular discourse to take on a more pedagogical function.

Some of the studies described in this volume have looked at metaphor from the point of view of the people who use and read the publications discussed. A particularly important chapter in this volume is Knudsen's, which looks at scientists' attitudes towards the use of metaphor in their disciplines. Much has been written by metaphor scholars about the role played by metaphor in the language used by expert members of certain discourse communities but there is very little research, perhaps with the exception Caballero's (2003, 2006) work on architectural discourse, which looks at what the people who produce or consume such texts actually think of it. Knudsen notes that there are two broad attitudes towards metaphor in the academic community. On the one hand, there appears to be an acceptance of the value of metaphor as a framing or heuristic device but on the other hand, there is widespread suspicion of overt linguistic metaphor. On the 'positive' side, she identifies five frames of metaphor each of which is characterised by particular groups of researchers. Metaphor is seen as: inferior/commonsensical knowledge; a visualization tool within scientific discourse; a way of communicating scientific knowledge to non-scientific audiences; a pre-theoretical device or hypothesis; and as a general frame of reference/scientific ideological perspective. This wide range of identified uses demonstrates that many practitioners have a strong grasp of the nature of metaphor as a heuristic tool and are able to exploit it as such, and this is encouraging. However, on the 'negative' side, she observed that some of the practitioners in her study appear to be suspicious and critical of metaphor and try to 'avoid' it if at all possible.

Other studies in this volume explore the political implications of metaphor use in certain genres and focus on slippage from one genre into another. For instance, Deignan and Armstrong show how 'management' metaphors have crept into discussions of public services and demonstrate how they are used to frame justice and penal policy in the United Kingdom. They illustrate how the borrowing of terms of such as 'management' from the field of business lowers expectations about the ability of government to reduce or eliminate crime. The use of metaphor may thus affect the ways in which policies are implemented and the expectations that people have of them. The policymaking theme is continued by Williams who notes the use of very specific conceptual metaphors in press releases produced in Canada describing a new internet facility.

Finally, the impact of the speaker's physical environment on the use of metaphor in workplace communication is explored in Harrison's chapter. In his study of the use of gesture in communication between workers working in a salmon packing factory where it is too noisy to speak, he finds metonymy to be far more common than metaphor. He explains that this is because the participants are always referring to concrete artefacts and not abstract concepts, and by pointing out that the gestural exchanges are very short and do not form part of lengthy or

elaborate utterances. He points to previous research by Cameron (2003) showing that longer stretches of discourse tend to be needed for metaphor to develop and argues that this is why metaphor was relatively underrepresented in his data. Another possible reason for his finding could relate to the fact that much of the communication is ancillary rather than constitutional (see Halliday, 1978) and there is a need for speed. In their study of metaphor use across different genres and registers, Deignan et al. (2013) found a preponderance of metonymy in some of the spoken genres, which they attributed to a need for speed in communication and the fact that shared background knowledge facilitated the use of time-saving metonymies.

### 3. Issues remaining

A common thread in many of the chapters in this volume is that they touch on the issue of conceptual metaphors and their relationship with the different types of systematic metaphors discussed above. Studies in this volume have shown quite categorically that different conceptual metaphors are employed in different genres. For instance, Beger notes a lecturer's use of a LOVE IS A BUSINESS TRANSACTION metaphor to convey a particular *theoretical approach to love* and suggests that it may not be a widespread, deeply engrained, universal conceptual metaphor. Rather, she argues that it might more appropriately be viewed as a *theory-constitutive* metaphor (see the aforementioned reference to Boyd, 1993). If certain metaphors only appear in certain contexts such as this, it may not be appropriate to refer to them as 'conceptual metaphors' and it may be more accurate to describe them as "systematic metaphors at the level of the discourse" (Cameron, 1999). Beger does however note the use of some more widely-observed conceptual metaphors, such as LOVE AS A UNITY OF PARTS and ANGER IS FLUID IN A CONTAINER. These would probably be described by Cameron (1999) as "globally systematic metaphors". This leaves us in a somewhat unclear position regarding the status of conceptual metaphors, and their relationship to 'globally systematic' metaphors. Are they the same thing with the latter being simply a more hedged definition, or are they two different things? The chapters in this volume have largely taken them to be conceptual metaphors but the issue has been shown to be complex and would be worth exploring further.

