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Metaphor and Metonymy in the Digital Age

EDITED BY
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Volume 8

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Theory and methods for building repositories of figurative language
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"The poet, however, uses these two crude, primitive, archaic forms of thought (simile and metaphor) in the most uninhibited way, because his job is not to describe nature, but to show you a world completely absorbed and possessed by the human mind."
Northrop Frye, The Educated Imagination

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Preface and acknowledgements

By presenting the most important projects featuring metaphor and metonymy repositories around the world, this volume aims to explain where metaphors and metonymies can be found (in thought, in language, and in communication), and how they can be harvested and classified. The volume is a result of an interdisciplinary collaboration between cognitive linguists, psychologists, and computational scientists employing and presenting a variety of methods which rely mostly on linguistic and, in one case, pictorial data. They all share the same passion for metaphors and metonymies, as well as the main assumptions of the cognitive linguistic approach to figurative language, which is based on the proposition that metaphor and metonymy underlie the human conceptual system and play a central role in human cognition, and that they are deeply entrenched in recurring patterns of bodily experience.

Earlier versions of these chapters were presented at the conference and round-table forum Building Figurative Language Repositories: Methods, Risks, and Challenges, held in Zagreb on 27 and 28 May 2016, organized by Kristina Despot. This conference was the first international meeting exclusively devoted to the trending topic of building electronic repositories of figurative language. The conference was generously co-funded by the Croatian Science Foundation as part of the project Croatian Metaphor Repository, led by K. Despot, and the Institute of Croatian Language and Linguistics, whose financial contributions are gratefully acknowledged. We are particularly grateful to Željko Jozić, the director of the Institute of Croatian Language and Linguistics, who wholeheartidly supported the project MetaNet.HR, the conference, and this book.

For their help in organizing the event, we are indebted to the scientific and organizing committee, and especially to the conference secretaries Ivana Brač and Ivan Pandžić. We are grateful to the keynote speakers, George Lakoff and Eve Sweetser, to the invited speakers – Antonio Barcelona, Marianna Bolognesi, Mario Brdar, Rita Brdar-Szabó, Zoltan Kövecses, Klaus-Uwe Panther, Günter Radden, Linda Thornburg, and Tony Veale, and to Simon Devylder, who was, based on the quality of his abstract, chosen by the Scientific Committtee to give his presentation within the invited talks session. We are especially grateful to the participants at the round table, and of course to all the participants of the conference. In preparing this book, we benefited greatly both from the valuable and interesting

contributions to this conference and from the vivid discussions those talks stimulated during the round table.

Tony Veale went beyond the call of collegiality in giving us inspiring and witty feedback on the content of the book, and especially in suggesting such a captivating title for its introduction during a joyful train ride from Dublin to Cork. He gave us the metaphor, we did the mappings, and it seemed like a perfect match for this book.

We would especially like to express our gratitude for the privilege of working in the inspiring and supportive academic communities of Metaphor Lab Amsterdam (University of Amsterdam), the Institute of Croatian Language and Linguistics, and the University of Osijek, but especially for the privilege of being inspired by and gaining knowledge at the University of California, Berkeley, and at the International Computer Science Institute.

We owe a special debt to Eve Sweetser, George Lakoff, Gerard Steen, Milena Žic Fuchs, and Tony Veale, whose work has been inspirational for us and has transformed our thinking.

We are indebted to two anonymous reviewers who gave us invaluable feedback and improved this book in many aspects.

Finally, we extend our deepest thanks to Gerard Steen and Christian Burgers, the editors of the *Metaphor in Language, Cognition, and Communication series*, for accepting this volume to be published within the series, and for actively assisting us both in editorial matters and by providing invaluable advice and suggestions on the structure, content, and form of this book.

Marianna Bolognesi, Mario Brdar, and Kristina Despot

Fantastic metaphors and where to find them

Marianna Bolognesi & Kristina Despot
University of Oxford / Institute of Croatian Language and Linguistics

> *Metaphor disrupts. It disrupts our conceptual category systems the way a game of musical chairs disrupts a formal dinner party, licensing guests to ignore the host's place settings in favor of whatever works best when the music stops. Metaphor is the ultimate appropriation device, allowing speakers to appropriate the stereotypical associations and linguistic norms of one domain of experience so as to transplant them wholesale onto another. Wherever metaphor goes, disruption and appropriation are sure to follow, even when we fail to notice, as we so often do, the deep upheaval taking place beneath the beguiling calmness of the metaphor's surface*
> Tony Veale, this volume

The title of this chapter echoes and metaphorically relates to the 2016 British – American fantasy film *Fantastic Beasts and Where to Find Them*, directed by David Yates and produced and written by J. K. Rowling as a spin-off and a prequel to the *Harry Potter* film series. The film begins with the arrival of Newt Scamander, a magizoologist, in New York. He carries a leather briefcase with worryingly insecure clasps, full of exotic specimens and extraordinary, fabulous creatures. As usually happens in fantasy movies, a bundle of incredible events leads to beasts escaping into the grimy and gothic city of New York. The rest of the film evolves around the recapturing of the escaped magical creatures and putting them into the safety of a local zoo.

To us, this plot seemed to be an appropriate framing for this book: metaphors are exotic, extraordinary, fabulous creatures that we, scholars or magizoologists, are trying to recapture and put into the zoo – a figurative language repository or a certain theoretical framework. Just as the magical creatures in the film are hidden in the dark corners of a huge and dangerous gothic city, metaphors and metonymies are hidden in thought (where they shape conceptual structures) and manifest themselves in various modalities of expressions (including language, images, and gestures) and in many of the genres of discourse that characterize authentic instances of communication.

Among metaphor scholars from different disciplines, it is by now widely accepted that metaphors are much more than just ornaments and poetic decorations – they are important and pervasive in thought because they help us to shape

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our conceptual structures and to organize and construct our values, beliefs, characters, and life choices. These structures are then reflected in language, gestures, images, music, and other modalities of expression. Most often, they are reflected in a very conventional, non-disruptive, and, to a non-specialist, even invisible way. However, these structures are sometimes expressed in a novel, creative, and disruptive way. To us, metaphors are "fantastic" precisely because of this ability to be both of these things, and in the chapters of this volume, we have tried to elucidate both of these faces of the phenomenon.

This volume will guide the reader through these murky places where metaphors and metonymies can be found "in the wild." It will reveal some theories and methods that one can use to capture them and more or less safely store them in repositories. Some of the main challenges involved in these endeavors will also be outlined.

The volume aims to explain where metaphors and metonymies can be found – i.e., in thought, in language, and in communication – and how they can be harvested and classified, by presenting the most important projects featuring metaphor and metonymy repositories around the world. We hope that our readers will appreciate that, in addition to metaphor, metonymy is also represented, for it represents an even more basic figurative device than metaphor (e.g., Panther & Thornburg, 2017). Additionally, we hope the readers will appreciate the diversity of the languages (including those less often represented in the field), resources, and methods covered. In this introduction, we will first present the theoretical and methodological predecessors and prerequisites to the building of repositories described in this volume. In the second part of the introduction, we will give an overview of the subsequent chapters of this volume.

1. Metaphor and metonymy repositories

Nearly forty years have passed since Lakoff and Johnson's (1980) seminal book on the importance of metaphor in human thought was published. It sparked a vast amount of research in many disciplines, from the cognitive sciences to cognitive linguistics, discourse analysis, pragmatics, literary studies, psychology, computer science and machine learning, clinical studies, social sciences, education, psychotherapy, etc., resulting in a large body of theoretical and empirical literature related to this subject in all these areas and in different languages. Many theories on figurative language and thought that have been developed more recently relate more or less critically to the ideas advanced by Lakoff and Johnson 40 years ago (Lakoff's Conceptual Theory of Metaphor, 1993; McGlone's attribute categorization hypothesis, 1996; Wolff & Gentner's structure mapping model, 2000; the conceptual mapping model of Ahrens et al., 2003; Bowdle & Gentner's career of metaphor theory, 2005; Lakoff's neural theory of metaphor, 2008; etc.).

From a methodological perspective, the study of figurative language and thought has dramatically advanced as well in recent years. Today, a reliable method for the identification of metaphor in language is available and widely used (the metaphor identification procedure known as MIP proposed by the Pragglejaz Group, 2007, and its variant MIPVU, developed by Steen et al., 2010). A reliable procedure for metaphor in discourse analysis has been proposed (metaphor-led discourse analysis by Cameron et al., 2009). Experimental methods were introduced to metaphor research, providing massive evidence of the embodied nature of our cognition most often through the research of neural connections between sources and targets of primary metaphors (cf., Gibbs, 1984; Gibbs, 2006; Matlock, 2004; Boroditsky, 2000; Casasanto & Boroditsky, 2008; Harmon-Jones, Gable, & Price, 2011; Williams & Bargh, 2008; Zhong & Leonardelli, 2008; Jostmann, Lakens, & Schubert, 2009 etc.). Methods for semi-automated corpus analysis have been implemented (for an overview, cf. Gries, 2014), as well as tools for mining large-scale collections of unstructured linguistic data (also called Big Data) and for generating metaphors (for an overview, cf. Veale, Shutova, & Beigman Klebanov, 2016). In this volume, a reliable method for corpus-based conceptual analysis is proposed (Despot et. al., this volume). Moreover, technological advancement has opened up new possibilities for the creation of large-scale electronic repositories of figurative language and thought, which is also described in this volume.

These new large-scale repositories did not emerge out of an empty space. There were several notable previous attempts to systematize metaphor research results and to build metaphor-annotated datasets for research use. Of the earliest such datasets, the Master Metaphor List (MML) (Lakoff et al., 1991) was one of the most widely used and cited among metaphor scholars in the area of linguistics. The MML was the direct inspiration for two of the projects described in this volume: MetaNet (Sweetser, David, and Stickles) and MetaNet.HR (Despot et al.). The MML is a hierarchical dataset (in the form of a pdf document) that groups metaphors into four main metaphor families (event structure, mental events, emotions, and a category called "other"). Under those families, conceptual metaphors are listed with their special cases, special sub-cases, linguistic examples, source and target domains, and conceptual mappings.[1] Valuable notes are sometimes provided to further explain certain relations as well as alternate names of metaphors. MML is a resource in which valuable hand-crafted knowledge has been collected and presented in a systematic and uniform way, providing deep insight into the hierarchical conceptual structure of several important metaphor families.

1. Not all of these features are listed for each CM, and the authors state in their short introduction that the present list is anything but a finished product.

This approach, especially in the analysis of the event structure family, gave rise to what would later become known as *cascades*[2] (David, Lakoff, & Stickles, 2016). The Hamburg Metaphor Database (HMD) (Eilts & Lönneker, 2002) is an online database of French and German metaphors, which are collected from mass media, and stored in domain-specific corpora. Metaphors in the HMD are annotated on the lexical and conceptual levels. For lexical annotation, information from the EuroWordNet database (synonyms) was used. The conceptual annotation is done using the MML (conceptual domains).

The largest available corpus, which was manually-annotated for all metaphorical language use, regardless of lexical field or source domain, is the VU Amsterdam Metaphor Corpus.[3] This corpus is based on a systematic and explicit metaphor identification procedure (MIPVU, Steen et al., 2010)[4] which has been applied to about 190,000 lexical units extracted from the BNC-Baby and belonging to four broad registers: academic texts, conversation, fiction, and news texts. The words in this corpus were annotated by six annotators for the following relations to metaphor: indirect metaphor, direct metaphor, implicit metaphor, and borderline cases. The main goal of building this corpus was to investigate which metaphors are used in which forms, in which discourse contexts, in which registers, and for which purposes (Krennmayr & Steen, 2017). The MIPVU project originated at the VU University Amsterdam, within the five-year research program "Metaphor in Discourse: Linguistic Forms, Conceptual Structures, and Cognitive Representations" led by Gerard Steen (funded by Netherlands Organization for Scientific Research, NWO, VICI). The Metaphor corpus is widely used by other researchers and research groups for annotating their own data on metaphor (i.e., Despot et al., this volume).

In addition to these, there are other, smaller scale or more specific resources, such as a dataset of metaphors of the mind (Barnden, 1997), metaphors of the mind in eighteenth-century literature (Pasanek, 2015), a set of metaphoric sentence stimuli annotated for frequency, concreteness, familiarity, valence etc. (Cardillo et al., 2010), and several datasets annotated for specific constructions

2. The term *cascades*, borrowed from neuroscience, was developed within the MetaNet project to designate inheritance relationships that link levels of metaphoric structure (cf. Dancygier & Sweetser, 2014, p. 57; Sweetser, David, & Stickles, this volume).

3. http://www.vismet.org/metcor/search/showPage.php?page=start

4. This is a version of MIP (Praglejaz Group, 2007) which is in many respects more detailed (in the specification of what is considered to be a lexical item, part-of-speech tags are considered to be a part of the lexical unit, diachronic perspective is deliberately neglected, similes are treated as direct metaphors, the notion of implicit metaphor is introduced for co-referents of metaphorical words etc.).

or target expressions (for a detailed list and descriptions, cf. Veale, Shutova, & Beigman Klebanov, 2016, pp. 64–72).

These resources, together with the new resources described in this book, contain valuable knowledge that has been used since the beginnings of the field in the demanding Natural Language Processing (NLP) tasks of automatic detection and interpretation of figurative language (Fass, 1991; Peters & Wilks, 2003; Mason, 2004; Bogdanova, 2010; Li & Sporleder, 2010; Shutova et al., 2010; Shutova, 2011, etc.). This collaboration of linguists, computational scientists, and engineers needs to be maintained and cherished further if we, linguists, are to take part in the exciting possibilities of a range of applications of automatic metaphor processing – from educational, clinical, and political applications to those of Artificial Intelligence (AI), computational creativity, creative writing, and storytelling.

2. A preview of this volume

The aim of this book is threefold: to give an overview of the most recent repositories of figurative thought as reflected in language and images; to illustrate the methods that these repositories deploy; and to provide a critical analysis of the risks and challenges involved in these operations. The chapters are provided by a number of acknowledged authors whose shared focus is to show the strengths and weaknesses of various methods used to construct repositories of figurative expressions found in language, thought, and communication, with a specific focus on two cognitive operations: Metaphor and Metonymy.

The repositories illustrated and discussed here include MetaNet,[5] a system that makes use of a repository of formalized frames and metaphors to automatically detect, categorize, and analyze expressions of metaphor in large-scale text corpora, currently housed at the International Computer Science Institute in Berkeley, California (Principal investigators: Eve Sweetser and George Lakoff); its sister project, MetaNet.HR – The Croatian Metaphor Repository,[6] based at the Institute of Croatian Language and Linguistics (PI: Kristina Despot); Córdoba Metonymy Database[7] (PI: Antonio Barcelona); the VisMet Corpus[8] of visual metaphors, hosted by the University of Amsterdam (PI: Marianna Bolognesi); and a

5. https://metanet.icsi.berkeley.edu/metanet/

6. http://ihjj.hr/metafore/en/

7. Ongoing project: http://www.uco.es/investiga/grupos/lincogf/?q=home

8. http://www.vismet.org/VisMet/

variety of web services for figurative language generation (such as MetaphorMagnet[9]) developed by Tony Veale at UC Dublin, Ireland.

These new resources and methods in figurative language research are described and discussed in the first part of the volume (see Table 1 for the overview). The second part of the volume presents a selection of contributions in which the risks and challenges involved in these methods are outlined and debated. In this perspective, the book takes a methodological focus that integrates and combines the newest technologies for mining and constructing (automated) repositories of figurative language with classical cognitive linguistic approaches.

Table 1. Overview of the resources presented in this volume

Resource name	**MetaNet Chapter 1**
PI	Eve Sweetser and George Lakoff
Host institution	International Computer Science Institute in Berkeley, California, USA
Short description	MetaNet encompasses the largest multilingual repository of both figurative language (and thought) and ontologically organized frames. There are two core components of the system: a hierarchically-organized conceptual metaphor repository, and an automated metaphor identification system that crawls texts in order to automatically detect, categorize, and analyze expressions of metaphor in large-scale text corpora.
Web site	https://metanet.icsi.berkeley.edu/metanet/
Languages	English, Spanish, Russian, Farsi
Availability	Freely available
Resource name	**MetaNet.HR** Chapter 5
PI	Kristina Despot
Host institution	Institute of Croatian Language and Linguistics, Croatia
Short description	MetaNet.HR is a sister project of the MetaNet project. This database lists hierarchically organized conceptual metaphors and metonymies decomposed into source-target relations among cognitive primitives, image schemas, and semantic frames, which are further decomposed into semantic roles. The database includes annotated metaphor examples and links to experiments, if applicable.
Web site	http://ihjj.hr/metafore/en/

9. http://boundinanutshell.com/metaphor-magnet

Table 1. (*Continued*)

Languages	Croatian, English
Availability	Freely available
Resource name	**Córdoba Metonymy Database** Chapter 2
PI	Antonio Barcelona
Host institution	University of Córdoba, Spain
Short description	The Córdoba Metonymy Database provides a tool to systematically investigate the functioning of conceptual metonymy across a wide variety of authentic discourse samples in English and Spanish. It is hierarchically organized, with the top ("generic") level of that hierarchy being the tripartite typology WHOLE FOR PART, PART FOR WHOLE, and PART FOR PART.
Web site	http://www.uco.es/investiga/grupos/lincogf/?q=home
Languages	Spanish, English
Availability	The database will be available upon request by the end of 2019. By mid 2020 the database will be available to a wider set of registered users.
Resource name	**VisMet Corpus** Chapter 4
PI	Marianna Bolognesi
Host institution	University of Amsterdam, Netherlands
Short description	VisMet 1.0 is the first (and, currently, the only) digital corpus of visual metaphors publicly released online. The first version of the corpus available (VisMet 1.0) contains roughly 350 images, all reprinted under written authorization provided by the copyright owners. The images have been selected, analyzed and annotated on different dimensions of meaning. The corpus covers visual metaphor variability across different genres previously identified in the scientific literature on visual metaphors thus encompassing advertisements, political cartoons, artworks and illustrations of various types (graffiti, digital art, photographs).
Web site	http://www.vismet.org/VisMet/
Languages	NA Metalanguage: English
Availability	Freely available
Resource name	**MetaphorMagnet** Chapter 3
PI	Tony Veale
Host institution	UC Dublin, Ireland

(*Continued*)

Table 1. (*Continued*)

Short description	Web service *Metaphor Magnet* realizes the view of metaphor as a resource and a service for creativity on demand. It is a vast collection of Web fragments rich in potential metaphors used to drive the processes of metaphor comprehension and generation. The *Metaphor Magnet* service expands each new metaphor-*qua*-query into a set of known metaphors via mappings derived from the Google n-grams; each of these pre-existing metaphors is then expanded into a set of contextually apt properties and behaviors. Ultimately, each of these qualities is re-expressed as a topic-specific IR query that is used to retrieve relevant hits for the topic from Google. In effect, the *Metaphor Magnet* service allows users to interact with a search engine like Google using affective metaphors and other expressive language forms.
Web site	http://boundinanutshell.com/metaphor-magnet
Languages	English
Availability	Freely available

2.1 New methods and digital resources for mining metaphor and metonymy in thought, language, and images

Eve Sweetser, **Oana David**, and **Elise Stickles** open up the volume by describing the MetaNet project, hosted at the International Computer Science Institute, Berkeley. This project encompasses the largest multilingual repository of both figurative language (and thought) and ontologically organized frames. Building on the considerable advancement in computational linguistic approaches to metaphor detection in large and diverse corpora over recent years, MetaNet has emerged as a powerful tool that makes metaphor identification in naturally-occurring texts possible across several languages and several target domains. There are two core components of the system: a hierarchically-organized conceptual metaphor repository, and an automated metaphor identification system that crawls texts in order to identify linguistic metaphors matching the contents of the repository. The authors detail some of the main features of MetaNet's automated component that set it apart from other metaphor identification techniques. These include a method of mapping metaphors to grammatical constructions, a hierarchical conceptual metaphor network reliant on the cascading inheritance from primary metaphors to specific metaphors, and semantic frame networks that create a link with lexical items in multiple languages. MetaNet has been implemented primarily as a method for identifying linguistic metaphors about issues of critical societal concern, such as poverty, cancer, and the gun debate. Although the

system was originally developed primarily to examine metaphors within political and economic domains, the general ontology allows new frames and metaphors to be incorporated, sometimes with very little added labor. This contribution provides a case study of MetaNet's capabilities in the detection of taxation metaphors in four languages – English, Spanish, Farsi, and Russian. The case studies show how grammatical structure, frames, metaphoric mappings, and metonymic structures are intertwined in a complex system of inheritance cascades, and how important it is to be aware of this complexity: grammar can be both metaphoric and metonymic in meaning, metonymic mappings may be needed to interpret metaphors, and metaphors are mappings specifically between frame structures. Altough it is maybe counterintuitive, taking all this into consideration and locating a given metaphor in its native cascade structure makes the analysis of a given metaphor actually simpler, and it is easier to understand the relationships between subcases as shared inheritance.

The second chapter, by **Antonio Barcelona**, is a contribution to both theory and method in metonymy research. He describes the Córdoba Metonymy Database that is being developed under his leadership at the University of Córdoba. The Córdoba Metonymy Database has been implemented in order to provide a tool to systematically investigate the functioning of conceptual metonymy across a wide variety of authentic discourse samples in English and Spanish. It includes eleven fields. In this chapter, the author first describes the database entry model, devoted to the hierarchy including the metonymy under analysis. The top ("generic") level of that hierarchy is the tripartite typology WHOLE FOR PART, PART FOR WHOLE, and PART FOR PART, which has been challenged by some metonymy researchers. Therefore, the author examines their theoretical arguments against that typology and concludes that they are insufficient to rule it out. Then he presents and illustrates the criteria followed in the compilation of the database to decide which generic type corresponds to a given metonymy. The conclusions reflect on the potential usefulness of investigating metonymy hierarchies and collecting them in a database, as well as on some of the problems involved. The criteria to categorize a metonymy at the generic level of the corresponding metonymy hierarchy is both theoretical and practical in that it proved useful to guide practical decisions on the generic type instantiated by each metonymy, and, at the same time, they constitute a theoretical proposal to defend the adequacy of the traditional tripartite generic typology.

Linguistic metaphors are most naturally viewed as the output of a language generation process, and as the input to a language understanding process. **Tony Veale**, however, shows in Chapter 3 that it is just as meaningful to view the conceptual metaphors that underpin these linguistic forms as an input to the generation process and an output of the understanding process. As he puts it, a large

repository of existing linguistic metaphors, such as a text corpus or a database of Web n-grams, can thus be viewed as an implicit source of the knowledge an agent needs to generate and understand novel or unseen linguistic metaphors. If one uses Web data as a knowledge resource for metaphor, it also makes sense to think of the algorithms and tools for manipulating this knowledge as Web services that can be called upon to generate and understand linguistic metaphors on demand. This chapter argues that potential metaphors in Web n-grams can be used as a resource for understanding and generating novel deliberate metaphors. It also describes a Web service Metaphor Magnet that provides this functionality on demand, allowing third-party applications to exhibit a measure of their own figurative creativity. Though Steen's (2011, 2015) view on the cognitive reality and practical utility of deliberate metaphors has been challenged (e.g., Gibbs, 2015), Veale shows how this distinction has significant computational value. Veale argues that what makes an n-gram a potential metaphor is the ability of an agent, either cognitive or artificial, to interpret it as a deliberate metaphor. This chapter describes metaphor repositories of the "new age" – those created by machines without further human intervention. Resources created by T. Veale will be of great interest to metaphor scholars because they represent the perfect place to find many fantastic metaphors.

Marianna Bolognesi, **Benjamin Timmermans**, and **Lora Aroyo** describe and analyze in Chapter 4 a recent digital resource that relates to, and enriches, the visual metaphors that are included in the VisMet corpus 1.0 (described and analyzed in Bolognesi, van den Heerik, & van den Berg, 2018). The repository hereby presented and analyzed is an original dataset of crowdsourced tags, that is, keywords that describe the visual metaphors to which a large number of participants (online workers, non-experts on metaphors) were exposed, for different amounts of seconds. The collection was implemented using the online platform CrowdFlower (now called Figure Eight), under the assumption that this method, which is based on the commonly defined *social tagging* phenomenon, can inform the researchers about some of the cognitive operations that viewers undergo when they are exposed to metaphorical images and are asked to annotate them. The authors report on their analysis of the collected tags, as well as on the results of a content analysis performed on the data, to manually classify the type of semantic information encoded in the user-generated tags. The authors show that, overall, viewers tend to produce tags that denote concrete, depicted entities. They also show that, the longer the viewers are exposed to the metaphorical images, the more contextual information they tend to provide in relation to the images. Finally, they show that words denoting abstract concepts, which by definition cannot be physically depicted, but must be inferred on the basis of visual (concrete) clues, tend to appear only when viewers are exposed to the metaphors for longer durations (15s

and 20s, as opposed to 1s and 5s). The results support the need to integrate experts' analyses of figurative expressions with crowdsourcing approaches that tap into the viewers' minds and can inform the experts about the type of salient information that attracts the viewers' attention when they are exposed to visual metaphors. The chapter also shows that some of the findings can be related to recently proposed frameworks of visual metaphor processing and analysis, and that some of the cognitive operations suggested in the literature about visual metaphor comprehension indeed emerge in the keywords produced by lay online workers who are exposed to these highly-structured figurative expressions.

Kristina Despot, **Mirjana Tonković**, **Mario Essert**, **Mario Brdar**, **Benedikt Perak**, **Ana Ostroški Anić**, **Bruno Nahod**, and **Ivan Pandžić** describe the theoretical background, methodology, tasks, results, and challenges of the MetaNet.HR (Croatian Metaphor Repository) project, in Chapter 5. The project follows the methodology of MetaNet: A Multilingual Metaphor Repository project (UC Berkeley and International Computer Science Institute; see Sweetser, David, & Stickles, this volume; Dodge, Hong, & Stickles, 2015). It combines a theory-driven introspective top-down approach that analyzes the system of conceptual metaphors in the Croatian language with a bottom-up corpus-based approach that analyzes how metaphors are used in language corpora. The project involves linguistic, computational, and psychological tasks. It includes theoretical research on conceptual metaphor, metonymy, semantic frames, image schemas, and cognitive primitives in the Croatian language, and the results of this research are presented in a database. The Neural Theory of Language and Thought and the Neural Theory of Metaphor (Feldman, 2006; Lakoff, 2008) serve as the theoretical background for the linguistic analysis of conceptual metaphors. Computational linguistic tasks involve research on metaphor in natural language processing and artificial intelligence work, involving the development of tools for semi-automatic metaphor detection and the semi-automatic extraction of linguistic metaphors. Psychological experiments are performed to further explain the nature of the links between concept meaning and perception as manifested through primary metaphors. The main result of the project is a figurative language database – MetaNet.HR (http://ihjj.hr/metafore/). This database lists hierarchically organized conceptual metaphors and metonymies decomposed into source-target relations among cognitive primitives, image schemas, and semantic frames, which are further decomposed into semantic roles. The database includes annotated metaphor examples and links to experiments, if applicable. This chapter explicitly relates to the main focus of this volume by describing the methods used to build one of the largest existing figurative language (and thought) repositories – MetaNet.HR, as well as the risks and challenges involved in particular stages of the project, from very general challenges such as building an appropriate

ontology of concepts to very specific challenges such as adapting the MIPVU method to the Croatian language.

2.2 Reflecting on the risks and challenges involved in building and using repositories of figurative language

Chapter 6 provides a thought-provoking contribution by **Zoltan Kövecses, Laura Ambrus, Dániel Hegedűs, Ren Imai**, and **Anna Sobczak.** Here the authors attempt to resolve a conflict between "corpus-based" (i.e., quantitative, based on real-world texts) and "intuitive" (i.e., qualitative, based on experts' intuitions) methods in metaphor research. In the past 15–20 years, there has been an increasing tendency to study metaphors as they can be found in real data (large corpora, specific discourses, conversations, etc.). What became known as the "corpus-linguistic method" of metaphor study distinguishes itself from a prior way of studying metaphor that is often labeled "intuitive," "subjective," and "eclectic." In this paper, the authors propose an updated version of the "intuitive" method, termed the "lexical approach," which is rooted in the analysis of lexical items based on dictionary searches. This method, for example, led to the implementation of the MIP procedure for metaphor identification, which today remains the only reliable (and manual) procedure to identify metaphors in linguistic texts. The authors compare the lexical approach with the corpus-based approach in some detail, making use of the concept of *surprise* (see Kövecses, 2015) for demonstrative purposes. While proponents of the corpus-based approach claim that the corpus-based approach is superior to the lexical approach, the authors show that, at least on the evidence of studying *surprise*, both approaches have their strengths and weaknesses. The lexical approach's strengths include: finding metaphorical expressions that do not contain an explicit target term; dealing with synonyms of target terms as potential metaphors for that target; and discovering schematic conceptual models associated with emotion concepts. The corpus-linguistic approach used in the paper worked better at finding the entire range of metaphorical expressions (both conventionalized and non-conventionalized) for surprise; at dealing with both types and tokens; and at offering frequency data and showing how frequency and conventionalization are related to each other. The paper therefore argues that, in certain domains, both methods must be employed for the best results. This chapter, written from a strong methodological perspective, argues for the need to converge the two methods in metaphor research, based on the argument that metaphors found in large databases of language use, as well as metaphors identified by metaphor experts through the lexical approach, can inform and advance metaphor theory by integrating and complementing each other.

Klaus-Uwe Panther and **Linda L. Thornburg** take a pragmatic perspective on figurative language and figurative reasoning by focusing on metonymic inferences,

in Chapter 7. In their rigorous cognitive linguistic analysis, they illustrate a specific category of speech act found in natural language: hedged performatives. Performative utterances are speech acts in which the speaker explicitly refers to the illocutionary act he or she is performing, and in doing so actually does perform it (e.g., "I name this ship the Queen Elizabeth," if uttered under the appropriate circumstances and felicity conditions, constitutes an act of naming a ship). Hedged performatives, in particular, display the performative verb "hedged" by e.g. modal, attitudinal, emotive words or expressions, and even by grammatical mood (see, e.g., Fraser, 1975; Panther, 2015, 2016). What is puzzling about hedged performatives is that, in some cases, the illocutionary meaning denoted by the performative verb is not affected by the hedge, whereas in other cases, hedging results in the cancellation of the illocutionary meaning conveyed by the performative verb. The authors show that performatives hedged by modals and propositional attitude expressions are linked to their target sense via metonymy, whereas performatives with emotive hedges entail their target sense. The findings reported in this chapter support the relevance of an approach to utterance meaning that distinguishes between coding and inferencing, where the first is an operation that machines can easily do (and possibly), while the latter is an operation that humans do more or less effortlessly, but for machines it is a great and unsolved challenge. In fact, the authors show that part of the overall meaning of these specific speech acts *is not* coded, and therefore *not compositionally computable*. Instead, it is accessible through metonymic inference: a cognitive operation that humans can perform automatically, but machines still cannot.

Simon Devylder, in Chapter 8, proposes to define the PART–WHOLE schema at a fine level of granularity, and to precisely determine its embodied origin by taking stock of the influential cognitive linguistic literature on the subject, confronting definitions and arguments to semantic tests in French and English, and connecting it with crucial anatomical data (de Vignemont et al., 2009) to show precisely how and where the mereological schema actually is in the flesh. Bringing together intuition-based methods with psycholinguistic perspectives to define this pervasive pattern of our conceptual system allows us to account for its complex architecture. Mereology – the study of parts, wholes, and their relation – is central to the 1,365 papers and monographs devoted to metonymy listed by Barcelona and Ibáñez (2015), in the sense that "part–whole contiguity is at the core of [metonymy]" (Peirsman & Geeraerts, 2006, p. 269). Building repositories of figurative expressions in general, such as the MetaNet project (Sweetser, David, & Stickles, this volume), MetaNet.HR – The Croatian Metaphor Repository (Despot et al., this volume), and repositories of metonymies in particular, such as the Córdoba Metonymy Database (Barcelona, this volume), thus call for a precise definition of the PART–WHOLE schema. In this chapter, readers interested in the analysis of figurative language in general, and in metonymy in

particular, will find a number of necessary clarifications on the PART–WHOLE relation that they will be able to use for their own semantic and grammatical analyses of such expressions. This qualitative contribution to the study of figurative meaning is a necessary step towards further quantitative research on metonymy because the proposed fine-grained definition of the PART–WHOLE schema, for instance, enables the design of a fine-grained coding scheme that could be quite useful in building repositories of the many figurative expressions built upon part–whole relations. There are different kinds of parts, different kinds of wholes, and many different kinds of part–whole relations, thus building repositories that include part–whole metonymies must be able to account for these diverse patterns of conceptual thought. More generally, this chapter makes a fine addition to this cognitive linguistic volume, as it not only looks back on the foundation of the discipline in supporting the embodied situatedness of language, but also allows a look forward to exciting present and future prospects of cognitive linguistics, such as the building of repositories of figurative language.

Finally, **Mario Brdar, Rita Brdar-Szabó** and **Benedikt Perak** discuss the role that metaphor repositories play in cross-linguistic studies of conceptual metaphors in Chapter 9, and argue for the construction of an ontologically-based metaphor repository as a pre-requisite for any sensible, holistic comparison of the way that conceptual metaphors are used in various languages. As a means of comparing metaphors (and metonymies) cross-linguistically, such a repository would provide the necessary systematicity by expressing various networks of hierarchical relations that conceptual metaphors consist of – ontological domains, types of linguistic constructions that activate metaphoric mappings, their relationship to other metaphors, cross-linguistic lexical equivalences, cultural and structural constraints, and their counterpart functions in other languages. The structure of this kind of a repository represents the methodological backbone for these comparisons in that it provides the most basic ontological *tertium comparationis*, as is shown in two case studies. The first is a study of two types of "time" metaphors. Focusing on Croatian and Hungarian, the authors show that the moving ego subtype is apparently rarely available, unlike the moving time subtype. This contrasts with English, where both are productive. The second case study is on conceptual metaphors used in medical discourse, specifically in organ transplantation. On the basis of the observations in these two case studies, the authors formulate some expectations from such a repository and present the architecture of the Ontological Model of Concepts and Construction (OMLCC), developed within the MetaNet.HR project described in Despot et al. (this volume). Rather than just schematically linking metaphoric domains, the OMLCC seeks to capture the ontological and conceptual organization in 16 emergent layers as the embodied human knowledge about the entities, properties, and their relations in the world, and to

(super)impose a referential lexical and constructional layer of language-specific knowledge upon it, thus formalizing the definition of the metaphor as a conceptual process involving the violation of the ontological congruency between concepts activated by the linguistic construction that triggers the emergent enrichment of the construed concept.

3. Summary

Method-wise, we hope that this volume shows how corpus-based, corpus-driven, experimental, and classic top-down approaches should be integrated with one another, and how the combination of them allows analysts to overcome the problems and weaknesses derived from using just one method. The volume addresses several other questions, which are often passionately raised within the discipline cognitive linguistics. We hereby summarize the main oppositions that emerged during the original symposium from which this book evolved.

Manual or automated methods? The contributions to this volume highlight challenges related to both manual methods as well as semi-automated and fully automated methods for metaphor analysis and generation. Because both types of approaches have strengths and weaknesses, their combinations have been used and will continue to be used both for linguistic and NLP purposes. The two types inform and integrate one another: on one hand, manually constructed repositories can be carefully controlled, each entry can be discussed by experts, errors can be corrected, and the reliability of the annotations can be tested. On the other hand, semi-automated and fully automated approaches to the construction of metaphor repositories are still in their pioneering stages but show the ability to scale up the size of these repositories with limited effort and cost.

Experts or crowd? Top-down or bottom-up? The contributions to this volume show strengths and weaknesses related to both the data that can be provided by experts and the data that can be provided by laymen in producing and using figurative expressions and in processing them. We believe that both perspectives are crucial for the investigation of how metaphors and metonymies work and for the creation of comprehensive repositories that can be used for multiple purposes. The experts vs. crowd dichotomy is related to the top-down vs. bottom-up approach to the study of figurative language: while the top-down approach is usually intended to be led by experts and based upon examples derived from intuitions and then checked in corpora (the so-called *lexical approach*, Kövecses et al., this volume), the bottom-up approach is driven by the identification and analysis of recurring patterns of metaphorical constructions in language use generated by non-experts.

Language or Thought? The contributions to this volume address the methods, risks, and challenges related to the construction of repositories of figurative expressions in various languages (and images) and of figurative structures in thought. While corpora of natural languages and of images can serve as a basis for the construction of repositories of figurative expressions, for the construction of figurative structures in thought, the resources are still scarce. From the present volume emerges the need to build a custom-made ontology that would represent both vertical and linear relations between the various existing levels and cognitive structures highlighted in the literature, including frames, image schemas, and cognitive primitives, and that can serve as a basis for the construction of a repository of figurative structures in thought. One of the greatest challenges involved in the construction of knowledge-based ontologies that can serve as a basis for the automatic identification and analysis of figurative thought lies in cross-linguistic and cross-cultural variation. In other words, while corpora of languages are clearly different from one another, because they collect linguistic expressions in various languages, a great challenge is to determine to what extent ontologies vary, and to what extent, instead, they contain the same conceptual structures, which can be explained by the fact that cognition is embodied, and, by the fact that we, as humans, share similar "hardware".

The common goal of all the endeavors described in this volume is the creation of a truly multilingual figurative thought and language repository, which would enable detailed cross-linguistic analysis including the detection of intercultural and inter-linguistic variations. Besides academic and educational applications, such a resource could help to achieve the visionary goal of constructing intelligent machines that are capable of understanding and producing figurative language and translating figurative expressions from one language to another. Moreover, as this volume clearly shows – computers are becoming capable of creative thinking, which then gives rise to computational cognitive, social, linguistic, and artistic creativity. We should not ignore these findings but rather help improve them, so that we can better understand the human mind and learn how and why it gives rise to such a magnificent phenomenon as creativity is.

References

Ahrens, K., Chung, S. F., & Huang, C. (2003). Conceptual metaphors: Ontology-based representation and corpora driven mapping principles. In *Proceedings of the ACL 2003 workshop on lexicon and figurative language* (Volume 14, pp. 35–41). Association for Computational Linguistics. https://doi.org/10.3115/1118975.1118980

Barcelona, A., & Ruiz de Mendoza Ibáñez, F. J. (2015). *Bibliography of metaphor and metonymy*. Amsterdam: John Benjamins Publishing Company.

Barnden, J. A. (1997). Consciousness and common-sense metaphors of mind. In S. O'Nuallain, P. McKevitt, & E. Mac Aogain (Eds.), *Two sciences of mind: Readings in cognitive science and consciousness* (pp. 311–340). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/aicr.9.20bar

Bogdanova, D. (2010). A framework for figurative language detection based on sense differentiation. In *Proceedings of the ACL 2010 student research workshop* (pp. 67–72). Association for Computational Linguistics.

Bolognesi, M., van den Heerik, R., van den Berg, E. (2018). VisMet: A corpus of visual metaphors. In G. J. Steen (Ed.), *Visual metaphor: Structure and process*. Amsterdam: John Benjamins Publishing Company.

Boroditsky, L. (2000). Metaphoric structuring: Understanding time through spatial metaphors. *Cognition*, 75(1), 1–28. https://doi.org/10.1016/S0010-0277(99)00073-6

Bowdle, B. F., & Gentner, D. (2005). The Career of Metaphor. *Psychological Review*, 112(1), 193–216. https://doi.org/10.1037/0033-295X.112.1.193

Cameron, L., Maslen, R., Todd, Z., Maule, J., Stratton, P., & Stanley, N. (2009) The discourse dynamics approach to metaphor and metaphor-led discourse analysis. *Metaphor and Symbol*, 24(2), 63–89. https://doi.org/10.1080/10926480902830821

Cardillo, E. R., Schmidt, G. L., Kranjec, A., & Chatterjee, A. (2010). Stimulus design is an obstacle course: 560 matched literal and metaphorical sentences for testing neural hypotheses about metaphor. *Behavior Research Methods*, 42(3), 651–664. https://doi.org/10.3758/BRM.42.3.651

Casasanto, D., & Boroditsky, L. (2008). Time in the mind: Using space to think about time. *Cognition*, 106, 579–593. https://doi.org/10.1016/j.cognition.2007.03.004

Dancygier, B., & Sweetser, E. (2014). *Cambridge textbooks in linguistics. Figurative language*. New York: Cambridge University Press.

David, O., Lakoff, G., & Stickles, E. (2016). Cascades in metaphor and grammar. A case study of metaphors in the gun debate. *Constructions and Frames*, 8(2), 214–255. https://doi.org/10.1075/cf.8.2.04dav

de Vignemont, F., Majid, A., Jola, C., & Haggard, P. (2009). Segmenting the body into parts: evidence from biases in tactile perception. *The Quarterly Journal of Experimental Psychology*, 62(3), 500–512. https://doi.org/10.1080/17470210802000802

Dodge, E. K., Hong, J., & Stickles, E. (2015). MetaNet: Deep semantic automatic metaphor analysis. In E. Shutova, B. B. Klebanov, & P. Lichtenstein (Eds.), *Proceedings of the 3rd Workshop on metaphor in NLP* (pp. 40–49). NAACL HLT. https://doi.org/10.3115/v1/W15-1405

Eilts, C., & Lönneker, B. (2002). The Hamburg Metaphor Database. *Metaphorik.de*, 03(2002), 100–110.

Fass, D. (1991). Met*: A method for discriminating metonymy and metaphor by computer. *Computational Linguistics*, 17(1), 49–90.

Feldman, J. (2006). *From molecule to metaphor. A neural theory of language*. MIT Press, A Bradford Book. https://doi.org/10.7551/mitpress/3135.001.0001

Fraser, B. (1975). Hedged performatives. In P. Cole, & J. Morgan (Eds.), *Speech acts* [Syntax and Semantics 3] (pp. 44–68). New York: Academic Press.

Gibbs, R. W., Jr. (1984). *The poetics of mind*. New York: Cambridge University Press.

Gibbs, R. W., Jr. (2006). *Embodiment in cognitive science*. New York: Cambridge University Press.

Gibbs, R. W., Jr. (2015). Does deliberate metaphor theory have a future? *Journal of Pragmatics*, 90(December 2015), 73–76. https://doi.org/10.1016/j.pragma.2015.03.016

Gries, S. T. (2014). Corpus and quantitative methods. In J. Taylor, & J. Littlemore (Eds.), *The Bloomsbury companion to cognitive linguistics* (pp. 279–300). London: Bloomsbury.

Harmon-Jones, E., Gable, P. A., & Price, T. F. (2011). Leaning embodies desire: Evidence that leaning forward increases relative left frontal cortical activation to appetitive stimuli. *Biological Psychology*, 87(31), 1–313. https://doi.org/10.1016/j.biopsycho.2011.03.009

Jostmann, N. B., Lakens, D., Schubert, T. W. (2009). Weight as an embodiment of importance. *Psychological Science*, 1(September), 1169–1174. https://doi.org/10.1111/j.1467-9280.2009.02426.x

Kövecses, Z. (2015). Surprise as a conceptual category. *Review of Cognitive Linguistics*, 13(2), 270–290. https://doi.org/10.1075/rcl.13.2.01kov

Krennmayr, T., & Steen, G. J. (2017). VU Amsterdam Metaphor Corpus. In N. Ide, & J. Pustejovsky (Eds.), *Handbook of linguistic annotation*. Dordrecht: Springer. https://doi.org/10.1007/978-94-024-0881-2_39

Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought*. New York: Cambridge University Press. https://doi.org/10.1017/CBO9781139173865.013

Lakoff, G. (2008). The neural theory of metaphor. In R. W. Gibbs, Jr. (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 17–38). [Online]. Cambridge Handbooks in Psychology. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511816802.003

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: The University of Chicago Press. [Updated version, 2002]

Lakoff, G., Espenson, J., & Schwartz, A. (1991). *Master metaphor list, second draft copy*. Berkeley, CA: Cognitive Linguistics Group, University of California.

Li, L., & Sporleder, C. (2010). Using gaussian mixture models to detect figurative language in context. In *Human language technologies. The 2010 annual conference of the North American chapter of the Association for Computational Linguistics* (pp. 297–300). Association for Computational Linguistics.

Mason, Z. J. (2004). CorMet: A computational, corpus based conventional metaphor extraction system. *Computational Linguistics*, 30(1), 23–44. https://doi.org/10.1162/089120104773633376

Matlock, T. (2004). Fictive motion as cognitive simulation. *Memory & Cognition*, 32, 1389–1400. https://doi.org/10.3758/BF03206329

McGlone, M. S. (1996). Conceptual metaphors and figurative language interpretation: Food for thought? *Journal of Memory and Language*, 35, 544–565. https://doi.org/10.1006/jmla.1996.0029

Panther, K.-U. (2015). Metonymic relationships among actuality, modality, evaluation, and emotion. In J. Daems, E. Zenner, K. Heylen, D. Speelman, & H. Cuyckens (Eds.), *Change of paradigms – new paradoxes: Recontextualizing language and linguistics* (pp. 129–146). Berlin: Mouton de Gruyter.

Panther, K.-U. (2016). How to encode and infer linguistic actions. *Chinese Semiotic Studies*, 12(2), 177–214. https://doi.org/10.1515/css-2016-0018

Panther, K.-U., & Thornburg, L. (2017). Metaphor and metonymy in language and thought: A cognitive linguistic approach. *Synthesis Philosophica*, 64, 271–294. https://doi.org/10.21464/sp32202

Pasanek, B. (2015). *Metaphors of mind: An eighteenth-century dictionary*. Johns Hopkins University Press.

Peirsman, Y., & Geeraerts, D. (2006). Metonymy as a prototypical category. *Cognitive Linguistics*, 17(3), 269–316. https://doi.org/10.1515/COG.2006.007

Peters, W., & Wilks, Y. (2003). Data-driven detection of figurative language use in electronic language resources. *Metaphor and Symbol*, 18(3), 161–173. https://doi.org/10.1207/S15327868MS1803_03

Pragglejaz Group. (2007). MIP: A method for identifying metaphorically used words in discourse. *Metaphor and Symbol* 22(1), 1–39. https://doi.org/10.1080/10926480709336752

Shutova, E. (2010). Models of metaphor in NLP. In *Proceedings of the 48th annual meeting of the Association for Computational Linguistics* (pp. 688–697). Association for Computational Linguistics.

Shutova, E. (2011). Computational approaches to figurative language. Ph.D. thesis, University of Cambridge

Steen, G. J. (2011). The contemporary theory of metaphor – now new and improved! *Review of Cognitive Linguistics*, 9, 26–64. https://doi.org/10.1075/rcl.9.1.03ste

Steen, G. J. (2015). Developing, testing and interpreting deliberate metaphor theory. *Journal of Pragmatics*, 90(December 2015), 67–72. https://doi.org/10.1016/j.pragma.2015.03.013

Steen, G. J., Dorst, A. G., Herrmann, J. B., Kaal, A., Krennmayr, T., & Pasma, T. (2010). *A method for linguistic metaphor identification: From MIP to MIPVU*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/celcr.14

Veale, T., Shutova, E., & Beigman Klebanov, B. (2016). *Metaphor: A computational perspective*. Morgan Claypool, Synthesis Lectures on Human Language Technologies. https://doi.org/10.2200/S00694ED1V01Y201601HLT031

de Vignemont, F. (2011). Embodiment, ownership and disownership. *Consciousness and Cognition*, 20(1), 82–93. https://doi.org/10.1016/j.concog.2010.09.004

Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science*, 322, 606–607. https://doi.org/10.1126/science.1162548

Wolff, P., & Gentner, D. (2000). Evidence for role-neutral initial processing of metaphors. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 26, 529–541. https://doi.org/10.1037/0278-7393.26.2.529

Zhong, C. B., & Leonardelli, G. J. (2008). Cold and lonely: Does social exclusion feel literally cold? *Psychological Science*, 19, 838–842. https://doi.org/10.1111/j.1467-9280.2008.02165.x

PART I

New methods and digital resources for mining metaphor and metonymy in thought, language, and images

CHAPTER 1

MetaNet

Automated metaphor identification across languages and domains

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We showcase some of the defining characteristics of the architecture of the MetaNet Automated Metaphor Identification System that make it stand out relative to other metaphor database and computational metaphor identification endeavors. The discussion focuses on the central role played by grammatical constructions in automatically discovering metaphoric language in large corpora, providing examples across the four languages studied – English, Spanish, Farsi, and Russian. Among the many target domains studied, we provide examples from Taxation (e.g., *taxes weigh me down*, TAXATION IS A BURDEN). Although the system was originally developed primarily to examine metaphors within political and economic domains, the general ontology allows new frames and metaphors to be incorporated, sometimes with very little added labor.

Keywords: MetaNet, computational linguistics, automated metaphor identification, cross-linguistic metaphor research, semantic frames, grammatical constructions, primary metaphors

1. Introduction

Big-data analysis of natural language corpora is growing fast – in the academic world, in industry, and in government. Because the use of the conceptual metaphor system, including semantic frames and embodied cognitive primitives (image schemas, e.g., Dodge & Lakoff, 2005), is so extensive and deep in human reasoning, serious linguistic research is necessary on how these conceptual structures play out in naturally-occurring language. It is necessary not the least because of the world-wide investment in big-data analysis of linguistic material, and the serious uses being made of such analyses in public policy decisions, business

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practices, and many academic fields. We know, for instance, that metaphor plays a big role in political decision-making (Charteris-Black, 2004; Lakoff, 1995; Lakoff & Johnson, 1980; Thibodeau & Boroditsky, 2011), and therefore an understanding of how metaphor plays out in current political discourse would prove useful. These texts are being produced faster than metaphor analysts can analyze them, so computational metaphor identification is one way to increase linguists' productivity.

Indeed, the need for computational models of figurative language in large texts is so deeply felt, that the Intelligence Advanced Research Projects Activity (IARPA) decided to invest resources in expanding the U.S. intelligence community's ability to decipher metaphor in public discourse.[1] Towards that end, the metaphor database and automated metaphor identification system MetaNet was established in 2011 with the help of funding from IARPA. The project was hosted at the International Computer Science Institute in Berkeley, California, and shared a space with FrameNet (Ruppenhofer et al., 2016), its counterpart and predecessor in the domain of cognitive linguistic implementation and computation (a relationship reflected in MetaNet's name).

MetaNet was one of several similarly-funded projects falling under the umbrella of the same IARPA program. Others include those reported in Levin et al. (2014), Shaikh et al. (2015), Gordon et al. (2015), and Mohler, Tomlinson and Rink (2015). These projects shared several features and goals in common: to create a cross-linguistic metaphor resource (specifically for English, Mexican Spanish, Iranian Farsi and Russian), and to apply the developed technologies to the study of specific social issues. The details of the metaphor formalization, computation, and automation systems developed differed, but shared insights emerged.

Over the course of several years, MetaNet's task was to construct an automated method for uncovering and analyzing metaphor patterns in public discussions on issues of social and political concern such as democracy, governance, corruption, taxation, cancer, the gun debate, and poverty. As such, MetaNet is not only a theoretical exercise in metaphor computation but has the specific goal of reaching a better understanding of social issues as discussed by regular citizens, journalists, and politicians. By being built in order to understand a particular set of target domains (i.e., specific societal problems) and being designed as a tool

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that has utility for metaphor analysts in particular, MetaNet is different from existing projects in computational linguistics, whose goal is rather to create robust, domain-non-specific NLP tools (among many others, Mason (2004), Gedigian et al. (2006), Shutova, Teufel and Korhonen, (2012)).[2]

MetaNet is founded on the principle that automated metaphor identification cannot be achieved without a core conceptual network consisting of relations existing across the mental lexicon, frame networks, and metaphor mappings across frames. For this reason, MetaNet can be thought of less so as an automated metaphor detection system, and more so as a computationally enhanced analogue to human metaphor analysts, producing empirical yields greater than any group of analysts can realistically achieve. Each individual object and relation among objects is defined by a human analyst, working in conjunction with other analysts and basing their decisions on the state of the art to date. This knowledge base is stored in a *metaphor and frame repository*, a large networked lattice of semantic entities (metaphors, frames, and lexical items) and their relationships to each other (Stickles et al., 2016). The automated metaphor identification system then deploys the contents of the repository over corpus texts, and the results are used by analysts to refine the system such that it can cast larger and larger nets in subsequent iterations,[3] detecting a broader variety of metaphors across more domains.

At its core, the project is grounded in the basic tenets of Conceptual Metaphor Theory (CMT), as put forth originally in Lakoff and Johnson (1980), Lakoff (1987) and Lakoff and Johnson (1999), but also incorporating subsequent landmark developments in the understanding of the deep roots of metaphor in embodied cognition (Grady, 1997; Gibbs, 2005; Lakoff, 2012). The assumption is, if we are able to devise a tool that can crawl large texts for common metaphors, such as POVERTY IS A DISEASE (*plagued by poverty*), CANCER IS WAR (*her battle with cancer*), and DEMOCRACY IS A BUILDING (*the pillars of democracy*), we can gain deeper

2. See Dodge, Hong, and Stickles (2015), David (2017), and David and Matlock (forthcoming) for an in-depth comparison of how MetaNet differs from statistical and seed-based approaches to metaphor in NLP.

3. Early iterations of the MetaNet repository comprised metaphors and frames drawn from extant sources in the literature, such as Lakoff and Johnson (1980) and FrameNet (Ruppenhofer et al., 2016). Additional data was collected from corpora as analysts focused on discovering metaphors for specific domains of interest, such as Poverty. As the repository's coverage expands, it enables detection of novel metaphors via the network of high-level metaphors (see Section 4 for details). For further explanation of how the MetaNet repository is implemented and can be used for metaphor detection, see Dodge (2016) and Stickles, Dodge, David, and Hong (2016).

insights into the conceptual systems and worldviews of the writers and communities producing these texts.

The architecture of MetaNet's full computational specifications is detailed in existing publications. For further details on the applications of the system towards an understanding of the polarized gun debate in American political discourse, see David, Lakoff, and Stickles (2016). Dodge (2016) and Dodge, Hong, and Stickles (2015) give an overview of the system overall, with specific applications to the domain of poverty in English news texts. For an in-depth overview of the computational mechanism, as well as how metaphoricity is determined and measured, see Hong (2016). Stickles et al. (2016) provides a summary of the metaphor-to-metaphor and other crucial relations which define the networking of the metaphor repository and formalize metaphor theory. Finally, David (2017) offers a short, non-specialist summary, with examples from the target domain of democracy. (Due to the complexities of the computational architecture, we are not able to cover them here, so we highly encourage readers to refer to the above works for questions about methodology).

The purpose of the current work is to showcase some of the defining characteristics of MetaNet's architecture that make it stand out relative to other metaphor database and automated metaphor identification endeavors. This includes the built-in symbiosis between metaphors and grammatical constructions, and metaphor cascades (inheritance structures) (David, Lakoff, & Stickles, 2016). Here, we also provide examples from the multi-lingual results across the four languages studied – English, Spanish, Farsi, and Russian, with a focus on the target domain of Taxation. Taxation is a domain that receives much attention in the news across all four languages and is a topic that generates both positive and negative evaluations. Sometimes politicians and policy makers construe tax increases as positive for the economy, but more frequently politicians and citizens feel taxation is burdensome, unnecessary, or detrimental to personal economic prosperity. Given these inconsistencies of affect,[4] it is interesting to explore some of the metaphors employed in its description.

2. Frames, mappings and grammatical constructions

One of the greatest developments in lexical and cognitive semantics is the theoretical and lexicographic theory of frame semantics (Fillmore 1976, 1982 and later). In frame semantics, the meanings of words are determined relative to broader

4. Unlike poverty, which is usually seen as wholly negative.

conceptual frames, either by evoking the frame or profiling some role of the frame (the participant in the scenario depicted by the frame). Frames are complex conceptual bundles that include both semantic and encyclopedic representations (e.g., the Restaurant frame contains information about the types of participants, events, and interactions that occur in a restaurant scenario; words such as *menu, waiter*, and *chef* only have meaning against the backdrop of the Restaurant frame). This principle of word meaning was subsequently implemented in a semantic role labeling system called FrameNet (Baker, Fillmore, & Cronin, 2003; Fillmore & Atkins, 1992; Fillmore, Wooters, & Baker, 2001; Ruppenhofer et al., 2016). MetaNet is largely inspired by FrameNet but extends the lexicon-semantic frame connection to also include the frame-to-frame and metaphor-to-metaphor mappings inherent in metaphoric meaning. Like FrameNet, MetaNet also begins with the semantic frame as the central, coherent semantic entity from which lexical items receive their meaning. Words do not possess a metaphoric meaning potential in and of themselves; rather, words are said to 'evoke' a frame, which in turn triggers a metaphor by virtue of the source-domain or target-domain status of the frame relative to the metaphor (Stickles, David, & Sweetser, 2016; Stickles & Dodge, forthcoming).

As an example, the automated metaphor detection system found many results for the metaphor TAXATION IS A BURDEN in both English and Spanish corpora.[5] Figure 1 illustrates the relationship between the phrases that were detected and deemed to be metaphoric across large corpora, and the frames – Taxation and Burden – linked respectively as the target and source frames of the metaphor. (The crucial role of grammatical constructions in this process will be fully explained in Section 3 below).

5. For Spanish we used the Spanish Gigaword Corpus (Mendonça et al., 2011), consisting of newswire data scraped from 1994 to 2010 (~4 billion tokens).

For English we used both the English Gigaword corpus containing newswire data (Parker et al., 2011, ~4 billion tokens), and the British National Corpus (100 million tokens, http://www.natcorp.ox.ac.uk/).

The Russian data is extracted from the 2-billion token Ru-Wac corpus (Sharoff, 2006) consisting of web-scraped Russian text.

Two Iranian Farsi corpora are used. One is the Bijankhan corpus (Bijankhan, 2004), the largest corpus for Farsi available, and consisting of news and other common texts (2.6 million tokens). The second is the Hamshahri corpus (AleAhmad et al., 2009), consisting of a scraping of the Hamshahari newspaper (version 2, http://dbrg.ut.ac.ir/Hamshahri/index.html), with around 63 million words (Darrudi, Hejazi, & Oroumchian, 2004).

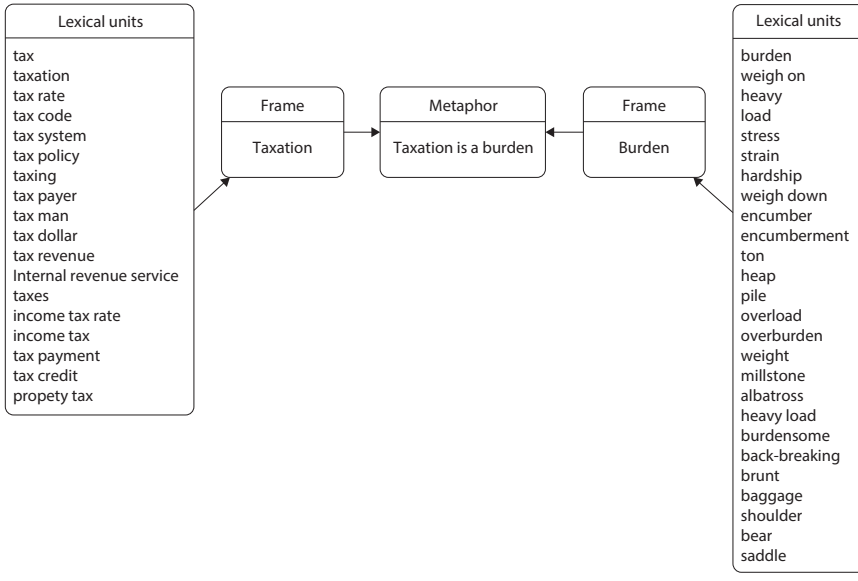

Figure 1. TAXATION IS A BURDEN with source and target domain frames and evoking lexical units in English

Focusing on English and Spanish results, Table 1 summarizes the results for Burden (Carga in Spanish) as the source domain frame and Taxation as the target domain frame from one particular iteration of the metaphor identification system,[6] and filtered for a metaphoricity score of over 0.7 in MetaNet, resulting in data highly likely to be metaphoric.[7] The source-domain evoking Lexical Units (LUs) are listed, along with their raw frequency (after the >0.7 metaphoricity filter), and their normalized frequency per 100 results (for comparability across languages).

6. The results presented here are reported from one specific extraction run (2015/05/14); MetaNet was continually updated and expanded over 5 years, so these results represent a snapshot of the system at that moment in time.

7. The system automatically assigns each automatically detected linguistic metaphor a metaphoricity score from 0 to 1. The score is based on the best path through the metaphor and frame inheritance networks, as triggered by the lexical items within the detected grammatical construction matching pattern. The metaphoricity score is the system's degree of certainty that a particular phrase is a good candidate for metaphor, given the metaphors available in the repository network. In brief, the system traverses the graph distance between the two identified frames. If there is a metaphor representation intervening between the (potential) source and (potential) target, it returns a high metaphoricity score. If the two frames inherit from the same frame and/or there is a relatively short distance between them, it returns a lower metaphoricity score as this indicates they are semantically related. The precise mechanisms of the metaphoricity score assignment are outlined in Hong (2016).