One way of exploring this complexity may be to recruit ideas from Dynamic Systems Theory, as Gibbs and Santa Cruz (2012) have done. They make a convincing case for the emergence of conceptual metaphor in discourse, by discussing how conceptual metaphors 'unfold' over time in conversation according to specific types of dynamics. They see conceptual metaphors as temporary instances of

stability in the system, which are described in dynamic systems theory as ‘attractor states’. Other conceptual metaphors also act on the conversation at the same time, and tend to ‘pull’ it in other directions. Thus no single conceptual metaphor has complete control over the way in which an utterance is interpreted. In their words:

This possibility offers a very different view of the traditional question regarding whether a single conceptual metaphor is activated or not during verbal metaphor processing as many conceptual metaphors, along with many other constraining forces, may have partial, probabilistic influence on one’s understanding of verbal metaphor.

(Gibbs & Santa Cruz, 2012, p. 305)

Gibbs and Santa Cruz go on to argue that conceptual metaphors will facilitate metaphor understanding to differing degrees, depending on the interaction of different variables, along multiple timescales, at any given moment in the conversation. It is therefore inappropriate to assume that a conceptual metaphor is activated every time a linguistic metaphor is encountered. This focus on the dynamic nature of metaphor ties in with Müller’s (2008) argument that metaphors are never intrinsically ‘dead’ or ‘alive’ and that metaphors display varying degrees of ‘awakeness’ over time and in different contexts of use.

Another issue that remains to be resolved is the extent to which one can establish whether users are aware of their own metaphor use and whether or not they might be said to use it ‘deliberately’. The notion of ‘deliberate’ metaphor was originally introduced by Steen (2008), who defines a ‘deliberate’ metaphor as one that is “expressly meant to change the addressee’s perspective on the referent or topic that is the target of the metaphor, by making the addressee look at it from a different conceptual domain or space” (2008, p. 222). He then proposes a set of criteria that an analyst might use to establish whether or not a particular metaphorical unit has been used ‘deliberately’. These include, for example, whether or not the metaphorical unit has been signalled, whether or not it is surrounded by metaphorical expressions from compatible semantic fields which are somehow connected, whether or not it elicits rhetorical effects such as persuasion or humour, and so on. The idea of deliberate metaphor has been questioned by Gibbs (2011) and further contributions to this debate have been made by Steen (2011) and Deignan (2011). Deliberate metaphor is relevant to many of the studies described in this volume.

We have seen a number of cases where the genre has required metaphor to be used for dramatic effect and where a significant amount of thought appears to have gone into metaphor production, but in other situations the level of ‘deliberateness’ is far less clear. In Beger’s academic expert corpus, the metaphor use is tightly linked to the exposition of specific expert models and we can detect a certain level of deliberateness in this case. We also saw in Beger’s study the possibility of deliberate *suppression* of a conceptual metaphor (*anger is fluid in a container*) when

that metaphor would be counter-productive to the goals of the counselling. The deliberate avoidance of metaphor by speakers and writers has not been considered in-depth by metaphor scholars who are interested in the concept of 'deliberate' metaphor. This is another line of research that would be worth pursuing.

Related to this is the finding, reported in Herrmann's chapter, that academic writers appear to largely avoid using similes, which are arguably one of the most 'deliberate' forms of metaphor. As we saw above, however, distinct sub-areas of academic discourse appear to use similes (and related forms) more than others – yet, with a simultaneous variation in predominant communicative functions, such as pedagogical and aesthetic, and interpersonal. Further research could usefully investigate the responses of academic writers when their attention is drawn to the metaphors that they have used, assessing for which purposes which types were chosen. It would be interesting to note what they do and do not learn from such an activity.