Table 1. TAXATION IS A BURDEN source-domain evoking Lexical Units in Spanish and English

Spanish		
Lexical Unit	**Norm. Freq. (per 100)**	**Raw Freq.**
carga 'weight/burden'	86.68	1,106
peso 'weight'	4.55	58
pesar 'weigh'	3.06	39
cargar 'burden (v.)'	2.19	28
agobiar 'oppress'	1.10	14
agobiante 'oppressive'	0.94	12
oneroso 'burdesome'	0.63	8
sobrecargar 'overload'	0.47	6
aguantar 'withstand'	0.39	5
Total		**1,276**

English		
Lexical Unit	**Norm. Freq. (per 100)**	**Raw Freq.**
burden (n., v.)	68.86	617
heavy	17.85	160
bear	3.23	29
weight	2.68	24
load (n.)	2.00	18
shoulder (v.)	1.34	12
burdensome	0.89	8
brunt	0.55	5
overburden	0.56	5
saddle (v.)	0.44	4
strain (n., v.)	0.45	4
pile (v.)	0.33	3
weigh down	0.33	3
stress (n.)	0.22	2
baggage	0.11	1
heap (n.)	0.11	1
Total		**896**

Table 1 summarizes a variety of metaphoric expressions involving TAXATION IS A BURDEN, as detected by the system, but only the source domain LUs are listed. This includes examples such as (1) through (4) from the Spanish and English results.

(1) Un 12,5 por ciento de las empresas privadas chinas lamentan la pesada carga de los impuestos.[8]
'Some 12.5 percent of Chinese private companies lament the heavy burden of taxes.'

(2) El peso del impuesto subió 60% en diez años para la clase media.
'The weight of the tax rose by 60% in ten years for the middle class.'

(3) [The nation's] economy is groaning under the weight of heavy taxes.

(4) The agricultural tax burden on farmers will be reduced by 7 billion yuan this year.

By structuring the metaphor repository as illustrated in Figure 1, yielding data such as in Table 1, we can achieve a certain degree of economy in the automation process. That is, instead of looking at every possible combination of Burden-relevant words with Taxation-relevant words, the system takes the entire bundle of LUs in both frames and checks candidate syntactic configurations in the corpus that may have one LU from each of these. Of course, there are other factors in determining which phrases will be identified as potential candidates for metaphor, as will be discussed in the following sections.

3. Metaphor and grammar

The above description of the MetaNet architecture leads to a discussion of the important role played by grammatical constructions in the expression of linguistic metaphor. As has long been noted, metaphoric mappings are not independent of grammatical structure but are deeply entwined with it. At least since Goldberg (1995) (also cf. Dancygier & Sweetser, 2014), it has been very clear that constructions themselves are interpreted metaphorically. For example, *She laughed Joe out of his bad mood* involves metaphoric interpretation of the Caused Motion Construction (CMC) as referring to Caused Change: *laugh* is not a verb of caused

8. Sentences throughout are reported with the internally-assigned LM (linguistic metaphor) identification number, as well as the corpus from which the sentence was extracted. This information is summarized in Appendix 1.

motion or caused change, so it is the larger construction that carries this meaning. Non-spatial verbs are part of similar patterns, as in *voted X out of office*, where *voted* does not indicate either motion or caused change of state, but the CMC is metaphorically interpreted as referring to caused change and voting as referring to the manner or means of change.

Sullivan (2007, 2013) has further shown that grammatical constructions have characteristic associated slots for source and target domains; for example, the modifying metaphoric Adjective-Noun construction necessarily has the Source in the adjective and the Target in the noun, as in ***bitter*** *tears* or ***blood-stained*** *wealth*. The latter are predicate adjective constructions, which crucially differ from domain adjective constructions, such as *economic* ***growth***. In domain adjective constructions the reverse is true in terms of metaphor frame mapping: the adjective is target, and the noun is source. Importantly, Sullivan's work has inspired the systematic categorization of argument structure constructions in how they distribute source-domain and target-domain material within the clause (Croft, 2003; David, 2016). Accordingly, MetaNet has been working to include argument structure construction information, by linking our efforts to the Embodied Construction Grammar model described in David (2017), Dodge (2010), Dodge and Petruck (2014), Stickles, David, and Sweetser (2016), Stickles (2016), and Stickles and Dodge (forthcoming).

In one example attested among the MetaNet results, ***snatch*** *from the* ***jaws*** *of poverty*, we must analyze metaphoric interpretations of the verb *snatch*, the preposition *from*, and the metaphoric CMC as a whole. The phrase *snatched from X* literally refers to physical caused motion away from a location. Since STATES ARE LOCATIONS and (CAUSED) CHANGE IS (CAUSED) MOTION, use of the CMC to refer to caused change is unsurprising (and was noted as early as Goldberg, 1995). None of these components can be left out, if an analysis is to explain the meaning of the whole phrase. But metaphor processing models generally don't include serious treatments of metaphoric uses of grammatical constructions.

Another benefit of incorporating constructions into the computational analysis of metaphor is that it helps assign the correct metaphor when the same two metaphor-triggering lexemes are present (one source and one target), but in different grammatical relation to each other. Consider the difference between (5a) and (5b):

(5) a. The meeting, held according to a decision of the last Summit of the Americas, called on social affairs ministers to attack poverty in times of economic globalization.
b. There are situations where poverty becomes unbearable, transforms itself to destitution and attacks the very dignity of man, Lula said.

In (5a), poverty is a problem conceptualized as an adversary that the problem-solvers are attacking, while in (5b) it is poverty that is the attacker, and the dignity

of man is attacked. These two instances have the same target domain, Poverty, but this target domain engages in mapping with the source domain evoked by *attack* in two different ways, resulting in two different metaphors. While (5b) evokes a more general metaphor SOCIAL PROBLEMS ARE AN ATTACKING FORCE, (5a) evokes ADDRESSING SOCIAL PROBLEMS IS ATTACKING AN ADVERSARY. The two metaphors differ as to how the target domain frame of Poverty maps to the 'attacked entity' in the Attacking frame of the source domain. When Poverty is conceptualized as the attacker, the metaphor is more likely to emphasize the physical harm aspect of the frame (i.e., the harming entity), whereas if it is the entity under attack, it is more likely to be thought of as an adversary in a physical combat scenario.

The two metaphors also differ in their causal structure. While poverty is a social problem in both sentences, in (5a) the specific causal target subframe evoked is Addressing Social Problems, and poverty is the affected entity. In (5b), poverty is the causal agent, and thus at the beginning of the causal action chain in the source domain (the Cause Effect Action frame) in Figure 2.

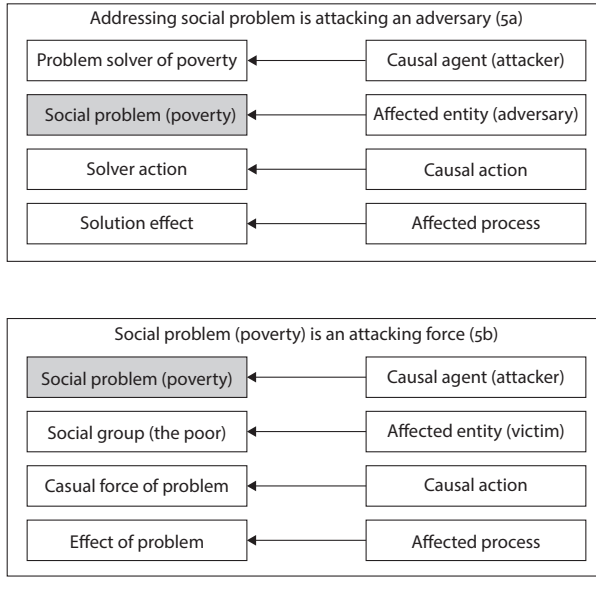

Figure 2. Different causal structures in source domain result in different causal entailments in target domain

Figure 2 illustrates the variable role-to-role mapping patterns in the two metaphors. The metaphors are different only by virtue of the grammatical construction in which the two Lexical Units appear. Each metaphor contains a bundle of roles

(frame elements) and depending on which argument structure construction contains the evoking words, a different metaphor with a different source-to-target role mapping pattern emerges.

In natural language, metaphor arises in quite a number of grammatical constructions, and it is difficult to create a system that robustly represents the entirety of a language's constructional inventory, let alone the metaphoric source and target frame mapping patterns for each. Although the previously-discussed MetaNet-related publications more thoroughly detail the full inventory of grammatical constructions (also called grammatical construction matching patterns) in the system (see e.g. Dodge, Hong, and Stickles, 2015, Table 2 is a summary of some of the patterns implemented, along with some example metaphoric phrases automatically identified from the corpora in each of the 4 languages studied.

Table 2. Examples of constructional matching patterns in MetaNet automation over 4 languages. S indicates a source domain-evoking LU; T indicates a target domain-evoking LU.

Construction	English	Spanish	Farsi	Russian
Noun(S) of Noun(T)	*epidemic of poverty* *the ball and chain of poverty*	*brecha de pobreza* breach POSS poverty 'breach of poverty' *carga del impuesto* burden POSS tax 'burden of the tax'	رشد تولید ملی 'growth of domestic product' درمان فقر 'treating of poverty'	*яма нищеты* pit poverty. GEN 'pit of poverty' *тюрьма бедности* prison poverty. GEN 'prison of poverty'
Noun(T)'s Noun(S)	*poverty's morass* *poverty's impact*	—	فریاد فقر 'cry/crying-out of poverty'	*Налоговое бремя* tax. POSS burden 'tax burden' *Налоговое давление* tax. POSS pressure 'tax pressure'
Verb(S)-Obj(T)	*the very rich gobble up more and more of our national wealth* *money lubricates the economy*	*combatir la pobreza* combat poverty. DEF 'combat poverty' *estancarse la economía* hold back economy. DEF 'hold back the economy'	آنچه فقر را از بین می برد 'kills poverty'	*получить образование* receive education. ACC 'get education' *притянуть богатство* attract wealth. ACC 'attract wealth'

(*Continued*)

Table 2. (*Continued*)

Construction	English	Spanish	Farsi	Russian
Subj(T)-Verb(S)	*the very rich gobble up more and more of our national wealth* *taxes will enslave the people*	*la economía crecioó* economy grow. PST 'the economy grew' *el desempleo se expande* unemployment REFL expand 'unemployment expands'	فقر غوغا می کند 'poverty causes turmoil'	*бедность калечит* poverty. NOM cripple 'poverty cripples' *бедность угрожает* poverty. NOM threaten 'poverty threatens'
Noun(T) is Noun(S)	*poverty is a disease* *the wealthy are leeches*	*mendigos son cánceres sociales* beggars COP cancers social 'beggars are a social cancer' *la pobreza es una mala consajera* poverty COP INDEF bad counselor 'poverty is a bad counselor'	مالیات بهترین راه است 'taxation is the best path'	*налог – это удар* tax COP blow 'tax is a blow' *деньги – это зло* money COP evil 'money is evil'

The constructions are encoded in the automated metaphor identification program in the form of construction matching patterns and utilize existing and tailor-made dependency parsers and part of speech taggers (each language necessitates a different NLP toolkit; see Hong (2016) for details). The system matches the LUs from frames to the construction matching patterns, determining whether the LUs identified in a particular phrase qualify as either the source or target domain slot in the construction. If they do, the system flags the phrase as potentially metaphoric, along with a metaphoricity score and a suggested set of candidate metaphors. The crucial feature of this metaphor identification approach lies in the constructions themselves – the constructions specify the target- and source-frame assignments. The frames and LUs themselves are not tagged as being target- or source-domain evoking. For instance, if the system encounters the phrase ***epidemic** of poverty*, it will score it as likely metaphoric because the Noun-of-Noun construction is stated as Noun1=source and Noun2=target. The Disease frame and the Poverty frame are not tagged as either source or target; the metaphoricity of frames is unspecified. Because the metaphor repository contains the metaphor POVERTY IS A DISEASE, the system will recognize that this metaphor is evoked via the Noun-of-Noun construction. Thus, no particular LU or frame is marked for metaphoricity; it is the

interaction between particular frames in specific constructions that informs the evaluation of metaphoricity.

4. Primary metaphors and metaphor cascades

Metaphor (like other aspects of language and behavior) comes from the physical structure of the brain (Lakoff, 2012) and from embodied cognition. Therefore, a cognitive linguistic theory of metaphor should reflect advancements in and insights from cognitive science and neuropsychology. Specifically, metaphor consists of mappings *between* frame structures – e.g., PURPOSEFUL ACTION IS FORWARDS MOTION (e.g., *We're not **getting anywhere** on this project*; *We're really **moving forward** in our relationship*) maps the Forwards Motion frame onto the Purposeful Action frame. This metaphor is likely to be a *primary metaphor* (Grady, 1997; Johnson, 1987; Johnson, 1997), since humans in all cultures experience from a very young age the correlation between the source and target domains: that is, they move forward to do some intended action.

Researchers should be able to test relationships between metaphors, and between frames and metaphors. One such relationship is that of *inheritance* between metaphoric structures; for example, LEGISLATIVE ACTION IS FORWARDS MOTION (e.g., *The bill is **moving** through the legislature, The bill is **stalled** in the legislature*) inherits PURPOSEFUL ACTION IS FORWARDS MOTION. More specific metaphor subcases inherit the more general, less detailed (i.e., more *schematic*) metaphor structure (Johnson, 1997); each subcase fully includes the structure of the higher-level schematic general case. In our analysis this means that, given any particular linguistic metaphor, a *cascade* of conceptual structure is instantaneously evoked by that specific metaphor. In the above example, the frame of Purposeful Action is fully instantiated in that of Legislative Action, and the more general metaphor (PURPOSEFUL ACTION IS FORWARDS MOTION) is fully instantiated in the more specific one (LEGISLATIVE ACTION IS FORWARDS MOTION). That is, everything we understand at a more general level about purposeful actions – that they are performed by agentive actors, that they can encounter difficulties, that they can be helped along or slowed down via exterior or internal means, etc. – holds true of the more specific instantiation of legislative action. In a metaphoric sense, we know that legislative action can be blocked/impeded, pushed, helped along, and it can go through or progress smoothly; we have this series of inferences by virtue of knowing that other physical actions can be affected in these various ways as well.

One problem when designing a metaphor database is deciding what should count as 'a metaphor,' and how that metaphor relates to other metaphors in the

system. A system built with the purpose of capturing metaphoric complexity requires that metaphors be strictly defined and categorized. Metaphors are designated as either representing the *main metaphor*, a *mapping* within that metaphor,[9] or an *entailment*[10] within that metaphor.[11]

For instance, consider one of the popularly cited "metaphors" LOVE IS A JOURNEY. This metaphor in fact encompasses many other sub-metaphors. Specifying which one of these sub-metaphors is "the metaphor," or whether any one of these sub-metaphors alone also constitutes "a metaphor" is difficult, as suggested by the numerous metaphors in the cascade shown in Table 3.

Table 3. LOVE IS A JOURNEY metaphoric complex – primary, general and entailed metaphors

Metaphor name	Type of metaphor
LOVE IS A JOURNEY	General metaphor. (The cultural issue the metaphor is about: long-term love relationships tend to require compatible purposes in life.)
LOVERS ARE TRAVELERS	Mapping within the general metaphor.
RELATIONSHIP IS A VEHICLE	Mapping within the general metaphor. (Frame-based inferences: vehicles transport people to destinations; in two-person vehicles, the people are in a container, close together, and travel to a shared destination.)
PURPOSES ARE DESTINATIONS; DIFFICULTIES IN ACHIEVING PURPOSES ARE OBSTACLES IN REACHING DESTINATIONS; RELATIONSHIPS ARE CONTAINERS; INTIMACY IS CLOSENESS	Primary metaphors evoked (by the general metaphor).

9. Since each metaphor is said to be no more than the sum of the mappings making it up (Lakoff & Johnson, 1980), every metaphor is accompanied by multiple 'mapping' metaphors. For instance, IDEAS ARE OBJECTS is a mapping metaphor in the main metaphor COMMUNICATION IS OBJECT TRANSFER. We should not see these as two different metaphors, but two ways of stating different aspects of the same metaphoric cascade.

10. Entailed metaphors are stated in terms of the inferential logic of the frames making up the source and target domains of the metaphor. For instance, the metaphor COMMUNICATION IS OBJECT TRANSFER has inferences about perspectives in the communicative exchange (CAUSING TO KNOW IS GIVING AN OBJECT VS. BEING COMMUNICATED TO IS RECEIVING AN OBJECT). These fall out of both what we know about communicating, and what we know about object exchange.

11. Relationships between metaphors are more fully discussed in David, Lakoff, and Stickles (2016) and Stickles, David, Dodge, and Hong (2016).

Table 3. (*Continued*)

Metaphor name	Type of metaphor
DIFFICULTIES IN LONG-TERM LOVE RELATIONSHIPS ARE OBSTACLES IN REACHING DESTINATIONS TOGETHER	Entailment of general metaphor with inferences from frame-based knowledge.
DIFFICULTIES IN LOVE ARE OBSTACLES IN REACHING A DESTINATION.	Entailment of general metaphor with inferences from frame-based knowledge.
CAUSING DIFFICULTIES IN LOVE IS PUTTING UP OBSTACLES IN REACHING A DESTINATION	Causal entailment of entailment of general metaphor.

Deciding which of these mappings is "the metaphor," or on which mappings an analyst should focus becomes hard. The reason for this difficulty is that they are not independent "separate" metaphors. Conceptual systems are organized in terms of cascades that hierarchically integrate primitive schemas, frames, primary metaphors, and complex conceptual metaphors. When considering the metaphoric meaning of a single expression, the entire underlying cascade system must be considered; in light of similar expressions, the cascade becomes a potent means of explaining cross-metaphor similarities and differences. For example, the metaphors in Table 3 together constitute a metaphoric cascade, with metaphoric linguistic expressions such as *on the rocks*, *at a crossroads* and *we've hit a dead-end street in our relationship* constituting linguistic triggers for the entire cascade.

The notions of *metaphor cascade* and *inheritance* among metaphors helped in making decisions about what constitutes a metaphor, and which metaphors should be included when designing the metaphor ontology of MetaNet. Approaching the issue in both a top-down and bottom-up manner, we developed a network that has the capacity to recognize specific instances of linguistic metaphor (e.g., any metaphoric expression about legislative action) given the more general primary metaphors that form the core of the network (e.g., PURPOSEFUL ACTION IS FORWARD MOTION). The latter remain unchanged, are assumed to be universal (and hence cross-linguistically available) and can have many subcases depending on what is specifically investigated during that iteration (legislative action, democratic action, action in addressing poverty, etc.).

As with the lexical unit-frame-metaphor relation described in Section 2, the combined top-down/bottom-up approach once again results in processing economy. In the latter examples about legislation, we do not need to specify higher and lower level inferential structures separately and independently – the inferences

of the schematic Purposeful Action frame cascade downwards into the frame of Legislative Action. The entire inferential structure of the Legislative Action frame need not be redundantly re-stated in the system; only those aspects of the Legislative Action frame structure that are specific and unique to it must be added (e.g., that the ultimate beneficiary of legislative action is society and its citizens, bills are passed, and legislators are the agents). This is a powerful mechanism, since a great many other sub-frames of Purposeful Action also exist and are also structured by this cascade mechanism. Although Purposeful Action is quite underspecified and schematic, it still carries powerful inferential structures such aspectual information (e.g., the inference that if I managed to do the initial stages of the action itself, I must have completed any preparatory stages).

MetaNet leverages inferences established at higher levels in primary metaphors and the primary image schemas populating their source domains, allowing them to be inherited by subcases subsumed under them. The hierarchical structure can be illustrated with a case in which the source domain of the metaphor is Physical Structure, as in Figure 3.

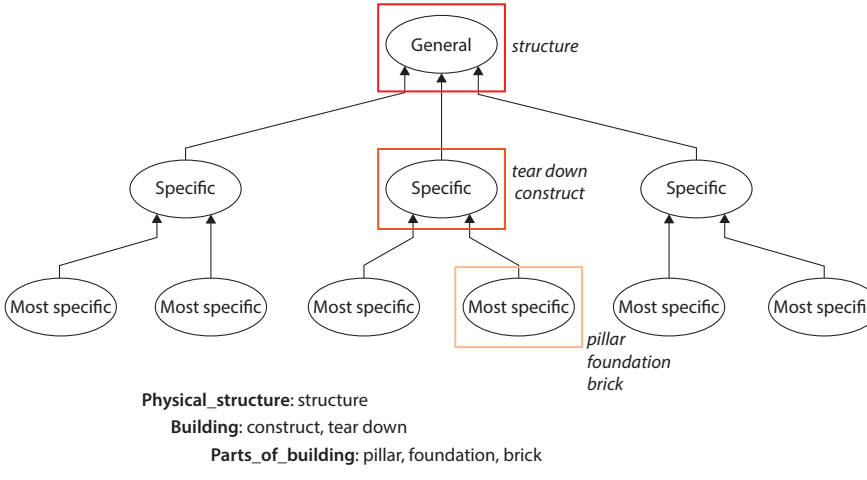

Figure 3. Hierarchical metaphoric organization in physical structure frames

In an example such as ***tear down*** *democracy*, the specific target domain is Democracy, and the specific metaphor is DEMOCRACY IS A PHYSICAL STRUCTURE. The source domain-triggering lexical units *tear down* bring to mind imagery of a large physical structure, such as a building or a wall, rather than a machine or a piece of furniture. At the most general level, walls, buildings, machines and furniture are all physical structures, but differ at an intermediate representational level: perhaps we can set apart large building-like structures that can have foundations (let's call these Buildings), and that can house people, from smaller functional structures

that have other kinds of utility (like Furniture).[12] Figure 3 exemplifies this distinction in representational specificity. There is even a more specific representation subsumed under Buildings, and focusing more on the parts of those structures, such as those exemplified by metaphoric expressions such as *the **pillars** of democracy* and ***building** democracy **brick** by **brick***.

In a hierarchically-organized metaphor repository, subcase relations among metaphors create this implicational organization of mappings and entailments. In this way, we know that all general source-domain triggering lexical items can evoke more specific instances too, while the reverse is not possible. That is, general inferences are inherited by more specific subcases of metaphors. For example, if I know that the parts of a Structure have been separated from each other, I generally know that the structure no longer functions as a structure; this is equally true of specific types of Physical Structures such as Furniture, Buildings, or Machines. However, there as specifications that hold of buildings (such as foundational support, and floors and height), that are specific to the Building frame and inapplicable to other types of physical structures. Crucially, this is not just a fact about language. Rather, it is such a pervasive, cross-linguistically present fact about language that it has to be a fact about cognition more generally.

We can use this inheritance-based system in implementing the metaphor network to decide where each additional linguistic metaphoric expression fits into the larger pattern. In this case, based on what we know of how the Physical Structure source domain is organized in relation to metaphors about Democracy, we might suspect that the same applies to metaphors about other target domains too: THEORIES ARE BUILDINGS, RELATIONSHIPS ARE BUILDINGS, A CAREER IS A BUILDING.

5. Multi-lingual metaphor detection: Towards understanding social issues

Metaphor across the world's languages has been amply documented (e.g., Lakoff, 1987; Kövecses, 2005), but few efforts have been made in creating computational solutions to detecting and analyzing metaphor cross-linguistically (with the exception of the sister projects to MetaNet, mentioned in the introduction to the current work).

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12. These types of distinctions among physical structures have been found to be useful in studies of the metaphor THEORIES ARE BUILDINGS, Lakoff and Johnson (1980), Grady et al. (1996) and Grady (1996, 1997).

One of the questions motivating the MetaNet project overall is, what kinds of source domain frames are common to all the languages studied when applied to a particular target domain? For example, is Poverty construed as a monster cross-culturally? A complementary question is, what metaphors arise as unique to particular subsets of languages, and what cultural models could provide explanations for these areas of deviation from the rest? The languages chosen for the purposes of training a system such as MetaNet are sufficiently typologically different, as well as geographically dispersed across the globe, to act as the empirical basis for a true test of potential patterns of universality in metaphor use. Furthermore, the languages studied are well-covered in textual news sources available online, providing ample data over which to train the system.

The data generated by MetaNet over the course of 5 years is massive (millions of linguistic expressions of metaphors identified) and covers a multitude of political and social topics (Governance, Poverty, Democracy, Wealth, Taxation, Bureaucracy, Gun Control, Economy, Cancer and Education). A singular exploration of all of this data is impossible and examining such a large and diverse data set is unlikely to produce any meaningful patterns of metaphor distribution. Instead, here we look closely at the domain of Taxation, which yields somewhat comparable numbers of annotation across all four languages. Table 4 summarizes this data. The source domains are presented here as a binning of source domain frames into broader categories that have cross-linguistic comparability.

Table 4. Taxation metaphors across four languages, grouped by source domain classes (metaphoricity >0.7)

(Taxation target)	English	Farsi	Russian	Spanish	Mean	Stdev.
Size (increase/decrease)	0.18	0.15	0.56	0.15	0.26	0.20
Movement	0.03	0.15	0.30	0.20	0.17	0.11
Crime/morality	0.00	0.61	0.02	0.01	0.16	0.30
Health	0.01	0.30	0.01	0.01	0.08	0.15
Upward movement	0.06	–	0.10	0.10	0.06	0.05
Location (vertical/ horizontal)	0.08	–	0.08	0.04	0.05	0.04
Crop/plant	0.00	0.15	0.04	–	0.05	0.07
Physical harm	0.06	–	0.07	0.05	0.05	0.03
Building	0.01	–	0.13	0.04	0.04	0.06
Machine	0.00	–	0.10	0.01	0.03	0.05
War	–	–	0.07	0.02	0.02	0.03
Downward movement	0.00	–	0.01	0.07	0.02	0.03
Physical burden	0.02	–	0.05	0.01	0.02	0.02

Table 4. (*Continued*)

(Taxation target)	English	Farsi	Russian	Spanish	Mean	Stdev.
Struggle	0.01	–	0.03	0.00	0.01	0.01
Factory	0.01	–	0.02	–	0.01	0.01
Protection	0.01	–	0.02	0.01	0.01	0.01
Human body	0.02	–	0.01	0.00	0.01	0.01
Enslavement	–	–	0.02	–	0.01	0.01
Game	0.00	–	0.01	0.01	0.00	0.00
Animal	–	–	0.01	–	0.00	0.01

The numbers are presented as normalized frequencies (per 10,000,000 corpus tokens) in order to make up for the large differences in corpus sizes across the four languages. The raw frequencies are presented in Appendix 2. Where values are missing, those are instances in which no results were found scoring 0.7 or higher in metaphoricity. This is not to say that these metaphors are not found in these languages; they were just not produced for this specific metaphor identification iteration. The standard deviation is presented as a measure of cross-linguistic variability.

Table 4 reveals a few surprising insights into how taxation is construed in these languages. First, by and large all languages use Size (e.g., *taxes **grow, cut down** taxes*) and Movement metaphors (e.g., ***sliding down** of commercial taxes, las ganancias se **aceleraron** fuertemente* (Spanish), 'taxes accelerated strongly') for all languages, although there is a great deal of variation in concentration of these metaphors, with Russian exhibiting the highest concentration for both top categories. The second-most common categories of metaphors are TAXATION IS A CRIME (A MORAL ISSUE), e.g., *taxation is **stealing** our hard-earned money*, and TAXATION IS MEDICAL TREATMENT, e.g., *tax **relief***, led by Farsi. Although the raw frequencies are quite low in many of these cases, the normalized frequencies illustrate the relative likelihood that a particular metaphor arises in a particular language, and which metaphors occur more frequently within a language in the corpora studied. The top-scoring metaphors are also the ones where languages differ the most, as indicated by the higher standard deviation values. That is to say, based on this sample and language set, there is no cross-cultural consensus on how taxation is discussed metaphorically, although certain source domain categories do emerge as contenders.

6. Conclusions and future developments

Every NLP technology has strengths and limitations. While MetaNet excels at automated deep semantic metaphor identification faithful to CMT across a limited

set of grammatical construction and target domains, and has multi-lingual coverage, there are still some underdeveloped areas. MetaNet casts a knowingly narrow net when it comes to the variety of linguistic metaphors that can be detected. For instance, cases of implicit or unmentioned target domain would never show up on the radar, as illustrated with this new headline:

(6) Charities are hitting Trump where it hurts – the wallet[13]

As is the case with most automatic metaphor recognition systems, MetaNet's metaphor identifier depends on the presence of both source and target domain lexical elements in the text. ***Attack*** *poverty* or ***collapse*** *of democracy*, phrases commonly positively identified in news corpus crawls, are cases in which such lexical signals are clearly present. But with a linguistic metaphor such as the one found in (6) – *hit X where it hurts* – and in other common expressions, such as *glass ceiling*, the current automated system would not recognize it as metaphoric because it requires both source domain and target domain language, whereas cases such as (6) only have source domain-evoking language. New developments in MetaNet (Dodge and Stickles, 2017; Stickles and Dodge, forthcoming) may lead to it systematically being able to detect such examples in the future.

Example (6) also points to the important role played by metonymy in our endeavor to automate metaphor recognition. The system would have no problem finding this sentence as metaphoric if it knew that wallet is metonymic for Wealth, and the violence metaphor evoked by *hit X where it hurts* is in fact a metaphor about wealth: COMPROMISING SOMEONE'S WEALTH IS ATTACKING THEM; THE LOCUS OF WEALTH IS THE WALLET. However, it does not have this capability yet.

To have a robust account of how metaphor works, researchers and developers of metaphor recognition technologies must take into account the ubiquitous presence of metonymic triggers for metaphor. The focus on metonymy, and the metonymy-metaphor link seems to be a thread pursued by others recently (e.g., Dancygier & Sweetser, 2014; Deignan, 2005; Panther, Thornburg, & Barcelona, 2009; Ruiz de Mendoza & Mairal Usón, 2007; Sullivan, 2013), and we endorse this program of thought. Understanding and formation of conceptual metaphor involves mapping of frames and image schemas and is evoked via specific linguistic constructions. Since frames are constantly being partially (metonymically) evoked, together they comprise a seamless whole: linguistic meaning is

13. http://money.cnn.com/2017/08/21/news/trump-mar-a-lago-charities-cancellations/index.html

computed in particular cognitive simulations, incorporating all of these structures and relations. Detailed analysis of any part of this whole demands awareness of – indeed, careful attention to – the other parts.

It is no longer possible for a natural language analyst to consider grammatical structure, frames, metaphoric mappings and metonymic structures separate and independent. Metaphors are structured in a complex system of inheritance cascades. Grammar itself can be both metaphoric and metonymic in meaning. Metonymic mappings may be needed to interpret metaphors (as with **jaws** of poverty), and of course metaphors are mappings specifically between frame structures. Obviously, one cannot investigate all of these aspects of language equally at a given time; but without careful awareness of all of them, the analysis of each aspect will be insufficient.

This might sound discouraging. But in fact, it is also a message of hope for analysts. Ultimately, we have a simpler analysis of a given metaphor if we locate it in its native cascade structure – we don't have to separately specify inherited structures for every individual subcase, and we can understand the relationships between subcases as shared inheritance. By attending to the cognitive structure of the whole, we simplify our treatment of the "parts."

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Refer to the project website, https://metanet.icsi.berkeley.edu/metanet/node/3, and the MetaNet Wiki, https://metaphor.icsi.berkeley.edu/pub/en/ for updates on the project and its members.

References

AleAhmad, A., Amiri, H., Darrudi, E., Rahgozar, M. & Oroumchian, F. (2009). Hamshahri: A standard Persian text collection. *Journal of Knowledge-Based Systems*, 22(5), 382–387. https://doi.org/10.1016/j.knosys.2009.05.002

Baker, C. F., Fillmore, C. J., & Cronin, B. (2003). The structure of the FrameNet database. *International Journal of Lexicography*, 16(3), 281–296. https://doi.org/10.1093/ijl/16.3.281

Bijankhan, M. (2004). The role of the corpus in writing a grammar: An introduction to a software. *Iranian Journal of Linguistics*, 19(2).

Charteris-Black, J. (2004). *Corpus approaches to critical metaphor analysis*. New York: Palgrave Macmillan. https://doi.org/10.1057/9780230000612

Croft, W. (2003). The role of domains in the interpretation of metaphors and metonymies. In R. Dirven, & R. Pörings (Eds.), *Metaphor and metonymy in comparison and contrast* (pp. 161–205). Berlin: Mouton de Gruyter.

Dancygier, B., & Sweetser, E. (2014). *Figurative language*. Cambridge: Cambridge University Press.

Darrudi, E., Hejazi, M. R., & Oroumchian, M. F. (2004). Assessment of a modern Farsi corpus. *Proceedings of the 2nd Workshop on Information Technology & its Disciplines (WITID)*.

David, O. (2016). Metaphor in the grammar of argument realization. PhD dissertation, University of California, Berkeley.

David, O. (2017). Computational approaches to metaphor: The Case of MetaNet. In B. Dancygier (Ed.), *The Cambridge handbook of cognitive linguistics* (pp. 574–589). https://doi.org/10.1017/9781316339732.036

David, O., & Matlock, T. (Forthcoming). From computational metaphor research to social relevance: A case study of poverty and cancer metaphors.

David, O., Lakoff, G., & Stickles, E. (2016). Cascades in metaphor and grammar: A case study of metaphors in the gun debate. *Constructions and Frames*, 8(2), 165–213. https://doi.org/10.1075/cf.8.2.04dav

Deignan, A. (2005). A corpus linguistic perspective on the relationship between metonymy and metaphor. *Style*, 39(1), 72–91. https://doi.org/10.5325/style.39.1.72

Dodge, E. K. (2010). Constructional and conceptual composition. PhD Dissertation, University of California, Berkeley.

Dodge, E. K. (2016). A deep semantic corpus-based approach to metaphor analysis. *Constructions and Frames*, 8(2), 256–294. https://doi.org/10.1075/cf.8.2.05dod

Dodge, E. K., & Lakoff, G. (2005). Image schemas: From linguistic analysis to neural grounding. In B. Hampe, & J. E. Grady (Eds.), *From perception to meaning: Image schemas in cognitive linguistics* (pp. 57–91). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110197532.1.57

Dodge, E. K., & Petruck, M. R. L. (2014). Representing caused motion in Embodied Construction Grammar. *Proceedings of the ACL 2014 Workshop on Semantic Parsing* (pp. 39–44).. https://doi.org/10.3115/v1/W14-2408

Dodge, E. K., & Stickles, E. (2017). Analyzing metaphoric source-domain language in corpora: A MetaNet approach. *Paper presented at the 14th meeting of the International Cognitive Linguistics Conference (ICLC 14)*, Tartu, Estonia, July 13, 2017.

Dodge, E. K., Hong, J., & Stickles, E. (2015). MetaNet: Deep semantic automatic metaphor analysis. In E. Shutova, B. B. Klebanov, & P. Lichtenstein (Eds.), *Proceedings of the Third Workshop on Metaphor in NLP* (pp. 40–49). https://doi.org/10.3115/v1/W15-1405

Fillmore, C. J. (1976). Frame semantics and the nature of language. *Annals of the New York Academy of Sciences*, 280(1), 20–32. https://doi.org/10.1111/j.1749-6632.1976.tb25467.x

Fillmore, C. J. (1982). Frame semantics. In *Linguistics in the morning calm: Linguistic Society of Korea* (pp. 111–137). Seoul: Hanshin Publishing Company.

Fillmore, C. J., & Atkins, B. T. (1992). Toward a frame-based lexicon: The semantics of RISK and its neighbors. In A. Lehrer, & E. F. Kittay (Eds.), *Frames, fields, and contrasts: New essays in semantic and lexical organization* (pp. 75–102). New York: Routledge.

Fillmore, C. J., Wooters, C., & Baker, C. F. (2001). Building a large lexical databank which provides deep semantics. *Proceedings of the 15th Pacific Asia Conference on Language, Information and Computation* (pp. 3–26).

Gedigian, M., Bryant, J., Narayanan, S., & Ciric, B. (2006). Catching metaphors. *Proceedings of the Third Workshop on Scalable Natural Language Understanding ScaNaLU 06*, (June) (pp. 41–48). https://doi.org/10.3115/1621459.1621467

Gibbs, R. W., Jr. (2005). *Embodiment and cognitive science*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511805844

Goldberg, A. E. (1995). *Constructions: A construction grammar approach to argument structure*. Chicago: The University of Chicago Press.

Gordon, J., Hobbs, J. R., May, J., Mohler, M., Morbini, F., Rink, B., Tomlinson, M., & Wertheim, S. (2015). A corpus of rich metaphor annotation. *Proceedings of the Third Workshop on Metaphor in NLP* (pp. 56–66). https://doi.org/10.3115/v1/W15-1407

Grady, J., Taub, S., & Morgan, P. (1996). Primitive and compound metaphors. In A. Goldberg (Ed.), *Conceptual Structure, Discourse and Language* (pp. 177–187). Stanford, CA: CSLI.

Grady, J. E. (1997). Theories are buildings revisited. *Cognitive Linguistics*, 8(4), 267–290. https://doi.org/10.1515/cogl.1997.8.4.267

Hong, J. (2016). Automatic metaphor detection using constructions and frames. *Constructions and Frames*, 8(2), 295–322. https://doi.org/10.1075/cf.8.2.06hon

Johnson, C. R. (1997). Metaphor vs. conflation in the acquisition of polysemy: The case of *see*. In M. K. Hiraga, C. Sinha, & S. Wilcox (Eds.), *Cultural, typological, and psychological issues in cognitive linguistics* (pp. 155–169). Amsterdam: John Benjamins Publishing Company.

Johnson, M. (1987). *The body in the mind: The bodily basis of meaning, imagination, and reason*. Chicago: The University of Chicago Press. https://doi.org/10.7208/chicago/9780226177847.001.0001

Kövecses, Z. (2005). *Metaphor in culture: Universality and variation*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511614408

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: The University of Chicago Press. https://doi.org/10.7208/chicago/9780226471013.001.0001

Lakoff, G. (1995). Metaphor, morality, and politics, or, why conservatives have left liberals in the dust. *Social Research*, 62(2), 177–213.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: The University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). Philosophy in the flesh: The embodied mind and its challenge to western thought. New York: Basic Books.

Levin, L., Mitamura, T., Fromm, D., MacWhinney, B., Carbonell, J., Feely, W., Frederking, R., Gershman, A., & Ramirez, C. (2014). Resources for the detection of conventionalized metaphors in four languages. *Proceedings of the 9th International Conference on Language Resources and Evaluation* (pp. 498–501).

Mason, Z. J. (2004). CorMet: A computational, corpus-based conventional metaphor extraction system. *Computational Linguistics*, 30(1), 23–44. https://doi.org/10.1162/089120104773633376

Mendonça, A., Jaquette, D., Graff, D., & DiPersio, D. (2011). *Spanish Gigaword second edition (LDC2011T12)*. Philadelphia: Linguistic Data Consortium.

Mohler, M., Tomlinson, M., & Rink, B. (2015). Cross-lingual semantic generalization for the detection of metaphor. *International Journal of Computational Linguistics and Applications*, 6(2), 117–140.

Panther, K.-U., Thornburg, L. L., & Barcelona, A. (Eds.). (2009). *Metonymy and metaphor in grammar* (Vol. 25). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.25

Parker, R., Graff, D., Kong, J., Chen, K., & Maeda, K. (2011). *English Gigaword fifth edition (LDC2011T07)*. Philadelphia: Linguistic Data Consortium.

Ruiz de Mendoza Ibáñez, F. J., & Mairal Usón, R. (2007). High-level metaphor and metonymy in meaning construction. In G. Radden, K.-M. Köpcke, T. Berg, & P. Siemund (Eds.), *Aspects of meaning construction in lexicon and grammar* (pp. 33–49). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/z.136.05rui

Ruppenhofer, J. K., Ellsworth, M., Petruck, M. R. L., Baker, C. F., & Scheffczyk, J. (2016). *FrameNet II: Extended theory and practice*. Berkeley, CA: International Computer Science Institute.

Shaikh, S., Strzalkowski, T., Taylor, S., Liu, T., Lien, J., Broadwell, G. A., Feldman, L., Yamrom, B., Cho, K., & Peshkova, Y. (2015). Understanding cultural conflicts using metaphors and sociolinguistic measures of influence. *Proceedings of the Third Workshop on Metaphor in NLP*, Denver, CO, June 5, 2015 (pp. 67–76). https://doi.org/10.3115/v1/W15-1408

Sharoff, S. (2006). Creating general-purpose corpora using automated search engine queries. In M. Baroni, & S. Bernardini, (Eds.) *WaCky! Working papers on the Web as Corpus* (pp. 63–98).

Shutova, E., Teufel, S., & Korhonen, A. (2012). Statistical metaphor processing. *Computational Linguistics*, 39(2), 301–353. https://doi.org/10.1162/COLI_a_00124

Stickles, E. (2016). The interaction of syntax and metaphor in gesture: A corpus-experimental approach. PhD dissertation, University of California, Berkeley.

Stickles, E., & Dodge, E. K. (Forthcoming). Corpus-based computational frame and construction analysis of motion metaphors. In M. Petruck, & N. Schneider (Eds.), *Computational semantics with frames and constructions*.

Stickles, E., David, O., & Sweetser, E. (2016). Grammatical constructions, frame structure, and metonymy: Their contributions to metaphor computation. In A. Healey, R. Napoleão de Souza, P. Pešková, & M. Allen (Eds.), *Proceedings of the 11th Meeting of the High Desert Linguistics Society 2015* (pp. 317–345).

Stickles, E., David, O., Dodge, E. K., & Hong, J. (2016). Formalizing contemporary conceptual metaphor theory: A structured repository for metaphor analysis. *Constructions and Frames*, 8(2), 166–213. https://doi.org/10.1075/cf.8.2.03sti

Sullivan, K. S. (2007). Grammar in metaphor: A Construction Grammar account of metaphoric language. PhD dissertation, University of California Berkeley.

Sullivan, K. S. (2013). *Frames and constructions in metaphoric language*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/cal.14

Thiboudeau, P., & Boroditsky, L. (2011). Metaphors we think with: The role of metaphor in reasoning. *PLoS ONE*, 6(2), e16782. https://doi.org/10.1371/journal.pone.0016782

Appendix 1. Sources and IDs of cited examples

Sentence #	MetaNet LM ID	MetaNet corpus source
1	509044796	ESGW:XIN_SPA
2	503635322	ESGW:AFP_SPA
3	2284633	ENGW:NYT_ENG
4	3626273	ENGW:XIN_ENG
5a	200404	ENGW:XIN_ENG
5b	200301	ENGW:XIN_ENG

English Gigaword Corpus (ENGW), Spanish Gigaword Corpus (ESGW); Agence France-Presse, English Service (AFP); Xinhua News Agency, English Service (XIN); New York Times Newswire Service (NYT)

Appendix 2. Raw frequencies of Taxation source domain classes in Table 4.

With Taxation as target:	English	Farsi	Russian	Spanish	Total
Size (increase/decrease)	73	1	112	59	245
Movement	14	1	59	81	155
Upward movement	24	–	20	40	84
Location (vertical/horizontal)	31	–	15	17	63
Physical harm	26	–	13	21	60
Building	3	–	25	16	44
Downward movement	2	–	1	27	30
Machine	2	–	20	2	24
Physical burden	10	–	9	2	21
War	–	–	14	7	21
Struggle	6		6	1	13
Medicine	5	2	2	4	13
Crime/morality	2	4	3	2	11
Crop/plant	2	1	7	–	10
Protection	4	–	3	2	9
Factory	5	–	4	–	9
Human body	7	–	1	1	9
Game	2	–	1	4	7
Enslavement	–	–	4	–	4
Animal	–	–	2	–	2

CHAPTER 2

The tripartite typology and the Córdoba Metonymy Database

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The Córdoba Metonymy Database has been designed as a tool for systematically investigating conceptual metonymy across a wide variety of authentic discourse samples, mostly in English and Spanish. Its entry model features eleven analytical fields. One of them, Field 2, is devoted to suggesting the most likely hierarchy including the metonymy under analysis. The top (or "generic") level of that hierarchy is the tripartite typology WHOLE FOR PART, PART FOR WHOLE, and PART FOR PART. After describing the database and its entry model, the author argues against the proposals to rule out the tripartite typology and discusses the criteria to apply the tripartite typology to the metonymies so far included in the database.

Keywords: metonymy, metonymy database, metonymy hierarchies, WHOLE FOR PART, PART FOR WHOLE, PART FOR PART

1. Introduction

This chapter addresses several of the thematic foci of the volume as a whole. It deals with some of the problems in the cognitive linguistic theory of metonymy and with the description of a figurative language repository, namely the Córdoba Metonymy Database, particularly with the identification and discussion of some of its problems and challenges.

Section 2 is devoted to a brief description and presentation of the database and its entry model and of how the repository works, and when it is expected to be publicly available. Section 3 three examines the objections to the traditional generic classification of metonymies into WHOLE FOR PART, PART FOR WHOLE and PART FOR PART. Section 4 presents and illustrates the criteria to be followed in the application of that generic classification to the metonymies registered in the database. Section 5 contains the conclusions.

https://doi.org/10.1075/milcc.8.03bar

2. Brief description of the Córdoba Metonymy Database and its entry model with special attention to the field *Hierarchical Level*

The compilation of a detailed annotated database of, mainly, basic and higher-level conceptual metonymies is one of the main objectives of a project carried out by the research group that I lead at the University of Córdoba. The initial, pilot version (in MS Word) of the database comprises over 1000 entries that register metonymies proposed in the specialized literature on metonymy and in our own research on authentic discourse. Most of the linguistic examples registered in the database so far are English language examples, but we have also registered examples of Spanish, American Sign Language and Spanish Sign Language metonymies. The architecture of the digital, web-based version of the database has also already been designed. It uses Drupal 7+ software in combination with a MySQL 5+ database located in our university's servers. A subset of the pilot database has already been fed into it.[1]

The database entry model features eleven analytical fields: *Metonymy category* (normally registering the conceptual metonymy label used by the linguist whose proposal is analyzed through the database entry), *Hierarchical level, Prototypicality, Examples and Taxonomic Domains* (i.e., the taxonomic domains represented by source and target), *Conventionality, Language* (English etc.), *Linguistic Domains* (in which the metonymy operates), *Metonymic Triggers, Chaining, Other Hierarchical Levels* and *Patterns of Interaction* (with metaphor and with other metonymies). Most of the analytical fields include two or more sub-fields. The database also includes one bibliographic reference field and a control area. For a detailed description and discussion of each analytic field, see Barcelona, 2018; Blanco-Carrión, 2018; and Hernández-Gomariz, 2018.

Figure 1 is a screenshot of the "Add content" area of the digital database (technically an "analysis sheet" connected to the MySQL database), where the various analytical fields are displayed as tabs that open by clicking on them. "Category label" opens by default, but the other fields will open by clicking on the corresponding tabs. Once a field is opened, the screen displays the information entered in that field.

Figure 2 is a screenshot of one of the fields of a completed entry, namely the one corresponding to Lakoff and Johnson's (1980, p. 38) example *the buses are on strike*, manifesting the high-level conceptual metonymy called by Lakoff and Johnson (1980, p. 38) THE OBJECT FOR THE USER OF THE OBJECT. The data entered in the field *Hierarchical Level* (Field 2 in the MS Word version) are displayed after clicking on the corresponding tab. The various levels (Generic, High, Basic, Low) and the sublevels (if any has been recognized) of High, Basic and Low are progressively displayed by clicking

1. The database will be available upon request by the end of 2019. By mid 2020 the database will be available to a wider set of registered users.

on each of them. After clicking on the lowest level recognized in the entry (Low in this particular entry), the whole hierarchy is displayed, as in Figure 2.

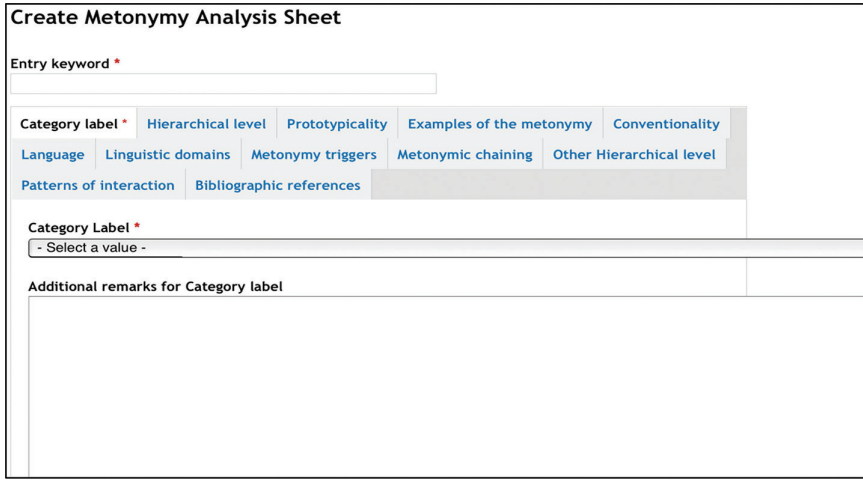

Figure 1. "Add content" area for the analytical and references fields in the database

Figure 2. A screenshot of a completed entry displaying the field *Hierarchical Level*

We hope that the digital database will constitute a useful reference tool for the cognitive linguistic community and for researchers and users in other areas, thanks in particular to its present search features that allow researchers to combine the information in a field with that in another field. For example, we may combine the data in Field 1 (Category Label of a conceptual metonymy, say THE OBJECT FOR THE USER) with the data in Field 7 (Linguistic Domain) to investigate the types of linguistic constructions that this metonymy is applied to (typically noun phrases) and the types of meanings they give rise to (both non-conventional meanings and conventional yet non-prototypical meanings). We hope to make the search process more sophisticated so as to be able to combine information from several fields and subfields. The database is also expected to usefully complement other cognitive-linguistic oriented figurative language repositories like the MetaNet (Sweetser, David, and Stickles, this volume) and the Croatian MetaNet.HR (Despot et al., this volume).

2.1 Problems involved in the completion of the database

Apart from the technical computational difficulties that we have had to get over in cooperation with our technicians, we have had, and still have, a number of theoretical, descriptive and practical problems in the application of the entry model. The problems affect all the analytical fields, except for the *Language* and *Prototypicality* fields. Apart from those affecting the fields *Hierarchical Level* and *Other Hierarchical Levels*, which will be treated in some detail below, the problems range from the lack of a category label suggested by the linguist that proposed the metonymy to the fact that different linguistic examples of the same high-level or basic-level conceptual metonymy have to be analyzed quite differently from each other in terms of the various fields. Returning to the conceptual metonymy illustrated in Figure 2, the various examples offered by Lakoff and Johnson (1980, p. 38) of OBJECT FOR THE USER OF THE OBJECT represent different source and target taxonomic domains: vehicles and drivers (as in *The buses are on strike*), firearms and professional killers (as in *The gun he hired wanted fifty grand*), etc. These differences recommend filling up one different entry for each linguistic example of the same conceptual metonymy. Another problem is to decide on the prototypical status of a meaning or form claimed to be motivated or guided by a conceptual metonymy, an item of information required by the *Linguistic domain* field. With feedback from my co-workers in the development of the database, I have gradually set up a number of criteria to guarantee a high degree of consistency in the completion of the entries. These are being collected in our internal document "Analytical criteria in entry completion and revision". Some of these criteria have been discussed in Barcelona, 2018; Blanco-Carrión, 2018; and Hernández-Gomariz, 2018.

The database is not publicly available yet. We still have to feed into the digital database the entries in the pilot MS Word version that have already been revised; and we also still have to revise and feed into the digital database a large number of entries now stored in the pilot version. More importantly, we still have to improve the multiple search feature of the digital version. Another factor that has slowed down progress is the lack of funding we have suffered in the last 18 months; this funding would have been used to pay our computer technician and an assistant helping us with the transfer of the MS Word entries to the digital database. We hope we will be able to gradually open the database to the academic community in the near future.

2.2 Some specific comments on the fields "Hierarchical Level" and "Other Hierarchical Levels"

The purpose of the first of these two fields is:

a. To propose a metonymic hierarchy that includes the metonymy under analysis and the level at which the latter is located, and
b. To increase knowledge about the hierarchical organization of metonymy.

These hierarchies may be revelatory of the ways metonymically-related concepts are related in the minds of members of a culture and language.

The hierarchy model in the database includes a maximum of four major levels: Generic, High, Basic and Low. The model contemplates two additional sub-levels for the last three major levels, so as to account for intermediate degrees of specificity, if necessary: Top High, Low High, Top Basic, Low Basic, Top Low, Lowest.

The purpose of the field *Other Hierarchical Levels*[2] is to suggest alternative hierarchies where the metonymy under analysis might fit. Its structure and the problems encountered in its completion are the same as in the field *Hierarchical Level*.

The actual application of the two fields to the metonymies in our corpus has raised a few problems, which has led us to the development of a number of criteria to ensure consistency in the completion of the fields. Apart from addressing the potential problems raised by the tripartite Generic level and its application, which will be discussed in Sections 3 and 4, those criteria deal, among other issues, with the type of hierarchy to be recognized (taxonomic rather than meronymic) and with the decision to assign a major hierarchical level or a sub-level to the

2. The inadequate label of this field was introduced in the deeper MsSQL database by one of our technicians (due to a misunderstanding of our instructions) and will be replaced by a more adequate label such as *Alternative Hierarchies* before making the digital database public.

metonymy under analysis. For a discussion of these criteria, see Barcelona (2018). In the rest of the chapter we deal exclusively with the problems affecting the Generic level.

3. Challenges to the tripartite generic typology in recent research on metonymy : A brief discussion

The generic tripartite typology of metonymy into WHOLE FOR PART, PART FOR WHOLE and PART FOR PART is a theoretical issue and also a practical classificatory issue. There have been some proposals to reduce this typology, as we see below.

Metonymies could be classified without appealing to any purported whole-part connection between metonymic source and target as a generic classificatory criterion. Metonymy is, after all, the strong mental activation of a target concept by means of a source concept with which it bears a privileged experiential association (Barcelona, 2011). More precisely, since metonymies operate within frames or ICMs (Barcelona, 2011; Kövecses & Radden, 1998; Panther & Thornburg, 2018; Radden, 2018), the conceptual elements that are actually connected by metonymy are the more or less abstract *roles* source and target perform within a frame (EFFECT-CAUSE, CATEGORY-MEMBER…). Therefore, metonymies could simply be classified in terms of a number of role connections like these, and the more abstract tripartite "generic" classification traditionally employed even in cognitive linguistics could be dispensed with.

However, the traditional use of that generic classification, despite its shortcomings, has the advantage of underscoring a property supposedly shared by each of the three generic types. Therefore, before hurrying to reduce or dismiss it, we should ask ourselves these questions: Is there any serious cognitive or semantic basis for regarding a concept as a metaphorical whole that includes another concept, which would then be one of its metaphorical parts? Is there any serious basis for regarding two concepts as parts of another concept that would metaphorically be a whole with respect to them? The answer, in my view, is positive. The pervasive overarching metaphor ABSTRACT ENTITIES ARE PHYSICAL ENTITIES maps physical entities and their properties, *including their whole-part structure*, onto abstract notions. Despite its limitations (Barcelona, 2011; Panther and Thornburg, 2018; Bierwiaczonek, 2013), Peirsman & Geeraerts' (2006) prototype approach to metonymy can actually be seen as an attempt at accounting for the metaphorical extension, in metonymy theory, of the domain of spatial and material whole-part structure onto increasingly more abstract domains. Proposing such metonymies as PART OF AN EVENT FOR THE WHOLE EVENT, as in *They stood at the altar* (Kövecses & Radden, 1998, p. 52), involves treating a "complex" event as a

metaphorical whole consisting of a number of metaphorical parts, i.e., a set of relatively "simpler" sub-events. Even the proposal of metonymic patterns connecting spatial parts and wholes, such as (SPATIAL) WHOLE FOR (SPATIAL) PART (illustrated by Peirsman & Geeraerts, 2006, p. 280 by means of such examples as *I took up the telephone* for "I picked up the receiver") presupposes the *schematization* and *abstraction* of the *conceptual* frame or ICM called "Thing-and-part ICM" by Kövecses and Radden (1998, p. 50) over many individual concrete, physical entities with distinct parts (like telephones and countless other physical entities); the above metonymy actually connects the abstract notion "whole of a physical entity" with the abstract notion "part of a physical entity".

The metaphor ABSTRACT ENTITIES ARE PHYSICAL ENTITIES is not arbitrary but motivated by the partial mapping of experiential physical knowledge onto the conceptualization of abstract experience, in many cultures and languages, including English. This makes it a useful metaphor to think and talk about certain conceptual operations (metonymy among them), and the tripartite typology a potentially useful classificatory scheme for metonymy at a very high ("generic") level of abstraction. The main objections to this typology are, unsurprisingly, not aimed at eliminating it completely, but at reducing it to render it more descriptively adequate.

At the risk of oversimplification, the various positions on the issue can be summed up as follows. Lakoff and Johnson (1980) and most cognitive linguistic researchers on metonymy, among them Kövecses and Radden (1998), Barcelona (2011), or Bierwiaczonek (2013), do not question the tripartite distinction into WHOLE FOR PART, PART FOR WHOLE and PART FOR PART. Others, notably Ruiz de Mendoza and his associates (Ruiz de Mendoza, 2000; Ruiz de Mendoza & Pérez, 2001; Ruiz de Mendoza & Galera, 2014), reduce the types to just two, namely WHOLE FOR PART and PART FOR WHOLE. Finally, others reduce the types to PART FOR WHOLE, but only from an "intensional" perspective (Panther & Thornburg, 2018).

3.1 The proposal by Ruiz de Mendoza and his collaborators to reduce the typology to WHOLE FOR PART and PART FOR WHOLE

Ruiz de Mendoza and his collaborators (RM&C) view metonymy as consisting of two alternative operations, which they call "domain expansion" and "domain reduction". In the former, the activation of one conceptual sub-domain, the source, leads to the activation of a larger conceptual domain, the target, that includes the source. In the latter, the activation of a domain leads to the activation of a smaller conceptual domain, the target, included in the source. In the first type of operation, we have what RM&C call "source-in-target"

metonymies; in the second type of operation, we have what they call "target-in-source" metonymies. RM&C obviously reason in terms of the metaphor ABSTRACT ENTITIES ARE PHYSICAL ENTITIES motivating the tripartite typology. So-called SOURCE-IN-TARGET metonymies are actually PART FOR WHOLE metonymies, whereas TARGET-IN-SOURCE metonymies are actually WHOLE FOR PART metonymies.

Since domain expansion / reduction are the only two types of metonymic operations recognized by RM&C, only two main types of metonymy are recognized in their model, PART FOR WHOLE and WHOLE FOR PART. RM&C reject the existence of PART FOR PART metonymies, because to them, the metonymies that are claimed in the literature to represent the PART FOR PART type are actually either

a. Misclassified instances of their two basic types, or
b. Instances of double metonymy.

A classic example used by them to illustrate claim (a) is *The ham sandwich is waiting for his bill*, which manifests a metonymy that has been variously called FOOD FOR CUSTOMER or ORDER FOR CUSTOMER in the literature, among other labels. Incidentally, this is one of the conceptual metonymies that Kövecses and Radden (1998, p. 58) regard as involving "indeterminate relationships", which means that they are not easily amenable to just one general (generic-, or high- or basic-level) metonymic pattern (they suggest that POSSESSOR-POSSESSED, PART–WHOLE and other relationships may also be involved). As Kövecses and Radden say, this is quite a frequent phenomenon (and this is, by the way, one of the reasons why the database entry model described in Section 2 features one field to register alternative metonymic hierarchies for the same conceptual metonymy). However, the general (basic-level) pattern this metonymy probably responds to most clearly is ORDER FOR CUSTOMER, considering the features of the RESTAURANT frame (the corresponding higher-level metonymy would be GOODS FOR CUSTOMER). RM&C argue (especially in Ruiz de Mendoza & Pérez, 2001) against Taylor (1995, p. 123) that this metonymy does not respond to the PART FOR PART generic type, because the order placed is part of our CUSTOMER ICM or frame, the metonymy thus responding to the PART FOR WHOLE type. Ruiz de Mendoza and Pérez (2001), additionally, argue that the FOOD ORDER (including both the linguistic order for food and the food consequently prepared and served) is as much a part of the CUSTOMER sub-frame within the more complex RESTAURANT frame as the clothes and other features or properties supposedly manifested by the customer. They offer an example like *The fur coat has left without paying*, which could be uttered by a waiter to refer to a particular customer wearing that coat, and where a salient

property (a "PART") of the customer, namely her clothing, is used to activate and refer to the customer herself.

But in the RESTAURANT frame the FOOD ORDER is one of the central roles structuring the frame, together with the premises, the menu, the various types of staff, the customers, the prices and the bill, etc. The customer's clothing (except, perhaps as part of the dressing code for *certain* restaurants) does not play a central role in the frame. So, even if there are grounds for regarding the FOOD ORDER as part of the specific conceptual frame for CUSTOMERS, these two entities are better regarded as performing clearly distinct roles, and to view the metonymic activation of the customer by the food order as operating in virtue of their prominent connected roles within the overarching RESTAURANT frame. The customer role is a complex frame-specific role[3] that gathers a bundle of more general "thematic roles" or "role archetypes" (Langacker 1999, p. 24), such as CAUSATIVE AGENT (of the linguistic action leading to the action chain including the registration of the order, the food preparation and delivery and the billing), BENEFICIARY (of that action chain), GOAL and RECEIVER (of the food and the bill) and SOURCE and AGENT (of the payment transferred to the relevant receiver –waiter, cashier, bank account). The linguistic FOOD ORDER is connected, as a prominent role, to the CUSTOMER via the above-mentioned action chain and is also a frame-specific role within the RESTAURANT frame; at the same time, it manifests one or more thematic roles, such as CONTENT of the customer's triggering linguistic action, EFFECTED PATIENT (if the order is registered in writing or by other means), and possibly others. The FOOD ordered (metonymically connected to the previous linguistic order) is also a frame-specific role performing a bundle of such thematic roles as EFFECTED PATIENT (due to food preparation), THEME (when transferred to the customer), PATIENT (subjected to consumption) and others. Since the RESTAURANT frame incorporates the COMMERCIAL TRANSACTION frame, to the above role complexity of CUSTOMER and FOOD ORDER we should add their corresponding specific roles in the COMMERCIAL TRANSACTION frame (at least BUYER and GOODS). None of the role prominence and complexity attached to CUSTOMER and FOOD ORDER *within the RESTAURANT frame* can be predicated of the customer's clothing.

The specific CUSTOMER and FOOD ORDER concepts somehow presuppose each other (the notion of restaurant customer presupposes the food she orders and vice-versa) due to their respective distinct but connected roles within the larger RESTAURANT frame. Therefore, there are also grounds for regarding the CUSTOMER

3. What we call "frame-specific roles" here correspond to what are called "Frame elements" in FrameNet (https://framenet.icsi.berkeley.edu/fndrupal/).

role as somehow included by the specific FOOD ORDER frame, and, consequently, for regarding the metonymy in the *ham sandwich* example as WHOLE (FOOD ORDER) FOR PART (CUSTOMER). We will discuss this issue in Section 4.

RM&C's best argument for their binary generic typology is their "domain-availability principle" (DAP). To them, the more inclusive frame or domain, i.e., the "whole", is what they call the "matrix" domain. The DAP stipulates that "whenever a metonymic noun phrase occurs in a sentence, only the matrix domain is available for anaphoric reference" (Ruiz de Mendoza & Pérez, 2001, p. 351). But the problem is that the matrix domain is identified on the basis of its availability for anaphoric reference, so that the reasoning seems somehow circular. They offer examples like (1)

(1) *The ham sandwich is* ***waiting for his bill*** *and he (*it) is* ***getting restless****.*

RM&C claim that the cause for the unacceptability of *it* as an anaphor for *ham sandwich* is that the matrix domain (i.e., the whole) is the metonymic target CUSTOMER, which is hard to refer back to by means of an inanimate anaphoric noun phrase (*it*), the "part" or subdomain then being the FOOD ORDER.

In my view, the highly relevant DAP proposed by RM&C (which has helped them to insightfully describe and attempt to explain certain aspects of the linguistic behavior of high- and low-level metonymies; see Ruiz de Mendoza & Galera, 2014), should be interpreted as a requirement for the *topic prominence* of the antecedent of an anaphor. That is, the target (T) or source (S) of a metonymy must be marked as topically prominent -therefore, as preferably accessible- by means of syntax (e.g., by assigning subject status to a phrase coding it) and / or by its occurrence in a discourse context strongly triggering (or at least not blocking) its mental activation, if it is to become the prime candidate for anaphoric reference (especially if the anaphor is a personal pronoun, given the semantic schematicity of these pronouns). In (1), the target CUSTOMER is strongly triggered by the cognitive context activated by the syntactic predicates (which I have set in boldface).

If the context shifts to one clearly triggering the opposite element (T or S) in the metonymic relation, and / or if an anaphoric noun phrase clearly triggering that opposite element is used, then this opposite element may become available for anaphoric reference:

(2) *The ham sandwich is* ***waiting for his check*** *because he (*it)* ***has already eaten*** *it / the food* (*him / *the customer)

In this example, the context, up to *eaten*, triggers the target CUSTOMER. But the context triggers the *source* FOOD after *eaten*; the source is also clearly triggered by

the full anaphoric noun phrase *the food* in a possible variant of this sentence; the variant with the anaphor *it* after *eaten* seems stylistically and communicatively less felicitous.

(3) *The ham sandwich has* ***complained*** *because it* (**he*) ***tasted horribly***.

In (3) the context triggers the target up to *complained* but it triggers the source thanks to *tasted horribly*, thus favoring the anaphor *it* as a somewhat "sloppy" subject of "tasted".

If the matrix or whole is solely or mainly determined on the basis of its availability as the antecedent of an anaphor, then, depending on the particular context of the application of the *same* conceptual metonymy (FOOD ORDER FOR CUSTOMER), the whole or "matrix" would be the metonymic target or the metonymic source; this makes it difficult to classify the metonymy at the generic level as either PART FOR WHOLE or WHOLE FOR PART.

The DAP seems to be somewhat more effective as a clue to determine the supposed WHOLE FOR PART (or "matrix domain for subdomain") status of RULER FOR ARMY (a type of CONTROLLER FOR CONTROLLED metonymy) and similar metonymies. This is their example (Ruiz de Mendoza and Pérez, 2001, p. 351), with the addition of my comments in brackets and a question mark before *it*:

(4) *Clinton* ***attacked Iraq*** (source- and target-triggering context; source is subject) *and he /?*it* (= the air force) ***killed thousands of civilians*** (source- and target-triggering context).

There does not seem to be an adequate context uniquely triggering the metonymic target (presumably the UNITED STATES AIR FORCE) as the antecedent of *it*, in part because *Iraq* is a "rival" antecedent for that non-personal pronoun; and in part because the predicate *killed … civilians* does not uniquely trigger the target UNITED STATES AIR FORCE, since the killing of civilians, though executed by the air force, is known to be ordered by the President, who is, therefore, responsible for that action (the President has the CONTROLLER role over the CONTROLLED Air Force). The use of *it* for UNITED STATES AIR FORCE thus seems stylistically odd or "sloppy", if not plainly unacceptable. Examples like this one seem to lend support to RM&C's claim that the matrix domain is the U.S. PRESIDENT, which then becomes almost exclusively available for anaphoric reference. Let us now examine example (5):

(5) *Bush* ***attacked Baghdad*** (source- or target-triggering context; source is subject). **?It / He* ***dropped hundreds of bombs on the population*** (source- or target-triggering context).

This example is similar to (4). But let us examine these other examples:

(6) *Bush* ***attacked Baghdad*** (source- or target-triggering context; source is subject). *They* ***dropped hundreds of bombs on the city*** (context triggers target more strongly than source; target-matching subject anaphor, since the target, the AIR FORCE, is a *collective* entity, which picks that unmentioned metonymic target as antecedent).

(7) *Bush* ***attacked Baghdad*** (source- or target-triggering context; source is subject). *The bombers / The pilots* ***dropped hundreds of bombs on the city*** (context triggers target more strongly than source; plural target-matching anaphors in both options – *the bombers* and *the pilots* – since the target, the AIR FORCE, is a *collective* entity, which picks that unmentioned metonymic target as antecedent).

The target-matching anaphor *they* in (6) is an instance of so-called "sloppy" anaphors, which are, however, easily interpretable thanks to metonymy and encyclopedic knowledge. The target-matching anaphors *the bombers* and *the pilots* in (7) connect to their implicit antecedents, namely, the U.S. Air Force bombers and pilots that participated in the attack, by means of a "bridging inference" (Clark, 1977) that connects them, as salient elements ("parts"), to the unmentioned AIR FORCE notion, already active as the target of the RULER FOR ARMY metonymy in the first sentence of these examples.[4]

According to the DAP, the matrix ("whole") of the RULER FOR ARMY metonymy is the target in examples (6) and (7), whereas it is the source in examples (4) and (5).

RM&C's other major claim, namely that PART FOR PART metonymies are misclassified instances of double metonymies (or metonymic chains; Barcelona 2005) featuring some combination of WHOLE FOR PART or PART FOR WHOLE patterns, is represented by their analysis (Ruiz de Mendoza & Mairal Usón, 2007, p. 40) of an example like *Proust is in the top shelf* as a chaining of WHOLE (AUTHOR) FOR PART (LITERARY WORK) FOR MEDIUM/FORMAT (WHOLE). In their terminology, this double metonymy would involve "domain reduction" plus "domain expansion". I agree that a metonymic chain is required to account for the meaning of the example. But it is not obvious, for reasons similar to those given above with respect to the FOOD ORDER FOR CUSTOMER metonymy, that the AUTHOR *necessarily* should be regarded as a whole with respect to her / his work or the other way around. Rather AUTHOR and WORK seem to be two connected salient elements of a complex frame (the

4. Barcelona (2013) argues that bridging inferences and other types of indirect anaphora (Emmott, 1999), including "sloppy anaphors", are guided by metonymy and encyclopedic knowledge. In the example, the *additional* metonymy guiding the bridging inferences is PART FOR WHOLE (of the AIR FORCE frame). In indirect anaphora, the antecedent is not verbally explicit but purely conceptual.

PRODUCTION frame or ICM; see Kövecses and Radden, 1998, pp. 56–57). However, as also suggested above in relation to FOOD ORDER FOR CUSTOMER, the source and the target figure in the conceptual representation of each other: The conceptual network for the AUTHOR notion presupposes that of the author's work. In Langacker's cognitive grammar (see e.g., Langacker, 1999), the work would be part of the *base* on which the author notion is profiled. The same could be said about the WORK notion with respect to that of AUTHOR, i.e., that the latter is part of the base on which the former is profiled. So, in a sense, the source and the target somehow "include" each other. Therefore, if the WHOLE-PART submapping of the ABSTRACT ENTITIES ARE PHYSICAL ENTITIES metaphor is to be used fruitfully in metonymy description, we need to specify precisely the technical sense in which these metaphorical terms will be used in metonymy description. I will attempt to do so in Section 4.

RM&C's proposal has the advantage that it allows these scholars to propose a systematic basic typology of metonymy chains or "double metonymies", in their terminology: double domain reduction, double domain expansion, domain reduction plus domain expansion, and domain expansion plus domain reduction (see e.g., Ruiz de Mendoza, 2014 for details). It is also a serious attempt at systematically accounting for the constraints on metonymy-guided anaphoric reference. Its weakness, in my view, is the absence of reliable, independently established (i.e., non-circular) criteria for determining the "matrix" (i.e., "whole") status of the domains involved in a metonymic relation, since availability for anaphoric reference has been argued above not to be a reliable criterion, and since the arguments offered to back the purported cognitive inclusion of certain domains by others (e.g., of FOOD ORDER by CUSTOMER, or of WORK by AUTHOR) do not seem conclusive.

3.2 Panther and Thornburg's proposal to reduce the typology to PART FOR WHOLE from an "intensional" perspective

In this proposal, the metaphoric "part" is the meaning or conceptual representation of the metonymy's source, and the metaphoric "whole" is the full meaning or conceptual representation guided by metonymy.

Panther and Thornburg (2018) (P&Th henceforth) claim that, from an "intensional" perspective, all metonymies are of the type CONCEPTUAL PART FOR CONCEPTUAL WHOLE. This claim is consistent with their view of metonymy as a natural inferential schema, thus a "means of semantic enrichment or elaboration" (Panther, 2006, p. 154; see also Panther, 2005; Panther & Thornburg, 2007). The source meaning is elaborated, thanks to metonymy, into the target meaning, which includes the source's conventional meaning. Therefore, whereas RM&C distinguish between "domain reduction" metonymies, i.e., WHOLE FOR PART, and

"domain expansion" metonymies, i.e., PART FOR WHOLE, P&Th only recognize the latter type, at least from an "intensional", i.e., conceptual, perspective. They illustrate their position with this example:

(8) *Wall Street is in panic*

Ruiz de Mendoza and Galera (2014, p. 120) analyze (8) as an instance of double metonymic reduction, involving the metonymic chain PLACE FOR INSTITUTION FOR PEOPLE, where Wall Street is a place and matrix domain (a "whole") including the New York Stock Exchange (NYSE) -the institution-, which is in turn the matrix domain (a smaller "whole") including the NYSE brokers –the people (who are in panic). That is, the example is analyzed as a chain of two WHOLE FOR PART metonymies.

By contrast, P&Th simply consider the "whole" or "part" status of source and target in the enriched meaning resulting from the metonymic operation. Since this enriched meaning coincides with the target meaning, which includes the source's meaning, they analyze the metonymy in (8) as involving "conceptual elaboration or expansion" by means of a chain of two PART FOR WHOLE metonymies, involving two increasingly complex targets:

> SOURCE (Wall Street is in panic) → TARGET 1 (The NYSE located on Wall Street is in panic) → TARGET 2 (The brokers working at the NYSE located on Wall Street are in panic).

The conceptual representation of Target 1 includes the source and is included in the conceptual representation of Target 2. As P&Th point out, the meaning of the source becomes somehow "blended" with that of the final target. What P&Th do is to compare the "literal" proposition expressed by the sentence (example 8) that includes an expression (*Wall Street*) of the source domain (LOCATION) with two propositions that are inferred thanks to the metonymic connection between the source (a location) and a salient entity located in it (an institution in this case), and by the metonymic connection of that institution to the staff located in it. The final proposition is obviously more complex than the initial proposition in the chain, and metaphorically "includes" it as a "part".

Radden (2018) puts forth a similar proposal, which also looks at the full conceptual representation invited by the metonymic operation in conjunction with other factors. To him, the source is included in what he calls the "complex target", which also includes the source, as well as what he calls the "inferred" target, and the inferred metonymic relation between the source and the inferred target. In his example *Molly married money*, intended as "Molly married a man with money", the source, expressed by means of the vehicle expression *money*, activates the POSSESSOR of the money. But this inferred target is not the real complex target

achieved in conjunction with the MARRIAGE ICM cued by *married*. This complex target could be paraphrased as "a man with money". That is, this complex target includes the source and the inferred target and is thus a metaphorical "whole" with respect to the source, and within which Radden, 2018 (R), similarly to P&Th, argues that the source conceptually blends with the inferred target. Despite this similarity between P&Th's and R's proposals, R does not claim explicitly that all metonymies are intensionally PART FOR WHOLE.

The particular application in both proposals of the whole-part submapping of ABSTRACT ENTITIES ARE PHYSICAL ENTITIES to the description of metonymy is not incompatible with one that applies the metaphor to the status of source and target with respect to each other, *prior to* their actual involvement in a metonymic operation; for example, to the status of causes with respect to effects, or of institutions with respect to their members. P&Th and R simply claim that the target meaning of a metonymic proposition is more complex than its source meaning, which leads P&Th to claim explicitly that, from that "intensional" perspective, metonymies are only PART FOR WHOLE. But this does not mean that, from the perspective of the conventional meronymic relation of source to target, metonymies cannot be classified at the generic level into the three traditional types, provided this classification is carried out on the basis of systematic criteria. We turn to these criteria in the next section.

4. Criteria applied in the database to determine Whole and Part status at the generic level of a hierarchy

Since the arguments discussed above for reducing the traditional tripartite generic typology of metonymy have been found insufficient, we have maintained the traditional tripartite typology in our database. In this section, I present the main criteria to be followed in the application of that typology to the metonymies registered in the database.

4.1 Preliminaries

The most influential basic classification of metonymies within cognitive linguistics to date, namely the one proposed by Kövecses and Radden (1998), also maintains this traditional distinction into WHOLE FOR PART, PART FOR WHOLE and PART FOR PART. The two reasons why we have kept it are, on the one hand, the lack of a better alternative and, on the other hand, its adequacy to capture the relative status of source and target in terms of the submapping of physical whole-part structure onto abstract structure within the metaphor ABSTRACT ENTITIES ARE PHYSICAL ENTITIES.

However, if later research showed convincingly that this generic typology should be replaced by a different one, or that the whole-part submapping should not be used at the generic level of metonymic hierarchies, or even that the generic level should be dispensed with altogether, our database would easily accommodate these changes and other changes in every entry, given its flexible design.

As stated in Section 2, metonymies are assigned to a hierarchy in the "Hierarchical Level" field of the database entries. This entails assigning them to one of the three generic types according to the criteria to be presented in Section 4.2. The database entries for the metonymies included in alternative generic typologies (especially RM&C's bipartite typology) by the linguists whose metonymies are registered in the database will include those alternative hierarchies in the entry field provisionally called "Other Hierarchical Levels", noting, in the "additional remarks" area of the field, that this is the hierarchy proposed by these linguists.

We have had to develop the criteria presented in Section 4.2 because we needed a set of uniform criteria in the completion of the two fields concerned with metonymic hierarchy and because most of the linguists whose proposed metonymies are registered in the database do not normally classify these metonymies at the generic level, which forces us to provide that classification in the corresponding entry.

The criteria do not solve all the theoretical problems affecting the tripartite typology. But they do constitute a principled strategy to decide about the generic type a metonymy seems to belong to. As such, they are systematic and explicit enough to help us apply the tripartite typology with confidence in the completion of the entries, especially in doubtful cases such as the instances of "assorted ICMs involving indeterminate relationships" (Kövecses & Radden, 1998, p. 58).

4.2 The criteria

These criteria are presented as "rules" in a decision procedure.

Rule 1

Observe the description of the metonymy at a lower (i.e., below generic) level (High, Basic, Low).

This description (provided that description is adequate)[5] is entered in the "Category label" field of the database, and it helps us determine the specific frame

5. This is one of the problems that affect that field. It is dealt with in the constantly updated unpublished internal-use document "Analytical criteria in entry completion and revision", composed and periodically revised by Antonio Barcelona.

roles of source and target as a first step to decide whether their connection is part–whole or part-part. In other words, we have to know whether the lower-level metonymic connection is, for example, between an entity (e.g., Zinedine Zidane) and a salient property of that entity (EXCELLENT SOCCER PLAYER).

Rule 2

Decide on the status of the physical or abstract "things" connected by the metonymy, i.e., its source and its target, in terms of the notions "whole" and "part".

In the context in which the linguistic expression (or an expression in other expressive modes such as visual art, music, gesture, etc.) is used, which one is a whole in relation to the other? Which one is a part in relation to the other? Or is neither of them a whole or a part in relation to the other and each of them is, rather, a part of a "larger" (i.e., more complex) whole "including" source and target (PART FOR PART)?

In the determination of the "whole" or "target" status of the metonymic source or target, we should attend *only* to the conventional *meronymic knowledge* about an individual or a collective entity. This strictly meronymic knowledge is part of the normally richer knowledge about the relational network involving the entity, i.e., "frame" or "script" knowledge.

Returning to the RESTAURANT frame example discussed in Section 3. This frame is, by the way, one of the ICMs that Kövecses and Radden (1998, p. 58) include in their set of "assorted ICMs involving indeterminate relationships". The meronymic or partonomic hierarchical structure of a restaurant includes such parts as the dining room(s), the counter(s), the tables and chairs, the meals, the food orders, the staff, the customers, etc. Each of these parts also has its own conventional meronymy: The tables have a board and a set of legs, etc.[6] The customers are (typically) individual human beings and they include such parts as their body and their physical or abstract properties, but not the food orders they place or the meal they consume. Nor are the customers a part of their meal or their food order (the latter might at most include the customer' name or code). However, the role relation between customers, food orders or meals is included in the detailed knowledge about the relational network involving these three entities, i.e., the restaurant "frame" or "script". This is why the complete frame-based knowledge about restaurant customers includes a slot for the meal consumed and the food order;

6. Conceived meronymic structure interacts inextricably with prototype categorization. The meronymic structure of non-prototypical category members is often different from that of the prototype. However, metonymy normally exploits the meronymic structure of prototypical category members.

and the other way around, the complete frame-based knowledge about restaurant meals includes a slot about the customer ordering and / or consuming it. But this does not mean that meals are an element in the meronymy of customers or vice versa. Hence, in terms of Rule 2, the generic-level typology to assign to a metonymy connecting them should not be PART FOR WHOLE or WHOLE FOR PART, but PART FOR PART, because both are role-connected, but mutually independent, elements or "parts" of the RESTAURANT frame.

Since metonymy normally exploits only widely shared meronymic knowledge, in many cases the researcher completing the entries only has to mine her / his own knowledge of the meronymic hierarchy involved and check the corresponding decision with another team member. A useful basic guide for this purpose is Kövecses and Radden (1998, Section 2), which classifies a number of basic high-level metonymies in terms of the tripartite generic typology. The account presented in Peirsman and Geeraerts (2006) may be a supplementary guide; it is compatible with a tripartite generic typology, since next to "Whole and part" configurations, it features basic metonymy-generating configurations like "containment", "contact", and "adjacency" that lend themselves to the "part and part" metonymic relationship.

In the cases in which the researchers are still uncertain about the meronymic status of source vis-à-vis target they must proceed to Rule 3.

Rule 3

This rule consists of a number of sub-rules.

Sub-rule 3a: Search for additional information on the relevant meronymy

Thesauruses, specialized dictionaries (medicine, computer science, etc.) and other resources, including the Internet, can be consulted for this purpose. For example, if a linguist claims that the noun phrase *the bypass* is metonymically used to designate a type of medical patient without suggesting a conceptual metonymy category for it (that is, without providing the information required by the "Metonymy category" field), we may have to investigate the meaning of the noun *bypass* in medical English before rushing to assign the metonymy to one particular metonymy category at any hierarchical level in the corresponding database entry. This investigation will tell us that the relevant meaning is "an operation in which a new pathway is created for the transport of substances in the body".[7] So if a nurse refers to a

7. http://www.medicinenet.com/script/main/art.asp?articlekey=11058 (last accessed October 4, 2017).

patient as *the bypass in room 6*, she connects an action to a person affected by that action (ACTION FOR PATIENT). Is the semantic patient a part of the action? This is a difficult question that we will try to answer below. But it is clear that the action, i.e., the bypass operation as such, is *not* a part of the patient. The other medical sense of the noun *bypass* designates the new passage so created surgically and it is metonymically connected to the "operation" sense via RESULT FOR ACTION.[8] The same problem arises: Is the result a part of the action or vice-versa? Again, we will try to answer it below in relation to other examples. Whichever medical sense of *bypass* is considered, i.e., the action or the result sense, if *bypass* in *The bypass in room 6* is interpreted as mentioning a *property* of the hospital patient ("the patient having had a bypass operation", or "the patient with the resulting alternative (artificial) blood passage"), the metonymy might then be regarded as SALIENT PROPERTY FOR CATEGORY / ENTITY. If properties of things were considered to be metaphorical parts of things, then we would have a case for regarding this metonymy as PART FOR WHOLE.

As can be seen, this additional investigation on the relevant meronymic structure may raise the issue of the meronymic structure of fairly abstract domains. This issue is the object of Sub-rule 3b.

Sub-rule 3b: *Determine the meronymic structure of abstract sources and targets*

The main difficulty to apply Rule 2 easily is the abstract nature of many domains and frames. In these cases, it is more difficult to assign "whole" or "part" status to the abstract "things". The decision depends on two additional sub-rules:

Sub-rule 3b-1: *Distinguish between frames and frame elements, especially when the same term is used to designate both*

For example, the term *action* can be used to designate both the ACTION frame or ICM and one of its frame elements. We follow here Kövecses and Radden (1998, pp. 54–55) on what they call the "Action ICM". This is a fairly general frame or ICM. In this respect, I reproduce below what they say (p. 54) about the PART-AND-PART conceptual configuration of this frame:

(…) while the relationship between a whole and its parts typically applies to things, the relationship between parts typically applies to conceptual entities within an event ICM. Events as a whole are far less clearly delineated than things, but

8. This passage can be seen as a new artificial part of the patient. Under this conceptualization, the metonymy would clearly be (physical) part for (physical) whole.

internally they are made up of a small number of conceptual entities as their parts. Their most important conceptual entity, the relation or predicate, is, moreover, not conceptually autonomous but dependent. Hence, the most natural manifestation of the PART-AND-PART configuration appears to be the relationship between the relational entity and one of the participants of an event ICM. These also constitute some of the types of relationship that may give rise to metonymy. (…) Action ICMs involve a variety of participants which may be related to the action (more exactly, the predicate expressing the action) or to each other. There are, thus, specific relationships such as those between an INSTRUMENT and the ACTION, the RESULT of an action and the ACTION, an OBJECT INVOLVED in an action and the ACTION, the DESTINATION of a motion and the MOTION, all of which are parts of the action ICM. The action ICM (…) is also taken to include events of motion, (…).

Consequently, they propose (pp. 54–55) a number of metonymies arising within this ICM: INSTRUMENT FOR ACTION, AGENT FOR ACTION, MANNER OF ACTION FOR ACTION, ACTION FOR AGENT, ACTION FOR OBJECT INVOLVED IN THE ACTION, RESULT FOR ACTION, etc. and then (pp. 55–58) they deal in similar terms with other very general event frames (INTENTIONAL PERCEPTION, CAUSATION, PRODUCTION) and with other very general state frames typically involving a stative relation between two entities (NON-INTENTIONAL PERCEPTION, CONTROL, POSSESSION, CONTAINMENT). All of them can give rise to PART-FOR-PART metonymies such as PRODUCER FOR PRODUCT, CONTAINER FOR CONTAINED, etc. We find Kövecses and Radden's proposal quite convincing. If the metonymic use of *bypass*, as discussed above, were categorized as an instance of ACTION FOR PATIENT, this would then be a PART FOR PART metonymy. If, however, it was categorized as an instance of SALIENT PROPERTY FOR CATEGORY, then the metonymy would be PART FOR WHOLE at the generic level (see sub-rule 3-c below).

Sub-rule 3b-2: *Observe the degree of "strength of contact"* (Peirsman & Geeraerts 2006) *between source and target in concrete or material domains, and the degree of "strength of conceptual connection" between source and target in abstract domains*.

As regards physical entities like an island or an object, the degree of "strength of spatial contact" and at the same time the degree of "strength of conceptual connection" between a real spatial whole and its parts is maximal, so that the whole is "mutilated", or, in extreme cases, transformed into a different type of entity or even destroyed, if one of its parts is detached from it. If the mass of land designated by the proper noun *England* were physically removed from the island designated by the proper noun *Great Britain*, the resulting island would be severely "mutilated" and would no longer properly correspond to the conventional description of the

referent of its name. Or if a bicycle were deprived of its two wheels it would also be mutilated or "destroyed" as a bicycle, i.e., it would be less easy to conceptualize the remaining object as a "real" bicycle. If a china jug were smashed into pieces, its essential "part" (the bounded amount of material substance constituting it, i.e., the bounded amount of china constituting the jug) would be spatially "dispersed" and no longer bounded into one spatially delineated physical object – the jug would be destroyed and become a group of heterogeneous small china pieces,[9] that group of china splinters would not be easy to correctly conceptualize as a real china jug any more.

As regards abstract "things", the usual combination of strength of spatial contact and strength of conceptual connection observable in physical wholes no longer exists because there is no real spatial contact between an abstract (purely metaphorical) whole and its parts. The whole is only connected to its parts conceptually. However, we can observe some parallelism between spatial wholes and abstract wholes. The strength of conceptual connection between an abstract whole and its parts is maximal, so that the whole is "mutilated", or, in extreme cases, transformed into a different type of entity or even destroyed, if one of its parts is detached from it. Take Kövecses and Radden's (1998, p. 50) example of the metonymic use of the expression *ballot* to activate the notion "democratic voting", and, through the latter, the notion of "democracy", as in an authentic sentence[10] like *The President would be elected on the basis of universal, equal and direct suffrage by secret ballot for a five-year term* (in that text, the secret character of a democratic voting is made explicit). In that example and in the sentence *A Declaration Committee was set up to organize a ballot on the British attitude to the League of Nations* (another authentic example taken from the British National Corpus; last accessed July 16), the noun *ballot* designates the abstract notion "use of a ballot in voting", which has been further extended to the more general abstract notion "use of a legal instrument to vote, such as a ticket, a voting paper, etc. *secretly and freely*" (see definitions 1 and 2 of noun *ballot* in the Oxford English Dictionary, 2nd edition; in its basic sense *ballot* designates a physical object, initially a small ball, used in voting). This abstract notion is an indispensable element of the broader abstract notion "democratic voting", to the point that if that element is missing, we can no longer accurately conceptualize an event as an instance of democratic voting. It is missing if the voters are forced to declare their vote verbally and publicly instead

9. To Peirsman and Geeraerts (2006), a high degree of strength of contact normally correlates with a high degree of the spatial boundedness of a physical whole.

10. Retrieved from the BNC by means of the Sketch Engine software. Last accessed July 16, 2018.

of secretly choosing a ballot corresponding to one of the candidates. Therefore, the abstract whole would be the notion (the frame) DEMOCRATIC VOTING and an essential part of it would be USE OF A LEGAL INSTRUMENT TO VOTE SECRETLY AND FREELY. And the metonymic use of the noun phrase *the ballot* in the two authentic examples above would be a PART FOR WHOLE metonymy at the generic level.

Sub-rule 3c: *Identify the "reference frame / ICM" or "functional domain" within which, or by reference to which, the metonymy occurs*.

There is widespread agreement that metonymy operates "within" frames or (propositional) ICMs; these are also called "functional domains" by Barcelona (2002, 2011). These frames / ICMs are normally registered in the "Metonymic triggers" field of our database entries. This information can also help us decide on the generic-level type of the metonymy being registered. The frame can be a fairly general frame, like the ICMs mentioned by Kövecses and Radden (1998) in their Section 2 (see sub-rule 3b-1 above), but it can also be fairly specific, like the RESTAURANT frame. In many cases, both general and specific frames are involved. An example is the euphemistic sentence *She is in the bathroom*, an instance of the metonymy LOCATION FOR RELATED ACTIVITY. This metonymy operates within the general LOCATION frame, a variant of the CONTAINMENT frame, according to Kövecses and Radden (1998: 58). Two frame elements are connected metonymically, the LOCATION itself and the RELATED ACTIVITY. The selection of the related activity to be included in the target (namely the elimination of bodily waste, a taboo topic) is determined by knowledge of the more specific BATHROOM ICM. The social-communicative principle of avoiding taboo notions is an additional trigger for the use of this metonymy instead of the direct description of the activity.

The identification of the reference frame also determines the generic type to be assigned to the large group of metonymies that connect a category to its properties, especially its salient properties. At the end of our discussion of sub-rule 3b-1, it was suggested that if the example *the bypass is in room 6* is categorized at the "high" level as an instance of SALIENT PROPERTY FOR CATEGORY, its more adequate generic-level categorization should be PART FOR WHOLE, rather than PART FOR PART (the generic-level type covering the alternative high-level analysis of *the bypass* as ACTION FOR PATIENT). The reason is that properties tend to be regarded by speakers as "parts" of things. This "commonsense" view is reflected in Kövecses and Radden's postulation (1998: 53-54) of a "CATEGORY-AND-PROPERTY ICM", where the category is a metaphorical whole, the properties are metaphorical parts, and the metonymic connection between the category and a property (normally a salient or a defining property), is WHOLE (the CATEGORY) FOR PART (the PROPERTY) or PART (the PROPERTY) FOR WHOLE (the CATEGORY).

5. Concluding remarks

This chapter is a contribution to both theory and method in metonymy research. It has briefly described the structure of the entry model applied in the metonymy database that a group of researchers under my leadership has been compiling at the University of Córdoba for a long time. This description had the purpose of contextualizing the detailed discussion of the theoretical and practical criteria to categorize a metonymy at the generic level of the corresponding metonymy hierarchy. An essential element of the discussion has been a careful examination of the proposals to reduce the tripartite generic typology. Arguments have been put forth to dismiss the proposal to reduce it to a binary typology – WHOLE FOR PART and PART FOR WHOLE – and to show that the proposal to reduce metonymy to PART FOR WHOLE from an 'intensional' perspective is not incompatible with the usual tripartite generic classification of metonymy.

The criteria presented in Section 4 will have to be periodically revised as more and more metonymies are added to the database, but so far, they have proved useful to guide our decisions on the generic type instantiated by each metonymy. At the same time, they constitute a theoretical proposal to defend the adequacy of the traditional tripartite generic typology.

References

Barcelona, A. (2002). Clarifying and applying the notions of metaphor and metonymy within cognitive linguistics: An update. In R. Dirven, & R. Pörings (Eds.), *Metaphor and metonymy in comparison and contrast* (pp. 207–277). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110219197.207

Barcelona, A. (2005). The multilevel operation of metonymy in grammar and discourse with particular attention to metonymic chains. In F. J. Ruiz de Mendoza Ibáñez, & S. Peña Cervel (Eds.), *Cognitive Linguistics: Internal dynamics and interdisciplinary interaction* (pp. 313–352). Berlin: Mouton de Gruyter.

Barcelona, A. (2011). Reviewing the properties and prototype structure of metonymy. In R. Benczes, A. Barcelona, & F. J. Ruiz de Mendoza Ibáñez (Eds.), *Defining metonymy in Cognitive Linguistics. Towards a consensus view* (pp. 7–57). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.28.02bar

Barcelona, A. (2013). Metonymy is not just a lexical phenomenon. In C. Alm-Arvius, N.-L. Johannesson, & David C. Minugh (Eds.), *Selected papers from the 2008 Stockholm Metaphor Festival* (Stockholm Studies in English 105) (pp. 13–46). Stockholm: Acta Universitatis Stockholmiensis.

Barcelona, A. (2018). General description of the metonymy database in the Córdoba project, with particular attention to the issues of hierarchy, prototypicality, and taxonomic domains. In O. Blanco-Carrión, R. Pannain, & A. Barcelona (Eds.), *Conceptual metonymy:*

Methodological, theoretical and descriptive issues (pp. 27–54). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.60.01bar

Bierwiaczwonek, B. (2013). *Metonymy in language, thought and brain*. Sheffield: Equinox.

Blanco-Carrión, O. (2018). Conventionality and linguistic domain(s) involved in the characterization of metonymies (for the creation of a detailed typology of metonymy). In O. Blanco-Carrión, R. Pannain, & A. Barcelona (Eds.), *Conceptual metonymy: Methodological, theoretical and descriptive issues* (pp. 55–73). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.60.02bla

Blanco-Carrión, O., Barcelona, A., & Pannain, R. (Eds.). (2018). *Conceptual metonymy: Methodological, theoretical and descriptive issues*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.60

Clark, H. H. (1977). Bridging. In P. N. Johnson-Laird, & P. C. Wason (Eds.), *Thinking: Readings in cognitive science* (pp. 411–420). Cambridge: Cambridge University Press.

Emmott, C. (1999). Embodied in a Constructed World: Narrative processing, knowledge representation, and indirect anaphora. In K. van Hoek, A. A. Kibrik, & L. Noordman (Eds.), *Discourse studies in cognitive linguistics* (pp. 5–29). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/cilt.176.03emm

Hernández-Gomariz, I. (2018). Analysis of metonymic triggers, metonymic chaining and patterns of interaction with metaphor and with other metonymies as part of the metonymy database in the Córdoba Project. In O. Blanco-Carrión, R. Pannain, & A. Barcelona (Eds.), *Conceptual metonymy: Methodological, theoretical and descriptive issues* (pp. 75–93). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.60.03her

Kövecses, Z., & Radden, G. (1998). Metonymy: Developing a cognitive linguistic view. *Cognitive Linguistics*, 9 (1), 37–77. https://doi.org/10.1515/cogl.1998.9.1.37

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: The University of Chicago Press.

Langacker, R. W. (1999). *Grammar and conceptualization*. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110800524

Panther, K.-U. (2005). The role of conceptual metonymy in meaning construction. In F. J. Ruiz de Mendoza Ibáñez, & S. Peña Cervel (Eds.), *Cognitive linguistics: Internal dynamics and interdisciplinary interaction* (Cognitive Linguistics Research 32) (pp. 353–386). Berlin: Mouton de Gruyter.

Panther, K.-U. (2006). Metonymy as a usage event. In G. Kristiansen, M. Achard, R. Dirven, & F. J. Ruiz de Mendoza Ibáñez (Eds.), *Cognitive linguistics: Current applications and future perspectives* (Applications in Cognitive Linguistics 1) (pp. 147–185). Berlin: Mouton de Gruyter.

Panther, K.-U., & Thornburg, L. (2007). Metonymy. In D. Geeraerts, & H. Cuyckens (Eds.), *Handbook of cognitive linguistics* (pp. 236–263). Oxford: Oxford University Press.

Panther, K.-U., & Thornburg, L. (2018). What kind of reasoning mode is metonymy? In O. Blanco-Carrión, R. Pannain, & A. Barcelona, (Eds.), *Conceptual metonymy: Methodological, theoretical and descriptive issues* (pp. 121–160). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.60.05pan

Peirsman, Y., & Geeraerts, D. (2006). Metonymy as a prototypical category. *Cognitive Linguistics*, 17, 269–316. https://doi.org/10.1515/COG.2006.007

Radden, G. (2018). *Molly married money*: Reflections on conceptual metonymy. In O. Blanco-Carrión, R. Pannain, & A. Barcelona (Eds.), *Conceptual metonymy: Methodological, theoretical and descriptive issues* (pp. 161–181). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.60.06rad

Ruiz de Mendoza Ibáñez, F. J. (2000). The role of mappings and domains in understanding metonymy. In A. Barcelona (Ed.) *Metaphor and metonymy at the crossroads: A cognitive perspective* (pp. 109–132). Berlin: Mouton de Gruyter.

Ruiz de Mendoza Ibáñez, F. J. (2014). On the nature and scope of metonymy in linguistic description and explanation: towards settling some controversies. In J. Littlemore, & J. Taylor (Eds.), *Bloomsbury companion to cognitive linguistics* (pp. 143–166). London: Bloomsbury.

Ruiz de Mendoza Ibáñez, F. J., & Galera Masegosa, A. (2014). *Cognitive modeling: A linguistics perspective* (Human Cognitive Processing 45). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.45

Ruiz de Mendoza Ibáñez, F. J., & Mairal Usón, R. (2007). High-level metaphor and metonymy in meaning construction. In G. Radden, et al. (Eds.), *Aspects of meaning construction* (pp. 33–49). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/z.136.05rui

Ruiz de Mendoza Ibáñez, F. J., & Peña Cervel, S. (Eds.). (2005). *Cognitive Linguistics: Internal Dynamics and Interdisciplinary Interaction* (Cognitive Linguistics Research 32). Berlin: Mouton de Gruyter.

Ruiz de Mendoza Ibáñez, F. J., & Pérez Hernández, L. (2001). Metonymy and the grammar: motivation, constraints and interaction. *Language & Communication*, 21(4), 321–357. https://doi.org/10.1016/S0271-5309(01)00008-8

Taylor, J. (1995[1989]). *Linguistic categorization. Prototypes in linguistic theory*. Oxford: Clarendon Press.

CHAPTER 3

Metaphor in the age of mechanical production

(Or: Turning potential metaphors into deliberate metaphors)

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A large repository of familiar linguistic metaphors is also an implicit repository of the knowledge any agent needs to generate and understand novel linguistic metaphors. Moreover, a sufficiently large repository of resonant juxtapositions is a rich source of the potential metaphors that an active imagination can rework and reframe as deliberate metaphors of its own. When using Web data as a knowledge resource for metaphor, it makes sense to think of the algorithms and tools for manipulating this knowledge as services that can be called upon to generate and understand deliberate metaphors on demand. A Web service called MetaphorMagnet that provides this functionality to third-party clients is presented, allowing other applications to exhibit a measure of their own figurative creativity.

Keywords: deliberate metaphors, potential metaphors, web services, Metaphor Magnet, metaphor generation

1. Introduction

Picasso famously claimed that "art is a lie that tells the truth." Fittingly, this artful contradiction suggests a compelling reason for why speakers are so wont to use artfully suggestive forms of creative language – such as metaphor and irony – when less ambiguous and more direct forms are available. While literal language commits a speaker to a tightly fixed meaning, and offers little leeway for the listener to contribute to the joint construction of meaning, metaphorical language suggests a looser but potentially richer meaning that is amenable to collaborative elaboration by each participant in a conversation. In Picasso's terms, a metaphor is

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an artifice that may be literally false (a "lie") but it is one that can better facilitate our access to knowledge.

A metaphor *X is Y* establishes a *conceptual pact* between speaker and listener (Brennan & Clark, 1996), one that says 'let us agree to speak of X using the language and norms of Y' (Hanks, 2006). Suppose a speaker asserts that "*X* is a snake". Here, the stereotype *Snake* conveys the speaker's negative stance toward *X*, and suggests a range of talking points for *X*, such as that *X* is *charming* and *clever* but also *dangerous*, and is not to be *trusted* (Lakoff, 1987; Veale & Hao, 2008). A listener may now respond by elaborating the metaphor, even when disagreeing with the basic conceit, as in "I agree that X can be charming, but I see no reason to distrust him". Successive elaboration thus allows the speaker and listener to arrive at a mutually acceptable construal of a metaphorical *Snake* in the context of *X*. So metaphors are flexible conceits that allow one to express a position while seeking elaboration or refutation of this position from others. Our computational models for the interpretation and elaboration of metaphors should allow speakers to exploit the same flexibility of expression when interacting with machines as they enjoy with other humans. Such a goal clearly requires a great deal of knowledge, since metaphor is a knowledge-hungry mechanism *par excellence* (Fass, 1997). However, much of the knowledge requirered for metaphor interpretation is already implicit in the large body of metaphors that are active in a community (see Martin, 1990; Mason, 2004). Existing metaphors are themselves a valuable source of knowledge for the production of new metaphors, so much so that an agent can acquire the relevant knowledge from corpora of figurative texts (Shutova, 2010; Veale, 2011; Veale et al., 2016).

Metaphors achieve a balance of suggestiveness and concision through the use of *dense descriptors*, familiar terms like "snake" that evoke a dense body of shared knowledge of stereotypical properties and behaviours (Fishelov, 1992). Though every concept has the potential to be used figuratively, casual metaphors tend to draw their dense descriptors from a large pool of familiar stereotypes shared by all speakers of a language (Taylor, 1954). A rich conceptual model of the lexicon is needed to allow the figurative import of these stereotypes to be inferred as needed in context. In this paper we show how a large lexicon of affective stereotypes can be mined from Web content, and further, how affective representations can be used selectively, to metaphorically highlight aspects of a given target concept in a specific metaphor. Because so many familiar stereotypes have polarizing features – think of the endearing and not-so-endearing features of babies, for instance – metaphors are ideal vehicles for conveying an affective stance toward a topic. Even stereotypes that are not used figuratively, as in the claim "Steve Jobs was a great *leader*", are likely to elicit deliberate metaphors (in the sense of Steen 2011, 2015) in response, such as "yes, a pioneer" or "such an artist!" or even "but what a tyrant!".

Proper-names can also serve as dense descriptors, as when Steve Jobs is compared to the fictional inventor *Tony Stark*, or Apple is compared to *Scientology*, or Google to *Microsoft*. Our affective lexicon needs to be a dynamic lexicon, capable of building dense stereotype representations whenever they are needed.

In many ways, a metaphor resembles a *query* in that staple of the information age, *Information Retrieval* (IR). Metaphors, like queries, allow us to simultaneously express what we believe and to elicit further information that may bolster or refute our beliefs. Metaphors, like queries, are very often concise, and require unpacking and expansion to be properly understood and acted upon. An expanded IR query (that is, one in which additional search terms have been added, as when we add "coffee" to a query for "Java" so as to retrieve documents about the beverage and not the programming language) is successful if it leads to the retrieval of a richer set of relevant information sources. Likewise, an expanded metaphor can be considered successful if expansion produces a rich interpretation that consistenty adds to our beliefs about a topic. Of course, there are important differences between metaphors, which elicit information from other humans, and IR queries, which elicit information from search engines. For one, IR typically fails to discriminate literal from non-literal language (Veale 2004, 2011), and reduces any metaphoric query to literal key words and phrases that are matched near-identically to texts (e.g., see Salton, 1968; Van Rijsbergen 1979). Yet everyday language shows that metaphor is an ideal form for expressing an information need. A query like "Steve Jobs is a good leader" can be viewed by an IR system as a request to consider all the ways in which leaders are stereotypically good, and to then consider all the metaphors that are typically used to raise these specific talking abouts about Steve Jobs.

It is unsurprising then that IR techniques prove to be useful in the robust treatment of metaphor. For instance, Kintsch (2000) tackles the metaphor-understanding problem using a staple of modern IR, the vector space model (VSM), by mapping ideas into a high-dimensional space that is defined by the texts those ideas are found in. A VSM is a mathematical abstraction built from statistical patterns of word co-occurrence in a large corpus. Within this spatial abstraction, individual words can be assigned a distinct point in a high-dimensional space, or more specifically, a vector that passes through such a point. A VSM allows semantic operations (such as similarity judgment) to be converted into mathematical operations. Thus, by measuring the angle between two vectors we can estimate the semantic similarity of the corresponding words, just as we can obtain the average of multiple vectors to build a blended representation for the intermediate semantic category that they imply. Though VSMs do not distinguish between literal and non-literal language, they can capture the shared associations and dimensions that link the literal and non-literal senses of the same word. In this chapter we do not employ a VSM approach, but do show how other IR techniques, such as

corpus-based query expansion (Vernimb, 1977; Vorhees, 1994, 1998; Navigli & Velardi, 2003; Xu & Croft, 1996), can be used to enrich, understand and generate metaphors on demand. In this approach to expansion, the additional terms that are added to a base query are those that automated corpus analysis reveals to be the most reliably informative of the ideas in the query, such as "charming" and "untrustworthy" for "snake," "brilliant" and "temperamental" for "genius," and so on. Expansion of a user's base metaphor is here performed using a comprehensive lexicon of affective stereotypes that is itself acquired by harvesting large quantities of attested figurative language use from the Web.

With these goals in mind, the rest of the paper assumes the following structure. Section 2 provides a brief review of related work and ideas in the domains of metaphor and "creative" information retrieval. The means by which a comprehensive lexicon of affective stereotypes is acquired from the Web is then presented in Section 3. We describe in Section 4 how a vast collection of Web fragments rich in potential metaphors – the Google n-grams (Brants & Franz, 2006) – is used to drive the processes of metaphor comprehension and generation. These capabilities are evaluated in Section 5, which considers the representational adequacy of metaphor as a proxy knowledge representation for dense descriptors that are used with an affective twist. Section 6 describes a working Web service, called *Metaphor Magnet*, that realizes this view of metaphor as a resource and a service for creativity on demand. The paper concludes in Section 7 with a discussion of future work in the area of creative Web services.

2. From potential metaphors to deliberate metaphors

Metaphor has been studied within computer science for four decades, yet it remains at the periphery of NLP research (Veale et al., 2015). The reasons for this marginalization are, for the most part, pragmatic ones, since metaphors can be as varied and challenging as human creativity will allow. The most success has been achieved by focusing on conventional metaphors (e.g., Martin, 1990; Mason, 2004), or on very specific domains of usage, such as figurative descriptions of mental states (e.g., Barnden, 2006). Metaphors are freshest when norms associated with one domain are newly exploited in another, to communicate meanings about very different kind of concept. Hanks (2006) refers to the novel use of a linguistic norm in a new domain as an *exploitation*, and notes that metaphors lose their freshness and die as each new exploitation becomes a norm in its own right. For example, it is a norm that we catch and throw physical objects like balls; while "to catch a cold" has become a norm in the domain of infections, and thus a conventional metaphor in its own right, it would still be novel to speak of "throwing a cold"

from one person to another. The norms and exploitations view of Hanks offers a lexicographer's take on flexible representations for AI/NLP, such as Wilks' (1978) *preference semantics*, later extended by Fass (1991, 1997) into a *collative semantics*.

More recently, some success has been obtained with statistical approaches that side-step the problems of symbolic knowledge representation altogether, by working instead with latent representations that are derived from word distributions. Turney and Littman (2005) show how a statistical model of relational similarity that is constructed from Web texts can retrieve the correct answers for proportional analogies, of the kind used in SAT/GRE tests. No hand-coded knowledge is employed, yet Turney and Littman's system achieves an average human grade on a set of 376 real SAT analogies. Shutova (2010) annotates verbal metaphors in corpora (such as "to *stir* excitement", where "stir" is used metaphorically) with the corresponding conceptual metaphors identified by Lakoff and Johnson (1980). Statistical clustering techniques are then used to generalize from the annotated exemplars, allowing the system to recognize and retrieve other metaphors in the same vein (e.g., "he *swallowed* his anger"). These clusters can also be analyzed to identify literal paraphrases for a given metaphor (such as "to *provoke* excitement" or "*suppress* anger"). Shutova's approach is noteworthy for operating with Lakoff and Johnson's inventory of conceptual metaphors without actually using an explicit knowledge representation of the domains involved.

Hanks (2006) argues that metaphors exploit distributional norms, patterns of word association in one domain that are knowingly exploited in another. To understand a metaphor, one must first recognize the norm that is exploited so as to derive insight from the exploitation. Common norms in language are the preferred semantic arguments of verbs, as well as idioms, clichés and other multiword expressions. Veale and Hao (2007a) suggest that stereotypes are conceptual norms that are a symbiotic part of many figurative expressions, since e.g., similes rely on stereotypes to illustrate the features ascribed to a topic, while stereotypes are often promulgated via proverbial similes (Taylor, 1954). They also show how stereotypical knowledge can be acquired by harvesting "Hearst" patterns (Hearst, 1992) of the form "as P as C" (e.g., "*as smooth as silk*") from the Web, and how (in Veale & Hao, 2007b) how this body of stereotypes can be used in a Web-based model of metaphor generation and comprehension.

Veale (2011) builds a rich query language from these stereotypes by allowing them to be combined with a limited set of operators that turn each one into a non-literal wildcard (see Mihalcea, 2002). We consider here just two operators, **@** (the stereotype operator) and **?** (the neighborhood operator), which can be combined with either a noun that denotes a stereotype (such as "knife") or an adjective that denotes a typical property of one (such as "sharp"). If **Noun** denotes a stereotype, then **@Noun** matches any adjective that denotes a stereotypical

property of **Noun** (so e.g., *@knife* matches *sharp, cold*, etc.) while **@Adj** will match any noun that denotes a stereotype for which *Adj* is a stereotypical property (e.g., *@sharp* matches *sword, knife, pin*, etc.). The neighborhood operator **?** complements the stereotype operator **@**. When combined with an adjective, **?Adj** matches any property that co-occurs with, and reinforces, the property denoted by **Adj** in similes; thus, *?hot* matches *humid* because "*as hot and sultry as*" is an attested combination in observed similes; for the same reason, **?Adj** also matches *sultry, spicy* and *steamy*. When combined with a noun, **?Noun** matches any noun with which **Noun** is seen to form an ad-hoc set (Hanks, 2005), where ad-hoc sets are typically denoted by the coordination of bare plurals, as in "lawyers and doctors" or "pirates and thieves". Thus, *?lawyer* matches *doctor* and *engineer*, while ?pirate matches *thief* and *hacker* (among many others). The knowledge needed for the @ operator is obtained by harvesting text from the Web, while that for the **?** operator is obtained by mining ad-hoc sets from the Google n-grams (Brants & Franz, 2006).

It is worth noting that Veale (2011) does not model the affective profile of either stereotypes or their properties, so the approach does not know e.g., that *thief* is typically a negative label, or that *damp* is typically an undesirable property. Neither does the model provide a convenient means of using affective qualities in a retrieval query. So we build here on the work of Veale (2011) in several important ways. First, we enrich and enlarge the stereotype lexicon, to include more stereotypes and more adjectival properties, as well as verb-based behaviours such as *swaggering, cutting, dancing* and *crawling* (i.e., the kind of qualities that one does not typically find in "as X as Y" similes but in "Xing like a Y" similes). We determine an affective polarity for each property or behaviour and for each stereotype, and show how polarized positive/negative viewpoints on a topic can be calculated on the fly. We also show how proxy representations for proper-named entities (like *Microsoft*) can be constructed on demand. Finally, we show how metaphors are retrieved from the Google n-grams, allowing a system to understand novel metaphors (like *Google is another Microsoft* or *Apple is a cult*) in terms of known metaphors, and to generate plausible metaphor expansions that better express a user's information needs (e.g., Steve Jobs was a *great leader*, Google is *too powerful*, etc.).

3. Potential similes and affective models

For practical purposes, we consider just two kinds of stereotypical features: properties that can be denoted by *adjectives* (e.g., *hot* for *desert* or *refreshing* for *lemonade*) and *behaviors* that can be denoted by verbs (e.g., *cutting* for *knife* or *flying* for *bird*). We use the generic term *feature* to refer to either properties or behaviors. So if a feature *f* is stereotypical of a concept *C*, we should expect to frequently

observe *f* in instances of *C* (Pasca & Van Durme, 2007), and can thus expect to see collocations of "*f*" and "*C*" in a resource like the Google n-grams (Brants & Franz, 2006). Consider these Google 3-grams from the English Web (and their recorded Google frequencies) for "cowboy":

a	lonesome	cowboy	432
a	mounted	cowboy	122
a	grizzled	cowboy	74
a	swaggering	cowboy	68

N-gram patterns allow us to find frequent ascriptions of a feature to a noun concept (e.g., *swaggering* to *cowboys*), but frequently observed features are not always noteworthy features (e.g., see Almuhareb & Poesio, 2004, 2005). However, if we also observe these features used in similes – such as "*swaggering like a cowboy*" or "*as grizzled as a cowboy*" – this is evidence that speakers assume these features to be elements of a consensus knowledge representation that is shared by speakers and listeners alike. So for each hypothesis *f is stereotypical of C* derived from 3-grams like those above, we generate the corresponding simile form: we use the "like" form for verbal behaviours such as *swaggering*, and the "as-as" form for adjectival properties such as *lonesome*. We dispatch each potential simile as a phrasal query to Google. The hypothesis *f is stereotypical of C* is validated if the potential simile is found at least once on the Web. That is, if even a single human has ever expressed the same wording on the Web, we can infer that the simile passes muster as an attested example of human language use. This is not evidence for the stereotypicality of the simile itself – as a Web count of 1 does not a cliché make – but for the salience of the property that is ascribed to its vehicle.

This mining process gives us over 200,000 validated hypotheses for our stereotype lexicon. To ensure that the contents of the stereotype lexicon are of the highest quality, we manually filter these validated hypotheses. The investment of a few weeks of labor produces a reliable and reusable resource. We obtain vivid pictures of many dense descriptors, such as the stereotypical *baby*, whose 163 salient features range from *cute* and *soft* to *whiny* and *fat*. After manual filtering, the lexicon maps 9,479 stereotypes to a set of 7,898 properties and behaviors, to comprise over 75,000 pairings.

3.1 Affective modelling

For the purpose of affective modelling, adjectival properties and verbal behaviors are treated equally as features after being acquired from the Web via different patterns. To understand the affective uses of a feature, we employ the intuition that features which support each other in a single simile (e.g., "as *lush and green* as a jungle" or "as *hot and humid* as a sauna") are more likely to have the same

affective polarity than those that do not. To construct a support graph of mutually supportive features, we gather all Google 3-grams in which a pair of stereotypical properties or behaviours *X* and *Y* are linked via coordination, as in "*hot and spicy*" or "*kicking and screaming*". A bidirectional link between *X* and *Y* is then added to the support graph if one or more stereotypes in the lexicon contain both *X* and *Y*. If this is not the case, we ask whether both features ever support each other in Web similes, by posing the query "*as X and Y as*" to the Web. If we obtain a non-zero hit set, we link *X* to *Y* and *Y* to *X* in the graph.

We next build a reference set Ref_{neg} of typically negative words, and a set Ref_{pos} of typically positive words. Given a few seed members for Ref_{neg} (such as *sad, evil, monster*, etc.) and a few seed members for Ref_{pos} (such as *happy, wonderful, hero*), we use the neighborhood operator **?** to expand this set by suggesting neighboring words with the same polarity (e.g., "sad and *pathetic*", "happy and *healthy*"). After three iterations in this fashion, we populate Ref_{pos} and Ref_{neg} with approx. 2000 words each.

If we label enough terms in the support graph with a discrete *pos* or *neg* sign, we can reliably interpolate a non-discrete *pos*/*neg* score for every feature in the graph. Let *N*(*f*) denote the set of neighboring terms to a feature *f* in the graph. Now, we define:

$$N_{pos}(f) = N(f) \cap Ref_{pos} \tag{3.1}$$

$$N_{neg}(f) = N(f) \cap Ref_{neg} \tag{3.2}$$

We assign non-discrete positive and negative affect scores (from 0 to 1) to *f* as follows:

$$pos(f) = \frac{\| N_{pos}(f) \|}{\| N_{pos}(f) \cup N_{neg}(f) \|} \tag{3.3}$$

$$neg(f) = 1 - pos(f) \tag{3.4}$$

where ||.|| denotes the cardinality of a set. We can think of *pos*(*f*) as an estimate of the probability that *f* is going to be used in a positive description of a target concept, and *neg*(*f*) as an estimate of the probability that *f* will be used in a negative description.

If a term *S* denotes a stereotypical idea that is described in the lexicon with the set of typical features (adjectival properties and verbal behaviors) denoted *typical*(*S*), then:

$$pos(S) = \frac{\sum_{f \in typical(S)} pos(f)}{\| typical(S) \|} \tag{3.5}$$

$$neg(S) = 1 - pos(S) \tag{3.6}$$

That is, we calculate the mean affect of the properties and behaviours of *S*, as represented in the lexicon via *typical*(*S*). Note that (3.5) and (3.6) are simply gross defaults. One can always use (3.3) and (3.4) to separate the features of *typical*(*S*) into subsets which are more negative than positive (i.e., to put a negative spin on *S*) or into subsets which are more positive than negative (i.e., to put a positive spin on *S*). Thus, we define:

$$typical_{pos}(S) = \{ f \mid f \in typical(S) \wedge pos(f) > neg(f) \} \tag{3.7}$$

$$typical_{neg}(S) = \{ f \mid f \in typical(S) \wedge neg(f) > pos(f) \} \tag{3.8}$$

For instance, a positive spin on the stereotype *baby* highlights features such as *smiling, adorable* and *cute*, while the negative spin focuses on features such as *crying, wailing* and *sniveling*. This ability to place a positive or a negative filter on the representation of a stereotypical concept is key to generating affective metaphors on demand.

4. Metaphor interpretation as metaphor expansion

The category-inclusion view of metaphor (see Glucksberg & Keysar, 1990) sees metaphors of the form "X is a Y", such as "my job is a jail", not as identity statements but as categorization statements. The "jail" of "my job is a jail" does not denote a literal jail, but the category of oppressive, jail-like situations, and so the metaphor identifies the referent of "job" as yet another member of that category. The word "jail" serves as a convenient, if oblique, label for this category, and though we may not be able to name the category more directly, we can assume it will impart many of the same features to its members as the category *jail* does to its own members. If a computational system is to appreciate the features that are projected from a source S onto a target concept T in a metaphor, it matters little if we cannot precisely identify a literal mediating category. What matters is that the system can identify a set of feature-rich intermediate categories that seem apt for both S and T, so that it can reason about the features that are projected from S onto T. Following Kintsch (2000), it also matters little whether these intermediate categories are metaphorical or literal. So

perhaps the set of mediating categories for "my job is a jail" is the set {*hell, trap, cage, nightmare*, …}, all of which share features with *jail* and all of which have features that can aptly be applied to certain kinds of jobs. Expanding on the category-inclusion view, we model metaphor interpretation as a process of expansion, in which an agent searches for the set of mediating categories that are attested for both the target concept T and for the source concept S, and whose stereotypical properties can meaningfully be projected onto the target concept T. In this section we present a set-theoretic view of the expansion process, showing how it uses corpus-attested associations and categorizations to arrive at a feature-rich interpretation.