In her chapter on the use of metaphor in press releases produced by the Government of Alberta in Canada, A. Williams reports that the metaphors used present a very rosy picture of the internet technologies that the Government is trying to promote. One would assume that very careful consideration has been given to the use of language in this context, but we cannot say with any degree of certainty whether the metaphors in these texts have been deliberately produced. More research involving informants who are professionals working in public relations departments in public and private sector organisations would be of benefit here as they would be able to give their own perspective on the use of metaphors.

Related to the issue of deliberateness is the notion of metaphor 'signalling'. Several of the studies reported in this volume have touched upon the ways in which metaphor is signalled, and Beger's chapter contains interesting findings with respect to different uses of signalling according to the level of expertise of the recipient of the text, and differential uses of similes (which could be interpreted as overtly signalled metaphors) in different contexts. We have also seen, in Harrison's chapter, how attention-getting devices are used in non-verbal communication before a piece of figurative language is used. The differential use of signalling is an area that could usefully be explored more systematically across different genres and registers. Some interesting work on the use of signalling devices has already been done in metaphor studies (Cameron & Deignan, 2003). This complements the work that has been conducted by discourse analysts on the use of discourse markers. A potentially fruitful line of enquiry might be the discourse markers *sort of* and *kind of*, which have been studied both by metaphor researchers and by discourse analysts. These two discourse markers have been found to serve a range of functions in conversation. They are used to introduce vague language (Channell, 1994) as well as serving a range of other conversational functions,

such as mitigation, hedging, hesitation and rapport management (James, 1983). Interestingly, in their aforementioned study, Cameron and Deignan (2003) found that *sort of* and *kind of* operate as signalling devices for both novel and conventional metaphor. They observed that when these two discourse markers were used to signal metaphor, their two main functions were to direct the interlocutor to a particular interpretation and to adjust the strength of a metaphor. They were also used to prevent metaphors from being interpreted literally, and to signal that a subsequent stretch of discourse coming up may be less than straightforward to interpret. These functions overlap in some ways with those reported by Lin (2010) in her work on the role of *sort of* and *kind of* in academic discourse more generally. She found that in university lectures, they were used to tone down speculative assumptions about the issues under examination or about the students, to hedge descriptive explanations for some phenomena based on lecturers' professional knowledge, to minimise potential threats to face, such as when giving advice, to qualify subsidiary information or exemplification provided to back up the key points, and to modify and frame reported speech. To date, no studies have investigated how the use of discourse markers to signal metaphor relates to the use of discourse markers that are used in discourse more generally, and it would be interesting to relate these two lines of research.

Another area that would benefit from further study is the effect that metaphor in spoken and written texts has on the consumers of those texts. In her chapter on the use of metaphor in press releases talking about new technologies, Williams notes the widespread use of personification metaphor. She notes that some critics have suggested that the tendency to anthromorphise technology can be harmful as it contributes to the process of 'commodity fetishism'. In other words, there is a risk that people might replace their personal relationships with object oriented interactions. She goes on to make the point that in her corpus, the personification metaphors circumscribed a largely passive role for citizens. In her analysis of the highway metaphor, she suggests that this metaphor provides an illusory sense of access since the internet is not a public resource in the same way as Canadian highways are. These ideas would be well worth exploring with informants who are asked to comment on their understanding of the texts and the ways in which their attitudes towards the internet may or may not have been affected by them.