4.1 Metaphor expansion

The Google n-grams database is a rich source of established metaphors of the copula form *Target is [a|an|the] Source*. Google's 3-grams provide tight 3-word framings that omit a determiner, such as "politicians are crooks" and "politics is war," whilst its 4-grams allow for the addition of a determiner, as in the 4-word framings "Apple is a cult", "love is a battlefield" and "Clinton is a survivor". Let *src*(*T*) denote the set of stereotypes that are used to describe *T* (i.e., potential source concepts for *T*) in the Google n-grams in explicit copula metaphors and categorization frames. To find potential metaphors for proper-named entities such as "Donald Trump", we focus on n-grams of the form *stereotype First* [*Middle*] *Last*, such as "*billionaire* Donald Trump." Thus, for example:

src(racism) = {*problem, disease, joke, sin, poison, crime, ideology, weapon*}
src(Hitler) = {*monster, criminal, tyrant, idiot, madman, vegetarian, racist, …*}

Following Kintsch (1998), we do not discriminate literal from non-literal assertions (e.g., "racism is a problem" versus "racism is a disease"). So we remain agnostic on literality, assuming each element of *src*(*T*) is a potential metaphor that may or may not be deliberate. What matters is that each can be framed as a deliberate metaphor for *T*.

Let *srcTypical*(*T*) denote the aggregation of all properties ascribable to a target concept *T* via the attested source concepts in *src*(*T*):

$$srcTypical(T) = \bigcup_{M \in src(T)} typical(M) \tag{4.1}$$

Let us denote a negative spin on a topic T as −T, and a positive spin as +T. We can thus formulate positive and negative variations of *srcTypical* for these special cases, in (4.2):

$$\begin{aligned} srcTypical(+T) &= \bigcup_{M \in src(T)} \text{typical}_{\text{pos}}(M) \\ srcTypical(-T) &= \bigcup_{M \in src(T)} \text{typical}_{\text{neg}}(M) \end{aligned} \tag{4.2}$$

So (4.1) and (4.2) offer a feature representation for topic *T* as viewed through the prism of metaphor. This is useful when the source *S* in the metaphor *T is S* is not a stereotype in our lexicon, as happens if one describes *Rasputin as Karl Rove* (George W. Bush's mesmeric political advisor) or *Apple as Scientology*. When the set *typical*(S) is empty, *srcTypical*(*S*) may not be, so *srcTypical*(*S*) can still act as a proxy representation for *S*.

The set of features that is evoked by a source concept S that can be meaningfully projected onto to a topic *T*, as attested by our n-grams corpus, is given by (4.3):

$$salient(T,S) = \begin{array}{lcl} srcTypical(T) & \cup & typical(T) \\ & \cap & \\ srcTypical(S) & \cup & typical(S) \end{array} \tag{4.3}$$

The more of S's stereotypical features that are salient in a description of T, the more apt the choice of S as a metaphor for T. We can quantify this aptness using (4.4):

$$aptness(M;T,S) = \frac{\| salient(T,S) \cap typical(M) \|}{\| typical(M) \|} \tag{4.4}$$

We can now construct an interpretation for the metaphor *T is S* by considering not just {*S*}, but the stereotypes in *src*(*T*) that are apt for *T* in the context of *T is S*, as well as the stereotypes that are commonly used to describe *S* – that is, *src*(*S*) – that are apt for *T*:

$$interpretation(T,S) = \{ M \mid M \in src(T) \cup src(S) \cup \{S\} \wedge aptness(M;T,S) > 0 \} \tag{4.5}$$

In effect, the interpretation of *T is S* is itself a set of apt metaphors for *T* that expand upon *S*. The elements $M_i \in interpretation(T,S)$ can now be sorted by *aptness*(M_i; *T*, *S*) to produce a ranked list of interpretations (M_1, M_2 … M_n). For any given interpretation M_i, the salient features of M_i are given by:

$$salient(M_i;T,S) = typical(M_i) \cap salient(T,S) \tag{4.6}$$

Some metaphors, and many similes of the form "X is as F as Y", explicitly direct our focus to one dimension or quality of a target topic. To model this explicit focus, we employ the following variants of (4.6):

$$salient(M_i;+f;T,S) = typical(M_i) \cap salient(T,S) \cap N_{pos}(f) \quad (4.6.1)$$

$$salient(M_i;-f;T,S) = typical(M_i) \cap salient(T,S) \cap N_{neg}(f) \quad (4.6.2)$$

Thus, for any viewpoint M_i in *interpretation*(*T, S*), the set *salient*(M_i; *T, S*) identifies the features of M_i that *T* is likely to exhibit when it behaves like M_i. Moreover, we can use the support graph N (and its sub-graphs N_{pos} and N_{neg}) to focus on just those features that are both salient to the metaphor and of explicit interest to the metaphor-maker.

4.2 Metaphor in action: A worked example

Consider the metaphor "*Google is another Microsoft*". We can expect the most salient aspects of *Microsoft* to be those that underpin our common metaphors for *Microsoft*, i.e., the stereotypes in *src*(Microsoft). These stereotypes and their associated features will provide the major talking points for any interpretation of the metaphor.

The Google n-grams suggest the following sources, 57 for Microsoft and 50 for Google:

src(Microsoft) = {*king, master, threat, bully, giant, leader, monopoly, dinosaur …*}
src(Google) = {*king, engine, threat, brand, giant, leader, celebrity, religion…*}

The following features are aggregrated for each:

srcTypical(Microsoft) = {*trusted, menacing, ruling, threatening, overbearing, admired, commanding, …*}
srcTypical(Google) = {*trusted, admired, reigning, ruling, crowned, shining, determined, lurking, …}*

Now, the salient features highlighted by *Google is another Microsoft* are given by:

salient(Google, Microsoft) = {*celebrated, menacing, trusted, challenging, established, threatening, admired, respected, …*}

So, applying (4.5) we obtain:

interpretation(Google, Microsoft) = {*king, criminal, master, leader, bully, threatening, giant, threat, monopoly, pioneer, dinosaur, …*}

Suppose we focus on the metaphorical expansion "Google is king", since *king* is the most highly ranked element of the interpretation (using (4.4), we calculate *aptness*(*king*, Google, Microsoft) = 0.48). Now,

salient(*king*; Google, Microsoft) = {*celebrated, overbearing, admired, arrogant, respected, ruling, commanding, revered, …*}

We should note that these properties and behaviours are already implicit in our perception of Google, insofar as they are highly salient aspects of the stereotypical concepts to which Google is frequently compared. The metaphor "*Google is another Microsoft*" – and its potential expansion, "Google is king" – simply crystalizes this set of features, from perhaps different comparisons, into a single act of figurative ideation.

The metaphor "*Google is another Microsoft*" is vague and lacks an affective stance. So suppose a user instead inputs the metaphor "Google is **–Microsoft**", where – is used to explicily impart a negative spin (+ can likewise impart a positive spin). In this case, *srcTypical*(–T) is estimated relative to $typical_{neg}$(T) as specified in (4.2), so that:

srcTypical(–Microsoft) = {*menacing, threatening, twisted, raging, feared, sinister, lurking, domineering, overbearing, …*}
salient(Google, –Microsoft) ={*menacing, bullying, roaring, dreaded…*}

It follows then that

interpretation(Google, –Microsoft) = {*criminal, giant, threat, bully, evil, devil, …*}

In contrast, one may impart a positive spin on *Microsoft* to view *Google* positively too, in line with how a technology investor (as opposed to a technology user) might think:

interpretation(Google, +Microsoft) = {*king, master, leader, pioneer, partner, …*}

To focus on a specific dimension of a target concept, one can use a simile with an explicit ground, such as "Google is as **powerful** as Microsoft". To identify the sub-set of properties that are salient to this ground, we use the variants of *salient*

in (4.6.1) and (4.6.2). The negative consequences of being as powerful a king as Microsoft are thus:

$$salient(king; -\text{powerful; Google, Microsoft}) = \{overbearing, arrogant, pompous, \ldots\}$$

Just as a few simple concepts can yield a wide range of options for the creative speaker, so too can these concepts yield a wide range of options for a creative system.

5. Empirical evaluation

The affective stereotype lexicon is the cornerstone of our computational approach to metaphor, and must reliably assign polarity scores both to stereotypes and the features they exemplify. Our affect model is simple in that it relies principally on *pos*/*neg* affect scores, but as demonstrated above, users can articulate their own expressive moods to suit their needs: for example, one can express disdain for excessive power by using the term **−powerful**, or express admiration for guile with the terms **+cunning** or **+devious** Veale and Hao (2012).

5.1 The affect of stereotypes and properties

The polarity scores assigned to a feature *f* in (3.3) and (3.4) do not rely on any prior classification of *f*, such as whether *f* is in Ref_{pos} or Ref_{neg}. That is, Ref_{pos} and Ref_{neg} are not used as training data, and (3.3) and (3.4) receive no error feedback. We expect that for $f \in Ref_{pos}$ that $pos(f) > neg(f)$, and for $f \in Ref_{neg}$ that $neg(f) > pos(f)$, but (3.3) and (3.4) do not iterate until this is so. Measuring the extent to which these simple intuitions are validated offers a good evaluation of our graph-based calculation of polarity scores.

Just five features in Ref_{pos} (approx. **0.4**% of the 1,314 properties and behaviors in Ref_{pos}) are given a positive affect score of less than 0.5 using (3.3), leading those words to be misclassified as more negative than positive. The misclassified property words are: *evanescent, giggling, licking, devotional* and *fraternal*. Similarly, just twenty-six properties in Ref_{neg} (approx. **1.9**% of the 1,385 properties and behaviours in Ref_{neg}) are assigned a negative affect score of less than 0.5 via (3.4), leading these to be misclassified as more positive than negative. The misclassified words are: *cocky, dense, demanding, urgent, acute, unavoidable, critical, startling, gaudy, decadent, biting, controversial, peculiar, disinterested, strict, visceral, feared,*

opinionated, humbling, subdued, impetuous, shooting, acerbic, heartrending, ineluctable and *groveling*.

Since Ref_{pos} and Ref_{neg} are populated with words that are chosen for their perceived *pos*/*neg* slants, this result is hardly surprising. Nonetheless, it does verify the intuitions that underpin (3.3) and (3.4) – that the affective polarity of a property or behavior *f* can be reliably estimated as a simple function of the affect of the co-descriptors with which it is commonly used across different contexts. We must still ask whether these polarity scores are consistent with the expected affect of the stereotypical ideas for which these properties and behaviors are typical. The sets Ref_{pos} and Ref_{neg} are populated in §3.1 with adjectives, verbal behaviors and nouns. Ref_{pos} contains 478 positive nouns (such as *saint* and *hero*) while Ref_{neg} contains 677 negative nouns (such as *tyrant* and *monster*). When we use these reference stereotypes to test the effectiveness of (3.5) and (3.6) – and thus, indirectly, of the stereotype lexicon itself – we find that **96.7%** of the positive noun exemplars are correctly assigned a mean positivity of more than 0.5 (so, *pos*(*S*) > *neg*(*S*)) while **96.2%** of the negative noun exemplars are correctly assigned a mean negativity of more than 0.5 (so, *neg*(*S*) > *pos*(*S*)). Though it may seem crude to assess the polarity of a complex stereotype as the mean of the polarity of its features, this does appear to be a reliable measure of the overall polarity of a dense descriptor.

5.2 Placing an affective spin on stereotypes

Nonetheless, stereotypes can be used with varying affect in different contexts. Consider the case of the stereotypical *baby*. We describe loved ones as "baby" to highlight just how much we care for them, and to emphasize features such as lovability and cuteness. But we also use the same word to negatively describe those that "*act like a baby*", that is, those who are overly dependent on others, or those who are weak, immature and excessively emotional. One can argue that the word "baby" is used in two different dictionary senses here, yet both would ultimately appeal to our mental representation of the same complex stereotype, a human baby. We can conceive of this kind of selective spin as a retrieval task: if *typical*(*S*) specifies the salient features of a stereotypical *S*, then can we retrieve from *typical*(*S*) only the positive features of S (e.g., for "baby" used affectionately), or only the negative features (e.g., of "baby" used as an insult)?

If we focus on stereotypes with at least one positive feature in Ref_{pos} or one negative feature in Ref_{neg} (there are 6,230 in all, with a mean of 2.95 features each in Ref_{pos}, and 3.55 features each in Ref_{neg}), the qualities corresponding to each *pos*/*neg* spin can be accurately retrieved. Table 1 reports macro-averages

for the selective retrieval of positive only (or negative only) qualities from 6,230 stereotypes.

Table 1. Macro-Average P/R/F1 scores for affective partition, the affective selection of positive and negative properties from 6,230 stereotypes

***Macro Average* (6,230 stereotypes)**	***Positive* properties**	***Negative* properties**
Precision	.962	.98
Recall	.975	.958
F-Score	.968	.968

If we focus on features that are associated with at least one stereotype in Ref_{pos} or Ref_{neg} (there are 4,536 in all), Table 2 reports macro-averages for the retrieval of more-positive-than-negative (or more-negative-than-positive) exemplars for these features.

Table 2. Macro-Average P/R/F1 scores for retrieval of **positive** and **negative** stereotypes for 4,536 properties and behaviours.

***Macro Average* (4,536 features)**	***Positive* stereotypes**	***Negative* stereotypes**
Precision	.986	.965
Recall	.949	.982
F-Score	.967	.973

In each case, these results show that a reliable affective partition can be achieved.

5.3 Representational adequacy of metaphors

Even ad-hoc stereotypes such as *Microsoft* or *Donald Trump* – dense decriptors that are not defined in the stereotype lexicon, but which can be given a proxy representation using *srcTypical* in (4.1) – can be given a positive or negative spin in context, since each has their own admirers and detractors. For instance, the n-gram metaphors that populate *src(Trump)* allow these properties to be inferred for *Donald Trump*:

srcTypical(+**Trump**) = {*successful, wealthy, trusted, irrepressible, leading, …*}
srcTypical(−**Trump**) = {*scheming, spoiled, ruthless, overbearing, vain, …*}

But how good a proxy is *src*(S) or *srcTypical*(S) for an *S* like *Trump* or *Microsoft*? Can we, for instance, reliably estimate the *pos*/*neg* polarity of *S* as a function of

src(S)? We can estimate *pos*(S) as in (5.1) below (where *neg*(S) follows simply as *1 − pos*(S)):

$$pos(S) = \frac{\sum_{M \in src(S)} pos(M)}{\| src(S) \|} \tag{5.1}$$

Testing this estimator on the stereotypes in Ref_{pos} and Ref_{neg}, the correct binary polarity (*pos* or *neg*) is estimated **87.2**% of the time. It follows that the copula metaphors in the Google n-grams – and consequently the contents of *src*(*S*) – are broadly consistent with our perceptions of whether a topic S has a positive or negative connotation overall.

If we consider all stereotypes *S* for which ||*src*(*S*)|| > 0 (there are 6,904 in our affect lexicon), we find *srcTypical*(S) covers, on average, just **65.7**% of the typical properties of *S* (that is, of *typical*(*S*)). As a proxy representation for *S, srcTypical*(*S*) is incomplete. However, this shortfall is often the reason we use novel metaphors in the first place. So consider (5.2), a variant of (4.1) that captures the longer reach of novel metaphors:

$$srcTypical^2(T) = \bigcup_{S \in src(T)} srcTypical(S) \tag{5.2}$$

Thus, *srcTypical2*(*T*) denotes the set of features that are ascribable to T via the expansive interpretation of all metaphors *T is S* in our Web corpus, since *S* can now project onto T any element of *srcTypical*(*S*). Using macro-averaging over all 6,904 cases where ||*src*(*S*)|| > 0, we find that *srcTypical2*(*S*) covers **99.2**% of *typical*(*S*) on average. Metaphors truly are a descriptive resource, and a well-chosen metaphor can allow us to emphasize almost any feature of a target idea *T* we might wish to highlight.

5.4 Human judgment

Our Web corpus is a source of potential metaphors that are treated as deliberate for the purposes of novel metaphor generation. Yet a metaphor only truly becomes deliberate when it is framed as such, to evoke in the mind of a reader the distinct spaces of source and target so as to encourage a comparative analysis of the content of both spaces. If our system's metaphorical outputs are to be judged as deliberate by humans, we shall have to give them an appropriate linguistic framing. The Twitterbot *@MetaphorMagnet* is an autonomous generation system that frames the conceits of (4.5) using a variety of framing strategies and tweets the resulting utterances in 140 characters or less (Veale, 2015).

For instance, noting that the feature *pampered* is typical of kings *and* newborns, *@MetaphorMagnet* frames the overlap via this deliberate metaphor: "*To be nurtured by and loved by a mother: This can turn majestic kings into weak newborns*." When eliciting human judgments on the metaphors produced by (4.5) and related mechanisms, we present judges with the full utterances that are generated by *@MetaphorMagnet*, and not the underlying conceits, as they can seem overly skeletal to non-experts. We ask the Twitterbot to generate 120 figurative utterances that are evenly distributed with regards to their overall affect and pay raters on the crowd-sourcing platform CrowdFlower (now renamed Figure Eight) a small sum for each of their judgments. Each metaphorical utterance corresponds to a single test unit, and we elicit 20 judgments for each unit from anonymous judges.

Table 3. Distribution of human judgments for comprehensibility and novelty

	Comprehensibility	**Novelty**
Very Low	6.49%	5.26%
Medium Low	17.39%	18.84%
Medium High	20.29%	20.13%
Very High	55.82%	55.77%

Novel metaphorical utterances should be novel *and* comprehensible. Table 3 shows the distribution of mean human judgments for the dimensions comprehensibility and novelty using the same 4-point scale for each. More than 75% of all judgments deem the machine-generated metaphors to rate satisfactorily high on each dimension. The human raters were also asked to judge the overall affect of each deliberate metaphor by grading each on a scale running from +2 (very positive) down to −2 (very negative). We averaged the judgments of the 20 different raters for each metaphor to arrive at a single overall estimate of affect, which shows a 0.85 agreement with the system's own affect score for these metaphors. The Cohen's Kappa coefficient for this agreement is 0.71.

6. Metaphor as a resource and a public Web service

Metaphor is a knowledge multiplier that allows us to expand our knowledge of a target T by using knowledge of other source ideas S as a magnifying lens. We have presented here a robust, stereotype-driven approach that embodies this practical philosophy. Knowledge multiplication is achieved using an IR-like expansionary model, in which an affective query is expanded to include all of the metaphors that are commonly used to convey this affective viewpoint. These viewpoints are

expanded in turn to include the salient qualities that are typically implied by each. This expansion approach owes much to IR, and so is, in turn, ideally suited to the creative enrichment of conventional IR.

These ideas have been implemented in the form of a Web service, named *Metaphor Magnet*, which allows users to enter affective metaphors of the form shown here (such as *Google is –Microsoft, life is a +game*, and *Steve Jobs is Tony Stark*). Each metaphor is viewed as a conversational gambit, and thus treated as a query to elicit supporting evidence for the affective stance conveyed by the metaphor. The *Metaphor Magnet* service expands each new metaphor-*qua*-query into a set of known metaphors via mappings derived from the Google n-grams; each of these pre-existing metaphors is then expanded into a set of contextually apt properties and behaviors. Ultimately, each of these qualities is re-expressed as a topic-specific IR query that is used to retrieve relevant hits for the topic from Google. In effect, the *Metaphor Magnet* service allows users to interact with a search engine like Google using affective metaphors and other expressive language forms. The service can currently be accessed at this URL:

http://boundinanutshell.com/metaphor-magnet

Metaphor Magnet can exploit the properties and behaviors of its stock of almost 10,000 stereotypes, and can infer salient qualities for many proper-named entities such as *Donald Trump* or *Steve Jobs* using a combination of copula statements from the Google n-grams (e.g., "*Steve Jobs is a visionary*") and category assignments from Wikipedia. When used interactively, the interpretation of the simile "*Donald Trump is as –popular as Hitler*" thus highlights a selection of negative viewpoints on the source concept, *Hitler*, and picks out an apt selection of viewpoints on the target *Donald Trump. Metaphor Magnet* displays both selections as side-by-side phrase clouds. The phrase cloud representing *Hitler* in this simile is shown in the screenshot of Figures 1a and 1b (right), while the phrase clouds for *Donald Trump* are shown in Figures 1a and 1b (left).

Figure 1a. Godwin's "rule of Hitler analogies" in action. On the left, a screenshot of Metaphor Magnet's phrase cloud for the perspectives cast by the affective metaphor "Donald Trump is as -popular as Hitler" on its target, "Donald Trump". On the right, the cloud of negative metaphors typically used for "Hitler" in the Google n-grams.

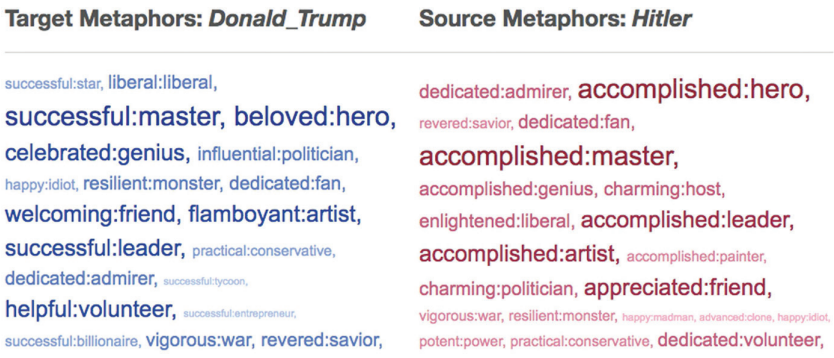

Figure 1b. The ugly side of "positive" spin. On the left, Metaphor Magnet's phrase cloud of the perspectives cast by "Donald Trump is as +popular as Hitler" on its target. On the right, the cloud of positive metaphors for "Hitler" in the Google n-grams.

Metaphor Magnet demonstrates the potential utility of affective metaphors in human-computer linguistic interaction, and provides a Web service via which other natural-language processing applications can acquire a measure of metaphorical competence of their own. When accessed as a service, *Metaphor Magnet* returns both HTML or XML data, and in this way it also serves as the foundation of *@MetaphorMagnet*. Given the resource-intensive nature of metaphor understanding and generation – processes which require lexico-semantic models to formulate hypotheses and vast amounts of corpus data to validate hypotheses – it is good design practice to view these processes as remote services that hide their complexity behind the simplicity of a Web interface.

7. Conclusions : Explaining the world with deliberate metaphors

The 2016 conference of the Cognitive Science society was held in Philadelphia just a week after the Democratic National Convention crowned its presidential nominee. The streets around the convention center still buzzed with rhetorical whimsy, and outside a nearby church fiery street preachers waved placards that read "*Ask Me Why You're Going to Hell*." The notices of the old church revealed a more temperate character, and advertised a sermon with the eye-catching title "*Jesus Disrupts*." Our metaphors are so pervasive that they often goes unnoticed by speaker and listener alike, but surely this was a metaphor reveling in its status as metaphor. Its author wanted to do more than convey the power of religion to change lives, and so the metaphor self-consciously appropriates the language of disruptive technology to foster the creation of new mental connections between the domains of faith and radical innovation. It was, as Steen (2011, 2015) terms

it, a truly "deliberate" metaphor. For the metaphor deliberately subverts the modern view of disruptive pioneers – as best illustrated by Steve Jobs and his *reality distortion field* – as messiahs. If tech pioneers are to be revered as "messiahs" then this new metaphor urges us to have as much faith in the real deal as in the people that design our phones. Steen calls these metaphors *deliberate* because they are designed to be noticed and calculated to make playthings of their source and target domains. Indeed, as metaphors go, this one was not just deliberate but surprisingly self-descriptive too.

Metaphor disrupts. It disrupts our conceptual category systems the way a game of musical chairs disrupts a formal dinner party, licensing guests to ignore the host's place settings in favor of whatever works best when the music stops. Metaphor is the ultimate appropriation device, allowing speakers to appropriate the stereotypical associations and linguistic norms of one domain of experience so as to transplant them wholesale onto another. Wherever metaphor goes, disruption and appropriation are sure to follow, even when we fail to notice, as we so often do, the deep upheaval taking place beneath the beguiling calmness of the metaphor's surface. Though no little skepticism has been expressed regarding the cognitive reality and practical utility of viewing deliberate metaphors as a class apart (e.g., Gibbs, 2015), Steen's hard distinction has significant computational value, not least when it comes to the merits of *potential* metaphors. Suppose the author of "Jesus Disrupts" intended nothing so baroque as the construal above when posting this sermon title, so that "disrupt" means nothing more here than its dictionary sense "to change things dramatically." But the metaphor is no less deliberate for existing only in the mind of a reader as a purposeful evocation of the technology domain, even if its status as a communicative act does change should this be the case.

The real world is festooned with potential metaphors like these, which may or may not have been crafted as deliberate provocations by their makers but which can usefully be appreciated as deliberate by their consumers, to arrive at deeper and more resonant interpretations. Potential metaphors permeate natural-language texts of all kinds, and so procedures for the identification of metaphors in text (e.g., see Steen et al., 2010) force annotators to make decisions about vexing constructs whose metaphoricity lies in the eye of the beholder. Not knowing the true intentions of the author, the best one can do is to recognize the potential for these constructs to be interpreted as deliberate metaphors. The texts of the Web are certainly no different in this regard, nor indeed are the free-floating snippets of the Web n-grams that – shorn of their original contexts of use – are even freer to support diverse construals that may go far beyond their authors' intentions. In this paper we have viewed a large corpus of Web n-grams as a large body of potential metaphors, and when the need arises, potential similes too. But what makes an n-gram a potential metaphor? It is the ability of an agent, either cognitive or

artificial, to interpret it as a deliberate metaphor that maps a specific source space onto a specific target space. So an agent only sees metaphor potential where it has the knowledge and the dexterity to deliver on that potential, to make it seem resonantly deliberate with the right framing.

Deliberate metaphor presents as much an opportunistic event for consumers as it does a planned and purposeful action for producers. The computational model we have outlined here is especially opportunistic in its use of Web n-grams, which it treats as a source of textual inspiration for the production of novel metaphors and utterances. The world of the model is not the open world of a human, but insofar as the Web holds up a mirror to many diverse aspects of the outside world an opportunistic machine can build vivid pictures of a great many of the domains that feed into human-oriented metaphors. Indeed, we might even think of deliberate metaphor as the means by which a machine can explain the oddities of the outside world that present themselves to it via language. That is, we can view any linguistic stimulus – whether a sermon title on a church or an n-gram on the Web – as an aspect of the world that requires explanation and view the conversion of potential metaphors into deliberate metaphors as a path to understanding. The danger that our machines may be reading too much into a stimulus is a real one – although it exists for humans too – yet it is not one that should present grave concerns to a creative agent more interested in poetic possibilities than precise facts. In the age of mechanical production our metaphor machines are not mind-readers but world builders.

References

Almuhareb, A., & Poesio, M. (2004). Attribute-based and value-based clustering: An evaluation. In *Proceedings of EMNLP 2004*. Barcelona.

Almuhareb, A., & Poesio, M. (2005). Concept learning and categorization from the web. In *Proceedings of the 27th annual meeting of the Cognitive Science Society*.

Barnden, J. A. (2006). Artificial intelligence, figurative language and cognitive linguistics. In G. Kristiansen, M. Achard, R. Dirven, & F. J. Ruiz de Mendoza Ibáñez (Eds.), *Cognitive linguistics: Current application and future perspectives* (pp. 431–459). Berlin: Mouton de Gruyter.

Brants, T., & Franz, A. (2006). *Web 1T 5-gram Ver. 1*. Linguistic Data Consortium.

Brennan, S. E., & Clark, H. H. (1996). Conceptual pacts and lexical choice in conversation. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 22(6), 1482–1493. https://doi.org/10.1037/0278-7393.22.6.1482

Fass, D. (1991). Met*: A method for discriminating metonymy and metaphor by computer. *Computational Linguistics*, 17(1), 9–90.

Fass, D. (1997). *Processing metonymy and metaphor. Contemporary studies in cognitive science & technology*. New York: Ablex.

Fishelov, D. (1992). Poetic and non-poetic simile: Structure, semantics, rhetoric. *Poetics Today*, 14(1), 1–23. https://doi.org/10.2307/1773138

Gibbs, R. W., Jr. (2015). Does deliberate metaphor theory have a future? *Journal of Pragmatics*, 90, 73–76. https://doi.org/10.1016/j.pragma.2015.03.016

Glucksberg, S., & Keysar, B. (1990). Understanding metaphorical comparisons: Beyond similarity. *Psychological Review*, 97(1), 3–18. https://doi.org/10.1037/0033-295X.97.1.3

Hanks, P. (2005). Similes and sets: The English preposition 'like'. In Blatná, R., & Petkevic, V. (Eds.), *Languages and linguistics: Festschrift for Fr. Cermak*. Prague: Charles University.

Hanks, P. (2006). Metaphoricity is gradable. In A. Stefanowitsch, & S. Th. Gries (Eds.), *Corpus-based approaches to metaphor and metonymy* (pp. 17–35). Berlin: Mouton de Gruyter.

Hearst, M. (1992). Automatic acquisition of hyponyms from large text corpora. In *Proceedings of the 14th international conference on computational linguistics* (pp. 539–545). https://doi.org/10.3115/992133.992154

Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. New York: Cambridge University Press.

Kintsch, W. (2000). Metaphor comprehension: A computational theory. *Psychonomic Bulletin Review*, 7(2), 257–266. https://doi.org/10.3758/BF03212981

Lakoff, G., & Johnson, M. (1980). Metaphors We Live By. Chicago: The University of Chicago Press.

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: The University of Chicago Press. https://doi.org/10.7208/chicago/9780226471013.001.0001

Martin, J. H. (1990). *A computational model of metaphor interpretation*. New York: Academic Press.

Mason, Z. J. (2004). CorMet: A computational, corpus-based conventional metaphor extraction system. *Computational Linguistics*, 30(1), 23–44. https://doi.org/10.1162/089120104773633376

Mihalcea, R. (2002). The semantic wildcard. In *Proceedings of the LREC workshop on creating and using semantics for information retrieval and filtering*. Canary Islands, Spain, May 2002.

Navigli, R., & Velardi, P. (2003). An analysis of ontology-based query expansion strategies. In *Proceedings of the workshop on adaptive text extraction and mining (ATEM 2003), at ECML 2003, the 14th European conference on machine learning* (pp. 42–49).

Pasca, M., & Van Durme, B. (2007). What you seek is what you get: Extraction of class attributes from query logs. In *Proceedings of the 20th international joint conference on artifical intelligence* (pp. 2832–2837).

Salton, G. (1968). *Automatic information organization and retrieval*. New York: McGraw-Hill.

Shutova, E. (2010). Metaphor identification using verb and noun clustering. In *Proceedings of the 23rd international conference on computational linguistics* (pp. 1001–1010).

Steen, G. J. (2011). The contemporary theory of metaphor – now new and improved! *Review of Cognitive Linguistics*, 9, 26–64. https://doi.org/10.1075/rcl.9.1.03ste

Steen, G. J. (2015). Developing, testing and interpreting deliberate metaphor theory. *Journal of Pragmatics*, 90, 67–72. https://doi.org/10.1016/j.pragma.2015.03.013

Steen, G. J., Dorst, A. G., Herrmann, J. B., Kaal, A., Krennmayr, T., & Pasma, T. (2010). *A method for linguistic metaphor identification: From MIP to MIPVU*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/celcr.14

Taylor, A. (1954). *Proverbial comparisons and similes from California. Folklore Studies 3*. Berkeley: University of California Press.

Turney, P. D., & Littman, M. L. (2005). Corpus-based learning of analogies and semantic relations. *Machine Learning* 60(1–3), 251–278. https://doi.org/10.1007/s10994-005-0913-1

Van Rijsbergen, C. J. (1979). *Information retrieval*. Oxford: Butterworth-Heinemann.

Veale, T. (2004). The challenge of creative information retrieval. *Computational Linguistics and Intelligent Text Processing: Lecture Notes in Computer Science, 2945*/2004, 457–467. https://doi.org/10.1007/978-3-540-24630-5_56

Veale, T. (2011). Creative language retrieval: A robust hybrid of information retrieval and linguistic creativity. In *Proceedings of ACL'2011, the 49th annual meeting of the association of computational linguistics*. June 2011.

Veale, T. (2015). Unnatural selection: Seeing human intelligence in artificial creations. *Journal of General Artificial Intelligence*, 6(1), 5–20. https://doi.org/10.1515/jagi-2015-0002

Veale, T., & Hao, Y. (2007a). Making lexical ontologies functional and context-sensitive. In *Proceedings of the 46th annual meeting of the Assocciation of Computational Linguistics*.

Veale, T., & Hao, Y. (2007b). Comprehending and generating apt metaphors: A web-driven, case-based approach to figurative language. In *Proceedings of AAAI 2007, the 22nd AAAI conference on artificial intelligence*. Vancouver, Canada.

Veale, T., & Hao, Y. (2008). Talking points in metaphor: A concise, usage-based representation for figurative processing. In *Proceedings of ECAI'2008, the 18th European conference on artificial intelligence*. Patras, Greece, July 2008.

Veale, T., & Hao, Y. (2012). In the mood for affective search with web stereotypes. In *Proceedings of the 21st international conference on World Wide Web*, Lyon, France. https://doi.org/10.1145/2187980.2188066

Veale, T., Shutova, E., & Beigman Klebanov, B. (2016). *Metaphor: A computational perspective*. Morgan Claypool, Synthesis Lectures on Human Language Technologies. https://doi.org/10.2200/S00694ED1V01Y201601HLT031

Vernimb, C. (1977). Automatic query adjustment in document retrieval. *Information Processing & Management*, 13(6), 339–353. https://doi.org/10.1016/0306-4573(77)90054-1

Voorhees, E. M. (1994). Query expansion using lexical-semantic relations. In *Proceedings of SIGIR 94, the 17th international conference on research and development in information retrieval* (pp. 61–69). Berlin: Springer.

Voorhees, E. M. (1998). Using WordNet for text retrieval. In *WordNet, an electronic lexical database* (pp. 285–303). Cambridge, MA: The MIT Press.

Wilks, Y. (1978). Making preferences more active, *Artificial Intelligence*, 11(3), 197–223. https://doi.org/10.1016/0004-3702(78)90001-2

Xu, J., & Croft, B. W. (1996). Query expansion using local and global document analysis. In *Proceedings of the 19th annual international ACM SIGIR conference on research and development in information retrieval*. https://doi.org/10.1145/243199.243202

CHAPTER 4

VisMet and the crowd

What social tagging reveals about visual metaphors

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This chapter describes the data collection and analysis related to a new digital resource soon to be added to the VisMet 1.0 corpus of visual metaphor (http://www.vismet.org/VisMet/, Bolognesi, van den Heerik, van den Berg, 2018), consisting of crowdsourced tags.[1] Tags are keywords used by online coders,[2] non-expert of metaphors, to annotate and describe the images to which they were exposed, for different amounts of seconds.

The semantic information retrieved through this *Social tagging*[3] experiment allows us to explore the type of information that users extract from visual metaphors, in a setting that better resembles the natural environment in which these images are usually experienced (i.e., for very limited amounts of seconds).[4] We hereby provide methodological guidelines on this innovative procedure and report the results of our data collection and content analysis in which we manually classified the type of semantic information encoded in the tags.

1. Tags are user-generated semantic labels, fragments of natural language that internet users produce to describe or annotate a digital resource such as a digital illustration. In a way, tags have a similar function to the keywords used to describe, index, and retrieve academic articles. The reasons that users have for tagging a digital resource and the types of tags that users produce depend on the resource. A more detailed discussion on this topic can be found in Bolognesi (2016).

2. With the term *coder* we refer here to the workers that participated to the annotation task and tagged the images of our corpus on the online platform where they were presented.

3. Social tagging is the production and application of tags in an open digital environment. Tags are produced by internet users rather than specialists as a way to classify and describe online content and are consequently available to other users.

4. The images used in this experiment are available on the VisMet 1.0 corpus: http://www.vismet.org/VisMet/

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Keywords: visual metaphor, social tagging, crowdsourcing task, metaphor processing

1. Introduction

VisMet 1.0 is the first (and, currently, the only) digital corpus of visual metaphors publicly released online, where with the term "visual" we hereby refer to metaphors expressed within the imagistic semiotic system (these are also called pictorial or verbo-pictorial). The first version of the corpus available (VisMet 1.0) contains roughly 350 images, all reprinted under written authorization provided by the copyright owners. The images have been selected, analyzed and annotated on different dimensions of meaning (Bolognesi, van den Heerik, & van den Berg, 2018). The corpus covers visual metaphor variability across different genres previously identified in the scientific literature on visual metaphors (e.g., Forceville, 1996; El Refaie, 2003; Forceville & Urios-Aparisi, 2009, Bolognesi, 2017a), thus encompassing advertisements, political cartoons, artworks and illustrations of various types (graffiti, digital art, photographs).

The method that has been adopted to identify and consequently analyze the images included in VisMet is described in detail in the dedicated contribution. In summary: images were first selected from authentic sources consisting of online visual collections of advertisements, political cartoons, and artworks. The first selection was based on whether visual incongruence was immediately noticeable, a peculiarity that usually signals that the image requires a non-literal reading, in order to be interpreted by the viewer (see, for example, Schilperoord, 2018). Subsequently, three independent annotators applied the VisMip procedure (Šorm & Steen, 2018), to decide whether the visual incongruities detected in the images were actually signaling visual metaphors (as opposed to other figurative constructs). The VisMip procedure relies on the idea that images displaying visual metaphors typically present (different types of) perceptually incongruous elements that violate an expected (or "literal") scenario. Such incongruities need to be mentally replaced with other elements, whose function it is to restore the visual feasibility (i.e., perceptual congruency) of the scenario. Detecting the incongruous elements (step 3 of the VisMip procedure) and replacing them with elements that would help restore the expected scenario (step 4) are two crucial cognitive operations, among others, required to unravel and interpret the metaphor. In this sense, the perceptual incongruities and their replacements inform the analyst about the structure of the denotative meaning of the metaphor. For example, Figure 1 displays an ATM machine fused together with a confessional. The visual incongruity (the fact that usually confessionals do not have ATM machines on the side) triggers, by means of visual contiguity and integration of the two entities, the

construction of a metaphorical comparison between the ATM and the confessional, which, in turn, can arguably stand metonymically for two (more) abstract concepts: money and religion, respectively.

Figure 1. An illustration realized by Angel Boligan (copyright owner), displaying an ATM machine fused with a confessional. Image reprinted with permission.

The images that passed the VisMip test, and were therefore labeled as metaphoric, were included in the corpus. In addition, in a series of formal content analyses, the images were classified by the three independent coders according to a taxonomy of metaphor types. The taxonomy distinguishes different dimensions of meaning, on which a metaphor can be classified, in line with the three-dimensional model proposed by Steen (2011) and Šorm and Steen (2018). These three dimensions refer to how the meaning of a metaphor is constructed at three different levels: Expression, Conceptualization and Communication. In particular, the denotative meaning is constructed at the level of metaphoric expression within the image, the connotative meaning is constructed at the conceptual level and the pragmatic

meaning at the communicative level. Following this model, the denotative meaning of the visual metaphors was classified in accordance with the model proposed by Phillips and McQuarrie (2004), which describes how the two terms of the metaphors are graphically rendered within the image (i.e., by juxtaposition, by fusion or by replacement). In addition, the annotators indicated whether any of the metaphor terms were graphically conveyed through a conventional symbol (cf. Content Expression, VisMet corpus). On the conceptual level the connotative meaning of each metaphor was classified as conventional or novel. The three annotators applied a procedure (described in Bolognesi, van den Heerik, & van den Berg, 2018), to detect whether any of the conceptual metaphors (Lakoff & Johnson, 1980) listed in online repositories would clearly underlie a visual metaphoric expression.

Like other repositories of figurative language, the VisMet corpus is – arguably – used primarily, if not exclusively, by experts in the field of metaphor studies. This peculiarity characterizes probably most of the repositories of figurative expressions, and it can be ascribed (also) to the highly technical structure and terminology used in such repositories. However, we argue that one of the main characteristics of visual metaphors, as opposed to linguistic metaphoric expressions and conceptual metaphoric structures that are typically processed subconsciously, is that such images are deliberately constructed by their authors, in such a way that the viewer is stimulated to change her standpoint about a given topic. In other words, the perceptual incongruities represented in the visual metaphors (i.e., artificial gestalts of objects fused together, unusual representations of objects in unexpected scenarios, etc.) may signal the presence of a *deliberate* metaphor (for *deliberate metaphor*, cf. Steen 2008, 2011).

As deliberate metaphors, these images fulfil specific communicative functions that vary in relation to the genre to which they belong (for example, advertisements typically aim at persuading the viewer/consumer to buy a product; political cartoons at criticizing societal aspects, etc.). However, if visual metaphors are typically intended to change the standpoint of the viewer, it should be crucially important to know how the recipients of these metaphorical messages react and interpret the intended message. Yet, to the best of our knowledge, there are virtually no studies aimed at investigating specifically what laymen (non-experts of metaphors) see and perceive as salient in such images, even though we are exposed to these images virtually on a daily basis, often for a very limited amount of time (imagine driving by a billboard in which a metaphorical print advertisement is displayed, or flipping through a newspaper in which political cartoons are illustrated). While, for example, consumers' behavior, and consumers' attitudes toward a specific product advertised through a visual metaphor has been investigated in a variety of behavioral studies, typically conducted in experimental settings and

sometimes using ad-hoc constructed stimuli instead of existing ones (e.g., Phillips & McQuarrie, 2004; van Mulken et al., 2010; van Mulken et al., 2012; Le Pair & van Mulken, 2010; van Hooft et al., 2013), it is still quite unclear what people *get*, by looking at these real instances of metaphorical images when they are exposed to them for a short amount of time. The aim of this study is therefore to investigate what people typically perceive and annotate as salient aspects of these images (i.e., the visual metaphors included in VisMet) and whether the features reported by the viewers can, in turn, inform the experts about how these images are processed and interpreted, and whether even short-time exposures can effectively enable viewers to construct meaning within these images.

2. Theoretical background

2.1 Tags as traces of human behavior

To investigate what laymen perceive as salient aspects when they are exposed to visual metaphors we used a series of tagging tasks. Social tagging is an increasingly popular phenomenon on the web that has recently caught the attention of many academic researchers interested in mining the semantic information encoded in these streams of Big Data. Social tagging can be defined as a large-scale uncoordinated operation through which internet users annotate digital resources (such as, for example, digital pictures or whole web-pages), with keywords known as "tags" (e.g., Cattuto et al., 2009).

The motivations that stimulate internet users to annotate digital resources through tags have been discussed in the literature, and different types of annotators have been proposed. For example, Strohmaier, Körner, and Kern (2012) suggest a macro-distinction between *categorizers* and *describers*, where categorizers tend to classify resources according to some shared high-level characteristics, to be then used as navigational aids for later browsing, while describers tend to use more detailed, accurate and precise descriptors. Other models suggest different categories of tagging motivations: Marlow et al., 2006, suggests a main distinction between organizational and social motivations; Ames and Naaman (2007) suggest a double distinction, between self vs social tagging, and organization vs communication driven tags; Heckner, Heilemann, and Wolff (2009) suggest a distinction between personal information management vs resource sharing; Nov, Naaman, and Ye (2009) propose a wider range of categories for tagging motivation, which include enjoyment, commitment, self-development, and reputation.

The literature review outlined above shows that social tagging is a complex phenomenon that taps into a variety of user-related motivations. The variety of

semantic information encoded in user-generated tags can be considered as a strength or a weakness, depending on the scope of the scientific project. In cognitive science, for example, this topic is currently hotly debated (see for example, Jones, 2016, for an overview): while on one hand tags (and other sources of Big Data) are large in size, freely available, produced in a more naturalistic, non-experimental setting, and constantly updated, on the other hand they are not as accurate and 'clean' as the data collected in experimental setting.

The present study deploys tags collected in response to the visual metaphors displayed in VisMet 1.0, which are considered as clues to understand how such images are understood and interpreted by the viewers. We hereby explore and analyze the information encoded in the crowdsourced tags that have been collected in response to the images included in VisMet.

2.2 Visual metaphor comprehension and interpretation

While many studies in the social sciences, marketing and communication strategies fields have investigated how visual metaphors (and in particular advertisements) are perceived and appreciated by different populations of viewers, and whether visual metaphor variability impacts in some way their behavior as consumers, only a few studies have addressed how visual metaphors are actually processed. Van Weelden and colleagues (2012) investigated how object shape affects visual metaphor processing, suggesting that perceptual similarity between the shapes of two entities enhances the conceptual relation between them. Šorm and Steen (2013) adopt a different approach, and explore the cognitive operations that viewers undergo when they comprehend and interpret a visual metaphor. The study is conducted by means of a think aloud experiment, in which participants are exposed to visual metaphors and are asked to verbalize their thoughts while looking at the images without any time constraints. The texts produced by the participants are examined in a formal content analysis, in which the authors show that the cognitive operations undertaken by the viewers can be related to an adapted version of the general model for aesthetic appreciation and aesthetic judgments, previously proposed by Leder et al. (2004). The model presented by Šorm and Steen applies specifically to visual metaphors and distinguishes between two types of macro-operations: the first type includes those operations aimed at identifying and perceiving the incongruities displayed in the image, while the second type aims at unraveling the incongruities and solving the metaphorical message. The authors report on an experimental study (think aloud task) through which they show that all the different processes encompassed in their theoretical model take place during the interpretation and emerge systematically in the verbalizations recorded by the analysts during the experiment.

Our study takes inspiration from this model, and in particular from the types of knowledge that comes into play at each stage of the processing, but controls the amount of seconds that participants are exposed to these images. As claimed above, time is a crucial variable for mining how these images are understood, because in natural settings we are typically bombarded by visual stimuli, to which we are exposed for limited amounts o seconds. By controlling the time exposure, we explore what type of information people typically extract from these images, when they see them for very short (1 or 5 seconds) or longer amounts of time (15, 20 seconds).

We hypothesized that being exposed to the image for different amounts of time might result in different types of tags being produced: short time exposures could lead the coders to produce only tags that describe the denotative meaning of the metaphor, such as the entities represented in the image, while longer time exposures could allow users to generate tags designating conceptual operations, abstract concepts that by definition cannot be graphically depicted but can be cued in context by means of concrete concepts (Bolognesi 2017b) and tags indicating some degree of comprehension of the image. Finally, for the longest time exposure we could expect to observe tags indicating a full interpretation and evaluation of the visual metaphor displayed in the image.

Our hypothesis is based on a plausible intuition, that is, shorter time exposures do not allow viewers to construct and elaborate fully-fleshed interpretations of the images. Nonetheless, if this was confirmed, it would remain unclear whether these images can be effective in real-world situations, in which we are exposed to them for limited amounts of time.

3. Method

In order to gain an understanding of what laymen get out of visual metaphors, and what type of semantic information they perceive as salient when exposed to these images, we crowdsourced tags for all the images included in the VisMet 1.0, using non-expert coders (i.e., online participants). Next, the tags that were systematically produced by at least three coders were classified by experts in order to see what type of semantic information was conveyed through the tags.

3.1 Crowdsourcing tags

Tags for the images in the VisMet 1.0 dataset were collected using the crowdsourcing platform that at the time of the datacollection was called CrowdFlower (now, Figure Eight). On this platform, thousands of crowd coders are available to perform annotation tasks and receive a monetary reward. In our task, each image was shown to a coder for a limited amount of time: short exposure (1 or 5 seconds) or

longer exposure (15 or 20 seconds). In order to test the time ranges chosen for the analysis, we performed a pilot experiment.

In the pilot experiment, 10 images were annotated, all for three different time exposures: 1 second, 5 seconds and 15 seconds. The coders were instructed to describe the images with comma separated tags so that their tags were not limited to a predefined set of tags. They were also explicitly asked not to write full sentences, but single words (e.g.: 'perfume', Figure 3) or short compounds (e.g.: 'Hugo Boss' Figure 3). The tags that were annotated were previewed in real-time below the text field, to allow the coder to verify the splitting of tags, which were separated from one another by commas. Also, the coders were told that after clicking on the start button, the image would be only visible once for a time between 1 to 15 seconds. This was done to prevent coders from not paying attention during the display of the image. The order of the durations was randomized to make the time exposure unpredictable, and coders were exposed to the same image only once, for one of the three possible exposures. Finally, we allowed coders to provide feedback in a text field at the end of their work. Based on the results of the pilot study, and the feedback provided by the coders, we refined the design of the main experiment.

In the main experiment, all images were annotated by 20 coders in each time condition, using the final annotation task design of Figure 2. In order to reduce the possible spelling mistakes and to have more homogeneous interpretations of the stimuli, only coders from native English-speaking countries were selected (United States, Canada, United Kingdom and Australia). Based on the feedback obtained in the pilot study, where some participants commented that for some images they would have needed a bit more time to understand what was going on, an additional time exposure was added (20s, in addition to 1s, 5s and 15s). Coders were rewarded $0.01 for each annotation, with a limit of 25 annotations per batch of 30 images. The stimuli were divided into batches to increase the diversity in coders.

In the task, the coders were instructed to look at the image and provide comma separated keywords that would best describe what they saw in the image. They were instructed to click on the "Show the image" button when they were ready to see the image. This button was strategically displayed in the middle of the screen. This way, we ensured that the coders' attention was focused on the middle of the screen during the exposure of the image. Also, they were notified in the instructions that an image would be shown only once, for a few seconds, with a duration time ranging from one to twenty seconds.

3.2 Classifying tags

The tags collected through the crowdsourcing tasks were manually classified in a formal content analysis, in order to see what type of semantic information was encoded therein.

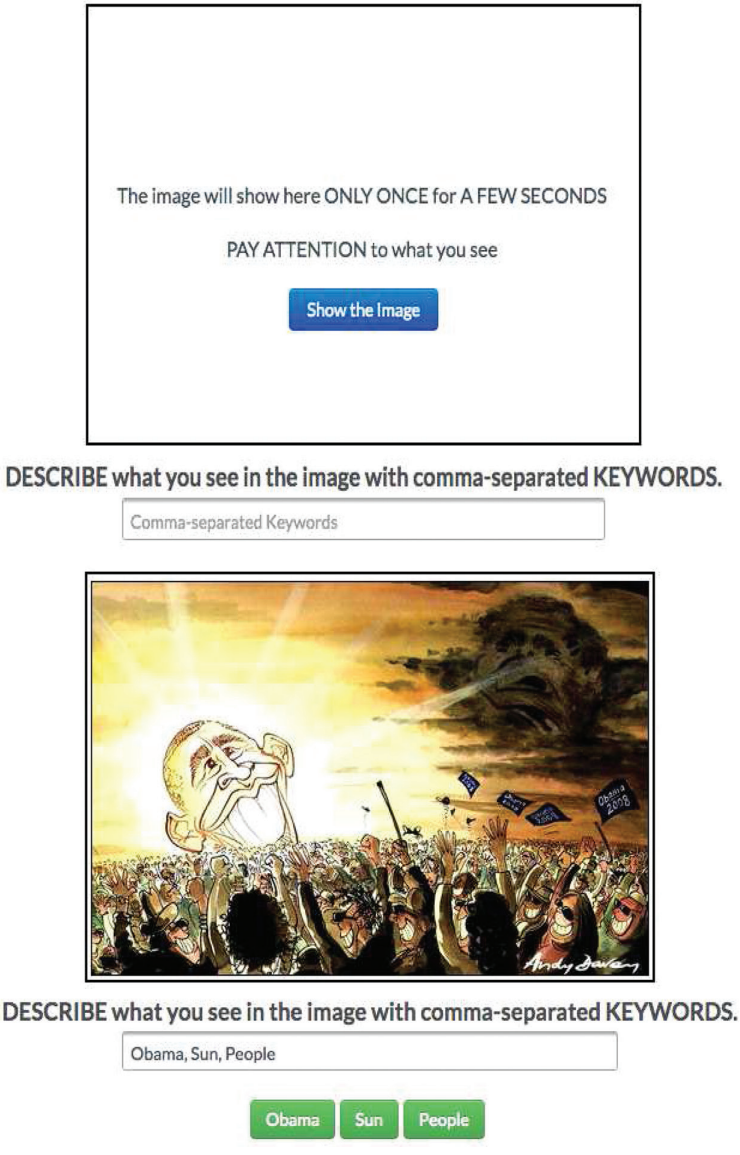

Figure 2. The phases of the crowdsourcing annotation task, where the image is exposed to the crowd coders for only a limited time

First, the data was *normed* (e.g., McRae et al., 2005), i.e., only the tags that were produced by at least 3 coders were retained, while the rest of the tags were not included in the content analysis. This step allowed the analysts to focus on the manual classification of the semantic information encoded in the tags that were consistently produced in response to a given image by at least 3 coders.

The resulting database was formatted in an editable spreadsheet, so that six independent analysts could classify the tags according to an ad-hoc constructed coding scheme. The spreadsheet rows displayed the following information: the image ID; URL at which the image could be seen; the time exposure (1; 5; 15; or 20 seconds); and the list of tags produced by at least three coders, ordered by production frequency.

The structure of the coding scheme reflects some of the findings reported by Šorm and Steen (2013), in relation to visual metaphor processing, as well as some preliminary observations of the data. In this respect, the proposed coding scheme is partially derived from theory (top-down construction) and partially data-driven (bottom-up construction). In particular, the model proposed by Šorm and Steen (adapted from Leder et al., 2004) distinguishes between a phase in which the viewers observe and describe the image and then identify the perceptual incongruities, followed by a phase in which the viewers integrate the perceptual information with new semantic information that is not visually represented but is triggered by the image itself in order to achieve a full comprehension of the visual message and interpretation of the metaphor.

Based on these features, the coding scheme was constructed in order to distinguish between things that were graphically depicted within the image and things that were not graphically represented but had to be integrated within the image in order to achieve a complete understanding of the message. Consider, for example, an advertisement displaying a car parked inside a stable, where the viewer would instead expect to see a horse. In this image, the (frequently produced) tag 'car' was classified as a graphically represented entity, while the tag 'horse' was classified as a non-represented concrete entity. An overview of the coding scheme is provided in Table 1. This is the coding scheme that was given to the analysts, together with examples (images) with which the coding scheme was explained to them.

As the coding scheme illustrates, categories were provided to classify, respectively, tags expressing evaluations about the image (code: EVAL); tags expressing contextual information about the visual genre, or about the commercial brand in case of advertisements (code: CONT); and tags expressing other types of information (for example, things that were not correctly identified due to the short time exposure, such as the tag 'girl' to describe an image with a man wearing a traditional costume with a skirt; code: OTHE). The first two macro-categories, which encompassed represented entities and non-represented entities, were further analysed into nested categories, each with a specific code that the analysts were asked to use when classifying the tags. In particular, the category of entities represented in the image distinguished concrete entities (code: YENT, where Y stands for *Yes*, i.e., the tag expresses something that is graphically represented in the image, and ENT, which stands for *entity*); perceptual properties (code: YPRO) and concrete actions (code YACT).

Table 1. The coding scheme used to classify types of tags

Macro category	Nested category	Examples	Code	Description
THINGS YOU SEE IN THE IMAGE	CONCRETE ENTITIES	car, horse, sun, president, clock, woman	YENT	which means Yes, this entity IS represented in the image (and therefore has to be quite concrete)
	PERCEPTUAL PROPERTIES	red, circle, pink	YPRO	which means Yes, this property IS represented in the image (and therefore has to be quite concrete)
	DEPICTED ACTIONS	eating, cooking, running, digging etc.	YACT	which means Yes, this Action IS represented in the image (and therefore has to be quite concrete)
THINGS YOU DON'T SEE IN THE IMAGE	CONCRETE ENTITIES (that are not represented!)	horse, car, cap	NCON	which means No, this concrete entity is NOT represented in the image
	ABSTRACT ENTITIES	economy, love, freedom	NABS	which means No, this is an abstract entity and therefore cannot be represented in the image
	CONCEPTUAL PROPERTIES	smart, silly, aggressive	NPRO	which means No, this property is abstract and therefore is not represented in the image
	ABSTRACT VERBS	understanding, decide	NACT	which means No, this action is not represented (is probably quite abstract)
EVALUATIONS	EMOTIONAL RESPONSES, SIGNS OF IMAGE APPRECIATION	beautiful, interesting, funny	EVAL	which means that this is a positive or negative evaluation OF THE WHOLE IMAGE
CONTEXTUAL INFORMATION	GENRE INFORMATION	advertisement, cartoon, political, wwf	CONT	which means that this tag explains what type of image it is
OTHER	other	don't know	OTHE	which means that none of the categories above apply

The second macro category, which was used to annotate tags that denote things that are *not* represented in the image, included the following distinctions: concrete entities that are not represented (code: NCON, where N stands for *not represented* and CON stands for *concrete entity*); abstract entities, which by definition lack referents

that can be graphically depicted (code: NABS); conceptual properties (as opposed to properties that can be perceived by the viewer through her senses, code: NPRO); and verbs referring to abstract actions (code: NACT).

The described coding scheme was explained to six independent analysts, who manually classified a sample of tags in two phases, in accordance with the guidelines proposed by Bolognesi et al. (2017), in relation to the manual classification of semantic features in formal content analyses. During a first pilot phase the analysts manually classified a sample of tags related to 10 images (for all the 4 time exposures), amounting to 236 tags. During this coding task, the analysts were explicitly asked to take notes about possible problems that were encountered, such as the ambiguity or lack of clarity for some category description, or the need to establish a new category that was missing in the coding scheme. After the first annotation task, the interrater agreement was checked. Then, the analysts mediated the disagreements in a discussion, and improved the coding scheme by adding a more detailed description of each category. Finally, a second annotation task was performed, based on a sample of 10 new images and 4 time exposures (221 tags total). The interrater agreement was checked among the 6 coders and compared to the values obtained in the previous task, for reliability purposes. The remaining set of tags was finally annotated by a single trained coder, as common practice observed in cognitive science and computational linguistics (see for example Recchia and Jones 2011; Kremer and Baroni 2011).

4. Analysis

In the following subsections, we report the results of our data collection (crowdsourcing task), and classification through formal content analysis performed by trained analysts.[5]

4.1 Crowdsourcing tags

As indicated above, a pilot experiment was first conducted on the CrowdFlower (Figure Eight) platform to test the design setup for the final crowdsourcing task. In the pilot experiment 10 images were used, which were displayed for 1 second, 5 seconds, or 15 seconds. Ten coders annotated each image for each time exposure. From the comments reported by the coders at the end of the task, in the text field, we learnt that they were not always focused on the image when it would be

5. The data is stored in an online repository on Open Science Framework: https://osf.io/n7qzr/?view_only=4bfb55ce569844c0b17912f0bc902179

exposed, and when the time exposure was particularly limited (1 second) they admitted to have missed the image. In order to prevent this during the main experiment, a black frame was placed where the image would appear, with the button to start the task displayed in the middle of the frame as pictured in Figure 2. Also, a three second countdown was added so that coders were more likely to have the full attention to the image when it would appear. Finally, from the feedback given by the participants in the pilot, we learnt that some participants would have preferred to have more time to understand and tag the images. For this reason, we added an additional exposure time of 20 seconds.

Based on the results of the pilot, and the feedback provided by the coders, we setup the main task. In the main task, all images were annotated by a total of 509 unique coders resulting in 27112 judgments. Each judgment contained on average 3.40 tags, and each tag contained on average 1.29 words, resulting in a total set of 92112 tags. An example can be seen in Figure 4, which contains all the tags that were produced by at least three coders for the image reproduced in Figure 3. In Figure 4 each column starting from column 2 represents a coder and the black box indicates that the coder annotated the tag displayed in the first column.

Figure 3. An illustration realized by Ferdi Rizkiyanto (copyright owner), for a popular perfume brand, displaying a river in the shape of the perfume bottle

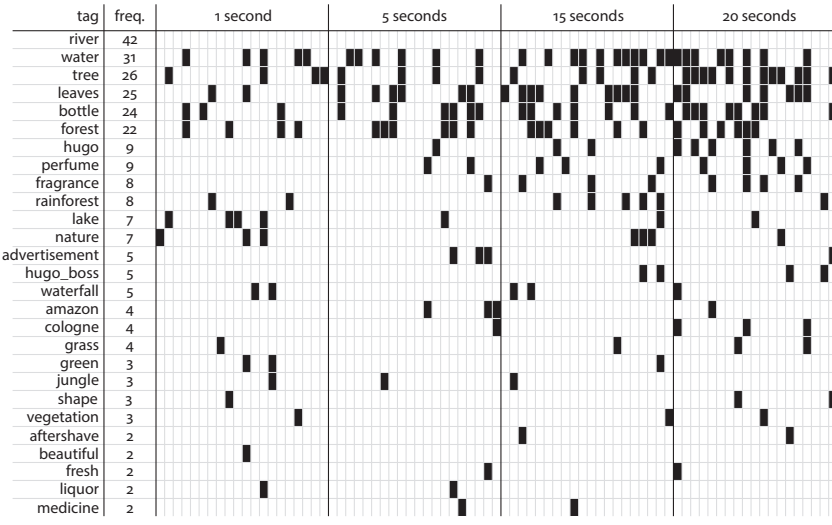

Figure 4. List of tags for the given image that were annotated by at least two coders

Table 2. Crowdsourcing results for each time exposure

Time exposure	**Tags**
1 sec	18 635
5 sec	21 618
15 sec	25 236
20 sec	26 624
total	**92 113**

Figure 4 visually shows that, on average, the longer the coders were exposed to an image, the more tags they tended to produce (increasing number of black boxes in the 5-15-20 second quadrants). Table 2 quantifies this tendency: the total number of tags produced increases as a function of the time exposure. This tendency is confirmed by the ANOVA test that we performed, in which we compared the total number of tags produced by coders in response to the images observed for 1, 5, 15, or 20 seconds respectively ($F = 244.094$, $df = 3$, $p < 0.005$). The ANOVA tests showed that the four conditions (i.e., being exposed to the same image for 1, 5, 15, or 20 seconds) led coders to produce, on average, a significantly different number of tags. We then performed a post-hoc Tukey HSD test, to identify which of the pairs of treatments are significantly differerent from each other. The results of the Tukey test showed that all the group pairs were significanctly different from one another ($p < 0.005$), which means that coders exposed to images for 1 second

produced significantly less tags than coders exposed to the same images for 5, 15, and 20 seconds; coders exposed to images for 5 seconds produced significantly less tags than coders exposed to the same images for 15 and 20 seconds; and coders exposed to images for 15 seconds produced significantly less tags than coders exposed to the same images for 20 seconds.

4.2 Classifying tags

In the first annotation task, 6 independent coders applied the coding scheme (illustrated in Table 1) to classify the tags that had been produced by at least 3 participants, in response to a visual metaphor, to which online coders had been exposed 1, 5, 15 or 20 seconds. The analysts coded a first sample of 10 images (and the related tags, produced at 4 different time exposures), amounting to a total of 236 tags. The interrater coefficients (Krippendorf's alpha and Fleiss' kappa) were computed, to assess the agreement among analysts and the overall reliability of the annotations. We obtained two identical coefficients for Krippendorff's α and Fleiss's κ scores ($k = .56$, $\alpha = .56$[6]). This suggests that there were not blank cells in the annotation files. As described in Bolognesi et al. (2017) alpha-like and kappa-like measures are by no means direct measures of truth or quality of the data: a dataset can encompass poor data, and a coding scheme might have no theoretical or cognitive foundations, and yet coders might use it in the same way and thereby obtain high intercoder reliability. This, however, does not mean that these measures cannot provide any useful information: sufficiently high scores in interrater agreement tests can be regarded as an indication of the adequacy of a coding scheme in relation to a specific dataset.

The disagreements were discussed in a debate among the six analysts. As a result of the discussion, they decided to keep the coding scheme as it was proposed but provided a more detailed description of each category to facilitate its application to the data. The analysts also decided to add some examples to the coding scheme to exemplify in which circumstances the categories had to be applied.

After the pilot annotation task and the related discussion took place, a second annotation task was performed by the six analysts, on a new sample of tags. In this second task, the six analysts annotated the tags associated by at least 3 coders to 10 new images, for the four different time exposures (221 tags total). The alpha and kappa scores showed a substantial improvement ($k = .69$, $\alpha = .69$).

Table 3 shows an example of annotation for the image displayed in Figure 3.

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6. By standard agreement in corpus linguistics and content analysis (see Bolognesi et al., 2017) this is considered to be a moderate level of reliability. Krippendorff's α and Fleiss's κ scores range from 0 to 1, where 1 represents the complete agreement. Scores above 0.7 are considered to be indicative for high reliability of the annotations.

Table 3. Tags and annotations produced in response to Figure 3

1	*river*	*water*	*lake*	*trees*	*forest*	*nature*	*bottle*				
5	*river*	*water*	*forest*	*bottle*	*leaf*	*trees*	*amazon*				
15	*water*	*river*	*leaf*	*bottle*	*forest*	*trees*	*nature*	*perfume*	*fragrance*	*rainforest*	
20	*trees*	*water*	*bottle*	*river*	*leaf*	*hugo*	*forest*	*perfume*	*cologne*	*fragrance*	*hugo boss*
1	*YENT*	*YENT*	*YENT*	*YENT*	*YENT*	*NABS*	*NCON*				
5	*YENT*	*YENT*	*YENT*	*NCON*	*YENT*	*YENT*	*NABS*				
15	*YENT*	*YENT*	*YENT*	*NCON*	*YENT*	*YENT*	*NABS*	*CONT*	*CONT*	*YENT*	
20	*YENT*	*YENT*	*NCON*	*YENT*	*YENT*	*CONT*	*YENT*	*CONT*	*CONT*	*CONT*	*CONT*

Table 4. Classification results for each time exposure

Sec.	NCON	YENT	NABS	EVAL	YPRO	YACT	NPRO	CONT	OTHE	NACT
1	139	1083	116	2	71	61	4	44	4	0
5	111	1299	113	2	82	96	5	116	19	0
15	128	1652	124	0	59	136	8	59	35	0
20	104	1738	135	3	90	143	24	110	17	1
TOT	**482**	**5772**	**488**	**7**	**302**	**436**	**41**	**329**	**75**	**1**

Table 4 shows the distribution of the 10 categories included in the coding scheme, over the whole dataset of tags produced by at least three coders, in relation to each of the different time-exposures. Overall, the table shows that the vast majority of tags produced denotes concrete entities represented in the image, for all the time conditions (code: YENT). The pie charts in Figure 5 illustrate this tendency, as well as all the percentages of the distribution of tags across the four time conditions.

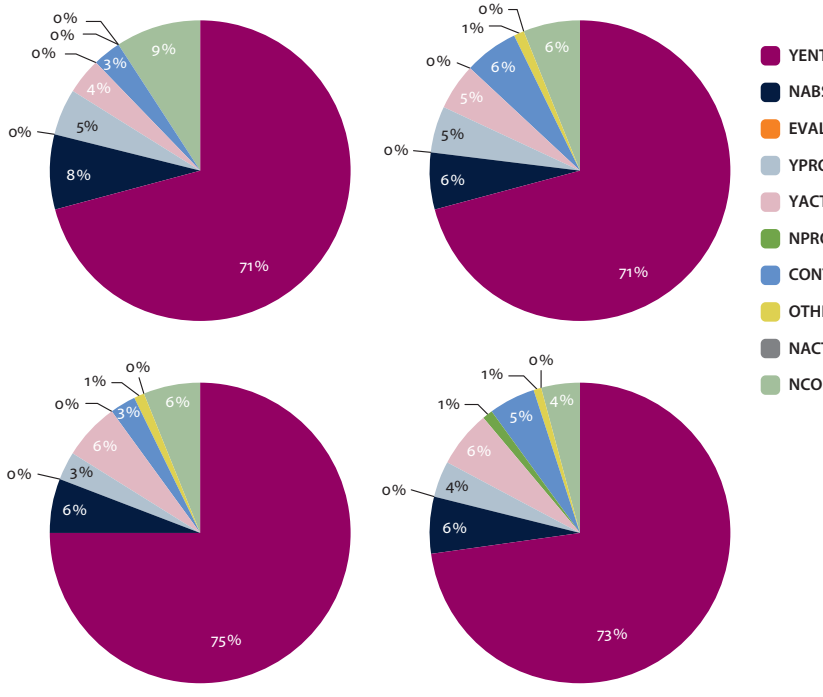

Figure 5. Distribution of the categories across the four time conditions

Table 3 also shows that the longer the exposure the higher the amount of tags produced for each category. But, as Table 2 displayed, the total amount of tags increases for longer durations. Therefore, the question is whether the *distribution* of the categories is significantly different across the different time exposures. In order to test this we ran two Chi-square tests using the R software for statistical analyses, to see whether there was a significant difference between the variable 'type of tags' and the variable 'time exposure.[7] In a first Chi-square analysis we grouped the macro categories described in Table 1 into four groups: entities, actions and properties that are physically depicted in the image (YENT+YPRO+YACT); entities, actions and properties that are *not* physically depicted in the image (NCON+NABS+NPRO+NACT); contextual entities (CONT) and other (OTHE). Moreover, we grouped the two short time exposures (1 + 5 seconds) and the two long time exposures (15 + 20 seconds). The results showed a statistically significant relation between time exposure and type of tags (χ^2 = 25.204, df = 3, p = 1.4e-05). In order to investigate the nature of the dependence between these two variables we calculated the Pearson residuals for each cell (or standardized residuals), reported in Table 5. Here we observe that the surprisingly large entry is the category identifying entities that are *not* represented in the image, at short time exposures. This means that the association between short time exposures and tags denoting entities anctions and properties *not* depicted in the images contribute the most to the total Chi-square score.

Table 5. Standardized residuals for the chi-square analysis on the macro-categories and short vs. long time exposures

	Not depicted	Depicted	Contextual	Other
Short exposure	2.822	−1.351	1.723	−1.323
Long exposure	−2.423	1.160	−1.480	1.136

We then ran a second, more fine-grained Chi-square analysis, on all the specific categories and all the four time exposures. In order to meet the basic assumption of the Chi-square test (frequencies > 5) we merged the categories NACT and EVAL together with the category OTHE, because these two categories had frequency < 5. The result of the Chi square test was significant (χ^2 = 135.76, df = 21, p < 2.2e-16). The standardized residuals for this analysis are reported in Table 6.

7. A possible caveat should be however declared: a chi-square assumes that the categories included are all nominal. This is not the case for the time exposure, which is ordinal.

Table 6. Standardized residuals for the chi-square analysis on all categories and all time exposures

	NCON	YENT	NABS	YPRO	YACT	NPRO	CONT	OTHE
one	4.822	−0.776	2.298	1.705	−2.487	−1.381	−2.416	−2.491
five	−0.092	−1.146	−0.035	1.413	−0.526	−1.466	4.526	0.391
fifteen	−0.496	1.264	−0.979	−2.708	1.367	−1.001	−3.379	2.495
twenty	−3.311	0.416	−0.869	−0.003	1.142	3.369	1.203	−0.753

Finally, we calculated the the contribution (in %) of each cell to the total Chi-square score. The relative contribution of each cell to the total Chi-square score gives some indication of the nature of the dependency between rows and columns of the contingency table. This analysis is reported in Table 7 and sisplayed in Figure 6.

Table 7. The relative contribution (in %) of each cell to the total Chi-square

	NCON	YENT	NABS	YPRO	YACT	NPRO	CONT	OTHE
One	17.129	0.444	3.890	2.140	4.555	1.405	4.298	4.569
Five	0.006	0.967	0.001	1.472	0.204	1.584	15.087	0.113
Fifteen	0.181	1.176	0.706	5.402	1.376	0.738	8.409	4.584
Twenty	8.077	0.127	0.556	0.000	0.961	8.358	1.067	0.417

Table 7 and Figure 6 show that the most contributing cells to the Chi-square are the two short exposures (1 and 5 seconds) with NCON (entities non-represented in the image but cued by the context) and CONT (contextual elements, such as tags indicating the specific visual genre).

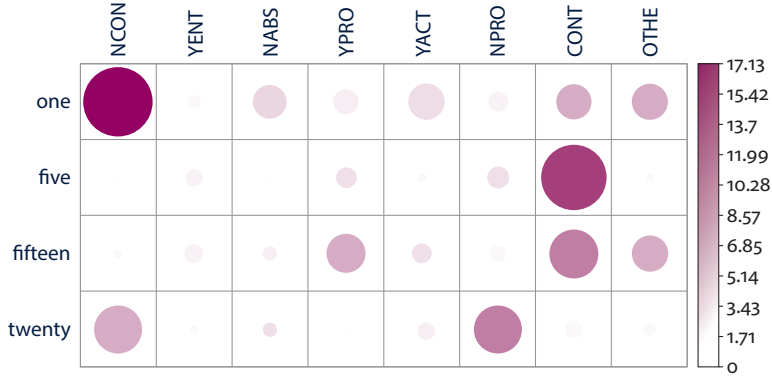

Figure 6. Visualization of the standardized residuals into relative percentages, showing which associations contribute the most to the Chi-square. Color and size of the dots are proportional to the percentage values

5. Discussion

We encounter metaphorical images on a daily basis, when flipping magazines' pages, watching TV, or driving around the streets of our cities. Very often we are exposed to these images for very limited amounts of seconds, and these quick exposures raise the question whether we can actually *get* something out of these images, when we see them. The aim of this study was to explore what type of information viewers get when they are exposed to visual metaphors for different amounts of seconds. This was achieved through a crowdsourcing task, in which online coders were exposed to the VisMet 1.0 visual metaphors for short durations (1 and 5 seconds) and for longer durations (15 and 20 seconds).

The results of our investigation show that, overall, the more viewers are exposed to these images, the more they tend to produce tags. In particular, viewers tend to produce mostly tags that denote concrete, depicted entities. This may not come as a surprise. However, among the tags that viewers produce when they are exposed to these images, there are also several tags that denote entities, actions, and properties that are *not* physically depicted within the images, but evoked by contextual cues. These categories of tags appear to be significantly related, and therefore more peculiar, of short time exposures. Our analysis revealed that entities that are not graphically depicted in the image but just cued by the context (NCON) and contextual elements, such as tags defining the genre to which the image belongs (CONT) are strongly related, respectively, to the 1-second and the 5-seconds exposures. In particular, the NCON tags were most strongly associated to the shortest time exposure (1 second), and the CONT tags were most strongly associated to the 5 seconds exposure. This phenomenon appears to be in line with Leder's model of aesthetic appreciation and aesthetic judgment that Šorm and Steen applied specifically to visual metaphors to construct their model of visual metaphor processing. In this model, in fact, identifying the context and integrating the implicit information that is not perceptually provided constitute the early stages of visual metaphor processing.

This suggests that the operation of integrating missing perceptual information in these images, or replacing the unexpected entity with an expected one (which motivates the tags denoting concrete entities that are not depicted in the images) might happen even *before* the viewer acknowledges and provides explicit clues to describe the visual genre to which the image belongs. Further psycholinguistic investigations (for example using eye-tracking) may build on these results to provide a more fine-grained analysis of the exact sequences in which the various processing stages take place.

For the purpose of our study, we have demonstrated that while viewers tend to construct detailed meaning proportionally to the amount of time they have at their disposal (the more they are exposed to these images, the more they are capable of adding information) even short time exposures (1 and 5 seconds) allow them to contextualize the image and detect implicit (missing) information.

Finally, we observed that tags expressing evaluations of the images and aesthetic judgment about the image or the metaphor were almost absent. We suggest that a reason for this might be methodological. In fact, on one hand in crowdsourcing tasks the recruited coders might be stimulated to keep their focus on accomplishing the task in the most efficient way, and therefore might avoid indulging in emotional states; on the other hand, the clear and concise instructions, and the fact that the task was performed remotely from the analysis, might have influenced a less-emotional behavior.

6. Conclusions

This chapter describes an innovative method that we used to mine information related to what people get from being exposed to visual metaphors for different amounts of seconds. In this perspective, the chapter contributes to the overall aim of this volume in three ways: first, by describing a new electronic resource (the dataset of tags) which will be soon added to the VisMet corpus; second, by illustrating the innovative method by which this resource was created (the crowdsourced tags on a multi-exposure visual task); and third, by discussing the theoretical implications related to the analysis of the tags (the relation to Šorm and Steen's model of visual metaphor processing). We also highlight potential risks related to our method, such as the fact that it may not provide a complete readout of the cognitive operations that the viewers undergo when they see and understand the visual metaphors.

In addition, this chapter supports the need to integrate experts' analyses of figurative expressions with a crowdsourcing approach that taps into the viewers' mind and can inform the experts about the type of salient information that attracts viewers' attention when they are exposed to visual metaphors. As anticipated in the introduction to this chapter, the present dataset will be soon released on the VisMet platform and will constitute a new open resource that can be used to test new research questions related to visual metaphors. We hope that the resource hereby described and discussed will facilitate the implementation of new experimental studies and quantitative analyses related to the structure and processing of visual metaphors.

References

Ames, M., & Naaman, M. (2007). Why we tag: motivations for annotation in mobile and online media. In *Proceedings of the SIGCHI conference 2007* (pp. 971–980). New York: ACM. https://doi.org/10.1145/1240624.1240772

Aroyo, L., & Welty, C. (2014). The three sides Crowd Truth. *Human Computation*, 1(1), 31–44. https://doi.org/10.15346/hc.v1i1.34

Artstein, R., & Poesio, M. (2008). Inter-coder agreement for computational linguistics. *Computational Linguistics*, 34, 555–596. https://doi.org/10.1162/coli.07-034-R2

Bolognesi, M. (2016). Flickr distributional tagspace: Evaluating the semantic spaces emerging from flickr tags distributions. In M. Jones (Ed.), *Big data in cognitive science* (pp. 144–173). New York: Routledge.

Bolognesi, M. (2017a). Conceptual metaphors and metaphorical expressions in images. In A. Baicchi, & E. Pinelli (Eds.), *Cognitive modelling in language and discourse across cultures* (pp. 367–383). Cambridge: Cambridge Scholars.

Bolognesi, M. (2017b). Using semantic feature norms to investigate how the visual and verbal modes afford metaphor construction and expression. *Language and Cognition* 9(3), 525–552. https://doi.org/10.1017/langcog.2016.27

Bolognesi, M., Pilgram R., & Van den Heerik R. (2017). Reliability in semantic categorization: The case of semantic feature norms classification. *Behavior Research Methods* 49(6), 1984–2001. https://doi.org/10.3758/s13428-016-0838-6

Bolognesi, M., van den Heerik, R., & van den Berg, E. (2018). VisMet: an online corpus of visual metaphors. In G. J. Steen (Ed.), *Visual metaphor: Structure and process* (pp. 89–117). Amsterdam: John Benjamins Publishing Company.

Cattuto, C., Barrat, A., Baldassarri, A., Schehr, G., & Loreto, V. (2009). Collective dynamics of social annotation. *PNAS*, 106(26), 10511–10515. https://doi.org/10.1073/pnas.0901136106

El Refaie, E. (2003). Understanding visual metaphors: The example of newspaper cartoons. *Visual Communication*, 2, 75–95. https://doi.org/10.1177/1470357203002001755

Forceville, C. (1996). *Pictorial metaphors in advertising*. London: Routledge. https://doi.org/10.4324/9780203272305

Forceville, C., & Urios-Aparisi, E. (Eds.). (2009). *Multimodal metaphor*. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110215366

Heckner, M., Heilemann, M., & Wolff, C. (2009). Personal information management vs. resource sharing: Towards a model of information behaviour in social tagging systems. *Proceedings of the Third international AAAI conference on weblogs and social media (ICWSM)* (pp. 42–49).

Jones, M. N. (Ed.). (2016). *Big data in cognitive science*. New York: Taylor and Francis Psychology Press. https://doi.org/10.4324/9781315413570

Kremer, G., & Baroni, M. (2011). A set of semantic norms for German and Italian. *Behavior Research Methods*, 43, 97–109. https://doi.org/10.3758/s13428-010-0028-x

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: The University of Chicago Press.

Le Pair, R., & Van Mulken, M. (2010). Effects of verbal anchoring in visual metaphors on perceived complexity and appreciation. In A. V. Prokhorov (Ed.), *Topical issues of advertising: Theory and practice* (Vol. II, pp. 26–36). Tambov: TSU.

Leder, H., Belke, B., Oeberst, A., & Augustin, D. (2004). A model of aesthetic appreciation and aesthetic judgments. *British Journal of Psychology*, 95, 489–508. https://doi.org/10.1348/0007126042369811

Marlow, C., Naaman, M., Boyd, D., & Davis, M. (2006). HT06, Tagging Paper, Taxonomy, Flickr, Academic Article, ToRead. *Proceedings of the seventeenth conference on hypertext and hypermedia* (pp. 31–40).

McRae, K., Cree, G., Seidenberg, M., & McNorgan, C. (2005). Semantic feature production norms for a large set of living and nonliving things. *Behavioral Research Methods*, 37, 547–559. https://doi.org/10.3758/BF03192726

Nov, O., Naaman, M., & Ye, C. (2009). Motivational, structural and tenure factors that impact online community photo sharing. *Proceedings of AAAI international conference on weblogs and social media (ICWSM 2009)*.

Phillips, B., & McQuarrie, E. (2004). Beyond visual metaphor: A new typology of visual rhetoric in advertising. *Marketing Theory*, 4, 113–136. https://doi.org/10.1177/1470593104044089

Poesio, M. (2004). Discourse annotation and semantic annotation in the GNOME corpus. *Proceedings of the 2004 ACL workshop on discourse annotation* (pp. 72–79).

Recchia, G., & Jones, M. N. (2012). The semantic richness of abstract concepts. *Frontiers in Human Neuroscience*, 6, 315. https://doi.org/10.3389/fnhum.2012.00315

Schilperoord, J. (2018). Ways with pictures, visual incongruities and metaphor. In G. J. Steen (Ed.), *Visual metaphor: Structure and process*. Amsterdam: John Benjamins Publishing Company.

Steen, G. J. (2008). The paradox of metaphor: Why we need a three-dimensional model of metaphor. *Metaphor and Symbol*, 23(4), 213–241. https://doi.org/10.1080/10926480802426753

Steen, G. J. (2011). The contemporary theory of metaphor – now new and improved! *Review of Cognitive Linguistics*, 9(1), 26–64. https://doi.org/10.1075/rcl.9.1.03ste

Strohmaier M., Körner, C., & Kern, R. (2012). Understanding why users tag: A survey of tagging motivation literature and results from an empirical study. *Web Semantics*, 17, 1–11. https://doi.org/10.1016/j.websem.2012.09.003

Šorm, E., & Steen, G. J. (2018). VisMip: Towards a method for visual metaphor identification. In G. J. Steen (Ed.), *Visual Metaphor: Structure and Process* (pp. 47–88). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/celcr.18.03sor

Šorm, E., & Steen, G. J. (2013). Processing visual metaphor: A study in thinking out loud. *Metaphor and the Social World*, 3(1), 1–34. https://doi.org/10.1075/msw.3.1.01sor

Van Hooft, A., van Mulken, M., & Nedergist, U. (2013). Cultural differences? Visual metaphor in advertising: Comprehension and tolerance in ambiguity in four European countries. In S. Rosengren, M. Dahlén, & S. Okazaki (Eds.), *Advances in advertising research* (Vol. IV, pp. 351–364). Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-02365-2_27

Van Mulken, M., & Le Pair, R. (2012). Appreciation and interpretation of visual metaphors in advertising across three European countries. In F. MacArthur, J. L. Oncins-Martínez, M. Sánchez-García, & A. M. Piquer-Píriz (Eds.), *Metaphor in use. Context, culture, and communication* (pp. 177–193). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.38.14mul

Van Mulken, M., Le Pair, R., & Forceville, C. (2010). The impact of perceived complexity, deviation and comprehension on the appreciation of visual metaphor in advertising across three European countries. *Journal of Pragmatics*, 42, 3418–3430. https://doi.org/10.1016/j.pragma.2010.04.030

Van Weelden, L., Maes, A., Schilperoord, J., & Swerts, M. (2012). How object shape affects visual metaphor processing. *Experimental Psychology*, 59(6), 364–371. https://doi.org/10.1027/1618-3169/a000165

CHAPTER 5

MetaNet.HR

Croatian metaphor repository

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This paper describes the theoretical background, methodology, tasks, results, and challenges of the MetaNet.HR (Croatian Metaphor Repository) project. It combines a theory-driven introspective top-down approach that analyzes the system of conceptual metaphors in the Croatian language (following the methodology of the MetaNet project) with a bottom-up corpus-based approach that analyzes how metaphors are used in language corpora. The project involves linguistic, computational, and psychological tasks. The main result of the project is a figurative language database – MetaNet.HR (http://ihjj.hr/metafore/). This database lists conceptual metaphors and metonymies decomposed into source-target relations among cognitive primitives, image schemas, and semantic frames, which are further decomposed into semantic roles. The database includes annotated metaphor examples and links to experiments, if applicable.

Keywords: MetaNet.HR, cognitive primitives, image schemas, semantic frames, primary metaphors, complex metaphors, metaphor families

1. Introduction

> *How does the physical brain give rise to thought and language? How do ideas and language arise from neurons?*

This question, formulated often by George Lakoff in his talks, has been in the focus of cognitive science, cognitive linguistics, artificial intelligence, psychology,

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philosophy, neuroscience, theory of mind, etc., for decades. A vast amount of interdisciplinary research, time, and money has been put into answering this question, and we are indeed much closer to answering it now than we were a few decades ago. The results of cognitive science and neuroscience (known as the neural revolution) have radically changed our understanding of the brain and thought, and consequently, of language. Among linguistic theories, the Neural Theory of Language and Thought (NTLT) comes closest to offering an answer to the question posed above. NTLT approaches language primarily as one of the functions of our brain, which it undoubtedly is.

Despite the neural revolution and the huge progress that has been made in this field, we still do not have an all-embracing theory of language that would provide a scientifically-proven explanation of how our brains "produce" thoughts and language.

The Croatian Metaphor Repository project and its metaphor database, MetaNet.HR,[1] based on theoretical insights from NTLT (the foundation of which is Conceptual Metaphor Theory) and the methodology of ICSI Berkeley's MetaNet (see Sweetser, David, & Stickles, this volume; Dodge, Hong, & Stickles, 2015), brings us one step further towards answering the main question stated at the beginning of this article.

MetaNet.HR schematically shows how complex metaphor systems can be divided into simpler metaphors, primary metaphors, semantic frames, image schemata, and cognitive primitives. It also shows which experiences the metaphorical systems of the Croatian language are based on. MetaNet.HR combines a theory-driven introspective top-down approach that analyzes the system of conceptual metaphors in the Croatian language with a bottom-up corpus-based approach that analyzes how metaphors are used in discourse.

In this paper, we will describe the theoretical background, methodology, tasks, results, risks, and challenges involved in the creation of the MetaNet.HR figurative language repository.

1. Neither this nor the Berkeley project is the first attempt to build such a database. Based on a number of proposed theories of metaphor (the Contemporary Theory of Metaphor, Lakoff, 1993; the Conceptual Mapping Model, Ahrens et al., 2003; the Structure Mapping Model, Wolff & Gentner, 2000; and the Attribute Categorization Hypothesis, McGlone, 1996), earlier collections of metaphors have been assembled and published for use by researchers. Examples of these include the following: The Master Metaphor List (MML) (Lakoff, Espenson, & Schwartz, 1991), the Hamburg Metaphor Database (HMD) (Eilts & Lönneker, 2002), and EuroWordNet synsets with MML source and target domains. See Bolognesi and Despot, this volume.

2. Theoretical background

2.1 Neural theory of language and thought

> *The nervous system evolved for sensing and action; language is a very recent extra.*
> (Feldman, 2006: 163)

Within MetaNet.HR, the Neural Theory of Language and Thought (NTLT) and the Neural Theory of Metaphor (Feldman, 2006; Lakoff, 2008) serve as the theoretical background for the linguistic analysis of conceptual metaphors. NTLT was developed at the University of California, Berkeley, under the leadership of Jerome Feldman and George Lakoff. It offers a framework that unites results from different research fields in cognitive science, which is focused on understanding the human brain and mind.[2] NTLT uses and confirms cognitive linguistic views on language, on the relationship between language, thought, and culture, and especially on the theory of the embodiment and figurativeness of language and thought (Lakoff & Johnson, 1980; Lakoff & Johnson, 1999; Lakoff, 1987; Johnson, 1987; Johnson, 2007; Turner, 1996; Fauconnier & Turner, 2003 etc.). NTLT fully accepts the fundamental findings of cognitive science – that the mind is inherently embodied, that thought is mostly unconscious, and that abstract concepts are largely metaphorical (Lakoff & Johnson, 1999, p. 3). These cognitive views of language, which reflect figurative, embodied thought, go against the philosophical (and linguistic) tradition of objectivism (Johnson, 1987, p. ix), which is based on the assumption that "objective reality" exists independently of our brain and experience, as well as against the Cartesian and Kantian view of *reason*. Cognitivists view reason as embodied, evolutionary, mostly unconscious, not purely literal but largely metaphorical and imaginative, not dispassionate but emotionally engaged, and not radically free but limited by human conceptual systems (Lakoff & Johnson, 1999, p. 3).

The basic principles of the Neural Theory of Language are (1) direct neural realization; (2) the continuity of thought, language, and evolution; (3) the importance of linguistic communities; (4) simulation semantics (which states that language understanding uses the same brain structures that are used for perception, motion, and emotions); and (5) the best-fit process.[3]

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2. The results of their research and insights have been published in Narayanan (1997a, 1997b), Shastri (2003), Feldman (2006), Lakoff (2008), Feldman, Dodge and Bryant (2009), Lakoff (2012), etc.

3. "All living things need to classify their inputs and act on them as best they can. The neural best-fit matching networks of our brains are far from perfect; for example, we often initially

The crucial property of our brain is its link to our body. The brain has evolved primarily to control the human (and animal) body, and the connection between sensation and action is therefore the dominant function of the human brain. The human brain is richly connected and profusely activated; one idea automatically activates others, and those ideas are always contextual (Feldman, 2006, p. 38).

NTLT states that the study of language should be explicitly based on the fact that thought is structured neural activity and that language is inextricable from thought and experience (Feldman, 2006, p. 3). NTLT accepts and makes use of basic cognitive linguistic concepts: prototypes and radial categories, image schemas, X-schemas, force-dynamics schemas, frames, conceptual metaphors and metonymies, cultural narratives, mental spaces (simulation semantics), blends, and constructions (grammatical and lexical).

2.2 Neural theory of metaphor

The Neural Theory of Metaphor (Lakoff, 2008) is based on one of NTLT's basic principles: the claim that mental structures parallel active neural structures, and that connected concepts are neurally connected. Therefore, the Neural Theory of Metaphor states that a metaphor is a neural circuit in our brain.

Neural metaphor theory was conceived in the work of Narayanan (1997a), Grady (1997), and C. Johnson (1997). Narayanan (1997a) was the first to model metaphors as neural mappings from the physical source domain of motion and action onto the abstract target domain of economics, and he pointed out that these mappings produce metaphorical inferences. C. Johnson (1997) studied how children acquire metaphors, and he discovered three stages of acquisition: (1) source domain only; (2) primary metaphors (children learn to use words from the source domain to denote meaning from the target domain); (3) the metaphorical use of words. These studies led to the development of the Neural Theory of Metaphor, with *primary metaphor* as its central notion. Grady (1997) notes that primary metaphors are widespread and likely universal, due to the fact that all humans have the same body and similar surroundings. This is why our earliest childhood experiences, which structure our brains, are largely similar in different cultures. Our

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mistake a stranger for someone we know. As we will see, the idea of making the best sense of complex input data is also important in understanding language processing. It is often useful to think of the brain as a system for finding solutions to complex computational problems involving many variables, which themselves are known only approximately. This kind of best-match computation is quite difficult and slow on electronic computers and hard to express in conventional programming languages, but it is essential in simulating theories that bridge brain and behavior" (Feldman, 2006, p. 67).

earliest experiences structure our brain with hundreds of primary metaphors, and many of them are the same in different languages. Using the best-fit mechanism, cultural frames combine with these primary metaphors, which result in different metaphorical systems (Lakoff, 2008, p. 26). The Neural Theory of Metaphor is complementary to the Neural Theory of Language and Thought, and it takes into account all the major findings of cognitive science and cognitive linguistics, which is why it is best suited as the theoretical background to the project we describe in this paper.

3. Main tasks of the MetaNet.HR project

As mentioned in the previous chapters, NTLT and NTM offer a theory that explains how metaphorical reasoning is based on human experience through primary metaphors, how primary metaphors contribute to complex conceptual metaphors, and how both primary and complex metaphors contribute to the meaning of expressions and grammatical constructions. It explains the role of conceptual metaphors in the conceptualizing and understanding of abstract concepts and the conceptual system as a whole, and it explains how conceptual metaphors contribute to the meaning of language (Lakoff, 2008: 36).

The main task of the MetaNet.HR project was to schematically represent all of this. Simply put, we wanted to examine whether (and if so, how) complex metaphor systems are composed of simpler metaphors, primary metaphors, semantic frames, image schemata, and cognitive primitives. Our aim was also to determine which concepts are connected through linguistic instantiations of conceptual metaphors (in a large linguistic corpus). Knowing from NTLT that mental structure parallels active neural structure and that connected concepts are neurally connected (Feldman, 2006, p. 38), we believe that drawing a map of connected concepts and deconstructed complex metaphorical expressions brings us closer to being able to draw a map of our minds.

To accomplish this, the primary task of the project is divided into three main modules, each of which has multiple concrete subtasks: computational, psychological, and linguistic.

3.1 (Cognitive) linguistic tasks

A top-down approach was primarily applied in constructing and populating the database, which represents the hierarchically organized metaphorical system of the Croatian language. The database consists of lists of conceptual metaphors, image schemas, cognitive primitives (cogs), and semantic frames. Conceptual metaphors (CMs) are organized into metaphor families. So far, the following families have

been processed: Event Structure, Emotions, Mind, Morality, Time, Economics, Governance, and Well-Being.

For each CM, we determine its *type* (primary, complex, and entailed metaphors) and *level* (general, specific), as well as its *family, source, target frame*, and *mappings*. We also indicate the *relations* and the *types of relations*[4] between the metaphor in question and other metaphors in the database (e.g., "is both a source and a target subcase of", "is a source subcase of", "is a target subcase of", "is a mapping within" etc.). For each CM, a linguistic example from the Croatian Web Corpus (hrWaC) is listed.

For each cog, image schema, or frame, we define its *type, family, semantic roles*,[5] *relations* to other frames, *metaphors* in which it serves as a source or target, *inferences*, and *lexical units*. Relations (both vertical and horizontal) between frames are also automatically graphically presented (the graph is interactive: each node can be clicked, opening further relations, see Figure 1).

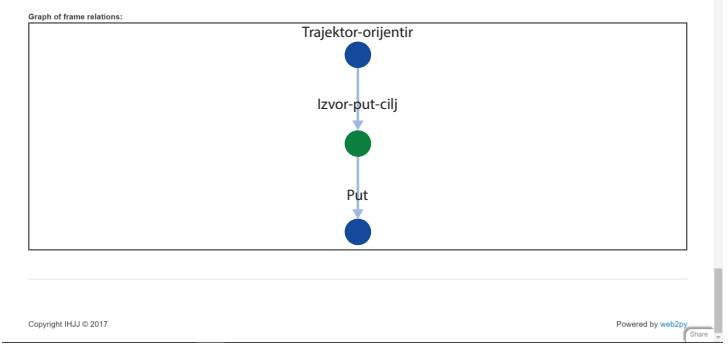

Figure 1. Graph depicting the frame relation between an SPG image schema (green dot) and its superordinate schema – the Trajector_Landmark schema (upper blue dot) – and its subordinate role within the SPG schema – Path (lower blue dot)

When entering semantic roles into the frame database, we use the English FrameNet (Ruppenhofer et al., 2016), which is based on the theory of frame semantics (Fillmore, 1976, 1982; Fillmore and Atkins, 1992, etc.), as our model.[6]

4. The most important such relationship is that of *inheritance* between metaphoric structures. As stated in Sweetser, David, and Stickles (this volume): "More specific metaphor subcases inherit the more general, less detailed (more *schematic*) metaphor structure (Johnson, 1997); each subcase fully includes the structure of the higher-level schematic general case."

5. For each role, we define: role type, role name, FrameNet role, role definition, and role gloss.

6. The Berkeley MetaNet project is largely based on the English Framenet, building on the lexicon of semantic frames, and adding the frame-to-frame mappings inherent in metaphoric

When defining vertical (hierarchical) relations, we use WordNet (Fellbaum, 1998, http://wordnet.princeton.edu) together with our own ontology of concepts, which has been developed to better suit the project's needs than the WordNet ontology (see Brdar, Brdar Szabo, and Perak, this volume).

Where applicable (usually with primary metaphors), descriptions and/or links to psychological experiments proving the embodiment of certain source-target connections are provided.

When creating the entry for a new conceptual metaphor in the database, the project analysts follow these steps:

a. defining the metaphor family
b. defining the source and target frames
c. selecting a target frame from existing ones or creating a new frame
d. repeating the procedure for the source frame
e. defining mappings
f. defining metaphor relations,
g. providing linguistic metaphors to serve as examples of the conceptual metaphor being created.

When this information is entered, an interactive graph of metaphors and frame relations can be automatically generated (with the selected nodes and branches, see Figure 2), the metaphor and frame lists/indices can be enlarged, and the created metaphor can be stored in a triplestore database. It is possible to click on each node and get further relations from there. Figure 2 depicts the relations of the CM ACTION IS MOTION with the following other CMs (clockwise): ACTION IS A JOURNEY, ACTION IS SELF-PROPELLED MOTION ALONG A PATH, A CAREER IS A JOURNEY, EASE OF ACTION IS EASE OF MOTION, THINKING IS MOVING, DIFFICULTIES ARE IMPEDIMENTS TO MOTION, PROCESS IS MOTION, IMPEDIMENT TO ACTION IS PHYSICAL IMPEDIMENT TO MOTION, ABILITY TO ACT IS ABILITY TO MOVE, NOT BEING ABLE TO ACT IS BEING IN A MAZE, MANNER OF ACTION IS MANNER OF MOVEMENT.

In order to prevent the project from being biased by metaphor research done in English and by English linguistic resources, we have not been focused entirely on the top-down conceptual approach; we have also applied a bottom-up corpus-based approach to ensure the project will reflect the metaphorical system of the Croatian language.

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meaning (see Sweetser, David, and Stickles, this volume). Given the fact that FrameNet does not exist for Croatian, the MetaNet.HR project includes the building of a lexicon of semantic frames simultaneously with the creation of a lexicon of their metaphoric connections in the form of an index of conceptual metaphors.

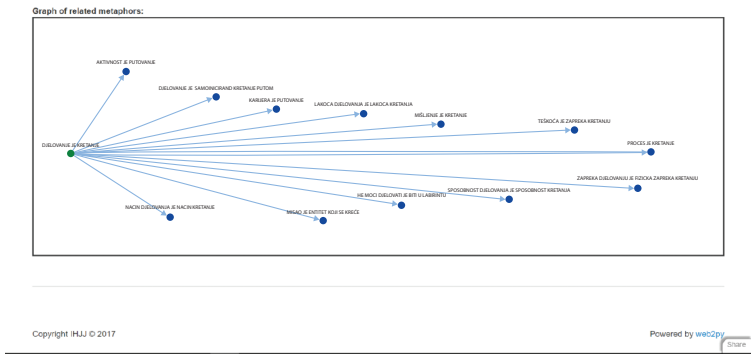

Figure 2. Interactive graph of related metaphors for the conceptual metaphor ACTION IS MOTION (green dot)

The bottom-up corpus analysis involves the following steps: choosing metaphor families, creating a list of target words, linguistic metaphor identification and annotation, conceptual metaphor identification, and data entry.

3.1.1 *Metaphor families*

The list of main metaphor families is defined by the project goals, and it includes the following metaphor families (for the first three project years): Event Structure, Time, Mind, Morality, Emotions, Economics, Governance, and Well-being. These metaphor families have proven to be crucial to our conceptualization, and they are inherently metaphorical (Lakoff, 1999).

For each of these large metaphor families, a corpus-based study was conducted to determine primarily the linguistic and then also the conceptual structure of the family.

For this task, hrWaC (the Croatian Web Corpus) is used (Ljubešić & Klubička, 2014). This is a corpus collected from the .hr top-level domain. The current version of the corpus (v2.0) contains 1.9 billion tokens and is annotated with lemma, morphosyntax, and dependency syntax layers. This corpus was chosen because it is the largest annotated corpus of the Croatian language.[7]

7. This corpus, however, is not a referential corpus of the Croatian language, and, as any other corpus, it does not represent the full linguistic reality. Since it was collected from the .hr top-level domain, the majority of the texts included belong to journalism-related genres. To amend this lack of literary genres, we used the Riznica Croatian Language Corpus (CLC) (Institute of Croatian Language and Linguistics) as an additional resource. CLC includes online newspapers, books, and articles; scanned versions of printed and published books and other hard-copy publications; and digital files of printed books made available by publishers. The corpus consists of fiction texts (28%) and specialized texts (72%). In 2017, the corpus was

3.1.2 *Creating a list of target words*

For each metaphor family, we have created a list of target words for which we have subsequently queried the corpus (see Table 1). For this task, we use in Word Sketches and the Thesaurus in Sketch Engine (Kilgarriff et al., 2004), see Figure 3. Additionally, we use Thesaurus Rex[8] (see Figure 4) to fill possible gaps in the previous step. Then, we compile a list with all the concepts extracted in this way, and at a group meeting, we decide if all of these target concepts are really connected to the metaphor family in question.[9] After this analysis, we create a list of target words to be searched for in the corpus.[10] Due to the tremendous amount of manual work required for this task, in this stage of the project, only noun forms have been included in the lists of target words. Future plans involve enlarging the lists of target words with other parts of speech, as well as the lists of synonyms.

Figure 3. Thesaurus in Sketch Engine for the word Mind in English corpus (enTenTen13)

segmented, part-of-speech tagged, and lemmatized for use in the development of the first Croatian corpus-based dictionary (Brozović Rončević et al., 2018)

8. Thesaurus Rex, a tool created by Tony Veale (http://ngrams.ucd.ie/therex3/), organizes words according to the fine-grained, ad-hoc categories into which they are placed by speakers in everyday language.

9. For example, for the word *um* 'mind', one of the coordinated concepts in the Croatian Word Sketch is *emocija* ('emotion'), which we will analyze within the Emotion Metaphors family, so we would leave this word out from the list of Mind Metaphors.

10. For example, this is how the following list of target words would be created for the target concept of *mind* in English: *mind, thought, think, imagine, idea, forget, remember, contemplate, understand, suppose, guess, realize, believe, assume, regard, brain, knowledge, know, memory, concept, opinion, mental, abstract, conceptual.*

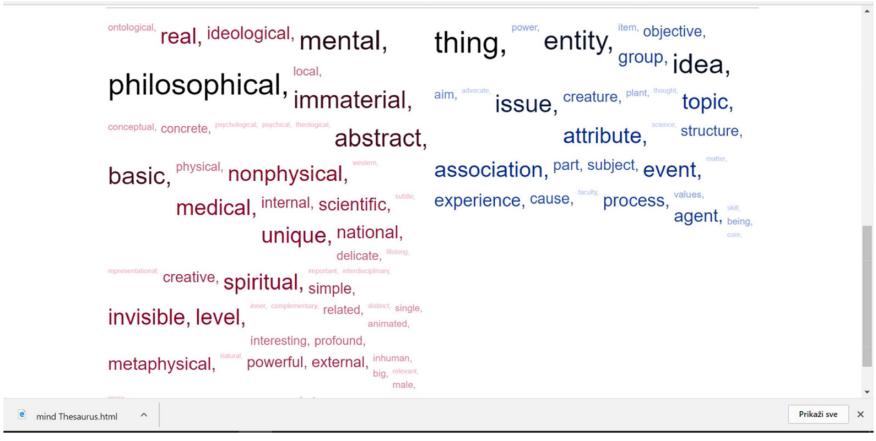

Figure 4. Visualization of the word *mind* and its cognates in Thesaurus Rex

3.1.3 *Linguistic metaphor identification and annotation*

For each of the target words from Table 1, using Sketch Engine for hrWaC 2.2., we analyze all the Word Sketches and a random concordance sample (300 lines per target word). Then, we annotate the metaphorical expressions and collocations using the MIPVU procedure (Steen et al., 2010).[11] At least two annotators annotate the same concordance sample, and points of disagreement are discussed by the entire group. A mutual decision is reached in cases where of disagreement. In addition to this, for each metaphor family (see Table 1), at least one full text from the web which discusses primarily this topic was chosen at a project meeting and annotated with MIPVU by two annotators. This has enabled us to harvest some metaphors in which metaphor targets were not explicitly mentioned.

11. Croatian, being a Slavic language, is rich in verbal prefixes that allow for metaphoric vs non-metaphoric meaning specializations. As noted by Sokolova (2013) for Russian, different prefixes behave differently in terms of metaphorical extensions. In the case of Croatian, it is quite common for the same verb (e.g. *svijetliti* 'shine') with one prefix (*o-*) to have the almost exclusively literal meaning of 'shedding light onto something' (*osvijetliti*), while its form with another prefix (*raz-*) denotes the primarily metaphorical meaning of 'explaining' (*rasvijetliti*), the form of which is still clearly connected to the source domain of light, thus reflecting the conceptual metaphor KNOWING IS SEEING. Despite the fact that the metaphorical meaning of these words in some dictionaries is listed as the first meaning, examples such as these are annotated and analyzed as metaphor-related words.

Table 1. A complete list of the metaphor families and their respective target words extracted from the hrWaC corpus and Thesaurus Rex and processed so far within MetaNet.HR

Metaphor family	Target words	
	Croatian	*English translation (approximate)*
Mind metaphors	*um, duh, duša, mozak, razmišljanje, mišljenje, razum, percepcija, inteligencija, svijest, ideja, pamet, misao, spoznaja, intelekt, svjesnost, psiha, sjećanje, pamćenje, znanje, mudrost*	mind, spirit, soul, brain, thinking, reasoning, reason, perception, intelligence, consciousness, idea, mind, thought, knowledge, intellect, awareness, psyche, memory, memory, knowledge, wisdom
Time metaphors	*vrijeme, dan, godina, mjesec, život, sat, tjedan, trenutak, razdoblje, datum, resurs, stoljeće, tisućljeće, čas*,	time, day, year, month, life, hour, week, moment, period, date, resource, century, millennium,
Emotion metaphors	*emocija, osjećaj, strast, želja, strah, doživljaj, radost, ljubav, vjera, sreća, ljepota, karakter, bol, raspoloženje, zadovoljstvo, mržnja, stres, tuga, patnja, osobina, nasilje, talent, ponašanje, uzbuđenje, intuicija, seks, nagon, instinkt, nada, ljutnja, zavist, ljubomora, gađenje, sram, stid, žalost*	emotion, feeling, passion, desire, fear, sensation, joy, love, faith, happiness, beauty, character, pain, mood, satisfaction, hatred, stress, sadness, suffering, trait, violence, talent, behavior, excitement, intuition, sex, instinct, instinct, hope, anger, envy, jealousy, disgust, shame, embarrassment, sorrow
Morality metaphors	*(ne)moralnost, (ne)moral, humanost, (ne)poštenje, (ne)pravednost, (ne) ljudskost, (ne)etičnost, domoljublje, (ne)pristojnost, (ne)vjerodostojnost, (ne)objektivnost, (ne)iskrenost, (ne)dosljednost, etika, plemenitost, (ne)korektnost, patriotizam, dobrota, ispravnost, humanizam, čestitost, dostojanstvo, (ne)istina, (ne)istinitost, laž, (ne)čovječnost, empatija, poniznost, (ne)skromnost, samopoštovanje, (ne)jednakost, nepristranost, požrtvovnost, poštivanje, (ne)vjernost, nevjera, prevara, nevinost, (ne)pouzdanost, predanost, dobronamjernost, (ne) tolerancija, grijeh, prijestup, zlo, zločin, kazna*	(im)morality, humanity, (dis)honesty, righteousness humaneness, ethics, patriotism, (in)decency, credibility, objectivity, sincerity, (in)consistency, ethics, nobility, (in) correctness, patriotism, goodness, correctness, humanism, congruence, dignity, truth, truthfulness, falsehood, (in)tolerance, sin, misdemeanor, cheating, evil, disobedience, devotion, innocence, crime, punishment

(*Continued*)

Table 1. (*Continued*)

Metaphor family	Target words	
	Croatian	***English translation (approximate)***
Well-being metaphors	*dobro, dobrobit, zdravlje, sigurnost, razvoj, kvaliteta, napredak, vrijednost, zaštita, zdravstvo, uspjeh*,	well, well-being, health, security, development, quality, progress, value, protection, health, success,
Event Structure Metaphors	*djelovanje, aktivnost, promjena, rad, proces, stanje, događaj, djelo, akcija, postupak, djelatnost, stvaranje, svrha, uzrok, posljedica, način, utjecaj, reakcija*	action, activity, change, work, process, state, event, work, action, process, activity, creation, purpose, cause, consequence, way, influence, reaction
Socio-political metaphors	*politika, vlast, organizacija, država, kultura, društvo, vlada, stranka, zakon, sustav, strategija, pravo, institucija, zajednica, medij, povijest, ekonomija, gospodarstvo, kriza, poslovanje, tvrtka, udruga, obitelj, škola, banka, poduzeće, obrazovanje, građanin, uprava, narod, muškarac, žena, dijete, roditelj, insustrija, turizam, demokracija, kapitalizam, socijalizam, poloprivreda, tržište, proizvodnja, investicija, poduzetništvo, trgovina, privreda, marketing, odgoj, sistem, upravljanje, kapital, ulaganje, nacija, civilizacija, tradicija, identitet, ideologija, religija, sloboda, mentalitet, baština, bogatstvo, siromaštvo, moć, elita*	politics, politics, government, party, law, system, strategy, law, institution, community, media, history, economy, economy, crisis, business, company, association, family, school, bank, entrepreneurship, commerce, economy, marketing, education, system, management, business, education, citizen, management, people, man, woman, child, parenting, insurrection, tourism, democracy, capitalism, socialism, agriculture, capital, investment, nation, civilization, tradition, identity, ideology, religion, freedom, mentality, heritage, wealth, poverty, power, elite

3.1.4 Conceptual metaphor identification

Annotators annotate all identified linguistic metaphors for the conceptual metaphor type. At least two annotators annotate the same concordance sample and texts, and points of disagreement are discussed by the entire group. A mutual decision is reached in cases of disagreement.

3.1.5 Data entry

At the end of this procedure, linguistic metaphors are added to the corresponding conceptual metaphor in the database, or a new CM is created in the database following the steps described above (see Figure 5).

Example Annotation	
Example Provenance	carobna-suma.com/2014/02/24
Example Comments	
Example Text	Iz ocaja možemo izići samo ako otpustimo sliku sebe koja nas drži u stanju ocaja.
Example Gloss	From desperation (we)can come_out only if (we)let_go the_image of_our self that us keeps in the_state of_despair.
Example english translation	We can come out of despair only if we forget the image of ourselves that keeps us there.

Example Annotation	
Example Provenance	www.tportal.hr/.../sto-uciniti-kad-ste-u-depresiji.html
Example Comments	
Example Text	Što uciniti kad ste u depresiji
Example Gloss	What to_do when (you)are in depression
Example English Translation	What to do when you are depressed

Examples from linked Linguistic metaphors:

Figure 5. Linguistic examples for the STATES ARE LOCATIONS CM

The main strength of this manual annotation procedure, which combines a bottom-up approach of corpus annotation according to strict principles with a top-down approach based on linguistic intuition and knowledge of the field, is that it enables the thorough and language-specific examination of metaphor families. This in return reflects all relevant (most frequent) source domains that enable conceptualization of the target domains in a specific language. Word Sketches compiled exclusively for the language in question (in this case, Croatian) are analyzed for each metaphor family or main target frame. The corpus of the specific language is then queried using language-specific target words. On all levels, from selecting target words to corpus querying, this procedure prevents the results from being biased by metaphor research in English, which still completely dominates the entire field, so that it really reflects the metaphorical system of the language in question. Manually annotated concordance samples, which are one of the results of this procedure, can serve as a prerequisite for high-level NLP automatic metaphor identification tasks using machine learning methods.

3.2 Computational tasks

The main computational task involves building a Croatian Metaphor Repository framework based on web2py tools. This framework enables the schematic and visual representation of the results of the two other modules. It is accessible at http://ihjj.hr/metafore/ (see Figure 6).

Figure 6. MetaNet.HR Database screenshot: A small part of the list of metaphors

A more demanding computational task within the project involves developing tools for semi-automatic metaphor detection, identifying metaphorical word use, and extracting linguistic metaphors semi-automatically. Automatic or semi-automatic detection of figurative language has been a challenge for computational linguists since the early 1990s (Fass, 1991; Mason, 2004; Shutova et al., 2010; Bogdanova, 2010; Li & Sporleder, 2010; Peters & Wilks, 2003; Shutova, 2011; Veale et al., 2016). Handcrafted knowledge has been considered crucial from the beginning (Martin, 1990; Mason, 2004), and many approaches to the automatic detection of metaphors rely on the availability of extensive, manually crafted lexical resources (Gedigian et al., 2006; Krishnakumaran & Zhu, 2007; Shutova et al., 2010). Automatic metaphor identification within the Berkeley MetaNet

project is also based on a manually created knowledge database.[12] Since MetaNet.HR is also a large, manually created knowledge database, and it serves as the basis for the automatic extraction of linguistic metaphors from texts. Computational analysis enables the extraction of morphosyntactic patterns for a certain domain, which will lead to the detection of new metaphors. In this part of the research, algorithms are being developed and programs are being created based on the merging of two methods: the metaphorical potential of words and word classes, and domain-sensitive semantic signatures.[13] If the semantic signature of a text closely matches the signature of a known metaphor, we will propose that it is likely to represent an instance of the same conceptual metaphor. A collection of manually detected metaphors (our database) within a particular target domain significantly facilitates this work.

The third computational linguistics task was to transfer all the data from a MySQL database into a triplestore database in the N3/Turtle format, which enables the direct inclusion of data into ontologies and the inclusion of linked-data-into-cloud computing. The programming functions over the CMR LOD (Linked Open Data) triplets include: searching the Virtuoso database of LOD, retrieving the attributes of metaphors and frames, retrieving the attributes of frame and metaphor hierarches, and the ability to download the database of triplets. The Virtuoso database with LOD information (subject, object, predicate) is generated from a MySQL database consisting of 6 tables assigned to categories in the repository (hierarchies, frames, metaphors etc.). The Virtuoso server with LOD information connects all the tables and their connections, which may or may not be visible to the user. Searches are performed on the information graph, the nodes of which may be connected to data from different tables in the MySQL database. Searches of this kind of information are performed with SparQL programming (see Figure 7). For ordinary users, a system of forms was built, in addition to the possibility of SparQL queries. The forms consist of user-friendly drop-down menus in which categories and attributes are easily defined.

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12. See Sweetser, David, & Stickles, this volume.

13. A domain-sensitive semantic signature is a set of highly related and interlinked senses drawn and augmented from a text that may be used to place the text within the semantic space of a metaphorical concept. A suite of binary classifiers is employed to detect metaphoricity within a text by comparing its semantic signature to a set of known metaphors (Mohler, Bracewell, Hinote, & Tomlinson, 2013: 27).

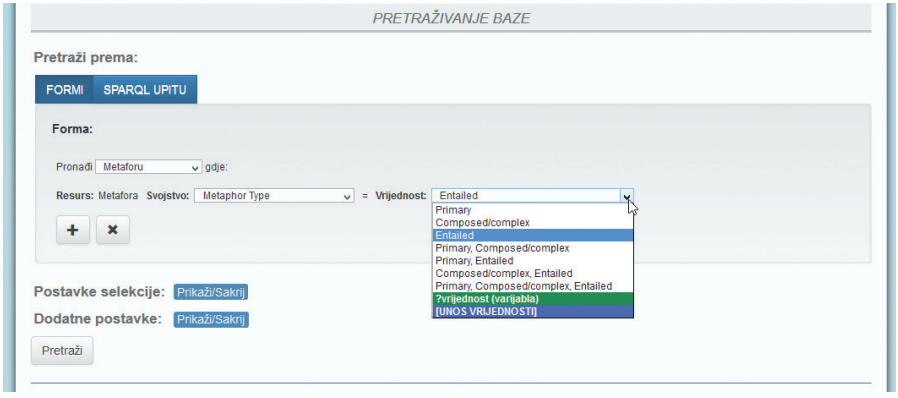

Figure 7. An example of a SPARQL query within the Virtuoso LOD database

All saved triplets may be downloaded from the Virtuoso LOD database. The nodes of the CMR cloud are in Turtle format (published entries of the W3 consortium), which means that the CMR is in line with international standards (it is compatible with RDF recommendations, see Figure 8).

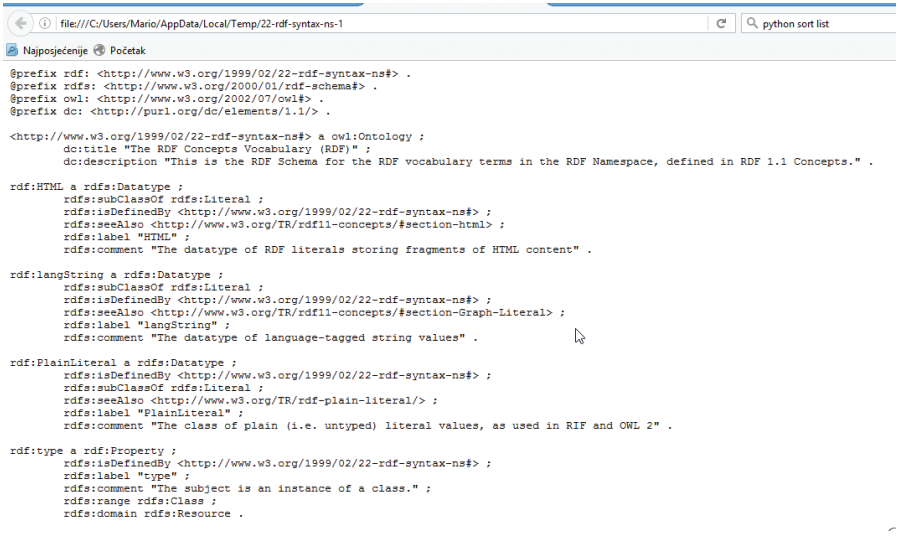

Figure 8. Layout of nodes in Turtle format

As can be seen in Figure 8, the nodes of the CMR graph are already prepared for similar nodes in other languages, which would only need to have an appropriate language index. This is the first step towards connecting potential repositories of different languages, which would then be comparable and searchable (see Figure 9).

Figure 9. Language index

The upper ontology built for this project (described in Brdar, Brdar-Szabo, and Perak, this volume), which will connect concepts (classes) above concrete entities, instances, and literals that are collected in the repository, has yet to be implemented. At the moment, it is only possible to open the webpage where a certain node is analyzed, and only in the Croatian language.

3.3 Cognitive-psychological tasks

Within the project, a series of psychological experiments were conducted to further describe and explain the nature of the links between concept meaning and perception as manifested through primary metaphors. The experiments conducted within the project focused on proving the embodied and unconscious connection between primary metaphor sources and targets. The results of these experiments (and of experiments performed by other researchers as well) are presented in the database in connection with their respective conceptual metaphors under the title *Experimental Research*. A brief description and bibliographical information are presented under this title in the database. The primary metaphors in the database that were experimentally tested within the project so far are the following: TIME IS SPACE, SIMILARITY IS CLOSENESS, and DIFFICULT IS HEAVY and "(Tonković, Brdar, Despot, in press)".

4. Results

The main result of the project is the MetaNet.HR database. MetaNet.HR is a database of conceptual and linguistic metaphors and metonymies, cognitive primitives, image schemas, and semantic frames of the Croatian language with corresponding lexical items.

This means that it is much more than simply a figurative language repository – it serves as a lexical and semantic repository of the Croatian language (serving therefore as the Croatian version of FrameNet). It is also a conceptual repository and ontology of concepts, bearing in mind that it lists and graphically presents

hierarchically organized concepts, as well as the (figurative) links between them, which are also hierarchically organized.

A by-product of the project consists of concordance samples from the Croatian web corpus, which are manually annotated for linguistic metaphors using the MIPVU method, as well as negative examples (ca. 24,000 manually annotated sentences). Since we were primarily interested in the conceptualization of the abstract concepts that were the topics of the project, the metaphoricity of the expressions containing target words was very high – in 42% of all the manually annotated sentences those concepts in question were metaphorically conceptualized.[14] This manually annotated corpus, together with the large manually created database, is an excellent prerequisite for the automatic extraction and interpretation of figurative language, and it can also serve as a resource for figurative language production (see Veale, this volume) and other computational creativity and artificial intelligence tasks.

5. Risks and challenges

The project of building a lexical, semantic, and conceptual repository, as well as an ontology of concepts of a certain language, is an extremely demanding task in terms of both its content and its scale.

In terms of the content of the project, the project group must make and discuss a series of non-trivial decisions during the process of creating every new CM entry in the database. Every step of the way is a challenge:

1. *The linguistic level* – annotating linguistic examples using MIPVU (Although this is the most reliable metaphor annotation method we know of, it was the first time this method was applied to the Croatian language, and we had to make many important decisions about how to annotate specific forms (e.g., prefixed verbs). In addition to this, disagreement between different annotators is normal even in English corpora, which are very well described and whose instructions are quite precise. In our project, two annotators annotate the same concordance sample, and cases of disagreement are recorded and discussed at group meetings. After solving the initial problems with adapting

14. It is not surprising that this number is significantly higher than in the results reported by Steen et al. (2010), given the fact that we were only looking at expressions containing an abstract target word. In the pilot versions of corpus annotation, which followed exactly the same principles as in the VU Amsterdam Metaphor Corpus, the results were surprisingly similar to the results reported there.