One problem with such studies is the fact that they would involve self-report data and introspection and these are notoriously unreliable ways of getting at what people really think. One way round this problem may be to adopt the sort of methodology that has been employed by researchers such as Boers (1997) in their investigations of the effects of conceptual metaphor on human behaviour. Using business and economics students as his test subjects, Boers (1997) showed that by construing economics in different ways through the use of different metaphors,

writers can influence their readers' views of these issues. When asked how particular economic problems could be resolved, Boers' students recommended different courses of action depending on how the issue had been construed metaphorically in the texts they had been exposed to. The participants were given a written scenario about a European company that was being faced with a cheaper Taiwanese competitor. Fifty participants received a scenario described in terms of 'HEALTH', 'FITNESS', and 'RACING' metaphors, whereas the other 50 participants received a version presented in terms of 'FIGHTING' and 'WARFARE' metaphors. Boers found that participants who had been exposed to the 'HEALTH', 'FITNESS', and 'RACING' metaphors were significantly more likely than the others to suggest that the size of the European company should be reduced by laying off personnel or by closing down less profitable departments. In accordance with the 'RACING' metaphor, they were also significantly more likely to recommend more innovation and research and development (in order to 'stay ahead of' the Taiwanese competitor). They typically talked about taking the company upmarket (producing expensive, high-quality goods), rather than competing with the Taiwanese on price grounds. Participants who had been exposed to 'FIGHTING' and 'WARFARE' metaphors were significantly more likely to recommend price cuts and to argue for a 'price war' in order to force the Taiwanese competitor out of the market. The solutions proposed by the participants were thus largely in line with the metaphors that they had been exposed to. Studies such as this could usefully be conducted on the sorts of data studied in some of the chapters in this volume, as they would allow researchers to test the extent to which recipients of these texts are actually influenced by the metaphors that they contain. This kind of method may for example be used in a possible follow-up on the study reported by Smith, who among other things discussed the effect of metaphor on recipients of explanatory texts dealing with dynamic systems. He argues that the metaphor use found in his corpus may carry the danger of learners forming oversimplified or even inaccurate ideas about dynamic systems, for example when reifying sequences and processes into objects located in time and space. A possible follow-up study could usefully elicit learners' understanding of particular aspects of dynamic systems theory that have been explained to them by means of different metaphors, and examine the impact of the different metaphors on their subsequent conceptualizations of dynamic systems theory.

Another topic that could usefully be explored in more depth is metonymy in specialist discourse. Metonymy crops up at fairly regular intervals throughout the volume and Harrison's chapter on gesture in the salmon packing plant is interesting as it reveals that metonymy, not metaphor is the hallmark of this type of communication. Metonymy thus appears to play a role in distinguishing the features of language used by particular discourse communities. Indeed, as we saw above,

in their study of metaphor use across different genres and registers, Deignan et al. (2013) found that the use of metonymy in particular genres and registers is largely governed by the communicative needs of the genre as well as register features such as the topic under discussion, the relationship between the speakers and whether the language is written or spoken. Of these different features, they found that those most likely to lead to metonymy are shared background knowledge and a need for speed in spoken workplaces settings.

Following on from this, another theme that would benefit from further study is the *relationship* between metaphor and metonymy in the language used by different discourse communities. Insiders and outsiders have been found to identify differing amounts of figurative content in discourse community-specific lexis, depending on their levels of expertise. Dirven (2003) proposes a continuum of interpretation stretching from literal interpretations at one end, through metonymy, to metaphor. This idea has been challenged by Croft and Cruse (2004), who suggest that metaphor and metonymy may be completely different processes that can co-occur, and by Barnden (2010) who points to the complexity and inherent 'slipperiness' of the metaphor/metonymy distinction. Thus, in principle, an expression can rarely be said to be purely metaphorical or metonymic in any abstract sense, but only for a particular user in a given context. What is metaphor for one person may be seen as another type of figurative language or even as literal usage by someone else. It would be worth exploring the ways in which people's interpretations of language move along this continuum, depending on their degree of membership of certain discourse communities.