MIPVU to Croatian, the average inter-annotator agreement in this task was quite high – between 89 and 93 percent.[15] The VU Amsterdam Metaphor Corpus (http://www.vismet.org/metcor/search/showPage.php?page=start; Steen et al., 2010) was used extensively as a reference corpus, and it was very helpful in solving specific problems.

2. As with all other methods of linguistic metaphor identification, the procedure developed for this project is unable to detect metaphorical expressions in which the target domain lexical element is not explicitly present. Through manual annotation, however, it is possible to detect metaphoric linguistic expressions in which the source domain lexical element is not specified, unlike automatic metaphor recognition systems (including the one developed within MetaNet), which depend on the presence of both Source and Target domain lexical elements (see Sweetser, David, & Stickles, this volume). Since we perform corpus analysis by querying the corpus for a list of target words, we are able to detect and annotate examples as metaphorical even if the source domain lexical unit is not explicitly present. In addition to this, a lexical approach is also applied (manual analysis of lexicographic resources), which enables the inclusion of some linguistic metaphors in which neither source nor target lexical units are explicitly present (see Kövecses et al., this volume). A complete manual annotation of entire texts thematically connected to the target concept has enabled the inclusion of some additional linguistic metaphors in which neither source nor target lexical units are explicitly present.
3. *From the linguistic to the conceptual level* – deciding on which conceptual metaphor the linguistic metaphor from the corpus is a reflection of. (Each MIPVU annotator annotates the example for the CM. Inter-annotator agreement on this level is lower than on the linguistic level – between 74 and 88 percent. The research group discusses all cases of disagreement and reaches a decision).
4. Defining metaphor type, level, source and target frame, mappings, relations to other metaphors, etc. (When entering these details, analysts use all available sources, primarily the Berkeley *MetaNet* database and literature on the metaphor that is being processed, as well as his/her own judgment. All problematic cases (noted as such by analysts during analysis or by the project leader in her regular editorial checks) are discussed at group meetings.

15. This is similar to the inter-annotator agreement measurements made in the compilation of the VU Amsterdam Corpus. On average, VU Amsterdam Corpus analysts reached a unanimous agreement on whether or not a word was related to a metaphor in 92.5% of all cases (Krennmayr & Steen, 2017, p. 1065).

5. Defining hierarchical relations between frames. (In order for the database to reflect the complexity of the human conceptual system, it was very important to organize all the semantic frames hierarchically in an ontologically real way, which will also help elucidate and explain the hierarchical relations between metaphors. In the beginning, the English WordNet was used to define hierarchical relations. In the final stage of the project, a custom-made ontology was created for the purposes of this project specifically (described in Brdar, Brdar Szabo, and Perak, this volume).
6. Defining semantic roles within certain frames. (In fulfilling this task, the English FrameNet is used as a model, which means that MetaNet.HR may be used as a Croatian FrameNet as well.)
7. Deciding which lexical units to connect to certain frames. (In fulfilling this task, we use all available lexicographic resources, both online and printed, from printed Croatian dictionaries to resources such as Sketch Grammar and Thesaurus Rex, as mentioned above.)

In terms of the scale of the project, the main challenge is to ensure that the database encompasses and reflects the entire complexity of the human conceptual system. To this aim, a vast number of concepts and lexical items must be processed and included in the database.

This challenge has been tackled so far by limiting the number of metaphor and frame families that are processed within the project (a top-down approach, see Table 1) in order to be able to perform an in-depth, corpus-based analysis of them. So far, all the main families have been processed. In the future, in order to include some other, less-known and less-studied families, the starting point should be the corpus annotation, which would represent the entire complexity of the conceptual system as reflected in the written language. For these future tasks, existing annotated corpora could be used as a useful starting point, such as the most prominent one – the VU Amsterdam Metaphor Corpus Online (Steen et al., 2010).

6. Conclusions and future outlook

MetaNet.HR is a project of the Croatian Science Foundation and the Institute of Croatian Language and Linguistics, and a sister project of *MetaNet*, a project hosted at the International Computer Science Institute in Berkeley, California. It is a lexical-semantic database, a repository of hierarchically organized human concepts (with defined semantic roles and lexical units) and their figurative links to other concepts/frames (which are also hierarchically organized).

At the current stage of the project, the types of figurative links between frames are primarily metaphorical and marginally metonymic. Future plans involve including other figurative mechanisms of thought as well.

The main strength of the project is that it takes into account and unifies research results from different fields (linguistics, cognitive science, psychology, and computer science), and that it reconciles different approaches to figurative language by using both bottom-up and top-down approaches. Its important strength also lies in the fact that it is much more than simply a figurative language repository. It aims at being a language specific knowledge database that schematically represents how our conceptual system is organized – both horizontally (via figurative links between concepts) and vertically (via hierarchical relations among frames and metaphors). Therefore, it can serve as a next-generation electronic dictionary as well – with the potential of becoming a multilingual project.

The weaknesses of the project arise from unanswered questions within the field of figurative language study, primarily from the fact that moving from the linguistic level to the conceptual level (defining the conceptual metaphor behind the figurative linguistic expression) still relies mainly on the annotator's knowledge of the field and his/her intuition. Within this project, this problem is successfully tackled by having more than one annotator and measuring inter-annotator agreement, which leads to a new weakness: the need for a great deal of manual annotation work.

The main output of the project is the lexical and semantic database MetaNet.HR. Other outputs not directly visible in the database include concordance samples manually annotated for metaphors using the MIPVU method, research papers and experiments, and the development of computational tools to automatically detect metaphors in large corpora.

The database and the entire framework (including both MySQL and LOD forms) are ready to be reliably applied by others as well. Future plans involve building a large multilingual and multimodal repository, which would include non-linguistic realizations of conceptual metaphors in both Indo-European and non-Indo-European languages, which would therefore make MetaNet a valuable resource for cross-lingual and cross-cultural research.

The main challenge of the project is the great deal of initial manual annotation and work needed to ensure that the database includes a vast number of frames, metaphors, and lexical items extracted from the corpus. Fortunately, once this manner of high-quality, manually annotated corpus is created, the possibilities for high-level NLP semantic tasks are much bigger. However, in order for this repository to be a schematic representation of the complexity of the human conceptual system, and in order for it to truly become a map of our minds by drawing a map of connected concepts and deconstructed complex metaphorical expressions, it

should become multilingual. With this project, and its role model, the MetaNet project, the groundwork has been laid for this endeavor.

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References

Ahrens, K., Chung, S. F., & Huang, C. (2003). Conceptual metaphors: Ontology-based representation and corpora driven mapping principles. In *Proceedings of the ACL 2003 workshop on Lexicon and figurative language* (Vol. 14, pp. 35–41). Association for Computational Linguistics. https://doi.org/10.3115/1118975.1118980

Bogdanova, D. (2010). A framework for figurative language detection based on sense differentiation. In *Proceedings of the ACL 2010 student research workshop* (pp. 67–72). Association for Computational Linguistics.

Brozović Rončević, D., Ćavar, D., Ćavar, M., Stojanov, T., Štrkalj Despot, K., Ljubešić, N., & Erjavec, T. (2018). Croatian language corpus Riznica 0.1. *Slovenian language resource repository CLARIN.SI*. http://hdl.handle.net/11356/1180.

Dodge, E. K., Hong, J., & Stickles, E. (2015). MetaNet: Deep semantic automatic metaphor analysis. In E. Shutova, B. B. Klebanov, & P. Lichtenstein (Eds.), *Proceedings of the 3rd workshop on metaphor in NLP* (pp. 40–49). NAACL HLT 2015. https://doi.org/10.3115/v1/W15-1405

Eilts, C., & Lönneker, B. (2002). The Hamburg Metaphor Database. *Metaphorik.de*, 03(2002), 100–110.

Fass, D. (1991). met*: A method for discriminating metonymy and metaphor by computer. *Computational Linguistics*, 17(1), 49–90.

Fauconnier, G., & Turner, M. (2003). *The way we think*. New York: Basic Books.

Feldman, J. (2006). *From molecule to metaphor. A neural theory of language*. Cambridge, MA: MIT Press, A Bradford Book. https://doi.org/10.7551/mitpress/3135.001.0001

Feldman, J., Dodge, E. K., & Bryant, J. (2009). A neural theory of language and embodied construction grammar. In B. Heine, & H. Narrog (Eds.), *The Oxford handbook of linguistic analysis* (pp. 111–138). Oxford: Oxford University Press.

Fellbaum, C. (Ed.). (1998). *WordNet: An electronic lexical database*. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/7287.001.0001

Fillmore, C. J. (1976). Frame semantics and the nature of language. *Annals of the New York Academy of Sciences*, 280(1), 20–32. https://doi.org/10.1111/j.1749-6632.1976.tb25467.x

Fillmore, C. J. (1982). Frame semantics. In *Linguistics in the morning calm: Linguistic Society of Korea* (pp. 111–137). Seoul: Hanshin Publishing Company.

Fillmore, C. J., & Atkins, B. T. (1992). Toward a frame-based lexicon: The semantics of RISK and its neighbors. In A. Lehrer, & E. F. Kittay (Eds.), *Frames, fields, and contrasts: New essays in semantic and lexical organization* (pp. 75–102). New York: Routledge.

Gedigian, M., Bryant, J., Narayanan, S., & Ciric, B. (2006). Catching metaphors. *ScaNaLU '06 Proceedings of the Third Workshop on Scalable Natural Language Understanding* (pp. 41–48).

Grady, J. (1997). Foundations of meaning. Doctoral dissertation, UC Berkely.

Johnson, C. R. (1997). Constructional grounding. Doctoral dissertation, UC Berkeley.

Johnson, M. (1987). *The body in the mind. The bodily basis of meaning, imagination and reason*. Chicago: The University of Chicago Press. https://doi.org/10.7208/chicago/9780226177847.001.0001

Johnson, M. (2007). *The meaning of the body: Aesthetics of human understanding*. Chicago: The University of Chicago Press. https://doi.org/10.7208/chicago/9780226026992.001.0001

Kilgarriff, A., Rychly, P., Smrz, P., & Tugwell, D. (2004). The sketch engine. In *Proceedings EURALEX 2004* (pp. 105–116). Lorient, France.

Kövecses, Z. (2011). Recent development in metaphor theory: Are the new views rival ones? *Annual Review of Cognitive Linguistics*, 9(1), 11–25. https://doi.org/10.1075/rcl.9.1.02kov

Krennmayr T., & Steen G. J. (2017). VU Amsterdam Metaphor Corpus. In N. Ide & J. Pustejovsky (Eds.), *Handbook of linguistic annotation*. Springer, Dordrecht. https://doi.org/10.1007/978-94-024-0881-2_39

Krishnakumaran, S., & Zhu, X. (2007). Hunting elusive metaphors using lexical resources. *FigLanguages '07 Proceedings of the Workshop on Computational Approaches to Figurative Language* (pp. 13–20).

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: The University of Chicago Press. https://doi.org/10.7208/chicago/9780226471013.001.0001

Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought*. New York: Cambridge University Press. https://doi.org/10.1017/CBO9781139173865.013

Lakoff, G. (2008). The neural theory of metaphor. In R. W. Gibbs, Jr. (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 17–38). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511816802.003

Lakoff, G. (2012). Explaining embodied cognition results. *Topics in Cognitive Science*, 4(4), 773–785. https://doi.org/10.1111/j.1756-8765.2012.01222.x

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: The University of Chicago Press. [Updated version, 2002]

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*. New York: Basic Books.

Lakoff, G., Espenson, J., & Schwartz, A. (1991). *Master metaphor list, second draft copy*. Berkeley, CA: Cognitive Linguistics Group, University of California, Berkeley.

Li, L., & Sporleder, C. (2010). Using gaussian mixture models to detect figurative language in context. In *Human language technologies: The 2010 annual conference of the North American Chapter of the Association for Computational Linguistics* (pp. 297–300). Association for Computational Linguistics.

Ljubešić, N., & Klubička, F. (2014). {bs, hr, sr} WaC – web corpora of Bosnian, Croatian and Serbian. In *Proceedings of the 9th web as corpus workshop (WaC-9)* (pp. 29–35). https://doi.org/10.3115/v1/W14-0405

Martin, J. H. (1990). *A computational model of metaphor interpretation*. Boston: Academic Press Professional, Inc.

Mason, Z. J. (2004). CorMet: A computational, corpusbased conventional metaphor extraction system. *Computational Linguistics*, 30(1), 23–44. https://doi.org/10.1162/089120104773633376

McGlone, M. S. (1996). Conceptual metaphors and figurative language interpretation: Food for thought? *Journal of Memory and Language*, 35, 544–565. https://doi.org/10.1006/jmla.1996.0029

Mohler, M., Bracewell, D., Hinote, D., & Tomlinson, M. (2013). Semantic signatures for example-based linguistic metaphor detection. In *Proceedings of the first workshop on metaphor in NLP, Atlanta, Georgia, 13 June 2013* (pp. 27–35). Association for Computational Linguistics.

Narayanan, S. (1997a). KARMA: Knowledge-based action representations for metaphor and aspect. Doctoral dissertation, UC Berkeley.

Narayanan, S. (1997b). Talking the talk is like walking the walk: A computational model of verbal aspect. In *Proceedings of the 19th Cognitive Science Society Conference*.

Peters, W., & Wilks, Y. (2003). Data-driven detection of figurative language use in electronic language resources. *Metaphor and Symbol*, 18(3), 161–173. https://doi.org/10.1207/S15327868MS1803_03

Ruppenhofer, J. K., Ellsworth, M., Petruck, M. R. L., Baker, C. F., & Scheffczyk, J. (2016). *FrameNet II: Extended theory and practice*. Berkeley, CA: International Computer Science Institute.

Shastri, L. (2003). Structured connectionist models. In M. Arbib (Ed.), *The handbook of brain theory and neural networks* (2nd ed.). Cambridge, MA: MIT Press

Shutova, E. (2010). Models of metaphor in NLP. In *Proceedings of the 48th annual meeting of the Association for Computational Linguistics* (pp. 688–697). Association for Computational Linguistics.

Shutova, E. (2011). Computational approaches to figurative language. Ph.D. thesis, University of Cambridge

Sokolova, S. (2013). Verbal prefixation and metaphor: How does metaphor interact with constructions? *Journal of Slavic Linguistics*, 21(1), 171–204. https://doi.org/10.1353/jsl.2013.0001

Steen, G. J., Dorst, A. G., Herrmann, B. J., Kaal, A., Krennmayr, T., & Pasma, T. (2010). *A method for linguistic metaphor identification, From MIP to MIPVU*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/celcr.14

Tonković, M., Brdar, M. & Despot, K. (In press). Is a difficult task literally heavy? Weight biases difficulty judgments. *Metaphor and Social World*.

Turner, M. (1996). *The literary mind*. Oxford: Oxford University Press.

Veale, T., Shutova, E., & Beigman Klebanov, B. (2016). *Metaphor: A computational perspective*. Morgan Claypool, Synthesis Lectures on Human Language Technologies. https://doi.org/10.2200/S00694ED1V01Y201601HLT031

Wolff, P., & Gentner, D. (2000). Evidence for role-neutral initial processing of metaphors. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 26, 529–541. https://doi.org/10.1037/0278-7393.26.2.529

PART II

Reflecting on the risks and challenges involved in building and using repositories of figurative language

CHAPTER 6

The lexical vs. corpus-based method in the study of metaphors

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In the past 15–20 years, there has been an increasing tendency to study metaphors found in real data (large corpora, specific discourses, conversations, etc.). What became known as "corpus-linguistic methods" of metaphor study, distinguish themselves from a prior way of studying metaphor that is often labeled "intuitive," "subjective," and "eclectic."

In this paper, we propose an updated version of this "intuitive" method, which is termed here the "lexical approach." We compare and evaluate this approach with the corpus-based one, making use of the concept of SURPRISE (see Kövecses, 2015) for demonstrative purposes.

We conclude with some methodological suggestions, in which we argue that the two approaches reinforce and complement one another, toward the common goal of advancing metaphor theory.

Keywords: lexical approach, corpus-based approach, cognitive linguistic methods, introspection

1. Introduction

Lakoff and Johnson in their paradigm-setting book on metaphor, *Metaphors We Live By* (1980), used a variety of random sources (such as TV shows and newspapers) and their native-language intuitions for their examples of conceptual metaphors. This kind of data collection prevailed for over a decade in Conceptual Metaphor Theory research, when several metaphor researchers began to voice concerns about the legitimacy of the method. They did so chiefly on two grounds: One is that native-language intuitions are, in general, not reliable in judgments about language use (see e.g., Sinclair, 1991). The other is that it is simply not

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methodologically rigorous to collect data in random and unsystematic ways; that is, the methodology of metaphor research should conform to accepted academic standards as regards what we take to be our data, how we identify metaphors, how we analyze data, how we keep our analysis empirically testable, and so on (see Cameron & Maslen, eds., 2010).

The early work on conceptual metaphors, including Kövecses (1986, 1988, 1990, etc.) on emotion concepts, is commonly regarded as eclectic, introspective, intuitive and unsystematic by many researchers in the study of metaphor (e.g., Cameron, 2003; Deignan, 2005; Stefanowitsch, 2006; Semino, 2008; Cameron & Maslen, eds., 2010). These and several other authors suggest that the study of metaphor can, and should, be conducted by methodologies that we can broadly term 'corpus-linguistic,' thereby observing the rules of methodological rigor and avoiding the unreliability of our linguistic intuitions.

While we are in sympathy with such suggestions, we also believe that the by now traditional 'intuitive' approach to emotion metaphors can be updated and improved. And once it is updated and improved, it can offer a viable alternative, or at least a complement, to corpus-based and corpus-driven[1] approaches to metaphors. We call this new version of the 'traditional intuitive' method the 'lexical approach' (the latter term originally used by Kövecses, 1986).[2]

Our goal in the paper is to compare the lexical approach with a representative way of how a corpus-based approach may be implemented. We use the emotion concept of SURPRISE for the purposes of the comparison. By applying these two different methods to the study of the metaphors and metonymies associated with SURPRISE, we hope to be able to gain some insight into the issue of how the two approaches are related to each other and, ultimately, to understand their relative strengths and weaknesses.

In the following sections of the paper, we briefly describe both approaches and examine the concept of SURPRISE first by means of the lexical approach and then by a corpus-based one.

2. Describing the lexical approach

We can describe the 'lexical approach' (or the 'lexical method') in the following way (for an initial description, see Kövecses, 1986, 1990): The researcher using

1. For the distinction corpus-based/corpus-driven see Tognini-Bonelli (2001).

2. We call this approach 'lexical' because it makes systematic use of lexical information available in dictionaries. This approach could also be called 'lexicographic' approach.

this method searches for various lexical items or other types of information that are related to the general topic, or concept, under investigation (such as particular emotions indicated by particular lexemes: e.g., *anger, fear*, and, in the present case, *surprise*). These include synonyms, antonyms, related words, various idioms and phrases, collocations, and, importantly, the definitions of the lexemes. The most likely sources for these types of information are dictionaries: monolingual and bilingual dictionaries, thesauri, collocation dictionaries, idiom dictionaries of various sorts, and, in general, any collections of words and phrases related to a concept (e.g., WordNet). Importantly, researchers prefer and tend to use dictionaries that offer example sentences and usage notes (about register, frequency, provenance, etc.) for the linguistic expressions (words, idioms, collocations, etc.) they contain for the lexeme in question. Clearly, it is unlikely that all of this information can be found in a single dictionary. As a result, often, several different dictionaries of various kinds must be consulted before one obtains all, or at least most or much, of the lexical information that pertains to the lexeme we are interested in. Moreover, dictionaries that are based on large corpora are vastly preferred to ones that are not.

The wealth of information available in dictionaries is useful in metaphor research. As a first step, we can check which phrases, synonyms, collocations, and so on, are metaphorical in nature. This can be done by means of a variety of methods, of which the best known one is the metaphor identification procedure (MIP) worked out by the Pragglejaz Group (2007). The procedure enables us to identify the various expressions as metaphoric (as opposed to literal or metonymic).

After the identification of the metaphorical linguistic expressions, we group the expressions into thematic clusters.[3] Each particular theme, or topic, around which the metaphorical expressions are grouped constitutes the source domain (typically, a concrete concept, B), whereas the lexeme that serves as our general search term (e.g., surprise in the present case) constitutes the target domain (typically, an abstract concept, A). It should be borne in mind that such A and B pairings of concepts (i.e., conceptual metaphors) can only be suggested as hypotheses to be validated. The testing of their psychological reality is a job for psycholinguists and other experimental scientists.

Given such hypothetical pairings of conceptual categories, the next step is to see *how* the two concepts are connected. More specifically, we check which elements of the source are connected to which elements of the target domain. One or several metaphorical expressions may be related to a particular element of the source, and this source element has its counterpart element in the target (as, for instance, in the "heat" element in the domain of hot fluid, which can be represented by several

3. Grouping of the expressions into clusters was done intuitively.

metaphorical expressions relating to anger, and which corresponds to the "intensity" element in anger). Such assumed (hypothetical) correspondences between the source and the target are called "mappings," or conceptual "correspondences."

In the rest of the paper, we examine the concept of surprise first by means of the lexical approach and then by a corpus-based one.

3. Surprise in the lexical approach

Elsewhere (Kövecses, 2015), Kövecses applied the lexical method to the study of surprise. What follows in this section is based on a summary of his most important findings.

Consider the entry for *surprise* in the Oxford Advanced Learner's Dictionary (http://www.oxforddictionaries.com/definition/english/surprise):

Surprise (noun)

1. An unexpected or astonishing event, fact, or thing: *the announcement was a complete surprise*
   1.1 A feeling of mild astonishment or shock caused by something unexpected: *much to her surprise, she'd missed him*
   1.2 [*As modifier*] Denoting something made, done, or happening unexpectedly: *a surprise attack*
2. *[As modifier] Bell-ringing* Denoting a class of complex methods of change-ringing: *surprise major*

Surprise (verb)

[*With object*]

1. (Of something unexpected) cause (someone) to feel mild astonishment or shock: *I was surprised at his statement [with object and infinitive]*: *Joe was surprised that he enjoyed the journey [with infinitive]: she was surprised to learn that he was forty*
   1.1 Capture, attack, or discover suddenly and unexpectedly; catch unawares: *he surprised a gang stealing scrap metal*

Phrases:

Surprise, surprise

1. *Informal* Said when giving someone a surprise.

1.1 Said ironically when one believes that something was entirely predictable: *we entrust you with Jason's care and, surprise surprise, you make a mess of it, take someone/something by surprise*

2. Attack or capture someone or something unexpectedly.
(take someone by surprise)
2.1 Happen when someone is not prepared or is expecting something different: *the question took David by surprise*

Origin

Late Middle English (in the sense 'unexpected seizure of a place, or attack on troops'): from Old French, feminine past participle of *surprendre*, from Medieval Latin *superprehendere* 'seize'.

As can be seen, the dictionary provides a large amount of information relevant to the study of the metaphoric (and metonymic) aspects of surprise. We get an idea of what the various senses of the lexeme are, what common phrases are related to it, a number of example sentences, and what the origin of the word is. The same dictionary also provides a number of synonyms for surprise:

Synonyms

astonish, amaze, nonplus, startle, astound, stun, flabbergast, stagger, shock, stop someone in their tracks, stupefy, leave open-mouthed, take someone's breath away, dumbfound, daze, benumb, confound, take aback, jolt, shake up

Informal: *bowl over, knock for six, floor, blow someone's mind, strike dumb astonished, amazed, in amazement, nonplussed, taken aback, startled, astounded, stunned, flabbergasted, staggered, shocked, shell-shocked, stupefied, open-mouthed, dumbfounded, dumbstruck, speechless, at a loss for words, thunderstruck, dazed, benumbed, confounded, agape, goggle-eyed, wide-eyed, jolted, shaken up*

And again, from the Oxford Advanced Learner's Dictionary (http://www.oxfordlearnersdictionaries.com/definition/english/surprise_1?q=surprise), we can obtain more synonyms:

Noun

1. *Kate looked at me in surprise*
Astonishment, amazement, wonder, incredulity, bewilderment, stupefaction, disbelief
2. *The test came as a big surprise*

Shock, bolt from the blue, bombshell, revelation, rude awakening, eye-opener, wake-up call
Informal shocker

Verb

1. *I was so surprised that I dropped it*
   Astonish, amaze, startle, astound, stun, stagger, shock;
   leave open-mouthed, take someone's breath away, dumbfound, stupefy, daze, take aback, shake up
   Informal bowl over, floor, flabbergast
2. *She surprised a burglar*
   Take by surprise, catch unawares, catch off guard, catch red-handed, catch in the act

Other dictionaries give us the common collocations for surprise (Online Oxford Collocation Dictionary http://oxforddictionary.so8848.com/search1?word=surprise):

surprise *noun*

[1] feeling of surprise

Adj. great, utter | mild, some | initial *After the initial surprise I got to like the place.* | mock *His eyebrows rose in mock surprise.* (*intensity*) Quant. element *The Egyptian team relied on the element of surprise to defeat their stronger opponents.*

Verb + surprise: express, register, show | feign *He feigned surprise when I went up and said hello.* | hide *She was quick to hide her surprise.* | cause *The president's remarks caused surprise and embarrassment.*

Prep. in ~ '*Walk twenty miles!' repeated the old man in surprise.* | to your ~*Much to her surprise she enjoyed the party.* | with/without ~*It was with some surprise that I read of his resignation.* | ~ at *She showed no surprise at the news.*

Phrases: an expression/a look of surprise, a gasp/scream/shriek, etc. of surprise, [2]something that you did not expect

Adj. big, complete, great, major, total | lovely, nice, pleasant, wonderful

Verb + surprise: come as | get, have *I had a lovely surprise when I saw Mark there.* | spring *Johnson sprung a surprise by beating the favourite in the first round.* | be in for *Your mother's in for a bit of a surprise when she gets home.* | catch sb by, take sb by *The storm took us completely by surprise.*

Surprise + noun: announcement, attack, party, victory, visit

Prep. ~ for *It was a complete surprise for me*. | ~ to *His refusal came as no surprise to his boss*.

Phrases: a bit of a/quite a surprise

surprise *verb*

Adv. greatly, really | not at all *The outcome did not surprise me at all*. | hardly | a little, slightly

Verb + surprise: wouldn't *It wouldn't surprise me if they announced they were going to get married*. | seem to | want to *They wanted to surprise their mother and get the breakfast ready*.

3.1 Lexical structure

Most obviously, the lexical approach takes notice of the several related senses of the lexeme *surprise*, as provided by several dictionaries. Four of these are especially important: the EMOTION sense, the CAUSE OF EMOTION sense, the CAUSING EMOTION sense, and the EFFECT OF EMOTION sense.

EMOTION sense: the noun *surprise*

> Definition: a feeling of mild astonishment or shock caused by something unexpected. (http://www.oxforddictionaries.com/us/definition/american_english/surprise)

CAUSE OF EMOTION sense: the noun *surprise*

> Definition: an unexpected or astonishing event, fact, or thing. (http://www.oxforddictionaries.com/us/definition/american_english/surprise)

CAUSING EMOTION sense: the verb *surprise*

> Definition: (of something unexpected) cause (someone) to feel mild astonishment or shock. (http://www.oxforddictionaries.com/us/definition/american_english/surprise)

EFFECT OF EMOTION sense: the modifier *surprise*

> Definition: feeling or showing surprise. (http://www.oxforddictionaries.com/us/definition/american_english/surprise)

The significance of this set of senses is that they reveal a schematic prototype for the concept of surprise. The schematic conceptual structure of surprise can be given as follows:

> cause (of emotion / surprise) – causes – emotion / surprise|
>
> effect of emotion / surprise

The structure is shared by many emotion concepts, such as anger or fear. We can think of it as the language-based folk model of surprise that overlaps with (though is not identical to) other emotion concepts.

3.2 Metaphors of surprise in the lexical approach

Consider the following conventional linguistic expressions as found in some of the dictionaries[4] consulted:

> Her biography is a real *eye-opener*.
> (http://www.merriam-webster.com/dictionary/eye-opener)
>
> The community was *stunned* by the tragedy.
> (http://www.oxforddictionaries.com/definition/english/stun)
>
> When he walked into his surprise birthday party, he was completely *speechless*.
> (http://www.yourdictionary.com/speechless)
>
> She was *shocked* at the state of his injuries.
> (http://www.oxforddictionaries.com/definition/english/shock#shock-2)

These expressions can be interpreted in terms of metonymy, but, at the same time, they also point to a 'deep' metaphoric structure, in that they show how the emotion surprise is produced by and emerges from a cause that results in an effect. The conceptual metaphor that accounts for the production and emergence of the effects of surprise above is best formulated as follows: SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE (that is a specific version of the metaphor THE CAUSE OF EMOTION IS A FORCE that is a specific version of CAUSES ARE FORCES).

In other cases, the linguistic coding of the SURPRISE process (cause of SURPRISE causes someone to undergo certain effects) does not contain the effect – only the cause.

> *spring a surprise on someone*: On his first day at work they sprang a surprise on him.
> (http://www.macmillandictionary.com/dictionary/british/spring-a-surprise)
>
> *bolt from / out of the blue*: He seemed to be very happy in his job, so his resignation came as a bolt out of the blue.
> (http://idioms.thefreedictionary.com/a+bolt+from+the+blue)
>
> *bombshell*: The news came as a bombshell.
> (http://www.oxforddictionaries.com/definition/english/bombshell)

4. Many of the dictionaries consulted are corpus-based or corpus-driven dictionaries, which makes lexical approach more similar to corpus-based approaches. See 6.6. for a more extensive discussion on this.

rude awakening: We had a rude awakening when we saw the amount of our phone bill. (http://idioms.thefreedictionary.com/a+rude+awakening)

wake-up call: The bombing was a wake-up call to strengthen domestic security. (http://www.thefreedictionary.com/wake-up+calls)

turn up / one for the books: There have been a lot of scandals in local politics over the years, but this is one for the books. (http://www.learnersdictionary.com/definition/book)

The mappings of the conceptual metaphor SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE can be given as follows:

the person affected by the physical/psychological force	→	the person experiencing the emotion/surprise
impacting the person physically or psychologically	→	causing the emotion/surprise
the force responsible for the physical or psychological impact	→	the cause of the emotion/surprise
the physical or psychological sensations/feelings produced	→	the emotional feeling/surprise caused
the responses to the impact associated with what the person feels	→	the physical or psychological responses produced by the cause and the emotion of surprise
the unexpectedness of the physical/psychological impact	→	the unexpectedness of the cause of the emotion/surprise

A further mapping of this conceptual metaphor is: the loss of control produced by a sudden force corresponds to the loss of emotional control.

The notion of 'loss of control' is the focus of another, related conceptual metaphor for surprise. It can be stated as SURPRISING (SOMEONE) IS AN UNEXPECTED SEIZURE/ATTACK. Some highly conventional idioms that exemplify the metaphor include:

take someone by surprise: The question took David by surprise. (http://www.oxforddictionaries.com/definition/english/surprise)

catch someone unawares: Burchill's shot caught the goalkeeper completely unawares. (http://www.macmillandictionary.com/dictionary/british/unawares)

catch someone off guard: Tom caught Ann off guard and frightened her. (http://idioms.thefreedictionary.com/catch+off+guard)

When we unexpectedly and suddenly take or catch someone, the person loses control. The metaphor SURPRISING (SOMEONE) IS AN UNEXPECTED SEIZURE/ATTACK is a special case of the SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE metaphor.

Here are the detailed findings concerning these two conceptual metaphors: (The numbers in parenthesis indicate the number of types and the number of examples we found in the dictionaries consulted.)

SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE (28 types, 1 example)

synonyms, e.g., bolt from the blue, bombshell, revelation

spring a surprise

Johnson sprung a surprise by beating the favourite in the first round.

SURPRISING SOMEONE IS AN UNEXPECTED SEIZURE/ATTACK (6 types, 2 examples)

to catch sb by surprise, to take sb by surprise

synonyms: catch unawares, catch off guard, catch red-handed, catch in the act

The storm took us completely by surprise.

Given the conceptual metaphors that we presented in this subsection, it can be suggested that SURPRISE is primarily characterized by two interdependent features: unexpectedness and loss of control. The former is indicated mainly by the SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE metaphor, while the latter mainly by the metaphor SURPRISING SOMEONE IS AN UNEXPECTED SEIZURE/ATTACK. However, it does not mean that these two are the only conceptual metaphors related to SURPRISE. As will be seen shortly below, the concept of SURPRISE is also characterized by more general, or schematic, metaphors, but which do not pertain to SURPRISE alone. In the Oxford Advanced Learner's Dictionary and the Online Oxford Collocation Dictionary (cited in Section 2), we have found the following schematic conceptual metaphors:

SURPRISE IS A PHYSICAL OBJECT (15 types, 15 examples)

INTENSITY OF SURPRISE IS THE SIZE OF A PHYSICAL OBJECT (5 types, 4 examples)

great surprise, big ~, complete ~, total ~, initial ~
After the initial surprise I got to like the place.
It was a complete surprise for me.

THE DISPLAY OF SURPRISE IS THE OBSERVABILITY OF A PHYSICAL OBJECT (4 types, 3 examples)

to express surprise, to show ~, to hide ~, to feign ~
He feigned surprise when I went up and said hello.
She showed no surprise at the news.

CAUSING SURPRISE IS THE TRANSFER OF A PHYSICAL OBJECT (1 type)

to get a surprise

ATTRIBUTING SURPRISE TO SOMEONE IS ATTRIBUTING THE POSSESSION OF A PHYSICAL OBJECT TO SOMEONE/SOMETHING (2 types, 5 examples)

to your surprise
to have a surprise
Much to her surprise she enjoyed the party.
I had a lovely surprise when I saw Mark there.

THE PRESENCE OF SURPRISE IS THE PRESENCE OF A PHYSICAL OBJECT HERE (1 type, 2 examples)

come as a surprise
The test came as a big surprise.
His refusal came as no surprise to his boss.

THE CO-PRESENCE OF SURPRISE AND ANOTHER STATE/EVENT IS THE INSTRUMENTAL USE OF AN OBJECT (2 types, 1 example)

with surprise, without surprise
It was with some surprise that I read of his resignation.

STATES ARE CONTAINERS (1 type, 1 example)

BEING SURPRISED IS BEING IN A CONTAINER (1 type, 1 example)
in surprise
Walk twenty miles!' repeated the old man in surprise.

SURPRISE IS AN EVENT (1 type, 1 example)

to cause surprise
The president's remarks caused surprise and embarrassment.

The conceptual metaphors of SURPRISE listed above clearly suggest that the lexical method can be successfully applied to identify a wide range of metaphors related to a specific concept. Moreover, this list could probably be extended by obtaining data from more dictionaries.

3.3 Metonymies of surprise in the lexical approach

Metonymies associated with emotion concepts indicate the responses or effects produced by particular emotions (see Kövecses, 1986, 1990, 2000). We can begin

to investigate the effects produced by the surprised person if we look at the words and idioms that are provided by (online) dictionaries as synonyms or near-synonyms of *surprise* in its various senses. We can broadly distinguish between physical and mental effects of surprise. The distinction between the two is not always easy to make in particular cases and the physical and mental effects often combine in many expressions.

Here is a list of the effects of surprise mentioned by some dictionaries and thesauri, such as www.learnersdictionary.com, http://www.merriam-webster.com, http://www.thefreedictionary.com, http://www.collinsdictionary.com, http://www.oxforddictionaries.com:

> PHYSICAL EFFECTS:
>
> eye-opener; leave open-mouthed; take someone's breath away; breathtaking; take aback; shake up; bowl over; floor; startled; staggered;

and metonymies of a slightly different kind from the Online Oxford Collocation Dictionary http://oxforddictionary.so8848.com/search1?word=surprise:

> an expression/a look of surprise; a gasp/scream/shriek, etc. of surprise

These are effects or responses can all metonymically indicate surprise. The general metonymy that applies to them is: THE PHYSICAL EFFECTS OF AN EMOTION FOR THE EMOTION (see Lakoff and Kövecses, 1987).

> MENTAL EFFECTS:
>
> speechless; stupefy; mind-blowing; dumbfound; daze; astound; shock; astonish; amaze; stun; flabbergast; dumbstruck; thunderstruck; confounded; flummoxed; turn up / one for the books (http://www.oxforddictionaries.com)

The dictionary definitions of these words contain one way or another, the element of surprise. The generic-level metonymy that characterizes these mental responses can be given as: THE MENTAL EFFECTS OF SURPRISE FOR SURPRISE.

4. Surprise in a corpus-based approach

In corpus linguistics, language is studied by using databases called 'corpora' – i.e., large collections of words (transcribed utterances or written texts), which are usually stored on a computer in a machine-readable format and may be accessed online or by using computer programs (cf. McEnery and Hardie, 2012; Deignan, 2005), e.g., the Corpus of Contemporary American English (COCA) or the British National Corpus. Corpora are constructed with the purpose of attaining a possibly high degree of representativeness of a given language and of enabling a researcher

to search, read, and analyze large amounts of naturally occurring spoken and written data in their linguistic context (cf. McEnery and Hardie, 2012).

We conducted a basic corpus-based[5] investigation of SURPRISE. We applied the procedure of 'concordancing,' which can be used to gather a list of citations ('concordance') of word form(s) that we do a search on to analyze the use and meaning of a word form in its linguistic context (cf. Deignan, 2005).29 We chose the COCA as the database for the study because it is one of the largest corpora of the English language, with about 520 million words. In a randomized search, we sampled a concordance of 2000 occurrences of the word form *surprise*. The sample was composed of randomly provided citations from academic, newspaper, and magazine articles from 1990 to 2012.[6]

The method of our corpus-based research was very similar to the one applied by Deignan (2005) as shown in the first paragraph of the section. We wished to identify certain source domains related to the concept of SURPRISE that were found previously with the help of the lexical approach, and simultaneously tried to find new source domains. There were conceptual metaphors that occurred both in the dictionaries and in the corpus data (e.g., SURPRISE IS AN UNEXPECTED SEIZURE/ATTACK), but there were also conceptual metaphors that appeared in the corpus data only (e.g., SURPRISE IS A SUBSTANCE).

4.1 Metaphors of surprise – a corpus-based approach

In general, we identified more metaphors with our corpus-based method than with the lexical method. Our results indicate that, out of the 2000 cases examined, the total number of metaphorical expressions of *surprise* is 832 – that is, nearly half of the overall number of cases – and these figurative expressions point to four groups of schematic metaphors, headed by objects, substances, containers, and events that are not specific to SURPRISE and can relate also to other emotion concepts (and ten specific versions of these schematic conceptual metaphors), two conceptual metaphors specific to SURPRISE that were found also with the lexical method (SURPRISE IS AN UNEXPECTED SEIZURE/ATTACK, SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE), and three conceptual metaphors that were

5. The corpus-based analysis performed here is basic, and it is sure that using different corpus querying methods and different corpora would yield different results. However, the conclusions drawn from the comparison are general, they are not about the details of the analysis, but about main principles of interconnectedness and usefulness of both approaches.

6. To make sure that all examples are different, we used the 'Remove Duplicates' function in the spreadsheet program. Only those examples were elicited that had the word form *surprise* without any affixes.

not identified with the lexical approach (SURPRISE IS AN OPPONENT, SURPRISE IS AN ILLNESS, and SURPRISE IS A PLACE).

Below is a list of the conceptual metaphors we found, along with the token- and type-frequencies of the linguistic expressions pertaining to them.

The four schematic metaphors that are not specific to SURPRISE and can also relate to other emotion concepts are SURPRISE IS A PHYSICAL OBJECT(EMOTIONS ARE PHYSICAL OBJECTS), SURPRISE IS A PHYSICAL SUBSTANCE(EMOTIONS ARE PHYSICAL SUBSTANCES), BEING SURPRISED IS BEING IN A CONTAINER((EMOTIONAL) STATES ARE CONTAINERS), and SURPRISE IS AN EVENT (EMOTIONS ARE EVENTS).

SURPRISE IS A PHYSICAL OBJECT (75 types, 678 tokens)

INTENSITY OF SURPRISE IS THE SIZE OF A PHYSICAL OBJECT (8 types, 119 tokens)

According to the corpus data surprise can be described as *big/bigger/the biggest* (75), *great/greater* (22), *huge* (3), *enormous* (1), *little* (15), or *small* (1); surprise can *get bigger* (1) or it can be *lessened* (1).

THE DISPLAY OF SURPRISE IS THE OBSERVABILITY OF PHYSICAL OBJECT (7 types, 21 tokens)
e.g., *to show a surprise* (9), *to see a surprise* (2), *to hide a surprise* (2).

CAUSING SURPRISE IS THE TRANSFER OF A PHYSICAL OBJECT (7 types, 25 tokens)
e.g., *to get a surprise* (11), *to bring a surprise* (3), *to give a surprise* (3).

ATTRIBUTING SURPRISE TO SOMEONE IS ATTRIBUTING THE POSSESSION OF A PHYSICAL OBJECT TO SOMEONE/SOMETHING (6 types, 257 tokens)
e.g., *to her surprise, he looks at her surprise, I have a surprise.*

THE PRESENCE OF SURPRISE IS THE PRESENCE OF A PHYSICAL OBJECT HERE (4 types, 168 tokens)
e.g., *to come as no surprise* (59), *to come as a surprise* (72), *surprise is (not) here/there* (28), *lack of surprise* (2).

THE CO-PRESENCE OF SURPRISE AND ANOTHER STATE/EVENT IS THE INSTRUMENTAL USE OF AN OBJECT (17 types, 23 tokens) e.g., *to react with surprise* (4), *to say with surprise* (3), *to realize with surprise* (2).

DIFFICULTIES ARE OBSTACLES (3 types, 3 tokens)
e.g., *to get over a surprise* (1), *to overcome a surprise* (1).

SURPRISE IS A PHYSICAL SUBSTANCE (7 types, 9 tokens)
e.g., *mix of surprise and annoyance*

THE INTENSITY OF SURPRISE IS THE AMOUNT OF THE PHYSICAL SUBSTANCE (6 types, 7 tokens)
e.g., *much of a surprise* (2), *more of a surprise* (1).

SURPRISE IS A SUBSTANCE IN A CONTAINER (1 type, 2 tokens)
e.g., *full of surprise* (1), *surprise in someone's eyes* (1).

STATES ARE CONTAINERS (5 types, 7 tokens)

BEING SURPRISED IS BEING IN A CONTAINER (5 types,7 tokens)
e.g., *to say in surprise* (2), *to ask in surprise* (2), *look at someone in surprise* (7).

EMOTIONS ARE EVENTS (10 types, 14 tokens)
e.g., *to cause surprise* (1), *to plan surprise* (3), *initial surprise* (2).

A similarly frequent conceptual metaphor we found that does not belong to the four schematic domains above was:

SURPRISING SOMEONE IS AN UNEXPECTED SEIZURE/ATTACK (5 types, 113 tokens)
The most frequent types were *to take someone by surprise* (72 tokens) and *to catch someone by surprise* (38 tokens).

As noted in section *Metaphors of surprise in the lexical approach*, this metaphor is a special case of the SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE metaphor, which was also identified with our corpus-based method:

SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE (2 tokens, 1 type)
e.g., *to spring a surprise* (2).

In addition, several other conceptual metaphors were identified, but these were of considerably lower frequency than the previous ones:

SURPRISE IS AN OPPONENT (4 types, 4 tokens)
e.g., *to protect from surprise* (1).

SURPRISE IS AN ILLNESS (2 types, 3 tokens)
e.g., *to recover from surprise* (2), *to die from surprise* (1).

SURPRISE IS A PLACE (2 types, 2 tokens)
e.g., *area of surprise* (1).

4.2 Metonymies of surprise – a corpus-based approach

With the corpus-based method used we found 126 metonymical linguistic expressions, which indicated various physical and mental responses to the emotion of surprise. The linguistic descriptions of physical reactions of surprise outnumbered descriptions of mental effects of surprise by almost three times. The schematic metonymies, as well as more specific metonymies or examples are presented below:

EFFECT OF SURPRISE FOR SURPRISE (89 types, 126 tokens)
e.g., *an expression of surprise* (3)

THE PHYSICAL EFFECT OF SURPRISE FOR SURPRISE (62 types, 89 tokens)

CHANGE IN EYE EXPRESSION FOR SURPRISE (22 types, 47 tokens)
e.g., EYES OPENING WIDE, BLINKING, RAISING EYEBROWS, *a look of surprise*

CHANGE IN FACIAL EXPRESSION FOR SURPRISE (17 types, 17 tokens)
e.g., *surprise lit his face*

SUDDEN MOVEMENT FOR SURPRISE (14 types, 15 tokens)
e.g., jumping, *[he] leaped back in surprise*

THE MOUTH OPENING FOR SURPRISE (5 types, 6 tokens)
e.g., *he gaped in surprise*

SUDDEN HALT FOR SURPRISE (1 type, 1 token)
e.g., *Gordon came to an abrupt halt in surprise*

CHANGE IN COLOR OF THE FACE FOR SURPRISE (1 type, 1 token)
e.g., *his face reddening with surprise*

CHANGE IN BREATHING FOR SURPRISE (1 type, 1 token)
e.g., *breathed Mr Cubby, in awed surprise*

INTENSIVE/SUDDEN HEART ACTIVITY FOR SURPRISE (1 type, 1 token)
e.g., *his heart jumped with surprise*

THE MENTAL EFFECT OF SURPRISE FOR SURPRISE (23 types, 29 tokens)

MAKING SOUND FOR SURPRISE (11 types, 13 tokens)
e.g., shouting, gasping, *murmur of surprise*

CRYING FOR SURPRISE (3 types, 5 tokens)
e.g., *[he] gave a little cry of surprise*

AN UPSETTING FEELING FOR SURPRISE (3 types, 4 tokens)
e.g., *staring in shocked surprise*

CHANGE IN VOICE FOR SURPRISE (3 types, 4 tokens)
e.g., *surprise in his voice*

LAUGHING FOR SURPRISE (2 types, 2 tokens)
e.g., *Kazo laughed in surprise*

INABILITY TO SPEAK FOR SURPRISE (1 type, 1 token)
e.g., *speechless with surprise*

5. Challenges of the two approaches

In order to provide a more complete picture of how SURPRISE is conceptualized, a few further observations are to be addressed in some detail.

First, since in the case of SURPRISE no attempt to control the emotion is implied, no such source domains as OPPONENT, CAPTIVE ANIMAL, SOCIAL SUPERIOR, FIRE, FLUID IN A CONTAINER, and so on, that are commonly associated with other emotions, were found with the lexical method. However, as it was indicated earlier in this paper, some of these conceptualizations appear in the corpus data, but in small numbers, which indicates the lack or marginality of the element of control in SURPRISE.

Second, Kövecses (2015) mentions that SURPRISE can be described in terms of a set of collocates such as *express, register, show*, or *hide*. In addition, the lexeme *surprise* is often accompanied by such grammatical elements as definite or indefinite articles that suggest the conceptualization of SURPRISE as a bounded physical entity. Thus, these expressions point to the schematic-level metaphor SURPRISE IS A PHYSICAL OBJECT which plays a role in the conceptualization of other emotions such as anger, fear, joy, and sadness as well (Kövecses, 2000).

Third, and in combination with the previous point, the expression *surprise, surprise* extracted from dictionaries requires additional commentary. Although this metaphorical reduplication instantiates the ironical exploitation of the general metaphor (that is, not target concept-specific) MORE MEANING IS MORE FORM, this strategy is not compatible with (at least, not applied to) other emotions, and therefore appears to be a unique trait exclusively pertaining to SURPRISE. To illustrate this, consider the *happiness, happiness* or *relief, relief* possibilities which do not achieve the same effect as in the case of *surprise, surprise*.

Fourth, two time-related metaphors occurred that do not fit into any of the established categories: *to be in for a surprise* (10 tokens) and *to be up for a surprise* (2 tokens) which have a more complex conceptualization. These collocations are not specific to the concept of SURPRISE, since we can be *up to/in for* many kinds of events, happenings, consequently they do not add more information to the conceptualization of SURPRISE.

Fifth, co-presence metaphors were identified in examples that contain the preposition *with* and they do not express causation but a kind of instrumentality or companionship. Therefore, in both cases the simultaneous presence is obvious, however, it is difficult to distinguish them and decide whether the instrumentality precedes the companionship in conceptualization or the other way around. Here are two examples that demonstrate this use:

a. knowingly when a new mother scales back may react with *surprise* when a new father wants to do the same.
b. touched his hand, and said with *surprise* and laughter: „You know

Sixth, corpus-linguistic approaches are typically not concerned with the different senses of a lexeme in the study of the metaphors associated with that lexeme. However, we will show that this concern is justifiable on theoretical grounds and that it can produce important findings.

6. Discussion

In the present section, we compare the results of the lexical and a corpus-based approach and try to determine the relative strengths and weaknesses of both.

6.1 Number of metaphors

Our most obvious finding is that the corpus-linguistic approach turned up more conceptual metaphors than the lexical one. By using the two methods we identified a wide range of conceptual metaphors – both schematic and specific, and even unconventional metaphors. However, the lexical method did not yield the conceptual metaphors DIFFICULTIES ARE OBSTACLES, SURPRISE IS AN OPPONENT, SURPRISE IS AN ILLNESS, and SURPRISE IS A PLACE. The conceptual metaphors found with the two methods, as well as the number of occurrences (types and examples in the case of the lexical method, tokens and types in the case of the corpus linguistic method used) are presented in Table 1.

6.2 Conventionalization

Dictionaries, by their very nature, contain metaphorical linguistic expressions that are highly conventionalized. For an expression to end up in a dictionary means that it has achieved a considerable degree of conventionalization. Novel, very recent or conceptually inconsistent expressions are not available in dictionaries.

For example, this is the case with such conceptualizations of SURPRISE as SURPRISE IS AN OPPONENT, where the metaphor is inconsistent with the main idea of SURPRISE that it involves an immediate loss of control: Because of the immediate loss of control, one cannot really fight SURPRISE to prevent it from coming into existence (unlike many other emotions, where the emotion can be 'fought off'). Consequently, the lexical method can only find conventionalized metaphorical expressions.

6.3 Types and tokens

The items in a dictionary related to a particular target lexeme (that is, the collocations, synonyms, etc.) are by definition types, not tokens. They are not part of actual linguistic usage (unless used by a dictionary in authentic example sentences). As a result, the lexical method can only deal with *types* (and occasional examples). In contrast, our corpus-based method finds a variety of *tokens* for particular *types*, which means that it works both with tokens and types. This way corpus-based approaches can measure frequency of use, which is something that the lexical method cannot do.

6.4 Presence of target term

The lexical method can actually make good use of idioms and various types of phrases that do not involve a target domain lexeme (such as *surprise*) in metaphor analysis. Because of their close conceptual relationship to the target, such items are commonly listed by dictionaries (e.g., *catch someone unawares, a bolt from the blue* in surprise) under target domain items.

Table 1. Conceptual and linguistic metaphors identified with the two methods

Metaphors identified with the lexical method (57 types, 42 examples)	**Metaphors identified with our corpus-based method (112 types, 832 tokens)**
SURPRISE IS A PHYSICAL OBJECT (15 types, 33 examples)	SURPRISE IS A PHYSICAL OBJECT (75 types, 678 tokens)
INTENSITY OF SURPRISE IS THE SIZE OF A PHYSICAL OBJECT (5 types, 6 examples)	INTENSITY OF SURPRISE IS THE SIZE OF A PHYSICAL OBJECT (8 types, 119 tokens)
THE DISPLAY OF SURPRISE IS THE OBSERVABILITY OF PHYSICAL OBJECT (4 types, 5 examples)	THE DISPLAY OF SURPRISE IS THE OBSERVABILITY OF PHYSICAL OBJECT (7 types, 21 tokens)
CAUSING SURPRISE IS THE TRANSFER OF A PHYSICAL OBJECT (1 type, 2 examples)	CAUSING SURPRISE IS THE TRANSFER OF A PHYSICAL OBJECT (7 types, 25 tokens)

(*Continued*)

Table 1. (*Continued*)

Metaphors identified with the lexical method (57 types, 42 examples)	Metaphors identified with our corpus-based method (112 types, 832 tokens)
ATTRIBUTING SURPRISE TO SOMEONE IS ATTRIBUTING THE POSSESSION OF A PHYSICAL OBJECT TO SOMEONE/SOMETHING (2 types, 8 examples)	ATTRIBUTING SURPRISE TO SOMEONE IS ATTRIBUTING THE POSSESSION OF A PHYSICAL OBJECT TO SOMEONE/SOMETHING (6 types, 257 tokens)
THE PRESENCE OF SURPRISE IS THE PRESENCE OF A PHYSICAL OBJECT HERE (1 type, 4 examples)	THE PRESENCE OF SURPRISE IS THE PRESENCE OF A PHYSICAL OBJECT HERE (4 types, 168 tokens)
THE CO-PRESENCE OF SURPRISE AND ANOTHER STATE/EVENT IS THE INSTRUMENTAL USE OF AN OBJECT (2 types, 8 examples)	THE CO-PRESENCE OF SURPRISE AND ANOTHER STATE/EVENT IS THE INSTRUMENTAL USE OF AN OBJECT (17 types, 23 tokens)
	DIFFICULTIES ARE OBSTACLES (3 types, 3 tokens)
SURPRISE IS A PHYSICAL SUBSTANCE (6 types, 3 examples)	SURPRISE IS A PHYSICAL SUBSTANCE (7 types, 9 tokens)
THE INTENSITY OF SURPRISE IS THE AMOUNT OF THE PHYSICAL SUBSTANCE (5 type, 2 examples)	THE INTENSITY OF SURPRISE IS THE AMOUNT OF THE PHYSICAL SUBSTANCE (6 types, 7 tokens)
SURPRISE IS A SUBSTANCE IN A CONTAINER (1 type, 1 example)	SURPRISE IS A SUBSTANCE IN A CONTAINER (1 type, 2 tokens)
STATES ARE CONTAINERS (1 type, 2 examples)	STATES ARE CONTAINERS (5 types, 7 tokens)
BEING SURPRISED IS BEING IN A CONTAINER (1 type, 2 examples)	BEING SURPRISED IS BEING IN A CONTAINER (5 types, 7 tokens)
SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE (28 types, 1 example)	SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE (1 type, 2 tokens)
SURPRISING SOMEONE IS AN UNEXPECTED SEIZURE/ATTACK (6 types, 2 examples)	SURPRISING SOMEONE IS AN UNEXPECTED SEIZURE/ATTACK (5 types, 113 tokens)
SURPRISE IS AN EVENT (1 type, 1 example)	SURPRISE IS AN EVENT (10 types, 14 tokens)
	SURPRISE IS AN OPPONENT (4 types, 4 tokens)
	SURPRISE IS AN ILLNESS (2 types, 3 tokens)
	SURPRISE IS A PLACE (2 types, 2 tokens)

This option was not available using our corpus-linguistic method since searches cannot find the target domain terms in such idioms.[7] This results in *not* finding a

7. The superiority of the 'lexical' method with respect to the absence of the target term is restricted to the condition that the corpus search can only include the exact target term and not related terms.

number of metaphorical expressions for target domains, hence missing or downplaying the role of some conceptual metaphors (such as SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE).

6.5 Synonyms

Many dictionaries list synonyms for the various senses of words. This gives the lexical approach a chance to identify further metaphoric and metonymic expressions associated with a target term. We saw above how a number of these synonyms associated with surprise can be viewed as metonymies and/or metaphors. Our corpus-based approach, on the other hand, cannot find these items because they do not contain the target term that is searched. For this reason, the conceptual metaphor SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE (central to the conceptualization of SURPRISE according to the data collected from dictionaries by applying the lexical approach) showed low frequency in the corpus data (3 tokens, 2 types) because we could only search for expressions which contained the word form *surprise*. However, SURPRISING SOMEONE IS UNEXPECTED SEIZURE/ATTACK, which is a special case of the SURPRISING SOMEONE IS UNEXPECTEDLY IMPACTING SOMEONE metaphor, displayed a significant frequency number (113 tokens) in the corpus.

6.6 Polysemy

By taking into account the polysemy of the target term, the lexical method can provide some insight into the lexical/conceptual structure of the target. The various related senses of the lexeme *surprise* offer a highly schematic model, or folk theory, of surprise, where the various components of the model include the cause of surprise (indicated by the noun *surprise*), the process of causing surprise (by the verb *surprise*), the ensuing emotion of surprise (by the noun *surprise*), and the various effects of surprise (by the adjective *surprised*). This situation does not characterize surprise only. It is shared by several other emotions, where the same word form actually reveals a schematic model or a part of it (such as cause + emotion). Clearly, lexical structure as a tool to reveal conceptual models falls outside the perspective of corpus-linguistic approaches. At the same time, corpus-based methods could be turned into a valuable tool in seeing which components of the model are most frequently referred to and which ones are used in which pragmatic context – aspects of lexical structure that the lexical approach could not handle.

Now we can ask which method performs better. To see this, we should assess the results as discussed in the foregoing six points.

1. In the case of metaphorical expressions that *do not contain a target term*, the lexical method performs better, since it can find most of these expressions.

2. The lexical method works better with *synonyms of target* as potential metaphors for that target.
3. The lexical method performs better in discovering *schematic conceptual models* associated with emotion concepts.
4. Our corpus-based method performs better in finding the *entire range of metaphorical expressions* (both conventionalized and non-conventionalized) – except for those expressions that do not contain the target term. The lexical method can only find the conventionalized metaphorical expressions – including those that do not contain the target term.
5. Our corpus-based method is more effective because it works *both with types and tokens*, whereas the lexical method can only work with types (occasionally with tokens).
6. The *frequency of tokens* associated with types can be studied only by using corpus-based methods. The lexical method cannot be used for this purpose.

These relative advantages and disadvantages of the methods can be related to a distinction that can be made between two levels of metaphor analysis: the supraindividual level and the individual level (see Kövecses, 2002, 2010, 2017), roughly corresponding to how linguistic items are shared (supraindividually) in the form of decontextualized linguistic expressions by speakers of a language versus how the linguistic items are actually used in context by individuals.

The lexical method operates at the supraindividual level when it deals with conceptual models (point 3) synonyms (point 2), idioms (including those not containing a target term) (point 1). It operates best at this level.

Our corpus-based method operates at the individual level when it finds both conventionalized and unconventionalized conceptual metaphors associated with a concept (point 4), both types and tokens (point 5), and token frequencies (point 6). It operates best at the individual level.

However, there is another factor that needs to be taken into account when we try to determine the relative strengths and weaknesses of the two approaches. There may be differences between general topic areas, or domains, related to the use of conventionalized expressions. For example, the domains of feminism, society, nation, and many others, appear to be much less characterized by highly conventionalized figurative expressions (such as idioms) than, say, the various domains of emotions. As is well-known, anger, happiness, love, and so on, can be described by a large number of highly conventionalized idiomatic expressions (sometimes several hundreds of them). This kind of figurative language does not characterize many other topic areas, domains, such as feminism, and so on. In the latter cases, the lexical method cannot be employed at all or cannot be employed equally efficiently. Some domains are rich in highly conventionalized

figurative language, while others are much less so. To clearly see the relative applicability of the two approaches, it would be essential to have some insight into when and why domains differ in this regard. One factor obviously is how recent a particular topic area is. Discourse about abortion or feminism is relatively recent, and, as a result, they have not developed a highly conventionalized mode of figurative expression. (But the same argument would probably not apply to domains like society and nation.)

Finally, it might be asked if today's corpus-based dictionaries count as typical sources of information for the lexical method, then what is the difference between the corpus-linguistic and lexical methods? Isn't it the case that the lexical method is simply one of many corpus-based methods? The answer to this question is that not even the best corpus-based dictionaries provide the non-conventional types associated with a domain, deal with both types *and tokens*, and allow us to see the frequencies of occurrence of particular lexical items. And the other way around, the lexical method has its own advantages, as pointed out above. Therefore, corpus-based dictionaries cannot replace corpus-linguistic methods (and the other way around). We need both for a fuller account of metaphorical patterns.

In summary, it makes sense to suggest that we can achieve best results in finding metaphors for SURPRISE if we use the lexical and one of the corpus-linguistic approaches together. This is a solution in the spirit of Kövecses (2011). The use of the lexical approach can overcome some of the weaknesses of corpus-based approaches: it can provide us with a schematic prototype of the category, it can give us a number of synonyms that may function as metaphors, it can identify idiomatic expressions that do not contain the term *surprise*, and it can help us reveal major concept-specific, as well as some schematic metaphors of SURPRISE. On the other hand, with the help of a corpus-linguistic approach we can identify the schematic (and to some extent, also the concept specific) metaphors of SURPRISE, the entire range of conventionalized and non-conventionalized metaphorical expressions, and both the types and tokens of the figurative expressions associated with SURPRISE. By the joint application of the approaches, we can obtain a high degree of completeness and accuracy in our language-based study of SURPRISE.

7. Conclusions

In the paper, we briefly outlined two potentially useful ways of doing linguistic metaphor analysis: the lexical approach and a corpus-based one. We suggested that the two methods complement each other. We make this recommendation not because we do not wish to take sides on the issue of which method is ultimately

better. We make it because this is what our analysis of the concept of SURPRISE led us to believe.

In the case of the concept of SURPRISE, the lexical approach fared better in certain respects than the corpus-based analysis performed here; specifically:

1. at finding metaphorical expressions that do not contain an explicit target term;
2. at dealing with synonyms of target terms as potential metaphors for that target;
3. at discovering schematic conceptual models associated with emotion concepts.

The corpus-linguistic approach we used worked better:

1. at finding the entire range of metaphorical expressions (both conventionalized and non-conventionalized) for surprise;
2. at dealing with both types and tokens;
3. at offering frequency data and showing how frequency and conventionalization are related to each other.

However, we must point out that these results may be biased because they are based on the study of a single specific emotion concept. Had we looked at another specific concept in an entirely different general domain, our findings could be different. Moreover, had we used different, more refined corpus querying methods, our findings could also be different. The only generalizable result seems to be that in certain domains both methods must be employed for the best results. In other cases, however, the lexical method may be much less useful. The issue can only be decided if researchers conduct several similar studies in comparing methodologies in the case of very different topic areas.

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References

Cameron, L. (2003). *Metaphor in educational discourse*. London: Continuum.

Cameron, L., & Maslen, R. (Eds.) (2010). *Metaphor analysis. Research practice in applied linguistics, social science and humanities*. London: Equinox.

Deignan, A. (2005). *Metaphor and corpus linguistics*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/celcr.6

Kövecses, Z. (1986). *Metaphors of anger, pride, and love*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/pb.vii.8
Kövecses, Z. (1988). *The language of love*. Lewisburg: Bucknell University Press.
Kövecses, Z. (1990). *Emotion concepts*. Berlin: Springer. https://doi.org/10.1007/978-1-4612-3312-1
Kövecses, Z. (2000). *Metaphor and emotion*. Cambridge: Cambridge University Press.
Kövecses, Z. (2002). *Metaphor. A practical introduction*. Oxford: Oxford University Press.
Kövecses, Z. (2010). *Metaphor. A practical introduction. Second edition*. Oxford: Oxford University Press.
Kövecses, Z. (2011). Methodological issues in conceptual metaphor theory. In S. Handl, & H-J. Schmid (Eds.), *Windows to the mind: Metaphor, metonymy and conceptual blending* (pp. 23–39). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110238198.23
Kövecses, Z. (2015). Surprise as a conceptual category. *Review of Cognitive Linguistics*, 13(2), 270–290. https://doi.org/10.1075/rcl.13.2.01kov
Kövecses, Z. (2017). Levels of metaphor. *Cognitive Linguistics*, 28(2), 321–347. https://doi.org/10.1515/cog-2016-0052
Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 202–251). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139173865.013
Lakoff, G., & Kövecses, Z. (1987). The cognitive model of anger inherent in American English. In D. Holland & N. Quinn (Eds.), *Cultural models in language and thought* (pp. 195–221). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511607660.009
McEnery, T., & Hardie, A. (2012). *Corpus linguistics: Method, theory and practice*. Cambridge: Cambridge University Press. https://doi.org/10.1093/oxfordhb/9780199276349.013.0024
Pragglejaz Group. (2007). MIP: A method for identifying metaphorically used words in discourse. *Metaphor and Symbol*, 22(1), 1–39. https://doi.org/10.1080/10926480709336752
Semino, E. (2008). *Metaphor in discourse*. Cambridge: Cambridge University Press.
Sinclair, J. (1991). *Corpus, concordance, collocation*. Oxford: Oxford University Press.
Stefanowitsch, A. (2006). Words and their metaphors. In A. Stefanowitsch, & S. Th. Gries (Eds.), *Corpus-based approaches to metaphor and metonymy* (pp. 64–105). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110199895
Tognini-Bonelli, E. (2001). *Corpus linguistics at work*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/scl.6

Sources

www.merriam-webster.com
www.oxforddictionaries.com
www.yourdictionary.com
www.thefreedictionary.com
www.learnersdictionary.com
www.macmillandictionary.com
www.learnersdictionary.com
www.collinsdictionary.com
www.corpus.byu.edu/coca

CHAPTER 7

Figurative reasoning in hedged performatives

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This chapter combines a cognitive linguistic and a pragmatic approach to a specific class of speech acts known as hedged performatives, such as *I can offer you a five-year contract*, which, despite the modal hedge can on the illocutionary verb offer, conventionally counts as an offer. We demonstrate that analytical tools such as conceptual framing and metonymic inferencing shed light on the meaning and use of hedged performatives. Using corpus data, we show that the target meanings of indirect speech acts, including hedged performatives, are not coded, and therefore not compositionally computable. Rather, they are accessible through cognitive operations that humans perform spontaneously and automatically, making them a challenge to machine-based simulations of such mental processes.

Keywords: attitudinal hedge, conceptual framing, emotive hedge, entailment, illocutionary-force preserving, illocutionary-force canceling, metonymic inference, modal hedge

1. Introduction

In his William James Lectures delivered at Harvard University in 1955, John L. Austin introduced a specific type of utterance instantiated by examples such as the following (Austin, 1962, p. 5):

(1) I name this ship the *Queen Elizabeth*.

(2) I bet you sixpence it will rain tomorrow.

Austin calls (1) and (2) *performative utterances*. What distinguishes them from other speech acts is that the speaker *explicitly* refers to the illocutionary act he or she is performing, and in doing so actually *does* perform it. Thus, if uttered under the appropriate circumstances and felicity conditions, (1) constitutes an act of naming a ship, and (2) constitutes an act of betting.

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Typically, in *explicit* performative utterances speakers refer to themselves by means of the personal pronoun *I*, and, crucially, the illocutionary verb occurs in the present tense. There is also usually a propositional content *p*, which may be coded e.g., as a finite complement clause or an infinitival clause, to name just two of the constructional possibilities.

In this chapter, a specific class of speech acts is discussed and amply documented with corpus data that, in contemporary pragmatics, is known as *hedged performatives*. We argue that hedged performatives can be analyzed by combining insights from speech act theory (Austin, 1962; Searle, 1969) and linguistic pragmatics (Fraser, 1975) with a cognitive-linguistic approach to figurative reasoning – here metonymic inferencing. In earlier work (Thornburg & Panther, 1997; Panther and Thornburg, 1998), the present authors call the kind of figurative reasoning involved in indirect speech acts *illocutionary metonymies*. Illocutionary metonymies have, to our knowledge, not yet been documented systematically in data bases (see Barcelona, this volume).

The term 'hedge' refers to the phenomenon observable in English and many other languages that a performatively used verb is specified by e.g., modal, attitudinal, emotive words or expressions, and even by grammatical mood (see e.g., Fraser, 1975; Panther, 2015, 2016), as e.g., *I can offer you lemonade or water*, which functions as an offer, or *May I congratulate you on your marriage, sir?*, which counts as an act of congratulation. What is conceptually and pragmatically puzzling about hedged performatives is that, in some cases, the illocutionary meaning denoted by the performative verb is not affected by the hedge, whereas, in other cases, hedging results in the cancelation of the illocutionary meaning conveyed by the performative verb.

More precisely, there exist three interpretive possibilities for uttererances with hedged performative verbs:

i. *Illocutionary force preserving hedges*: The hedge is compatible with the illocutionary verb and does not affect the illocutionary force expressed by the performative verb.
ii. *Illocutionary force canceling hedges*: The hedge is compatible with the illocutionary verb, but has the effect of *canceling* the force denoted by the illocutionary verb, leading to a different illocutionary force.
iii. *Conceptual/pragmatic incompatibility between illocutionary force and hedge*: The hedge is semantically and/or pragmatically incompatible with the illocutionary verb.

In this contribution, we focus mainly on illocutionary force preserving hedges (henceforth: *F-preserving hedges*), with occasional remarks on interpretive possibilities (ii) and (iii). To account for F-preserving hedges we rely on a model

of figurative, i.e., metonymic, reasoning that connects a hedged source sense to a target meaning of ACTUALITY, i.e., an explicit performative meaning. We are concerned mainly with the technical problem of how hedged performatives relate to explicit performative utterances. Socio-pragmatic functions of hedged performatives, such as e.g., negative politeness effects (see Brown & Levinson, 1987), are mentioned only in passing.

The chapter is organized as follows. In Section 2, a classification of F-preserving hedged performatives is proposed in terms of the semantics of the hedge and the number of hedges that precede the performative verb. We argue that performatives hedged by modals and propositional attitude expressions are linked to their target sense via *metonymy*, whereas performatives with emotive hedges *entail* their target sense. Section 3 briefly discusses illocutionary force canceling hedges (henceforth: *F-canceling hedges*). Section 4 deals with the hedges *can* and *must* and their influence on the following performative verb. Apart from their basic modal meanings, these two modals are shown to invite a rich array of metonymic and pragmatic inferences, which are relevant to whether they have an F-preserving or F-canceling effect. Section 5 closes this contribution with an outlook on future research. The data used in this chapter are authentic and retrieved from the *Corpus of Contemporary American English* (COCA) (http://corpus.byu.edu/coca/), from the *Corpus of Global Web-Based English* (GloWbE) (corpus.byu.edu/glowbe/), and occasionally from *WebCorp* and *Google Books*.[1]

2. Illocutionary force preserving hedged performatives

To begin with, it is important to formulate a reliable criterion for determining whether or not an illocutionary verb is actually used performatively. In fact, such a criterion exists. Explicit performatives can be modified by the instrumental adverbs *hereby* or *herewith*, especially if the performative utterance belongs to a formal, officialese or legal register:[2]

(3) […] I [hereby] *claim* that he took the money without her knowledge.
(COCA 1993)

1. For the examples retrieved from *COCA*, the year of attestation is given in parentheses. For the data from *GloWBe*, the year of attestation (if possible) and the country of origin is given in parentheses. The following abbreviations are used: CA = Canada, GB = Great Britain, NZ = New Zealand, US = United States.

2. In the following examples, as well as throughout this chapter, words and expressions relevant to the analysis are italicized.

(4) […] I [hereby] *promise* you that I will never, ever do it again. (COCA 2009)

(5) I [hereby] *urge* you to get help. (COCA 2001)

(6) I [hereby] *apologize* for sending a recorded message […]. (COCA 2011)

(7) I [hereby] *declare* this tunnel open. (COCA 1998)

In Examples (3)–(7), the illocutionary verb can be modified by the instrumental adverb *hereby* – a clear indicator that it is used performatively. Crucially, this is also the case with F-preserving hedged performatives, as witnessed by the authentic Examples (8) and (9) (see also Panther, 2016, p. 197, for discussion of these examples):

(8) I *can hereby confirm* that our customers appreciate our specialist expertise […]. (WebCorp)

(9) I *can hereby report* that the distance between today and yesterday, or at least between 2000 and 1900, is exactly 541 footsteps. (COCA 2002)

F-preserving hedged performatives constitute a special case of what Searle (1975) calls conventionalized *indirect speech acts*. Searle claims that the indirectly conveyed illocutionary force, i.e., the primary illocutionary act in his terminology, can be canceled. However, this assumption has to be taken with a grain of salt in the case of F-preserving hedged performatives, as the two examples (10a,b) show:

(10) a. I *would suggest* that one essential aspect of an effective, robust, and comprehensive music education is intercultural studies. (COCA 2015)

b. […] If you asked me, I would suggest that you confront Hana with your feelings and give her a last chance. (*https://books.google.co.uk/books?isbn=1326971247*)

In (10a), the use of *I would suggest* strongly implies the performative interpretation 'I suggest'. We have not been able to find corpus data providing evidence that this interpretation is defeasible. Even in (10b), where *I would suggest that […]* functions as the apodosis of the protasis *If you asked me*, despite the double hedging of *suggest*, the illocutionary force denoted by this verb is not affected. Example (10b) is a polite suggestion with a low degree of imposition.

However, if, as in (11), the counterfactual *would have suggested* is used, the utterance does not count as a suggestion, i.e., the hedge *would have* has a canceling effect:

(11) If asked, I *would have suggested* the Crown's men look for a house in Isleworth where Mary Swanford does dwell. But I was not asked, and the Crown is proceeding against those they have netted. (*https://books.google?isbn=1491780525*)

In the following sections, F-preserving hedged performatives are presented and discussed according to the *number* of hedges that precede the performative verb and according to the *conceptual type* of the hedge.

2.1 Single hedges

As already mentioned, the most common single hedges are modal, attitudinal, and emotive words or expressions, and the grammatical mood of the sentence.

2.1.1 *Modal hedges*

Among the modal hedges one finds *can, be able to, must, have to*, and *would*, as exemplified by the following corpus data (the metonymic inference to an ACTUALITY, i.e., performative, meaning is indicated by the arrow '→' and *p* stands for some propositional content):

(12) I *can offer* you a month's wages and the fare for your transportation home to New England. (COCA 1994)
'I offer you *p*' [example reproduced from Panther, 2016: 202]

(13) I *can recommend* the octopus and cress salad, and juicy scallops on a johnnycake (a cornmeal pancake). (GLoWbE, GB)
'I recommend *p*' [example reproduced from Panther, 2016: 197]

(14) Once again, I *must ask* you to lower your voice. (COCA 2011)
'I ask you to *p*' [example reproduced from Panther, 2016: 209)

(15) I *must warn* you that this is not a propitious time to sell – in the middle of a war […]. (COCA 2004)
'I warn you that *p*' [exampled reproduced from Panther, 2016: 208]

(16) I *have to tell* you to stop drinking right now, or you'll have to get out. (COCA 1992)
'I tell you to *p*'

(17) I *would argue* that this president has had more land on his plate from the day he got in office than any other president – including Franklin Roosevelt. (COCA 2012)
'I argue that *p*'

What all of (12)–(17) have in common is a high-level metonymy that can be formulated as VIRTUALITY → ACTUALITY, i.e., what is literally represented as a virtual (potential, obligated, or hypothetical) speech act (source meaning) counts as an actually performed speech act (target meaning). Thus e.g., (15) has the target meaning (18) (where the subscripted letters *S* and *T* symbolize the source and the target meaning, respectively):

(18) $[_{T}[_{S}$ I *must warn* you that *p*] & I actually *warn* you that *p*]

Note that in (18) the target sense conceptually *incorporates* the source sense, which we regard as a defining property of conceptual metonymy. The metonymic operation does not obliterate the source meaning but preserves it as backgrounded information.[3] However, as the reader will already have noticed, for reasons of simplicity, in this contribution target senses are notated without representations of their incorporated source senses.

2.1.2 *Propositional attitude hedges*

Verbs and expressions of propositional, i.e., mental, attitude may hedge performatives without affecting the illocutionary force of the performative verb. Here are some examples of such attitudinal hedges:

(19) I *want to inform* you that these people are drugging me. (COCA 1992)
'I inform you that *p*'

(20) I *would like to thank* you for your confidence, Mr. President, and for the appointment […]. (COCA 2011)
'I thank you for *p*'

(21) Mark Updegrove, I *want to thank* you very much for joining us this morning. (COCA 2015)
'I thank you for *p*'

(22) I *would like to* sincerely *apologize* for the recent letter you received from the special investigators […]. (COCA 2015)
'I sincerely apologize for *p*'

Utterances (19)–(22) invite a *metonymic inference* DESIRED PERFORMANCE OF SPEECH ACT → ACTUALLY PERFORMED SPEECH ACT, a special case of the metonymy VIRTUAL SPEECH ACT → ACTUAL SPEECH ACT, which, in turn, is a subcase of the already mentioned general inferential schema VIRTUALITY → ACTUALITY.

2.1.3 *Emotive hedges*

Frequently, performatives are hedged by emotive expressions. Different from modal and propositional attitude hedges, emotive predicates such as *be pleased (to), be happy (to), regret (to)* are not metonymically linked to their infinitival

3. For in-depth treatments of the role of metonymy in language and thought, see e.g. Bierwiaczonek (2013), Denroche (2015), Littlemore (2015), Kövecses and Radden (1998), Panther and Thornburg (2007), Radden and Kövecses (1999, 2007), Ruiz de Mendoza Ibáñez (2014).

complement (which contains the performative verb), but rather they *entail* their complement. The following examples illustrate emotive hedges (the entailment relation is symbolized by '⊩'):

(23) I *am happy to report* that the kitchen performed a lot better on subsequent visits […]. (COCA 2010)
⊩ 'I report that *p*'

(24) I *regret to inform* you that Casilda Bannek will not be able to play the part of Rose in tonight's performance. (COCA 1992)
⊩ 'I inform you that *p*'

(25) I *am pleased to announce* at this hour [that] the United States Senate is moving forward on a package of tax cuts that has strong bipartisan support. (COCA 2010)
⊩ 'I announce that *p*'

(26) I *am happy to inform* you that no such oppression exists among modern-day Soapoids. (COCA 1993)
⊩ 'I *inform* you that *p*'

(27) I *regret to inform* you that I shall not be at the meeting to-night. (COCA 1995)
⊩ 'I *inform* you that *p*'

2.1.4 *Entailment vs. metonymic inference*

In Examples (23)–(27), the entailed meanings are, by definition, not cancelable without contradiction. For example, the speaker of (23) cannot cancel the semantic implication that he or she actually performs an illocutionary act of reporting something.[4]

In contrast, although the metonymic inferences in the examples given in Sections 2.1.1 and 2.1.2 are very strong and, in the given contexts, hard to cancel, they are not semantically necessary implications. To see this, consider the contrast between (28) and (29). Sentence (28) is taken from the State of the Union address delivered by President Barack Obama to the United States Congress in 2013, while (29) is taken from an interview Donald Trump gave on the American television program *NBC Today* in 2011. Note that both (28) and (29) contain a token of *I can announce*:

4. Note in passing that the emotive hedge *I am happy to report that p* in (23) sounds more idiomatic than the simple unhedged performative *I report that p*.

(28) Tonight, I *can announce* that, over the next year, another 34,000 American troops will come home from Afghanistan. (COCA 2013)

(29) Mr. TRUMP: I think I'm presidential. I think I have a very high aptitude, and I think I was at the best schools and always did good, I was a good student. But there's only one thing I can do, and that some time prior to June I *can announce* that I'm going to run. (COCA 2011)

The difference between (28) and (29) is that in the former utterance *I can announce […]* strongly invites the (metonymic) inference 'I (hereby) announce […]' whereas in the latter *I can announce […]* does not have the same force: In 2011, Trump refers to a possible *future* announcement that he will run for president. To conclude, the contrast between examples such as (28) and (29) shows that *contextual* factors may coerce a metonymic reading of hedged performatives as performatives, but the metonymic relation as such can, in principle, be suspended or even be canceled.

2.2 Double hedging

Performative hedges can also occur in combination. The sequence of hedges is *constrained*: As is shown in Sections 2.2.1 and 2.2.2, the modal element – be it an auxiliary or a full verb – must immediately precede the performative verb. In other words, emotive hedges (2.2.1) and mood hedges (2.2.2) have modally hedged performatives *within* their scope.

2.2.1 *Emotive predicate plus modal*

Emotively tinged modally hedged performatives are quite frequent. Consider the following examples:

(30) Sir Toby, I'm *afraid I must ask* you and Sir Andrew to leave. (COCA 2009)

(31) I am *happy to be able to confirm* that we are going ahead with that proposal. (GloWBe, GB)

(32) I am *happy to be able to assure* you that this is all complete nonsense. (GloWBe, US)

The target senses of (30)–(32) involve a combination of entailment and metonymy. For example, the interpretation of (30) can be accounted for by the following inferential chain:

(33) a. Sir Toby, I'm *afraid I must ask* you and Sir Andrew to leave ⊩

b. Sir Toby I *must ask* you and Sir Andrew to leave →

c. Sir Toby I *ask* you and Sir Andrew to leave.

The general inferential schema can be formulated as follows (*p* and *q* represent propositional contents):

(34) a. EMOTIVE PREDICATION (p) ⊩
b. MODALLY HEDGED PERFORMATIVE (q) →
c. PERFORMATIVE (q)

2.2.2 *Mood plus modal*

Another type of hedged performative combines a grammatical mood (sentence type) with a modal expression:

(35) *May I congratulate* you on your recent marriage, Lord Greenleigh?
(COCA 2006)

In (35), the sentence type INTERROGATIVE establishes the syntactic frame within which the modal hedge followed by the performative verb is embedded. Literally, the speaker asks Lord Greenleigh if he is permitted to congratulate the latter on his recent marriage. However, the speaker takes for granted his *permission* to perform the congratulatory act so that his utterance actually *counts as* a (polite) act of congratulation. The inferential chain involved can be represented by the following simplified predicate calculus notation (with *S* = Speaker, *H* = Hearer, *p* = propositional content):

(36) a. ASK-QUESTION (S, H, PERMIT (H, CONGRATULATE (S, H, p))) →
b. BE-PERMITTED (S, CONGRATULATE (S, H, p)) →
c. CONGRATULATE (S, H, p)

A special case is instantiated by (37) where the sentence type INTERROGATIVE is combined with the complex hedge *would it be too much to*, which results in a directive act (request) that displays a high degree of negative politeness:

(37) *Would it be too much to ask* you to join us, if only for a few minutes?
(COCA 2005)

Finally, there also exist hedged performatives that are literally IMPERATIVES with a verb of permission in their scope, as in the following two utterances:

(38) a. [*A*]*llow me to assure* you, string theory, right or wrong, is science, it has extremely deep ties to the rest of physics […]. (GLoWBe, US)
b. [*A*]*llow me to tell* you that the allusion to the Gribouille's short-sighted idiot in one of your recent talks seemed catastrophic to me.
(COCA 1991)

Utterances (38a,b) function indirectly as assertive acts, i.e., speech acts whose propositional content has a truth value. How does this indirect assertive force come about? A possible reconstruction of the inferential pathway is given in (39):

(39) a. DIRECTIVE (S, H, PERMIT (H, S, ASSURE/TELL (S, H, p)) →
b. BE-PERMITTED (S, ASSURE/TELL (S, H, p)) →
c. ASSURE/TELL (S, H, p))

The inferential schema (39) is structured analogously to the one given in (36). The first step in (39) is a conceptual leap – from the speaker asking the hearer *pro forma* to allow her to tell the hearer that *p* – to the presumption that this permission is already established (39a→b); and the second inference moves from the given permission to tell the hearer that *p* to the conclusion that the speaker *actually* tells the hearer that *p* (39b→c).

2.2.3 *Conditional plus modal*

As a third type of double hedging, consider the following utterance from an interview with Mary Robinson, UN Commissioner for Human Rights, conducted by CNN journalist Jim Clancy in 2002:

(40) All right, Mary Robinson, *if* I *can ask* you to stay right there, we're going to take a short break.
(COCA 2002) [example reproduced from Panther, 2016, p. 203]

Jim Clancy's utterance clearly counts as an act of asking or requesting the hearer (Mary Robinson) to stay on the air. The crucial trigger of this interpretation is the *if*-clause, under which *I can ask you to stay right there* is embedded. The hypothetical meaning of the *if*-clause and the meaning of *can*, which comes close to the sense 'may, be allowed to' in this context, jointly motivate the reading of this example as a polite directive speech act.

If-clauses (without a following consequent clause) can be used quite systematically as indirect speech acts. Witness the following example (retrieved from the *Lancaster Oslo Bergen* Corpus (LOB) discussed in Panther and Thornburg (2003, p. 134):

(41) If we could go up to your room, sir […].

Utterance (41) conventionally counts as a request, but notice that, in contrast to (40) where the modal of ability hedges the illocutionary verb *ask (to)*, in (41), what Panther and Thornburg (1998) call a BEFORE component of the illocutionary scenario of requests, viz. the hearer's ability to carry out the requested action, is evoked by the modal.

3. Illocutionary force canceling hedges

The illocutionary force expressed by a performative verb can also be canceled under certain circumstances. The following discussion does not provide definitive solutions to the problem under which conditions F-canceling takes place, but more modestly, by way of example, pinpoints some intriguing data that still await an in-depth conceptual-pragmatic analysis.

To begin with, consider examples (42)–(44):

(42) I *would like to appoint* you as my Senior Advisor […]. [GloWbE, CA]

(43) He gave her a crooked grin. "And I'm the owner. I *can fire* you."
"Not till we get back to Selene."
(COCA 2001) [example reproduced from Panther, 2016, p. 205]

(44) "I'm the captain of this craft," Pancho said firmly. "I *can order* you to stay inside." (COCA 2001) [example reproduced from Panther, 2016, p. 198]

By means of (42), a speaker can express her wish or intention to appoint the addressee as her Senior Adviser, but the utterance does not count as a declaration that the hearer is actually appointed as a result of the utterance. Similarly, (43) does not count as an act of firing the hearer, i.e., the modal hedge *can* has the effect of canceling the illocutionary force of "firing" the addressee; rather, it functions as a threat or a warning that the addressee might be fired in the future. In a similar vein, by means of utterance (44) the speaker (a fictitious character named Pancho) does not order the hearer to stay inside but only warns him that he is *legitimized* or *authorized* to order the hearer to stay inside (for a discussion of (43) and (44), see also Panther, 2016: 198).

A further example in which the modal *could* has an F-canceling effect is (45):

(45) Good. I *could ask* you to repeat everything I told you, but that panicked look is its own reward. (COCA 2003)

Utterance (45) does not constitute a directive speech act. The *but*-clause signals that the speaker will most likely refrain from asking the hearer to repeat everything the speaker told him. Note however that, if the mood in (45) is changed from DECLARATIVE to INTERROGATIVE, the result is a performative interpretation, i.e., the use of the requestive verb *ask (to)* marks the utterance as a (polite) directive speech act:

(46) *Could* I *ask* you to repeat everything I told you […]?

Why does (45) not count as a directive illocutionary act, whereas in uttering (46) the speaker *does* perform an indirect request, i.e., the illocutionary force indicated by *ask (to)* survives in (46) but not in (45)? We propose that the answer

to this puzzle is to be sought in the differing meanings of *could* in (45) and (46), respectively.

In utterance (45), the modal hedge *could* signals that the speaker is legitimized or in a position of authority to perform a directive speech act, but the performance of this directive act remains hypothetical rather than reaching the level of actuality. To the extent that compliance with the propositional content of (45) is felt not to be beneficial for the hearer, the utterance conveys the force of a warning or threat that a directive speech act might be performed in the future.

As to (46), the speaker's act of *asking* the hearer *whether* a hypothetical *possibility* obtains to *request* the performance of a certain action comes semantically very close to asking the addressee whether he or she *allows* the speaker to perform the request in question. In other words, the inferential structure of (46) is analogous to that of (35) (as more formally represented in (36)). If the hypothetical meaning of *could* is neglected, the inferential pathway from the illocutionary source meaning of (46) to its requestive target meaning can be represented as follows:

(47) a. ASK-QUESTION (S, H, BE-PERMITTED (S, REQUEST (S, H, p))) →
b. BE-PERMITTED (S, REQUEST (S, H, p)) →
c. REQUEST (S, H, p)

As two additional intriguing pieces of data, consider (48) in comparison to (49):

(48) I *would recommend* a 90-day election period with no commercials or campaigning before the set date. (COCA 2015)

Utterance (48) can definitely convey a recommendation. The literal hypothetical meaning of this recommendation is *backgrounded* in this example (although it is still present), and the actual performance of the speech act of recommendation is *foregrounded*.

But what happens if the mood of (48) is changed from DECLARATIVE to INTERROGATIVE, as in (49)?

(49) *Would* I *recommend* a 90-day election period with no commercials or campaigning before the set date?

The answer to (49) might be *yes* or *no*. The illocutionary force indicated by the verb *recommend* does not survive. Utterance (49) is clearly a question ('You are asking me whether *p*') – not a recommendation.

Finally, compare (50) with (51):

(50) "My dear daughter," he said to her. "I *must tell* you that I am not your real father." (COCA 2002)

(51) "My dear daughter," he said to her. "I **?***can tell* you that I am not your real father."

In (50), the choice of *must* as the hedge of *tell* is pragmatically appropriate because most likely the news *I am not your real father* would be felt as bad and emotionally troubling by the daughter. In contrast, the infelicity of *can tell* in the made-up example (51) seems to be due to the incongruity between *can*, which implies an evaluatively and emotionally positive orientation, and the content of the speaker's shocking announcement.

As evidenced e.g., by (50), *tell* can be hedged by *must* without losing its performative force. Given the right context, *can* can also function as an F-preserving hedge of this verb; witness e.g., (52) and (53):

(52) I *can tell* you, Bob, you're not going to solve crime without the cooperation of the community. (COCA 2015)

(53) I *can tell* you that we are not going to know for a few minutes exactly what has happened in Santiago itself because of communication issues. (COCA 2015)

The modal *can* in (52) appears to be motivated by the speaker's intention to communicate that, given his expert knowledge, he is legitimized and authorized to tell the hearer that crime cannot be solved without *the cooperation of the community*. The modal *can* exhibits a slightly different use in (53) where it connotes that the speaker, at the time of utterance, is only in a position of providing limited information to his audience about *what has happened in Santiago*.

4. The metonymic potential of *can* and *must*

In this section, the function of the modals *can* and *must* in hedged performatives is discussed in more detail and illustrated with a variety of examples. We restrict ourselves to an analysis of hedged *assertive* speech acts and a few remarks on *commissives* and *directives* (for other hedged illocutionary types such as expressives and declarations, see Panther, 2016). Following Panther (2015), we argue that *can* and *must*, in addition to their modal senses, are typically associated with and point to certain evaluations, emotions, and mental states, which can be represented as metonymic relations.

4.1 The metonymic potential of *can* in assertive speech acts

The claim we want to defend is that expressions of the form *can do p* have, in general, a "positive" orientation. It is not accidental that, in 2008, Barack Obama ran his presidential campaign with the slogan *Yes, we can*. This message was intended to impart confidence in the future president's ability to solve urgent political, economic, and social problems, and the use of *can* was intended to convey strong

feelings of optimism. The conceptual frame properties of *can* relevant to the present study are represented in Figure 1.

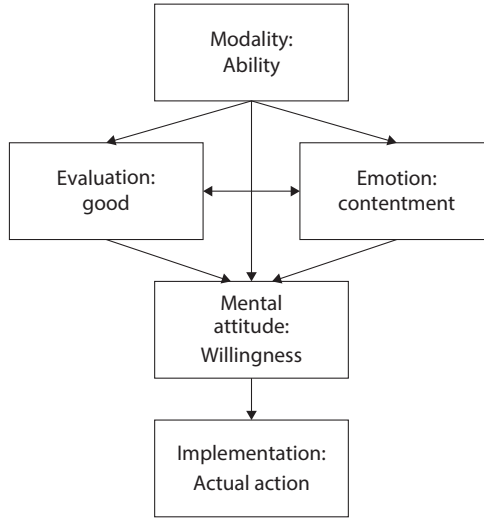

Figure 1. Frame properties of *can* (*do p*)

The central meaning component ABILITY of *can* is metonymically linked to other meaning components in the frame, such as a positive evaluation of some state-of-affairs as GOOD and an emotional state of CONTENTMENT or even HAPPINESS. ABILITY is also linked to ACTION via the intentional state WILLINGNESS. Evidence for the existence of these frame elements comes from hedged performatives such as (54) and (55) (retrieved from a European Parliament session):

(54) Mr President, it is *with considerable pleasure* that I *can inform* you […] that the Commission has today adopted a proposal that modifies national regimes of design protection […]. (europarl.europa.eu)

(55) It is *with great satisfaction* that I *can inform* you that the Commission fully accepts the three amendments […]. (europarl.europa.eu)

Utterances (54) and (55) explicitly code the positive emotional state of the speaker, i.e., *with considerable pleasure* and *with great satisfaction*, respectively, which is pragmatically congruent with the positive orientation of the modal hedge *can*. In Figure 2 the schematic illocutionary frame for utterances of the type *I can inform you that p* is represented.

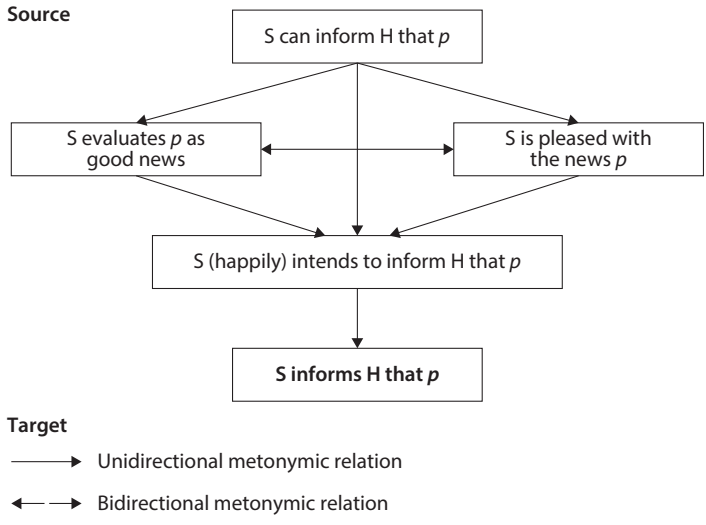

Figure 2. Illocutionary frame: *I can inform you that p*

The act of informing somebody that *p* is an instance of the illocutionary type that Searle (1976) calls *assertive* or, alternatively, *representative*. What holds for *I can inform you that p* can be generalized to many other, if not all, assertive speech acts. The schema *S can assert that p* thus involves the following metonymic inferences (where → symbolizes 'unidirectional metonymy' and ↔ 'bidirectional metonymy'; see also Panther, 2015, pp. 143–144):

S CAN ASSERT THAT p

(56) a. ABILITY TO ACT → ACTUAL ACTION
b. p → POSITIVE-EVALUATION-of-p
c. p → POSITIVE-EMOTION-CAUSED-by-p
d. POSITIVE-EVALUATION-of-p ↔ POSITIVE-EMOTION-CAUSED-by-p

4.2 The metonymic potential of *must* in assertive speech acts

4.2.1 *Negatively evaluated and experienced obligations*

In contrast to *can do p*, we contend that, in one of its typical uses, *must do p* has a "negative" orientation, i.e., it conveys negative evaluations, negative emotions, and a corresponding negative attitude, i.e., reluctance, to perform a certain action. The frame properties of *must* are diagrammed in Figure 2.

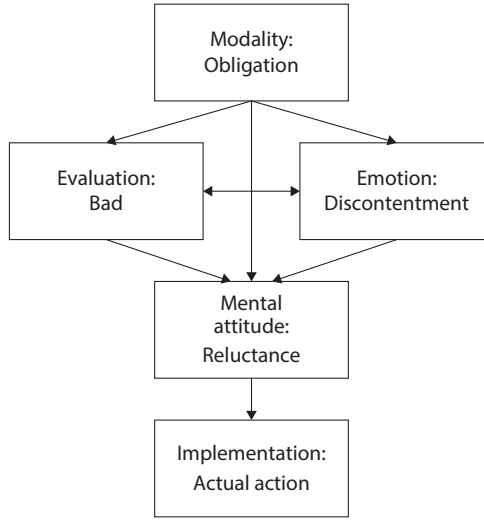

Figure 3. Frame properties of *must (do p)*

The meaning components in the frame represented in Figure 3 – other than OBLIGATION, which is overtly expressed in performatives hedged by *must* – can be inferred from the context and/or situation. A case in point, in which possibly negative emotions, a corresponding negative evaluation, and reluctance to convey bad news are not overtly expressed but metonymically evoked, is given in (57):

(57) I *must inform* you that there are only 30 seats available for this wonderful rare event! (GloWbE, NZ)

The fact that there are *only 30 seats available* obviously reduces chances for interested people to attend *this wonderful rare event*, and this state-of-affairs is likely to be evaluated negatively by the addressee and may cause a feeling of discontentment.

In other cases, one or more meaning components of the *must* frame are overtly expressed. A highly negatively loaded example with an explicit coding of emotion is (58):

(58) It is with *deep regret* that I *must inform* you of the tragic loss of an LTHS freshman student. (GloWbE, GB)

The following example, a letter sent in 1957 to a student who applied for admission to the Princeton University Law School, also explicity codes a feeling of regret:

(59) Dear Mr. Wax: In reply to your recent letter, I *regret* that we *must inform* you that Princeton University has no Law School.
(http://www.lettersofnote.com/2011/11/dear-princeton-law-school.html)[5]

For the outside reader this letter produces a humorous effect, not least because it constitutes a case of *presupposition failure*. The law school to which Mr. Wax applies does not exist, and the application letter is therefore null and void in legal terms, i.e., treated as if had never been written.

Another meaning component, viz. RELUCTANCE, to perform the assertive speech act can also be coded in performatives hedged by *must*, as attested by the following corpus data:

(60) I *must reluctantly* state there is substantial evidence that Senator Riegle played a much greater role than he now recalls […]. (COCA 1990)

(61) I *must reluctantly concede* that you are right. (GloWbE, US)

(62) I *must reluctantly admit* that the average 'friendly' alien seems to need a lot more shelter 'Lebensraum' than the average Londoner […]. (GloWbE, CA)

In conclusion, the metonymic inferences involved in assertives hedged by *must* can be summarized as follows:

S MUST ASSERT THAT p

(63) a. OBLIGATION TO ACT → ACTUAL ACTION
b. p → NEGATIVE-EVALUATION-OF-p
c. p → NEGATIVE-EMOTION-CAUSED-BY-p
d. NEGATIVE-EVALUATION-OF-p ↔ NEGATIVE-EMOTION-CAUSED-BY-p

4.2.2 *Happily performed obligations*

As demonstrated in Section 4.2.1, one important function of F-preserving performatives hedged by *must* is to indicate a negative evaluative and emotive orientation and a certain reluctance to perform an assertive speech act, although, despite this mental attitude, the illocutionary act is in fact performed. In this section, we show that sometimes obligations or duties are felt to be pleasurable, i.e., they have evaluatively and emotionally a positive orientation, and the speech act denoted

5. Note that the emotions and evaluations expressed or metonymically evoked in messages such as (59) are informed by social conventions rather than by genuine assessments and feelings.

by the performative verb is therefore "happily" performed. As a first example, consider (64):

(64) I *must tell* you, we have witnessed what I like to call a nonviolent revolution, a revolution of values, a revolution of ideas. (COCA 2015)

The description of the revolution in question as *nonviolent*, as a *revolution of values*, and *a revolution of ideas* is a clear indication that the speaker views the events reported as positive and emotionally highly satisfying. The obligation the speaker feels to impart this information to the hearer(s) is thus happily and willingly fulfilled.

Similarly, in the following piece of humor retrieved from a cartoon, which depicts a woman who is on the phone with her friend, *must* refers to some piece of exciting and hence positively evaluated and experienced news:

(65) Oh, Cynthia, I *must tell* you. I just found the cutest mutual fund […]. (www.cartoonstock.com/directory/m/mutual_fund.asp)

The positive evaluative noun phrase *the cutest mutual fund* makes it abundantly clear that the speaker feels an overwhelming urge to tell her friend about her finding. Note that the adjective *cute*, here in its superlative form, usually refers to an endearing characteristic of humans and animals (e.g., *a cute baby / dog*, etc.), not financial instruments.

A linguistic feature of (65) deserving special mention is that the (hedged) performative part of the utterance (*I must tell you*) and its propositional content (*I just found […]*) are orthographically separated by a period, instead of being connected e.g., by the complementizer *that*. Despite their syntactic coding as independent sentences, pragmatically, the two clauses in combination can be regarded as an F-preserving hedged performative utterance. In other words, given the context, *I must tell you* is not just the *assertion of an obligation*, but the obligation is conceptualized as *fulfilled*, i.e., the *assertive* speech act designated by *tell* is actually performed.

4.3 The metonymic potential of *can* in commissive speech acts

In this section, we present and analyze a few hedged performatives with a commissive force. The following examples have been retrieved from COCA (see also Panther, 2016, p. 202, for discussion of these data):

(66) I *can promise* you that we won't give up […]. (COCA 2001)

(67) And I *can guarantee* you that I will not be the only Democrat working for his re-election. (COCA 2004)

(68) I *can offer* you a month's wages and the fare for your transportation home to New England. (COCA 1994)

Utterances (66)–(68) are F-preserving hedged performatives: (66) functions as a promise, (67) as an act of guaranteeing, and (68) constitutes an offer. The conceptual-pragmatic mechanisms at work in these commissives are similar to those that are operative in assertives hedged by *can*. Among other things, a fulfilled promise is intended to *benefit* the hearer, i.e., it is definitely viewed as GOOD and causes a feeling of CONTENTMENT in the hearer. In other words, we find *conceptual-pragmatic congruence* between *can* and *promise*, as represented in Table 1:

Table 1. Conceptual-pragmatic congruence: *can* and *promise*

	***can* (do p)**	⇔	***promise* (to do p)**
EVALUATION	p is GOOD	⇔	p is GOOD for H
EMOTION	p CAUSES EMOTION OF CONTENTMENT	⇔	p CAUSES EMOTION OF CONTENTMENT (e.g., GRATITUDE)

⇔'congruent with'

While *can* nicely collocates with performatively used commissives, the combination of *must* with a commissive verb usually has an F-canceling effect. Consider examples (69)–(71) (see also the discussion of (69) in Panther, 2016, p. 209):

(69) I *must promise* myself not to even try to comment on such a deep subject on my cell! (WebCorp)

(70) A kid from La Jolla told me about surfing and the sun-bleached rituals of the California beaches and the small coast towns I *must promise* to visit one day. (COCA 1997)

(71) If there was a conflict in work and studies, I *must promise* to always choose work. (GloWbE, US)

Utterance (69) is not a promise, but merely *states* the speaker's obligation to promise in the future; it is thus (not yet) an act of self-commitment regarding future behavior. The reason why, by means of uttering (69), the act of promising does not come about is due to a conceptual-pragmatic conflict between *must* and *promise*. As we have repeatedly pointed out in this chapter, the modal *must* may trigger negative evaluative/emotive implications regarding the propositional content, and it connotes some reluctance or hesitancy to actually perform the act of promising. Similarly, in (70), the statement of an obligation to promise to visit some coast towns in the future does not constitute a genuine promise at the moment of the utterance. Finally, like (69) and (70), example (71) does not function as an F-preserving hedged performative, i.e., it does not constitute a promise at the moment of writing. Rather, the author *reports* a contractual obligation to choose work over studies – in case the two are in conflict.

Finally, it is important to note that examples of the form *I must promise […]* are extremely rare; (69)–(71) are the only examples we have been able to retrieve in the three corpora *WebCorp, COCA*, and *GloWbE*, respectively. The reason for the infrequent attestation of *I must promise […]* appears to be that *must* not only has an F-canceling effect when hedging *promise*, but it is also conceptually-pragmatically incongruent with the latter (see Table 2).

Table 2. Conceptual-pragmatic incongruence: *must* and *promise*

	***must* (do p)**	**⇐*⇒**	***promise* (to do p)**
EVALUATION	p is BAD	⇐*⇒	p is GOOD for H
EMOTION	p CAUSES EMOTION OF DISCONTENTMENT	⇐*⇒	p CAUSES EMOTION OF CONTENTMENT (e.g., GRATITUDE)

⇐*⇒ 'incongruent with'

4.4 The metonymic potential of *must* and *can* in directive speech acts

Directive speech acts can quite naturally be organized into two classes – depending on whether they are congruent with *must* or with *can*. Strong directives, with a high degree of imposition, such as *ask (to), urge, insist*, and *order* are compatible with *must* and hence yield F-preserving hedged performatives.

(72) […] I *must ask* you to leave (COCA 2015)

(73) I *must urge* you not to expect miracles […] (COCA 1991)

(74) Respectfully I *must insist* you both stop with uninformed sensationalism, and instead check into the Reality Suite. (GloWBe, US)

(75) No matter how much you protest, *I must order you* as your King to marry the princess Alanna. (*https://books.google.com/books?isbn=1631356062*)

While *I must ask you to do A* metonymically evokes the explicit performative *I (hereby) ask you to do A*, an utterance of the form *I can ask you to do A* functions as a mere statement about what the speaker can do, i.e., the directive force of *ask (to)* does not survive, as e.g., in (76) (see also the discussion of this example in Panther 2016, p. 203):

(76) I *can ask* you to change your way of thinking about it like that, but it won't do any good. (GloWBe, US)

The following example, which originates from a blog in Great Britain describing the experience of the writer with deaf education, is also not F-preserving:

(77) I *can insist* on information being written down and focus on reading and writing which are my best methods. (GloWBe 2012, GB)

In (77), the modal *can* cancels the illocutionary force of the directive verb – here that of *insist (on)*. As in the case of (76), the utterance has the force of an assertive act; it *describes* what the speaker *can insist on*, but no more.

In contrast to the strong directives discussed above, recommendations are illocutionary acts with a relatively low degree of imposition. A recommendation leaves the addressee the option of not heeding its propositional content. Consequently, the verb *recommend* is perfectly congruent with *can* (as in example (78)), preserving its directive illocutionary force (see Table 3).

(78) I *can recommend* their smoked salmon, simple and very fresh.
(GloWBe, US)[6]

Table 3. Conceptual congruence of *can* and *recommend*

	***can* (do p)**	⇔	***recommend* (doing p)**
EVALUATION	p IS GOOD	⇔	p IS GOOD / BENEFICIAL FOR H
EMOTION	p CAUSES EMOTION OF CONTENTMENT	⇔	p CAUSES EMOTION OF CONTENTMENT (e.g., GRATITUDE) IN H'S MIND

⇔'congruent with'

The following utterance is of special interest in that it contrasts two hedged performatives, viz. *can recommend* and *must warn*:

(79) This is a great album, and I *can recommend* it highly, but I *must warn* you that if you're only into 70s style sympho-prog, this will probably leave you pretty cold. (Google search: *www.gepr.net/v.htlm*)

I can recommend […] in (79) has the same semantics and pragmatics as in (78): it readily evokes the reading 'I (hereby) recommend […]' (see Table 3). With regard to *I must warn […]*, as pointed out in Panther and Köpcke (2008, p. 97) and Panther (2016, p. 208), it is important to note that a warning is a hybrid illocutionary act, which has both an assertive force (its propositional content has a truth value), but it is also a directive to the effect that something should be done (or not) in order to avoid some potentially dangerous situation. It is this latter sense that motivates the choice of *must* in (79); the speaker feels morally, ethically, or otherwise obliged to warn the hearer about something that could negatively affect her, and in focusing explicitly on the obligation to warn actually accomplishes a

6. Notice that in (78) the complement is not coded as a clausal argument. Nevertheless, there is arguably an implicit propositional content *p*, which conveys the message that customers should order the smoked salmon offered on the menu.

warning. Also, notice that *must* does not convey reluctance to perform the speech act (in contrast to the assertive speech acts discussed in Section 4.2.1).

Finally, consider an example in which *recommend* is hedged by *must*:

(80) Lastly, I *must recommend* to Beatrix Potter fans the new book by Marta McDowell, Beatrix Potter's Gardening Life. (COCA 2014)

In (80), the function of *must* appears to be analogous to that in (65) (Section 4.2.2). The speaker happily performs his obligation to recommend a new book to Beatrix Potter fans. The frequently negative evaluative and emotive orientation conveyed by *must*, and the reluctance to perform the speech act denoted by the performative verb (see Figure 2, and the examples in Section 4.2.1) is thus suspended, if not canceled, in (80), and a positive evaluative and emotive orientation prevails.

5. Conclusion and outlook

The conceptual-pragmatic analysis of hedged performatives has revealed the relevance of an approach to utterance meaning that distinguishes between coding and inferencing. Part of the overall meaning of speech acts is not coded, i.e., not compositionally computable, but accessible only through inference, in particular, metonymic inference. In the present contribution, the significance of inferential meanings has been illustrated with two modal hedges on performatives, viz. *can* and *must*. In addition to their conventional literal (source) meaning, these modals are metonymically associated with values such as GOOD vs. BAD, mental attitudes such as WILLINGNESS vs. RELUCTANCE (to perform the speech act in question), and emotions such as CONTENTMENT vs. DISCONTENTMENT, all of which contribute to the intended target meaning of the hedged performatives in question. However, these meaning components do not follow by necessity from the meaning components ABILITY (*can*) and OBLIGATION (*must*); as we have shown, they can be canceled, e.g., in the case of *must*, which, in certain contexts, reverses its negative polarity conveying positive evaluations, emotions, and willingness to perform the illocutionary act designated by the performative verb.

The pragmatic interpretations proposed in this chapter are by no means the last word on the matter; they will certainly have to be refined or even revised in various respects. A task for the future is to formulate more precise conceptual-pragmatic constraints on hedged performatives, especially multiply-hedged ones, i.e., on the conditions under which performative verbs preserve their illocutionary force and those under which their force is canceled. Another interesting typological project for the future is to determine whether (F-preserving)

hedged performatives are a universal phenomenon and to investigate how natural languages differ in the types of F-preserving hedges they allow and exploit for communicative purposes.

References

Austin, J. L. (1962). *How to do things with words*. Oxford: Clarendon Press.

Bierwiaczonek, B. (2013). *Metonymy in language, thought and brain*. Sheffield: Equinox.

Brown, P., & Levinson, S. C. (1987). *Politeness: Some universals in language use*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511813085

Denroche, C. (2015). *Metonymy and language: A new theory of linguistic processing*. New York: Routledge.

Fraser, B. (1975). Hedged performatives. In P. Cole, & J. Morgan (Eds.), *Speech acts* (Syntax and Semantics 3) (pp. 44–68). New York: Academic Press.

Kövecses, Z., & Radden, G. (1998). Metonymy: Developing a cognitive linguistic view. *Cognitive Linguistics*, 9(1), 33–77. https://doi.org/10.1515/cogl.1998.9.1.37

Littlemore, J. (2015). *Metonymy: Hidden shortcuts in language, thought and communication*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781107338814

Panther, K.-U. (2015). Metonymic relationships among actuality, modality, evaluation, and emotion. In J. Daems, E. Zenner, K. Heylen, D. Speelman, & H. Cuyckens (Eds.), *Change of paradigms – new paradoxes: Recontextualizing language and linguistics* (pp. 129–146). Berlin: Mouton de Gruyter.

Panther, K.-U. (2016). How to encode and infer linguistic actions. *Chinese Semiotic Studies*, 12(2), 177–214. https://doi.org/10.1515/css-2016-0018

Panther, K.-U., & Köpcke, K.-M. (2008). A prototype approach to sentences and sentence types. *Annual Review of Cognitive Linguistics*, 6, 83–112. https://doi.org/10.1075/arcl.6.05pan

Panther, K.-U., & Thornburg, L. L. (1998). A cognitive approach to inferencing in conversation. *Journal of Pragmatics*, 30(6), 755–769. https://doi.org/10.1016/S0378-2166(98)00028-9

Panther, K.-U., & Thornburg, L. L. (2003). Metonymies as natural inference and activation schemas: The case of dependent clauses as independent speech acts. In K.-U. Panther, & L. L. Thornburg (Eds.), *Metonymy and pragmatic inferencing* (Pragmatics and Beyond New Series 133) (pp. 127–147). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/pbns.113.10pan

Panther, K.-U., & Thornburg, L. L. (2007). Metonymy. In D. Geeraerts, & H. Cuyckens (Eds.), *Oxford handbook of cognitive linguistics* (pp. 236–263). Oxford: Oxford University Press.

Radden, G., & Kövecses, Z. (1999). Towards a theory of metonymy. In K.-U. Panther, & G. Radden (Eds.), *Metonymy in language and thought* (Human Cognitive Processing 4) (pp. 17–59). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.4.03rad

Radden, G., & Kövecses, Z. (2007). Towards a theory of metonymy. In V. Evans, B. K. Bergen, & J. Zinken (Eds.), *The cognitive linguistics reader* (pp. 335–359). London & Oakville: Equinox.

Ruiz de Mendoza Ibáñez, F. J. (2014). On the nature and scope of metonymy in linguistic description and explanation: Towards settling some controversies. In J. Taylot, & J. Littlemore (Eds.), *The Bloomsbury companion to cognitive linguistics* (pp. 143–166). London: Bloomsbury.

Searle, J. R. (1969). *Speech acts: An essay in the philosophy of language*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139173438

Searle, J. R. (1975). Indirect speech acts. In P. Cole, & J. L. Morgan (Eds.), *Speech acts* (Syntax and Semantics 3) (pp. 59–82). New York: Academic Press.

Searle, J. R. (1976). A classification of illocutionary acts. *Language in Society*, 7, 1–23. https://doi.org/10.1017/S0047404500006837

Thornburg, L. L., & Panther, K.-U. 1997. Speech act metonymies. In W.-A. Liebert, G. Redeker, & L. Waugh (Eds.), *Discourse and perspective in cognitive linguistics* (pp. 205–219). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/cilt.151.14tho

CHAPTER 8

Mereology in the flesh

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Figurative language repositories typically encompass expressions that are coded manually in formal content analyses. This chapter proposes to discuss a number of theoretical and methodological issues related to mereology – the study of parts, wholes, and their relation – that are crucial for coding part–whole figurative expressions. This contribution draws the attention to the importance of: distinguishing language and experience of part whole relations; taking into account the existence of two different kinds of whole; and finding ways to implement these distinctions in coding schemes to be used to annotate figurative expressions in electronic repositories. Finally, based on cognitive scientific evidence, this chapter formulates a hypothesis on how part–whole relations are acquired through bodily experiences and therefore could indeed said to be "in the flesh".

Keywords: mereology, metonymy, partonymy vs.meronymy, embodiment, manual coding

1. Introduction

The usefulness of figurative language databases can be measured, among other criteria, by inter-rater reliability indexes. Scoring high on these indexes implies that the various contributors to the databases disagree to a strict minimum when they make an entry and categorize a metonymy or a metaphor as being of the X, Y, or Z type. One way to keep inter-rater disagreement to a minimum is of course to provide contributors with a set of categorization criteria that are both theoretically and practically unambiguous. This chapter is a contribution to identifying a number of clear criteria for the coding of figurative expressions that are based on part–whole relations.

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The Bibliography of Metaphor and Metonymy (Barcelona & Ruiz de Mendoza Ibáñez, 2015) lists 1365 papers and monographs devoted to the analysis of metonymy, for which mereology – the study of parts, wholes, and their relations – plays a central role: "spatial part–whole contiguity is at the core of the category [metonymy]" (Peirsman & Geeraerts, 2006, p. 269). Building repositories of figurative expressions in general, such as the MetaNet project (Sweetser, David, & Stickles, this volume), the MetaNet.HR – Croatian Metaphor Repository (Despot et al., this volume), the COGMOD project, and of metonymies in particular such as Córdoba Metonymy Database (Barcelona, this volume), thus call for a fine-grained definition of these relations. The present contribution proposes to add a few cobblestones to a way already paved by many contributions, to which I frequently refer throughout the chapter.

The general theoretical contribution of this chapter is to clearly distinguish the *language* and the *experience* of part–whole relations to account for the "reciprocal relation between prelinguistic-experience and linguistic meaning" (Blomberg & Zlatev, 2014, p. 397). Alternative linguistic expressions can refer to the same state of affairs in experience and alternative state of affairs in experience can be referred to by the same linguistic expression. Building conceptual explanations on the assumption that language and experience map onto each other on a one-to-one basis is the main source of the issues discussed in this chapter.

The methodological contribution of this chapter is to show how these theoretical ambiguities lead to practical shortcomings in the analysis of meaning in general, and in the coding of entries of a database in particular. Ways to adjust these theoretical ambiguities will be presented as well as supported by several examples showing how these adjustments can be operationalized in the coding scheme of repositories of figurative language.

I first propose to discuss several issues related to the conflation of conceptual and linguistic meaning of part–whole relations (Section 2). Then, I propose to clearly identify two different kinds of wholes – the *Gestalt* and *componential* wholes – which is needed to identify the semantic components of expressions structured mereologically. Each kind of whole is distinctly synthesized and thus involves a different system of conceptualization, which gives way to a number of linguistic constraints (Section 3). In cognitive linguistics it is commonly assumed that conceptualizing entities as wholes made of parts is not innate but acquired through the experience of our bodies and environment (e.g., Lakoff, 1987, pp. 273–274; Kövecses, 2006, p. 209). But what sensorimotor experience can possibly be at the origin of structuring wholes into parts? Based on a compelling contribution from cognitive science (de Vignemont et al., 2009) I formulate a hypothesis on how mereology could indeed be in the flesh (Section 4).

2. Towards a sharper definition of the part–whole relation

This section is not intended to provide a prescriptive set of rules but rather proposals that aim at drawing attention to specific issues related to the study of part–whole relations so as to avoid potential shortcomings. The underlying issue of all the others presented in the following sub-sections is the conflation of the fundamentally distinct – yet interacting – experiential vs. linguistic phenomena of part–whole relations and the extension of this conflation to meta-explanations. Taking this distinction into account can help resolve the ambiguities that are identified in the following Sections (2.1). This distinction is crucial in general and in particular for the study of parts and wholes in language and thought because some linguistic part–whole relations can be marked in some languages but absent from others. For example, the English expression *part of* can conflate both conceptual relations of partonomy and taxonomy (e.g., *wheels are part of cars*; *birth control pills are part of the category of pills*). The conflation of linguistic and conceptual meaning becomes problematic when the affordances of a specific language (e.g., the possibility of referring to both 'part of' and 'kind of' conceptual relations with the English expression *a part of*) become extended to meta-explanations that aim at explaining cross-culturally shared pre-predicative processes. I propose to systematically show how relations that can be conflated at the linguistic level cannot be confused at the experiential level. More specifically I will discuss why partonomy is not taxonomy (2.2), possession (2.3), containment (2.4), or contiguity (2.5) at the conceptual level. I will systematically show why extending these linguistic conflations to conceptual explanations is not only problematic theoretically but also practically when one needs to operationalize these criteria in the coding scheme of a database where different contributors have to agree on categorizing the same type of entries in the same way.

2.1 Partonomy is not meronymy

To start with some terminological clarification, *mereology* is defined as the science or study of parts and wholes, and as such includes both notions of *partonomy* (experiential structures based on part–whole relations) and *meronymy* (linguistic structures based on part–whole relations).

Partonomy is sometimes used as a synonym for *meronym*y, but both terms are here defined as clearly distinct: the former exclusively refers to experiential/pre-predicative part–whole relations, in contrast to the latter, which exclusively refers to part–whole relations as linguistic phenomena. Partonomy is here synonymous to Sonesson's (1989, 2010) term *factorality*, defined as a pre-predicative

phenomenon starting out from the perception of part–whole relations. Factorality is perhaps a less transparent term to the linguist reader, therefore we will talk about *partonomy* when we refer to part–whole relations of *the experiential lifeworld*.

The experiential lifeworld is defined as the world we directly experience in consciousness (Dermot, 2005, p. 9; Husserl, 1970, p. 49; Konderak, 2018, p. 115–116; Sonesson, 2016, p. 26). Using Gibson's (1932) example, there is no way we could perceive the movement of the Earth going round the Sun through the senses. In the experiential lifeworld, it is the Sun that rises up and sets down. It is the experiential lifeworld that is relevant to take into account when one attempts to explain the pre-predicative phenomena we cognitively process, conceptualize and eventually structure into semiotic systems such as language. Taking into account the part–whole relations of the experiential lifeworld allows avoiding the pitfalls of objectivism that we find in Seto (1999, p. 94) who claims that part–whole relations are "based on real-world constitutive relations [that] we are not free to change […] because the world is there just as it is". In phenomenological terms part–whole structures reside in the *intentional* object, correlating with the intentional act (e.g., perception, imagination) of the subject (Husserl, 1970a; Sokolowksi, 2000; Blomberg & Zlatev, 2014). The possibility of intending objects as 'wholes made of parts' allows many languages to capture and code the conceptual process with diverse strategies (e.g., Panther, Thornburg, & Barcelona, 2009), and once the distinction between language and experience is made clear, their interaction can then be explored.

In order to make the *experiential vs. linguistic distinction* explicit, and because we are here bound to use language to refer to both experiential and linguistic structures, I will use single quotes to refer to objects and relations described at the experiential level (e.g., 'part of' or 'hand') and italics for the linguistic expressions (e.g., *a part of* and *hands* in English, or *une partie de* and *mains* in French).

The human body is both a universally shared domain of experience and the most salient object we encounter on a daily basis. It is also a domain of conceptualization that is referred to with language-specific features, as for instance in the segmentation of the body into body part terms, the semantic extensions of which greatly varies across languages (e.g., Majid & Van Staden, 2015). As a domain of conceptualization, it provides a resourceful platform to explore the distinction between experientially shared part–whole relations (i.e., partonomy) and language-specific patterns of part–whole linguistic expressions (i.e., meronymy). Accordingly, the points discussed below will frequently recruit examples of experiencing the body and referring to it linguistically to illustrate the unsystematic one-to-one mappings between language and experience and present what this implies for the formulation of meta-explanations.