Some of the studies reported in this volume found interactions between other types of figurative language besides metaphor. In Harrison's chapter, metonymic gesture was found to interact with hyperbole, when the workers held their hands about a metre apart to indicate that the slices of salmon were too thick. Harrison also points out in his chapter that at times it was difficult to tease apart metonymy and metaphor in his data. When workers wanted to indicate that the thickness of the salmon slices should be moved 'up' two notches, they held out their thumb and moved it upwards twice. The actual movement required by the worker in this context involved pressing a button and they were not required to flick levers up or down. It is therefore possible to interpret this as a *MORE IS UP* conceptual metaphor or as a metonymy for some sort of perceived movement that takes place *within* the machine. This is further evidence for the aforementioned blurred distinction between metaphor and metonymy. In order to gain a fuller picture of the ways in which figurative language is used in different specialist discourse communities, it would be worth studying how practitioners in these communities combine different sorts of figurative language in order to meet their communicative needs. Harrison's chapter is the only one in this volume to have focused on multimodal

metaphor and a full account of the role of metaphor in genre and register variation would need to include this dimension.

Turning to the attitudes of the metaphor producers themselves, we saw in Knudsen's study that although many practitioners are aware of the heuristic value of metaphor, some remain highly critical and even fearful of metaphor and there appears to be very little awareness of the benefits that communication involving metaphor can bring. Smith's study showed that in discussions of dynamic systems theory there is very little awareness of the metaphors used and of their possible limitations. In her chapter on policymaking, Williams makes the point that it would be useful for policymakers to reflect on the metaphors that they use and to explore their implications. Although many policy makers and other people who are charged with producing influential texts are probably aware of the effects of rhetorical devices and imagery, there is little evidence to suggest that they reflect systematically the role of metaphor in their language. When they do, they are sometimes critical of it, as Knudsen's study showed. However, as metaphor researchers we are aware of the fact that it is impossible to speak or write wholly without metaphor and that this is therefore something of an artificial goal. It needs to be acknowledged that there will be a metaphorical element to virtually all forms of communication, and having a full grasp of the implications of the metaphors that one employs is likely to be of considerable benefit to text producers.

It therefore appears that there is still work to be done in promoting an awareness of metaphor in practitioners outside the immediate metaphor research community. Within the metaphor community itself, there have been some attempts to reach out to other researchers. For example, Lynne Cameron and her research team have run metaphor workshops for social scientists, which explore the use of metaphor in their disciplines. As well as being beneficial to the social scientists, these workshops have allowed metaphor researchers to test out metaphor-related theories and methodologies on different types of data. This work has subsequently been extended to look at the role played by metaphor in perception and communication of terrorist risk. In a further project, 'Living with Uncertainty', Cameron and her research team are using metaphor analysis to investigate how living with the uncertainties created by urban violence, terrorism, and increased migration can affect social empathy. Among other things, they are looking at the role of metaphor in the language used by people to speak of 'the Other'. They are using the results from this investigation to develop a dynamic model of empathy. We are therefore beginning to see some powerful applications of metaphor theory to real world issues. Metaphor scholars could usefully build on this work by endeavouring to publish their work in academic journals outside the field of metaphor studies in order to raise awareness of the subtle ways in which ideas can be shaped and skewed by metaphor.

#### 4. Conclusion

This chapter must therefore conclude by acknowledging the impressive progress that metaphor researchers have made in the exploration of metaphor in real-life genres and registers both in this volume and elsewhere. The field of metaphor studies has come a very long way since the publication of Lakoff and Johnson's *Metaphors We Live By* in 1980. It now needs to reach out further into other disciplines and other walks of life, such as politics, psychotherapy, business communication, education, advertising, and cross-cultural understanding (in its broadest sense). Internationally, there is increasing recognition of the need to build inter-disciplinary research teams in order to conduct research that meets the needs of today's society. Metaphor constitutes an ideal subject area around which such teams might be built as metaphors provide a key to understanding yet can be understood in different ways by different research communities. As well as drawing on current work that is being done on conceptual metaphor theory, inter-disciplinary studies of metaphor would need to take account of the dynamic nature of metaphor, the extent to which metaphor is 'deliberately' used by the people within the discourse communities, the effects that the metaphors have on the consumers of the texts, and the extent to which metaphor behaves differently from other discourse features.

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