To illustrate why the experiential vs. linguistic meaning distinction is important to take into account, there is for example no body part term for 'upper arm' in French (Devylder, Bracks, Kozai, Shimotori, & Siahaan, *forthcoming*), no word for 'hand' in Indonesian (Majid & Van Staden, 2015), and no expression for 'a part of' in Jahai (Burenhult, 2006) or in Kuuk Thaayorre (Gaby, 2006). However, there is no evidence supporting that this linguistic absence presupposes the lack of experiencing 'upper arms' or 'hands' as body parts in French and Indonesian, or that Jahai and Kuuk Thaayorre speakers do not experience anything as parts of larger wholes (see also Sonesson, 1993). It just means that there is no word for it and as Majid and Van Staden (*ibid*, pp. 586–587) put it:

> [T]here cannot be a one-to-one mapping between lexical representations and the body structural representation. If that were true then we would be forced to the conclusion that the body structural representation is different for speakers of different languages, and therefore culturally relative. There is no evidence for this radical proposal.

The distinction between experiential partonomy and linguistic meronymy is not only necessary to solve the issues addressed in the following sub-sections but also useful to study the expression of partonomy in semiotic systems other than language, such as pictures (e.g., Sonesson, 1989, p. 35; Stampoulidis & Bolognesi, under review), or gestures (e.g., Mittelberg, 2018, p. 11).

2.2 Partonomy is not taxonomy

Winston, Chaffin, and Herrmann (1987, pp. 430–431) raise a red flag on the vagueness of the English term *part*, which can encode both a 'part-of' relation and a 'kind-of' relation, the latter consisting of the very distinct conceptual process of taxonomy.

Both 'part–whole' and 'kind-of' relations are relations of inclusion and as a result "taxonomy and partonomy, […] tend to be confused" (Radden & Kövecses, 1999, p. 34). Such confusion can be seen when Lakoff (1987, p. 287) states that "each higher-order category is a whole, with the immediately lower categories being its parts", and when Radden and Kövecses (1999, p. 34) state that they "feel justified in analyzing Category and-Member ICMs as instances of the whole-part configuration". The English language allows for the conflation of 'kind of relations' and 'part of relations' with the expression *a part of*, but it is quite a common feature of language to subsume conceptually, experientially, or logically distinct phenomena under the same expression. It is however problematic to maintain this conflation at the explanatory conceptual level because meta-explanations aim at accounting for phenomena that are not language-specific.

I propose that the 'part–whole' relation is to be strictly distinguished from the 'member-category' relation. The 'member-category' relation is the inclusion of one category in another, as in 'car' and 'vehicle', where 'car' is the more specific item (hyponym) included in the larger category 'vehicle' (hypernym). For 'part–whole' relations the crucial relation is not a relation between classes or categories of entities but "observable at the level of individual entities" (Cruse, 2002, p. 248) within the boundaries of a single entity, as for instance between 'wheels' and 'car': 'wheels' are 'parts' of the whole entity 'car'.

To operationalize this theoretical distinction as part of a protocol destined to contributors of figurative language databases, one could design semantic tests that could help determine if the conceptual relation at work in the entry is structured on a 'kind of' or on a 'part of' relation. Using linguistic expressions to account for experiential distinctions could be criticized as repeating the same kind of inaccuracies that this contribution aims to avoid. As a response, there is a point where theoretical considerations need to be operationalized, because database editors and contributors cannot just keep thinking about what they should do, but actually do it, hence compromises must be found. Moreover, several validity criteria per semantic test seems like an acceptable compromise as they can better "cancel out" the degree of inaccuracy and conflation patterns that are inherent to the language-specific meaning of terms like *type, kind*, or *part*. Taking these considerations into account and recruiting the works of Cruse (1986, p. 89; 2002, p. 248), Lyons (1977, p. 292), Miller and Johnson-Laird (1976, p. 241), and Winston et al. (1987), I propose the two following semantic tests.[1]

Taxonomy test

In a relation between two entities 'X' and 'Y', 'X' and 'Y' are connected by a taxonomic relation where 'X' is 'a conceptual kind of' Y, if and only if:

i. *Xs are a type of Y*
ii. *Xs are Ys*
iii. *a X is a kind of Y*
iv. *a X is a Y*

1. These tests would be invalid for languages like Kuuk Thaayorre or Jahai where there is no term for 'part–whole' relations, and for the languages where *type, kind*, or *parts* conflate different conceptual relations from what the English terms conflate. We would therefore also need to adapt each test to each language represented in the database.

Partonomy test

In a relation between two entities 'X' and 'Y', 'X' and 'Y' are connected by a partonomic relation where 'X' is 'a conceptual part of' Y, if and only if:

i. *Xs are parts of a Y*
ii. *Xs are parts of Ys*
iii. *a X is part of a Y*
iv. *a X is a part of a Y*

Consider that as contributors to a database or repository of figurative language we have to code the two following entries (1) and (2) (Davies, 2008):

(1) *We need to hire an extra pair of hands, but we can't pay him much.*

(2) *Remember to take the pill every day is just a pain in the neck.*

Both examples are extracted from the Corpus of Contemporary American English, but they also are classic examples of metonymies in the literature. Example (2) is for instance used by Radden and Kövecses (1999, p. 34), to support that taxonomies can metaphorically be understood as part–whole structures following Lakoff (1987, p. 287). However it can be argued that using language-specific meta-metaphors to identify a type of figurative expression at the conceptual level may be risky. Both examples are analyzed through the proposed semantic tests to illustrate why taxonomy cannot be confused with partonomy at the conceptual level.

1. X = hand, Y = person

   a. Partonomy test:
      i. *hands are parts of a person*
      ii. *hands are parts of persons*
      iii. *a hand is part of a person*
      iv. *a hand is a part of a person*

      Conclusion: X (vehicle) and Y (target) are partonomically related in the expression *an extra pair of hands* in (1).

   b. Taxonomy test:
      i. **hands are a type of person*
      ii. **hands are persons*
      iii. **a hand is a kind of person*
      iv. **a hand is a person*

      Conclusion: X (vehicle) and Y (target) are not taxonomically related in the expression *an extra pair of hands* in (1).

2. X = birth control pill, Y = pill

    a. Taxonomy test:
        i. *birth control pills are a type of pill*
        ii. *birth control pills are pills*
        iii. *a birth control pill is a kind of pill*
        iv. *a birth control pill is a pill*

    Conclusion: X (target) and Y (vehicle) are taxonomically related in the expression *take the pill* in (2).

    b. Partonomy test:
        i. **birth control pills are parts of a pill*
        ii. **birth control pills are parts of pills*
        iii. **a birth control pill is part of a pill*
        iv. **a birth control pill is a part of a pill*

    Conclusion: X (target) and Y (vehicle) are not partonomically related in the expression *take the pill* in (2).

At the linguistic level, it would be acceptable to say that *birth control pills are part of pills* in the sense of the expression *part of* that means *part of the category of*. But this Anglo-specific affordance is not preserved at the conceptual level: partonomy and taxonomy are distinct conceptual organizations. As a result, meta-explanations that have to be valid cross-linguistically cannot maintain this conflation either.

The taxonomy vs. partonomy distinction seems to remain quite unnoticed in the metonymy literature and consequently in the coding schemes of databases, an example of which is to be found in the entry model of the Córdoba Metonymy Database who suggest classifying CATEGORY FOR MEMBER metonymies as WHOLE FOR PART metonymies (Barcelona, 2011, p. 20, 2018, p. 45):

> […] WHOLE FOR PART metonymies such as *the pill has reduced the birth rate in many countries* (PILL [CATEGORY] FOR BIRTH CONTROL PILL [MEMBER]; a member is a distinct part of a category, which is the relevant whole in this case).

Accordingly, the value of *the birth control pill* example for the generic level of field 2 of the Córdoba Metonymy Database entry model (see Barcelona, 2018) would be WHOLE FOR PART. Regarding the arguments presented above in support of a clear distinction between 'part–whole relations' and 'category-member relations' it would perhaps be preferable to add a CATEGORY FOR MEMBER value for the generic level of field 2. In fact, the taxonomy vs. partonomy distinction is already well implemented in the hierarchical structure of the coding scheme of the Córdoba Metonymy Database. Barcelona, (2018, p. 37; this volume) explains that the former 2013 model has been updated because "one of the deficiencies was the mixing

of a taxonomic ("kind of") hierarchy with a meronymic ("part of") hierarchy". It would therefore be relevant to implement this distinction for the values of the generic level of field 2 as well.

2.3 Partonomy is not possession

'Partonomy' and 'possession' can be conflated at the linguistic level in French in expressions like Det N *a* Det N in (3) and (4).

(3) *Cet homme a une grosse tête*. ('This man has a big head')

(4) *Cet homme a une voiture toute neuve* ('This man has a brand-new car')

In French then, the construction [Det N *a* Det N] is neutral with respect to 'possession' and 'part–whole relation' at the conceptual level. In other words, French speakers can use the same linguistic expression to refer to two distinct experiential phenomena (i.e., partonomy and possession). Experientially, it is quite straightforward that the experience of 'having a head', and the experience of 'having a car' is different. This experiential distinction is actually marked in about 18% of the world languages according to the World Atlas of Language Structures (Dryer and Haspelmath, 2013), and as illustrated in Paamese in (5) and (6).

(5) *Vatu-k*
body-1SG
'my head'

(6) *Vakili ona-k*
canoe POSS-1SG
'my canoe'

In Paamese, the forms of possessive constructions systematically correspond to the experiential distance between the possessor and the possessum via diagrammatic iconicity (Devylder, 2018). This means that the *experiential* distinction between 'having body parts' (i.e., partonomy), and 'having a vehicle' (possession) is also *formally* distinct (i.e., N-1SG vs. N POSS-1SG) in Paamese. This form-meaning mapping is what is commonly known as *(in)alienable possessions* in the literature (Chappel & McGregor, 1996) and which is actually quite a misleading term that can give way to circularity.[2]

Partonomy and possession can be conflated (e.g., in the French construction [Det N a Det N]) or distributed (e.g., in Paamese in (5–6)) at the linguistic level,

2. See Devylder (2018: 317–318) for a discussion on the circularity of the notion of inalienability as traditionally defined in the literature.

but they are always distinct at the experiential level. This distinction should thus be reflected in the coding scheme of databases, particularly if they mean not to exclude the languages that do mark the experiential distinction.

Consider that as a contributor to a database or repository of figurative language we have to code the two following entries (Davies, 2008):

(7) *You really should stop applauding because you give me a big head.*

(8) *Now he's driving a car and wondering what hit him.*

According to Langacker (2009), the profile/active-zone discrepancy of (8) would qualify this expression as a grammatical metonymy. We understand from the context of the utterance that it is the driver's car that was hit, not the driver himself. To qualify the metonymy in (8) as a part–whole type of metonymy would be problematic because the car that was hit is not experientially 'part of' the driver but 'possessed' by him. Comparatively in (7), the conceptual relation between 'head' and 'person' is partonomic, because the experience of 'having a head as a person' is based on a part–whole structure.

The MetaNet project makes a clear distinction between the part–whole frame and the possession frame, which allows defining the nature of their relation without conflating the distinct experiential phenomena. However, one specific conceptual metaphor the mapping of which is coined as WHOLES ARE POSSESSORS – in the latest version of the model (October 2014) – could be problematic. Example (9) is listed in the repository as a linguistic instantiation of the conceptual mapping where 'possession' is the source frame and 'part–whole' is the target frame.

(9) *The eye possesses several parts.*

At the linguistic level, the 'eye' can indeed be expressed in English as *a possessor of several parts* as attested in (9). But at the conceptual level (i.e., at the extra-linguistic/pre-predicative level where *conceptual* metaphors dwell) do we really experience our eyes as 'possessors' of a pupil and an iris in the way that we experience a car we just bought? An eye *possessing* parts is a semantic extension of the English verb *to possess* to refer to a 'part–whole' relation at the linguistic level, similarly to the French Examples (3–4) analyzed above, but there is no possible confusion of the phenomena of 'possession' and 'partonomy' in experience. These are two distinct experiential phenomena that are not "mapped onto each other" at the conceptual level contrary to what the conceptual mapping WHOLES ARE POSSESSORS implies.

Another reason why the conceptual mapping is problematic has to do with the language specificity of the semantic extension found in the linguistic term *to possess*. The verb can conflate both meanings of 'possessions' (e.g., as in *the organization possesses real estates overseas*) and of 'partonomy' in (9), but for example

the French verb *posséder* does not allow such extension from possession to partonomy of a body part (e.g., *?l'oeil possède plusieurs parties*. 'the eye possesses several parts'). As a result, keeping a language specific conflation in a conceptual mapping that aim at explaining non language-specific phenomena cannot be valid. It should particularly be avoided in a multi-lingual repository of figurative expressions because it would probably substantially lower the inter-rater reliability index of contributors of various L1.

2.4 Partonomy is not containment

The distinction between the container-contained relation and the part–whole relation that can be conflated at the linguistic level but not at the conceptual level can be demonstrated in the same manner as in the two previous sub-sections. When an entity X is linguistically expressed as contained in an entity Y it can indeed entails that X is 'part of' Y at the conceptual level as expressed in (10), but it does not have to as in (11).

(10) *El cerebro està en la cabeza* ('The brain is in the head')

(11) *Guarda el brócoli en el refrigerador*. ('keep the broccoli in the fridge')

These two Spanish examples show that 'containment' and 'partonomy' can be conflated at the linguistic level. They however remain experientially distinct. Phenomenologically, we do not have any direct experience of our brain as 'contained' in our head partly due to the lack of nociceptors[3] yet we experience it as being a central 'part of us'. Comparatively, we experience the food in the fridge as 'contained in it', yet not conceptually 'part of it'. Hence the relevance of making a distinction between partonomy and containment at the conceptual level so that examples such as (12) and (13) can be unambiguously coded as two distinct types of metonymy.

(12) *El cerebro de una violentísima banda criminal*. ('the head of a violent crime syndicate')

(13) *Tu veux boire un verre*? ('do you want a drink')

Cerebro, in (12) literally 'brain' in Spanish, but metonymically referring to the leader of the violent gang would be coded as a part–whole type, whereas *un verre*, in (13) literally 'a glass' in French, but metonymically referring to the beverage 'contained' in it, would be coded as a containment type, which could not be a subtype of part–whole metonymies.

3. i.e., pain receptors.

2.5 Partonomy is not contiguity

"Contiguity has always constituted the definitional core of metonymy" write Peirsman and Geeraerts (2006b, p. 278), who also assume that "the prototypical spatial contiguity relation is constituted by part–whole contiguity and that all other metonymical patterns are related to it" (*ibid*). In contrast, Sonesson (2010, p. 155) makes a clear distinction between contiguity and factorality (that we call partonomy in this chapter):

> Each time two objects are perceived together in space, there is contiguity; and each time something is seen to be a part of something else, or to be a whole made up of many parts, there is factorality (as defined in Sonesson 1989).

Peirsman and Geeraerts (*ibid*) assume Dirven's (2002, p. 88) definition of contiguity, which nuances the referential aspect of the "referential contiguity" linguistic tradition (Norrick, 1981), "stressing that the relations that lie at the basis of metonymic shifts of meaning are not just objectively given, but rely on a process of construal" (Peirsman & Geeraerts, 2006b, p. 273). Peirsman and Geeraerts (*ibid*) nonetheless admit that "[a]fter all, the concept of contiguity is no less vague than that of domain or domain matrix". Peirsman and Geeraerts' (*ibid*) prototypical model as well as Seto's (1999) classification of metonymy that define contiguity as constituted by part–whole relations are used as a starting point for the following discussion. But first, we can start with this simple and straightforward definition of experiential contiguity:

1. Contiguity is the relation between X and Y, when X and Y are either perceived spatially or temporally next to each other.
2. Being "next to each other" spatially or temporally requires X and Y to be experienced in direct contact in space or in direct succession in time.

The conceptual conflation of partonomy and contiguity proposed by Peirsman and Geeraerts (2006b, p. 278) echoes the classification of Seto (1999), who Peirsman and Geeraerts cite as an influential reference to their model. Seto makes the following claims:

1. "partonomy is based on the perception of contiguity in the real world" (Seto, 1999, p. 94)
2. "partonomy is just one of several contiguous relations" (*ibid*, p. 95).

In stark contrast to Seto's and Peirsman and Geeraerts, I propose that contiguity and partonomy are not only distinct but also two mutually exclusive experiential phenomena. First, partonomies have a hierarchical structure whereas contiguities do not. Two simple examples can be recruited to illustrate this point. For example,

'the blade of a knife' can be described as 'a part of a knife', but not contiguous to it. If we understand two spatially attached entities as 'contiguous' then the blade of a knife is not "attached to the knife", as there is no knife without a handle, hence the 'blade' would be attached to the 'handle' not to the 'knife'. A part of a whole (e.g., the blade of a knife) can be contiguous to another part of the same whole (e.g., the handle of a knife) but neither parts are contiguous to the knife as a whole. Similarly, In English, the construals of the body part terms 'forearm' and 'upper arm' are connected by a symmetrical and non-hierarchical relation of contiguity: both segments are contiguous to each other without any hierarchical configuration. In contrast, the body part terms referring to the 'forearm' and the 'arm' are connected by an asymmetrical and hierarchical relation of partonomy: the 'forearm' is part of the 'arm', but the 'arm' is not part of the 'forearm'. In sum, many objects of our immediate environment are experienced as contiguous (e.g., the piano seat is contiguous to the piano) and not part of each other. On the other hand, those who are perceived as part of each other (e.g., the keys of the piano and the piano as a whole functional music instrument) are not contiguous.

The distinction between contiguity and partonomy is important in the analysis of figurative expressions such as metaphors and metonymies. Consider the two following expressions for instance:

(14) *The kettle is boiling*.

(15) *My phone died*.

As Seto (1999, p. 95) rightfully points it out, the water (target domain) is not part of the kettle (vehicle) in (14). It is just perceived as spatially contiguous to it as well as contained in it. In (15), the target domain is the 'battery', which is part of the vehicle 'phone' but not contiguous to it: a phone battery is spatially contiguous to other parts of the phone like the SIM-card for instance, but it does not make sense to say that a battery is contiguous to the phone as a whole, because that whole functional phone is *composed* of its parts (battery, SIM-card, screen, and so on).

The contiguity vs. partonomy distinction is further supported by experimental data. Devylder et al. (*forthcoming*) asked 90 speakers of French, Indonesian, and Japanese to describe a set of stimuli depicting people who were injured with cuts on various location of their bodies. French speakers never described the stimuli illustrating a cut on the 'upper arm' as a cut on the 'forearm': what affects X does not affect Y, if X and Y are contiguous. Contrastively, French speakers would alternatively describe a cut on the 'forearm' also as a cut on the 'arm': what affects X affects Y, if X and Y are connected by a part–whole relation. Moreover, French and Japanese speakers never described a cut on the 'hand', as a cut on the

'arm': the conceptualization of the segment 'hand' in French and Japanese (*main* and *te*, respectively) is contiguous to the conceptualization of the segment 'arm' (*bras* and *ude*) and as a result cannot be connected by a part–whole relation.

Moreover, it is important to note – in relation to the distinction of experiential vs. linguistic levels that has been emphasized in this section – that we human beings, who speak different languages, do not necessarily have the words corresponding to our shared bodily experience of partonomy (as evidenced by de Vignemont et al., 2009, discussed in Section 4). Even though French speakers do not have a word for 'upper arm', they still experience their 'upper arms' as a functional bundle of muscles, bones, tendons and nerves that operates within a larger whole of flesh and bones, 'the arms', of which 'the upper arms' are parts. Similarly, in the task designed by Devylder et al. (*ibid*), the descriptions of Indonesian speakers who used the same word (*tangan*[4]) to describe a cut that was located both on the 'hand' and on the 'forearm' do not necessarily indicate that Indonesians have no notion of the experiential boundary of the wrist that is linguistically marked in French and in Japanese. In fact, another study run by Devylder, Bracks, Shimotori, and Siahaan (*forthcoming*) consisting of an elaborated version of the body coloring task designed by Majid and Van Staden (2015) provides non-linguistic evidence that Indonesian speakers do perceive a boundary between 'hand' and 'wrist' even though the word *tangan* collapses both segments. In brief, the video-recordings of the coloring performances show that a vast majority of the Indonesian participants mark a pause and lift up their pen at 'the wrist' when asked to color in what the word *tangan* refers to, thus indicating the existence of an experiential discontinuity that contrasts with the linguistic continuity marked by the term *tangan*. We observed the same phenomenon for the Indonesian term *kaki* and the Japanese term *ashi* that both collapse the distinction between 'leg' and 'foot'. These finding supports the claim according to which there is no simple one-to-one mapping between the experience of body parts and their language-specific lexicons as claimed by Majid and van Staden (2015, pp. 586–587) already quoted above.

The partonomy vs. contiguity distinction is also particularly necessary to explicate the Jahai categorization of the body and provides an example of a language that only marks contiguity of distinct body parts but not part–whole hierarchy. As Burenhult (2006, p. 178) explains, the Jahai system of simplex body part terms is characterized by 'hierachy avoidance', which means for example that there is no linguistic device to express a "part of" relationship:

4. In Indonesian, *tangan* collapses both 'the hand' and 'arm' segment as is the case in many languages like Croatian, Russian, Kinyarwanda, and others.

> In Jahai this may be particularly evident in the terms for wrist and ankle-joint, where a single term *krīl* is optionally made specific by means of a modifier denoting hand or foot. However, the *krīl* as such is never described or indicated as part of the hand or foot; the association seems to be entirely based on contiguity.

Burenhult (*ibid*) and most of the literature on body part representation (e.g., Majid et al., 2006) make a clear distinction between body units that are *spatially* or *partonomically* expressed in language: "for all we know, most of the complex body part terms in Jahai may have such a spatial rather than 'part of' relation between their components".

In sum, partonomy and contiguity are two distinct experiential phenomena, and regarding the above arguments, it seems quite mistaken to claim that "partonomy is just one of several contiguous relations" (Seto, 1999, p. 95), or to position partonomy at the center of a prototypical model based on contiguity (Peirsman & Geeraerts, 2006).

To summarize Section 2, I hope to have brought up to the attention of the reader the need to take into consideration a number of points in the definition of partonomy that all find their source in the distinction of language and experience. Their distinction does not entail that linguistic and experiential phenomena never intersect – they clearly do – but they do not systematically map onto each other on a one-to-one basis and should therefore not be confused at a meta-linguistic level. These proposed adjustments have practical applications for the analysis of meaning in general and specifically for the coding scheme of a database that includes figures of speech that are often structured by part–whole relations. The ambitious enterprise of building such repositories requires that its contributors agree as much as possible with each other when they enter and code a part–whole metonymy in the database. It is of course a much easier task to point out how a model or a coding scheme can be improved rather than actually designing and implementing it. The purpose of this section was to contribute in making future inter-rater reliability indexes score higher when coding a part–whole metonymy entry, nothing more. To pursue that goal a step further, I now suggest making a distinction between two different kinds of whole. This distinction is relevant notably for the grammatical part–whole metonymies found at the clause level.

3. Two different kinds of whole

There are at least two different kinds of whole, which I suggest to call *Gestalt wholes* and *componential wholes*. The terms are directly inspired from Talmy's (1988, 2000, p. 78) own distinction between the *Gestalt level of synthesis* and *componential level of synthesis*, yet the two distinctions differ, hence the need for a slightly

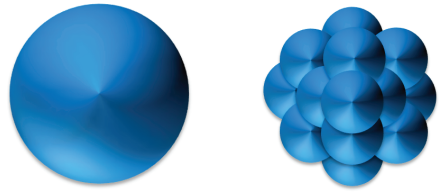
different terminology. Talmy (2000, p. 78) describes the result of a componential level of synthesis as an "unsynthesized multiplexity of independent elements", but "multiplexity" suggests that the synthesizing process only applies to homeomerous[5] parts, which fits Talmy's illustrating example (i.e., "a cluster of trees"), but not all part–whole relations (e.g., parts of the body are of different kinds). The proposed distinction is also related to a number of other existing approaches in the CL literature, which I could not however employ as such in this paper, for they never exactly describe the phenomenon identified in this section. It is nonetheless important to note that the Gestalt vs. componential distinction is related to, yet distinct from, Lakoff's (1987, p. 442) *MASS vs. MULTIPLEX* schemas, Jackendoff's (1991, p. 20) *substances* vs. *aggregates*, and from Langacker's (2008, pp. 571–572) *summary* vs. *sequential scanning* to a certain extent. The distinction I propose here is for instance much closer to Ruiz di Mendoza and Peña's (2009) interpretation of Lakoff's *MASS to MULTIPLEX image schema transformation*, and also to Sonesson's (2013, p. 537) *configurations* vs. *structures* on the pre-linguistic level. The (un)boundedness of entities seems to be a crucial criterion in characterizing metonymies (e.g., Peirsman & Geeraerts, 2006; Ruiz de Mendoza & Peña, 2009), but it does not correspond to the distinction proposed below since both wholes have clear boundaries and are thus both bounded. The boundedness criterion may however be observed as a distinctive feature in their relative internal structure, particularly when each kind of whole are "destructured": the componential wholes decompose into 'parts' (i.e., clearly bounded units), whereas Gestalt wholes breaks into 'pieces' (i.e., units with arbitrary boundaries). Here are two suggested definitions for componential wholes and Gestalt wholes:

A *componential whole* is a structure constituted by its parts, which are organized in a specific way in relation to their whole, and in relation to one another within the whole.

In contrast, a *Gestalt whole* is an entity holistically conceptualized in a way that does not allow access to the elements it is made of as 'parts'.

Since these definitions refer to quite abstract concepts, the two following pictorial representations in Figure 1 may help visualizing the distinction.

5. "Homeomerous parts are the same kind of thing as their wholes, for example, (*slice-pie*), while nonhomeomerous parts are different from their wholes, for example, (*tree-forest*)" (Winston et al., 1987, p. 420).



a. Gestalt whole b. Componential whole

Figure 1. The Gestalt whole vs. componential whole distinction

The distinction between these two kinds of whole appears quite clearly when they undergo a separation event, as each kind of whole separates in different ways, and into different kinds of result. On the one hand, a componential whole can be – physically and experientially – separated into its different parts. For instance, a bike can be decomposed into a saddle, two wheels, handlebars, and so on. These separated units can be conceptualized as *parts* of the bike in a strict sense since they are both functional to their whole and have non-arbitrary boundaries (Cruse, 1986, p. 157; Winston et al., 1987, p. 422; Cruse, 2002, p. 248; Croft & Cruse, 2004, p. 151; Vieu & Aurnague, 2007). On the other hand, a Gestalt whole cannot be decomposed – physically or experientially – into functional and non-arbitrary bounded parts, since by the above-proposed definition, it is *holistically* (vs. *componentially*) "synthesized" (Talmy, 2000, p. 78). In the scope of a Gestalt whole it is not even relevant to refer to its non-accessible parts, since a Gestalt whole excludes the notion of 'part' by the definition proposed above. It does not mean that a Gestalt whole cannot undergo separation events, but that the results of a separation event affecting a Gestalt whole are 'pieces', not 'parts'.

Typical separation events of an object conceptualized as a Gestalt whole are breaking events. As Cruse (2002, p. 248) explains: "not all portions of an object qualify as parts: a glass jug dropped on a stone floor does not break up into parts, but into pieces." Two different kinds of synthesis (at the conceptual level) are sometimes constrained by the verbal semantics of specific verbs like *cut* or *break* (at the linguistic level) (Devylder, 2017). The verbal semantics of *break* can only code for a conceptualization of the affected figure as a *Gestalt whole*, while the verbal semantics of *cut* allow both conceptualizations (*Gestalt* or *componential*). English precisely captures this distinction as evidenced by the (un)availability for certain argument structure alternations (16–17).

(16) a. *I cut my finger*
b. *I cut myself*

(17) a. *I broke my finger*
b. **I broke myself*

It is because the semantics of certain verbs like *break* constrains the conceptualizer to construe the affected figure as a Gestalt whole that (17b) cannot refer to any conceivable situations. Indeed a "broken Gestalt whole" – whether it is a finger or a jug – is affected in its *integrity* in contrast to a 'cut componential whole'. Cutting events like the one referred to in (16) do not constrain the conceptualizer to construe the figure to be affected in its integrity: we naturally make sense out of the *discrepancy* (Langacker, 2009, p. 50) between the profile (Self as a whole) and the active-zone (finger as a part) in (16b) because (16a) codes for a componential level of synthesis, i.e., the human body structured as a whole composed of body parts. From there, it is then possible to conceptualize that what affects the part (i.e., 'my finger') affects the whole (i.e., 'myself'), which in other words is a *synecdochic process*, if we assume synecdoches to be the metonymy sub-types characterized by a mereological semantic transfer. The synecdochic process is blocked in expressions like (17) because synecdoches involve the construal of parts, and there is no such configuration to begin with within the Gestalt holistic conceptualization of an object. This is the case for *a broken finger*, where the break verb imposes to conceptualize the affected figure as a Gestalt whole. In other words, the breaking event described in (17) affects the figure (the finger) in its integrity, and as a whole in itself: the fact that a finger is a body part is irrelevant in the conceptualization imposed by the constraints of a breaking expression like (17).

It is important to note that these two different kinds of whole correspond to two different ways of experiencing an entity as a whole, but not necessarily to two different kinds of entity. In other words, the same entity (e.g., a salad, a coffee cup, a finger) can alternatively be experienced and linguistically referred to as a Gestalt whole and as a componential whole. Think for example of a salad made of tomatoes and lettuce. When one says, *I ate half the salad*, the speaker does not prototypically mean they only ate 'the lettuce', leaving the 'tomatoes' on the side. The rather uncontroversial interpretation of this sentence indicates that the entity referred to here is conceptualized as an undifferentiated Gestalt whole. However, the exact same salad may also be conceptualized as made of the components 'tomatoes' and 'lettuce' (in the context of a recipe for instance) and would thus be constituted as a componential whole. Both componential wholes and Gestalt wholes are wholes; they are just synthesized in distinct ways. As mentioned above, when these two kinds of wholes undergo a separation, the results of this separation are at least of two different kinds: 'pieces' for Gestalt wholes, and 'parts' for componential wholes.

4. The embodied origin of part–whole relations

For the past thirty years cognitive linguistics has evolved in different ways, which may challenge the integrity of the discipline (Divjak, Levshina, & Klavan, 2016).

What still seems to hold the temple together however, is the credo that language is not an autonomous cognitive faculty, and that language and cognition are embodied. The understanding of metonymy and the part–whole relation from a CL perspective therefore also assumes these principles (Lakoff & Johnson, 1980, p. 39; Kövecses, 2006, p. 209; Barcelona, 2011, p. 8; Brdar-Szabó & Brdar, 2012, p. 728; Zhang, 2016). Indeed Lakoff (1987, pp. 273–274) argues that the part–whole schema is embodied because:

> We are whole beings with parts that we can manipulate. Our entire lives are spent with an *awareness* of both our wholeness and our parts. We *experience* our bodies as WHOLES with PARTS [my emphasis].

Kövecses (2006, p. 209) gives a substantially similar account of the origin of the part–whole relation:

> The most obvious bodily *experience* that led to the existence of this [part–whole] schema is that we *experience* ourselves as wholes with parts. We conceive of our body as parts of the larger whole that we are [my emphasis].

The – unnamed – phenomenological approach of Lakoff and Kövecses who both turn to the *experience* of the body to explain the origin of part–whole relation at the conceptual level is intuitively convincing. I suggest to detail and support this phenomenological analysis with the complementary perspective and methods of cognitive science as presented in a study by de Vignemont, Majid, Jola, and Haggard (2009).

The authors address the question of body mereology, that is, the segmentation of the body into parts from the perspective of primary sensorimotor mechanisms of the body. What in the experience of our body prompts us to experience it as a whole made of parts, and what sets the boundaries of these parts? De Vignemont et al. (2009, p. 502) make three assumptions, which are thoroughly tested with four experiments:

> the segmentation of the body into parts may partly derive from the organization of the somatosensory system, the organization of the motor systems, or from extrinsic perceptual factors such as visual discontinuities.

In other words, body mereology come from the way we *sense* our bodies through our complex tactile system, which captures information from the sense of *touch*. Segmenting our bodies into parts also come from our motor experience. That is, the experience of our body when it is in motion. De Vignemont et al. (2009, p. 503) therefore respectively test two systems, which potentially shape the experience of our body as a whole made of parts: *somatosensory mereology* and *motor mereology*.

Somatosensory mereology consists of the information captured by our somatosensory system (i.e., the sense of *touch*), which is then mereologically processed. According to de Vignemont et al. (2009, p. 502): "tactile sensation arises

from receptors in the skin, which form a continuous sensory sheet covering the entire body and is considered a single sense organ". The continuous tactile field of the skin would therefore suggest that we sense our body as a continuous and undifferentiated whole, as opposed to a whole segmented into parts. However, the authors show that *joints* are anatomical landmarks, which structure this continuous field. De Vignemont et al. (2009, pp. 510–511) reach that conclusion when they observe that the same distance between two tactile stimuli is sensed as being greater when the two stimuli are on distinct body parts (i.e., separated by a joint, for instance *the wrist*) than when located on the same body part (e.g., the forearm): "in distance judgment, the joint delineates body parts leading to a 'category boundary effect'". Moreover, the results of the study show that this sensorial segmentation is intrinsically *tactile* and not cross-modal (i.e., *tactile information* completed *by visual information*) as it was first hypothesized.

On the other hand, motor mereology refers to the information being captured by our motor system and then mereologically processed. In brief, it could be summarized as "our bodily experience through action". At first one would think that motor experience is what leads us to segment our bodies into clearly identified parts because muscles are discrete units with clear boundaries. Surprisingly, it is however quite the opposite because "very few actions involve a single muscle alone: muscles work in functional groups to achieve actions" (*ibid*, p. 503). De Vignemont, Majid, Jola, and Haggard (*ibid*, p. 511) therefore conclude "action produces a distributed and integrated experience of the body, linking together the body parts involved in motor synergies". Furthermore, the study demonstrates that action (i.e., the motor system) reduces the boundary effect induced by the somatosensory system.

To briefly sum up this compelling study, de Vignemont et al. (2009, p. 510–511) clearly identify two systems that shape the mereological experience of our body: the somatosensory system and the motor system. On the one hand *somatosensory mereology* […] "relies on a structured description of the body, categorically organized. The joints play the role of body landmarks. In distance judgment, the joint delineates body parts leading to a 'category boundary effect'" (*ibid*, 510–511). On the other hand, and in contrast *motor mereology* "relies on a more unified and consistent representation of the body […] action produces a distributed and integrated experience of the body, linking together the body parts involved in motor synergies" (*ibid*).

All in all, de Vignemont et al. (2009, p. 511) conclude that "the mereology of the sensing body and the mereology of the acting body appear to have the functions of differentiating and grouping parts, respectively". To refer back to the distinction between partonomy and contiguity in 2.5, this study suggests that these two cognitive processes are also distinct and interacting in the experience of our

body. Furthermore, according to the distinction and definition of the two different kinds of whole in Section 3, and following de Vignemont et al.'s (2009) findings, an interesting question could be asked. If on the one hand, the experience of our bodies, and more precisely our somatosensory and motor experience, is indeed the source of this pervasive cognitive process that makes us experience objects as wholes and parts, and if on the other hand somatosensory mereology and motor experience give way to two different kinds of mereology – respectively segmenting the whole body into parts, and unifying distinct units involved in motor synergies into functional wholes – then could not this somatosensory / motor dual experience be the embodied origin of the distinction between *componential wholes* and *Gestalt wholes*? This question is perhaps worthy of further investigation.

5. Summary and conclusion

This chapter aimed at making a theoretical contribution to the analysis of part–whole relations in language and experience, which have crucial empirical applications in the analysis of meaning in general, and in the design of repositories of figurative language in particular. Clarifying the distinction between the experiential level and the linguistic level, going toward a sharper definition of the part–whole relation, and providing a more detailed hypothesis on its embodied origin matters very much for further research on figurative language. Similarly, to the point raised by Bouveret and Sweetser (2009, p. 57) about identifying what exact frames are being mapped in figurative cutting and breaking expressions and by Sullivan (2007) in her analysis of the LIGHT IS INTELLIGENCE overarching conceptual metaphor, this contribution supports that a fine-grained identification of the components of meaning are all the more necessary to take into account for the study of figurative language.

The theoretical adjustments, further distinctions, and detailed account of the embodied origin of the part–whole relation that I have proposed in this chapter have methodological applications in the analysis of figurative meaning in general and in the design of building repositories of figurative expressions in particular. Since partonomy, taxonomy, possession, containment, and contiguity are clearly distinct experiential phenomena, which can be conflated or distributed in linguistic expressions, they cannot be organized in dependent hierarchical relations to each other. Concretely, this proposition implies that in the design of an annotation scheme, these distinct experiential types are organized as distinct conceptual types on the same hierarchical level. So, for example, containment metonymies cannot just be marked as subtypes of part–whole metonymies, because some expressions that are build upon a 'containment' type of relation do not necessarily involve a

partonomic structure (e.g., *the kettle is boiling*). It would therefore be problematic for the contributors of databases to be limited (by the coding scheme) to annotate some entries as both structured by a part whole relation and a containment relation if that is not the case. By situating these five types of experiential phenomena on the same level of the coding scheme, database entries could then be marked as expressions combining two or more conceptual relations, but it would also leave the option of coding expressions as only structured by one of these types independently of the other. In sum, a "flat" hierarchical organization of these distinct conceptual structures would allow to account for both patterns of their conflation and distribution in figurative expressions.[6]

Of course, this "horizontal" structure should be enriched by a "vertical" and implicational structure within each type as there are for examples many different kinds of part–whole relations (e.g., component-whole, portion-whole, stuff-object, etc.) as described in Devylder (2016). The Gestalt vs componential whole distinction would then appear quite useful to implement this implicational structure within the coding scheme of a database.

The taxonomic depth and hierarchical structure of the coding scheme that are proposed in this chapter would make the annotation of figurative expressions more valid cross linguistically, and potentially reveal detailed shared patterns and variations in the structure of figurative language. More generally the theoretical and methodological propositions can contribute to a better understanding of the intricate relations at work between sensorimotor experience, cognitive processing, and figurative language.

References

Barcelona, A. (2011). Reviewing the properties and prototype structure of metonymy. In R. Benczes, A. Barcelona, & F. J. Ruiz de Mendoza Ibáñez (Eds.), *Defining metonymy in cognitive linguistics: towards a consensus view* (pp. 7–58). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.28.02bar

Barcelona, A. (2018). General description of the metonymy database in the Córdoba project, with particular attention to the issues of hierarchy, prototypicality, and taxonomic domains. In O. Blanco-Carrión, A. Barcelona, & R. Pannain (Éds), *Conceptual metonymy: Methodological, theoretical, and descriptive issues*, 27–54.

6. It must however be noted that this chapter has only focused on the relation between partonomy and the other four experiential phenomena. It has not analyzed the relations among the other four experiential phenomena (e.g. containment and contiguity), which must be further investigated.

Barcelona, A., & Ruiz de Mendoza Ibáñez, F. J. (2015). *Bibliography of metaphor and metonymy*. Amsterdam: John Benjamins Publishing Company.

Blomberg, J., & Zlatev, J. (2014). Actual and non-actual motion: why experientialist semantics needs phenomenology (and vice versa). *Phenomenology and the Cognitive Sciences*, 13(3), 395–418. https://doi.org/10.1007/s11097-013-9299-x

Bouveret, M., & Sweetser, E. (2009). Multi-frame semantics, metaphoric extensions, and grammar. In Kwon, I., H. Pritchette, & J. Spence (Eds.), *Thirty-fifth annual meeting of the Berkeley Linguistics Society (BLS)* (pp. 49–59). Berkeley: Berkeley Linguistics Society.

Brdar-Szabó, R., & Brdar, M. (2012). The problem of data in the cognitive linguistic research on metonymy: A cross-linguistic perspective. *Language Sciences*, 34, 728–745. https://doi.org/10.1016/j.langsci.2012.04.012

Burenhult, N. (2006). Body part terms in Jahai. *Language Sciences,* 28(2–3), 162–180.

Chappell, H., & McGregor, W. (1996). *The grammar of inalienability: A typological perspective on body part terms and the part–whole relation*. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110822137

Cruse, D. A. (1979). On the transitivity of the part–whole relation. *Journal of Linguistics*, 15, 29–38. https://doi.org/10.1017/S0022226700013086

Cruse, D. A. (1986). *Lexical semantics*. Cambridge: Cambridge University Press.

Cruse, D. A. (2002). The Lexicon. In M. Aronoff, & J. Rees-Miller (Eds.), *The handbook of linguistics*. Oxford: Blackwell.

Croft, W., & Cruse, D. A. (2004). *Cognitive linguistics*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511803864

Davies, M. (2008). The Corpus of Contemporary American English (COCA): 560 million words, 1990-present. Available online at https://corpus.byu.edu/coca/.

Dermot, M. (2005). *Edmund Husserl: founder of phenomenology*. Cambridge: Polity.

Devylder, S. (2016). The PART–WHOLE schema we live through: a cognitive linguistic analysis of part–whole expressions of the Self. Doctoral dissertation. Retrieved from theses.fr. (Accession No. s73829).

Devylder, S. (2017). Cutting and breaking the embodied self. *CogniTextes*, 15. Retrieved from http://cognitextes.revues.org.

Devylder, S. (2018). Diagrammatic iconicity explains asymmetries in Paamese possessive constructions. *Cognitive Linguistics*, 29(2), 313–348. https://doi.org/10.1515/cog-2017-0058

Devylder, S., Bracks, C., Shimotori, M., & Siahaan, P. (2019). *Carving the Body at Its Joints: Crossing Boundaries between the Language and Cognition of Body Categorization*. Manuscript submitted for publication.

Divjak, D., Levshina, N., & Klavan, J. (2016). Cognitive linguistics: Looking back, looking forward. *Cognitive Linguistics*, 27(4), 447–463. https://doi.org/10.1515/cog-2016-0095

de Vignemont, F. (2011). Embodiment, ownership and disownership. *Consciousness and Cognition*, 20(1), 82–93. https://doi.org/10.1016/j.concog.2010.09.004

de Vignemont, F., Majid, A., Jola, C., & Haggard, P. (2009). Segmenting the body into parts: evidence from biases in tactile perception. *The Quarterly Journal of Experimental Psychology*, 62(3), 500–512. https://doi.org/10.1080/17470210802000802

Dirven, R. (2002). Metonymy and metaphor: Different mental strategies of conceptualization. In Dirven, R., & R. Porings (Eds.), *Metaphor and metonymy in comparison: Metonymy as a prototypical category and contrast* (pp. 75–111). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110219197.75

Dodge, E. K., & Lakoff, G. (2005). Image schemas: From linguistic analysis to neural grounding. In B. Hampe (Ed.), *From perception to meaning: Image schemas in cognitive linguistics* (pp. 57–92). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110197532.1.57

Dryer, M. S., & Haspelmath, M. (Eds.). 2013. *The world atlas of language structures online*. Leipzig: Max Planck Institute for Evolutionary Anthropology. (Available online at http://wals.info, Accessed on 2017-05-10.)

Enfield, N. J., Majid, A., & Van Staden, M. (2006). Cross-linguistic categorization of the body: Introduction. *Language Sciences*, 28(2), 137–147. https://doi.org/10.1016/j.langsci.2005.11.001

Gaby, A. R. (2006). The Thaayorre 'true man': Lexicon of the human body in an Australian language. *Language Sciences*, 28, 201–220. https://doi.org/10.1016/j.langsci.2005.11.006

Hampe, B. (2005) (Ed.). *From perception to meaning. Image Schemas in Cognitive Linguistics*. Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110197532

Husserl, E. (1970a). *The crisis of European sciences and transcendental phenomenology*. An introduction to phenomenological philosophy (D. Carr, Trans.). Evanston: Northwestern University Press (original work published 1954).

Jackendoff, R. (1991). Parts and boundaries. In B. Levin, & S. Pinker (Eds.), *Lexical and conceptual semantics* (pp. 9–45). Cambridge: Blackwell.

Kimmel, M. (2005). Culture regained: Situated and compound image schemas. In B. Hampe (Ed.), *From perception to meaning: Image schemas in cognitive linguistics* (pp. 285–312). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110197532.4.285

Kovecses, Z. (2006). *Language, mind, and culture: A practical introduction*. Oxford: Oxford University Press.

Lakoff, G. (1987). *Women, fire and dangerous things: What categories reveal about the mind*. Chicago: The University of Chicago Press. https://doi.org/10.7208/chicago/9780226471013.001.0001

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: The University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*. Boston: Basic books.

Langacker, R. W. (2009). Metonymic grammar. In K.-U. Panther, L. Thornburg, & A. Barcelona (Eds.) *Metonymy in grammar* (pp. 45–71). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.25.04lan

Lyons, J. (1977). *Semantics*. Cambridge: Cambridge University Press.

Lévy-Bruhl, L. (1914). L'expression de la possession dans les langues mélanésiennes. *Mémoire de la Société de Linguistique de Paris* 19(2), 96–104.

Majid, A. (2010). Words for parts of the body. In B. C. Malt, & P. Wolff (Eds.), *Words and the Mind: How words capture human experience* (pp. 58–71). New York: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195311129.003.0004

Majid, A., & Staden, M. (2015). Can nomenclature for the body be explained by embodiment theories? *Topics in Cognitive Science*, 7(4), 570–594. https://doi.org/10.1111/tops.12159

Majid, A., Enfield, N. J., & van Staden, M. (2006). Parts of the body: Cross-linguistic categorization. *Special issue of Language Sciences*, 28, 137–359. https://doi.org/10.1016/j.langsci.2005.11.001

Miller, G. A., & Johnson-Laird, P. (1976). *Language and perception*. Harvard: Harvard University Press. https://doi.org/10.4159/harvard.9780674421288

Mittelberg, I. (2018). Gestures as image schemas and force gestalts: A dynamic systems approach augmented with motion-capture data analyses. *Cognitive Semiotics*, 11(1). https://doi.org/10.1515/cogsem-2018-0002

Norrick, N. R. (1981). *Semiotic principles in semantic theory. Amsterdam studies in the theory and history of linguistic science IV* (Current Issues in Linguistic Theory 20). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/cilt.20

Panther, K.-U., Thornburg, L. L., & Barcelona, A. (Eds.). (2009). *Metonymy and metaphor in grammar* (Vol. 25). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.25

Peirsman, Y., & Geeraerts, D. (2006). Metonymy as a prototypical category. *Cognitive Linguistics*, 17(3), 269–316. https://doi.org/10.1515/COG.2006.007

Radden, G., & Kövesces, Z. (1999). Towards a theory of metonymy. In K.-U. Panther, & G.Radden (Eds.), *Metonymy in language and thoughts* (pp. 17–60). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.4.03rad

Rohrer, T. (2005). Image schemata in the brain. In B. Hampe (Ed.), *From Perception to Meaning: Image Schemas in Cognitive Linguistics* (pp. 165–196). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110197532.2.165

Ruiz de Mendoza, F. J. 1998. The role of mappings and domains in understanding metonymy. In A. Barcelona (Ed.), *Metaphor and metonymy at the crossroads* (Topics in English Linguistics 4) (pp. 109–132). Berlin: Mouton de Gruyter.

Seto, K. (1999). Distinguishing metonymy from synecdoche. In K.-U. Panther, & G. Radden (Eds.), *Metonymy in language and thought* (pp. 91–120). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.4.06set

Sokolowski, R. (2000). *Introduction to phenomenology*. Cambridge: Cambridge University Press.

Sonesson, G. (1989). *Pictorial concepts*. Inquiries into the semiotic heritage and its relevance for the visual analysis of the visual world. Chartwell-Bratt Ltd.

Sonesson, G. (1993). The multiple bodies of man. *Project for a semiotics of the body*. Degrés, Bryssel, XXI: 74, été 1993: d1–d42.

Sonesson, G. (2010). Semiosis and the elusive final interpretant of understanding. *Semiotica*, 179(1–4), 145–258. https://doi.org/10.1515/semi.2010.023

Sonesson, G. (2013). Aspects of "physiognomic depiction" in pictures: *From macchia to microgenesis. Culture Psychology*, 19(4), 533–547.https://doi.org/10.1177/1354067X13500329

Sonesson, G. (2016). Lifeworlds: The cognitive semiotics of culture. In D. Dunér, & G. Sonesson (Eds.), *Human lifeworlds: The Cognitive semiotics of cultural evolution* (pp. 23–62). Berlin: Peter Lang Publishing Group.

Stampoulidis, G., & Bolognesi, M. (under review). Bringing metaphors back to the streets: A corpus-based study for the identification and interpretation of rhetorical figures in street art.

Sullivan, K. S. (2007). Frame-based constraints on lexical choice in metaphor. In *Proceedings of the 32nd annual meeting of the Berkeley Linguistics Society* (pp. 375–385). Berkeley, CA: Berkeley Linguistics Society.

Talmy, L. (1988). Force dynamics in language and cognition. *Cognitive Science*, 12, 49–100. https://doi.org/10.1207/s15516709cog1201_2

Talmy, L. (2000a). The fundamental system of spatial schemas in language. In B. Hampe (Ed.), *From perception to meaning: Image schemas in cognitive linguistics* (pp. 37–47). Berlin: Mouton de Gruyter.

Talmy, L. (2000b). *Toward a cognitive semantics: Concept structuring systems*. Cambridge, MA: MIT Press.

Van Staden, M., & Majid, A. (2006). Body colouring task. *Language Sciences*, 28(2), 158–161. https://doi.org/10.1016/j.langsci.2005.11.004

Vieu, L., and Aurnague, M. (2007). Part-of relations, functionality and dependence. In M. Aurnague, M. Hickmann, & L. Vieu (Eds.), *The categorization of spatial entities in language and cognition* (pp. 307–336). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.20.18vie

Winston, M., Chaffin, R., & Herrmann, D. (1987). A taxonomy of part–whole relations. *Cognitive Science*, 11, 417–444. https://doi.org/10.1207/s15516709cog1104_2

Zhang, W. (2016). *Variation in metonymy: Cross-linguistic, historical and lectal perspectives* (Vol. 59). Walter de Gruyter GmbH & Co KG. https://doi.org/10.1515/9783110455830

Zlatev, J. (2005). What's in a schema? Bodily mimesis and the grounding of language. In B. Hampe (Ed.), *From perception to meaning: Image schemas in cognitive linguistics* (pp. 313–342). Berlin: Mouton de Gruyter. https://doi.org/10.1515/9783110197532.4.313

Zlatev, J. (2016). Turning back to experience in Cognitive Linguistics via phenomenology. *Cognitive Linguistics*, 27(4), 559–572. https://doi.org/10.1515/cog-2016-0057

CHAPTER 9

Metaphor repositories and cross-linguistic comparison

Ontological eggs and chickens

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This chapter focuses on the relationship between repositories of figurative speech, cross-linguistic research and ontology models. We first demonstrate on two case studies some problems caused by cross-linguistic comparison of some conceptual metaphors and claim that the interaction between repositories and cross-linguistic research results in more synergy if an ontology model mediates between them. We then present the architecture of the Ontological Model of Concepts and Construction that seeks to capture the ontological and conceptual organization in 16 emergent layers and (super)impose a referential lexical and constructional layer of language-specific knowledge, metaphor appearing as a conceptual process involving the violation of the ontological congruency between concepts activated by linguistic construction triggering emergent enrichment of the construed concept.

Keywords: repository, ontological model, cross-linguistic comparison, time metaphors, entrenchment, construction, ontological violation, metaphor identification

1. Introduction

In this chapter, we start from two related questions: Can metaphor repositories do without any (previous) cross-linguistic research? Can the cross-linguistic study of conceptual metaphors do without some sort of metaphor repository? An obvious answer in both cases seems to be: yes, they can do without each other, both in principle and in practice. However, in this chapter we show that the metaphor repositories and cross-linguistic research on metaphors are better off when they

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inform each other. This dialectic relation between the two explains the subtitle of the present chapter: it is difficult to establish which one precedes the other. What is more, we also claim that their interaction can produce even better results if it is not direct but mediated through an ontology model.

A repository in the background of a cross-linguistic comparison of metaphors (and metonymies) can certainly be beneficial because it provides the necessary systematicity, i.e. by knowing the position of a conceptual metaphor within a repository and the way it relates to other metaphors, we can better calibrate our expectations as to what can function as its counterpart in another language and consequently we can better understand cross-linguistic equivalences. Of course, this presupposes that the structure of the repository is not flat (i.e. it is not just a simple list), but that it reflects a network of hierarchical relations. This hierarchical structure in its background is most adequate for both contrastive research and as a support of the repository itself if based on an ontology model. On the other hand, cross-linguistic research on metaphors of any magnitude, from just small probes, to systematic comparisons, can significantly improve the internal architecture of such a repository in the sense of optimizing the organization of information and facilitating data retrieval.

As this part of the present volume is concerned with risks and challenges we face when constructing repositories of figurative language, we are going to concentrate in this chapter on how insights gained in the course of contrastive research can facilitate the work on such a repository, i.e. how it can, if not completely eliminate, then at least alleviate certain risks and challenges. Specifically, we are concerned with the following problems, which are at the same time our research questions.

RQ1: How can we be sure that the degree of the granularity of our repository is descriptively adequate, i.e. how can we be sure that it is comprehensive, containing all the types of conceptual metaphors and metonymies in a given language?

RQ2: Should the architecture of such a repository pay attention only to conceptual metaphors and metonymies attested in a given language?

RQ3: Should we also be concerned in our repository with the variable footprint of individual conceptual metaphors and metonymies?

We can of course never be sure that a repository contains all types of conceptual metaphors and metonymies given in a language for a number of reasons. This may simply stem from the fact that a language is always in a constant state of flux, innovating itself, which also applies to the system of figurative expressions which may be continually enriched by adding new (types of) expressions, or shedding some, but also due to the method of obtaining the data: (automated) mining for them in various corpora, introspection, elicitation, or any combination of these. However

well we plan these methods and however well the searches are executed, we can at best hope to be quite close to the goal of descriptive adequacy without ever fully reaching it. What we would like to demonstrate in the rest of this chapter is that this asymptotic movement towards descriptive adequacy can be greatly helped by taking a cross-linguistic perspective as well as by adopting an ontological system. We exemplify the advantage of a contrastive perspective in the first case study in Part 2 (dealing with the system of conceptual metaphors used in the discourse on organ transplantation), and the corrective role of ontology in Part 3 below.

As for RQ2, we would like to claim on the basis of that same case study that contrastive work can uncover some gaps in individual systems, which may also be modelled by the underlying ontology. A repository that flexibly takes such gaps into consideration is more advantageous for at least two reasons. On the one hand, it is better suited to accommodate any changes in the system that might occur at a later stage, i.e. it may require fewer modifications later, some of which may compromise its very foundations, calling for a reshuffling of the whole repository and thus hindering further cumulative work on it. Secondly, because of its cross-linguistic comparability, such a repository is much easier to team up with other similar projects in the case of future work on a multilingual repository.[1]

Finally, we tackle RQ3 in the second case study in Part 2, the one on two types of time metaphors in Croatian, Hungarian and English, arguing that repositories constructed with an eye to the inclusion within a larger multilingual repository, should take care of the variable degree of the entrenchment of individual conceptual metaphors and metonymies, in particular those that are more specific cases of a single superordinate metaphor or metonymy, forming a subsystem or a family of related metaphors or metonymies. A repository should be checked for this phenomenon, language-internally but also compared with other languages because if it is flat with respect to this aspect (regardless of ultimate reasons for this, be it the particular method of data gathering or something else) it may end up not only presenting a skewed picture of the system it aims to present, but also be less than fully aligned with other similar repositories, and therefore less compatible with them, ultimately even not being fit for inclusion into a multilingual database. The underlying ontology, thanks to its network of relations, also has the potential of pointing to such misalignment.

In Part 3 of the present chapter we sketch a sort of emergent ontology that would be not only adequate for dealing with the problems that crop up in the case studies, but also be robust and open enough to stand the test of further potential trials as new problems arise, which could lead to further developments and

1. This idea was present from the outset of the work on the construction of the Croatian Metaphor Repository (Despot et al., this volume), and explains some aspects of its structure.

improvements. In the final section we sum up the insights gained in the course of these case studies and the ways that a repository based on such an ontology should reply to challenges.

2. Case studies

The two case studies that follow are not related in terms of their topics, but what they share is the moral from contrastive studies of figurative language. In other words, their sole function is to demonstrate that insights from cross-linguistic research, coupled with an ontology, can help decide on the questions we outlined above and thus improve the architecture of repositories of figurative language.

2.1 Metaphors in medical discourse

In this part of the chapter we briefly consider some metaphors found in medical discourse, specifically in transplant surgery. Note that the term *organ transplantation*, is itself metaphorical. The verb comes from Late Latin *transplantare* 'plant again in a different place,' from Latin *trans-* 'across' + *plantare* 'to plant'. It was extended to people (in the 1550s) and then to organs or tissue (1786), which is now the dominant sense, at least according to the majority of dictionaries. Nevertheless, the link between the literal, botanical sense and the medical one is still alive. The organ/body part is metaphorically conceived as a plant, and the human, i.e. the patient corresponds to a garden.

The situation in other languages may be more or less similar, sometimes making the term less (clearly) metaphorical. In German, the noun *Transplantation* is primarily used in the medical sense, the botanical one is recorded in some dictionaries as a secondary sense, but because it is used only as specialized term, native speakers are hardly aware of the metaphorical origin of the medical term. What is more, the corresponding verb, *transplantieren*, is used only in the medical sense. In the past, it was in paralell use with *Überpflanzung*, the literal translation form Latin (*über* 'over' + *Pflanzung* 'planting'). From a synchronic point of view, however, both the verb and the nominalization should be considered dead metaphors, as the source domain is made opaque.

A related pair of lexemes, the verb *verpflanzen* and the nominalization *Verpflanzung* are used in their literal sense of transferring a plant from one place to another, just like English *transplant*. However, it can also be used metaphorically to denote grafting of tissue, primarily of skin. This makes it a metaphor different from the metaphor lexicalized in English as *transplant*. It is conceptually more narrow than *transplant* (which is often treated as a more general term than *graft*, i.e. the latter is a hyponym of the former). The source (and in part the target)

domains are also different. The source domain is not the whole plant (moved from one place to another), but just a shoot or a branch (corresponding to the tissue grafted), while the human patient now does not correspond to a garden, i.e. the now location of a plant, but to the whole host plant receiving the graft.

In the case of the Croatian term *presađivanje organa*, used in parallel with *transplantacija* (a dead metaphor similar to that we have in German *Transplantation*) the organ/body part is metaphorically conceived as a plant, and the human, i.e. the patient corresponds to the garden. *Presađivanje* is used as a cover term for both transplanting and grafting. Hungarian more or less mirrors this with its *szervátültetés* (*szerv* 'organ' + *át* 'over' + *ültetés* 'planting'), next to the rarely used *transzplantáció*. The French term *greffe*, used interchangeably with *transplantation*, is derived, just like the English *graft* 'shoot inserted into another plant', which is clearly metonymically motivated, coming from Old French *graife* 'grafting knife, carving tool; stylus, pen,' from Latin *graphium* 'stylus,' from Greek *grapheion* 'stylus,' from *graphein* 'to write.' The Polish term *przeszczepianie narządów* 'organ transplantation', is also based on the botanical metaphor of grafting. Turkish *organ nakli* is apparently based on the metaphor of transfer, as is Finnish *elinsiirto* (*elin* 'organ' + *siirto* 'transfer').

A number of languages, however, lack any metaphorically motivated term to cover this phenomenon, i.e. they use a corresponding item borrowed from Latin, but it is properly speaking opaque intralingually, e.g. Azeri *transplantasiya*, Latvian *orgānu transplantācija, transplantasi* organ in Bahasa Indonesia, etc.

What we have seen here is that several related conceptual metaphors use various, though related, source domains, while sharing the target domain. Some of these metaphors are closer to each other than others. At the same time it is also clear that a number of languages lack a corresponding metaphor. However, the metaphor in question is not isolated, it is part of a larger system. Looking at the relationship between transplantation and graft(ing) metaphors, and their counterparts in various languages, focusing on how they relate in hierarchical terms we notice some cross-linguistic differences; either transplantation or graft(ing) can be at the hierarchically highest level:

Table 1. Transplantation and grafting metaphors across languages.

		Specific (level II)	
Languages	**Generic (level I)**	**organ**	**tissue**
English	**transplantation**	transplantation	grafting
French	**grafting**/ (transplantation)	grafting/ (transplantation)	grafting/ (transplantation)
Croatian, Hungarian	**transplantation**	transplantation	transplantation

Borrowing the notions of hyponymy and hyperonymy, we could say that one and the same conceptual metaphor can be its own hyponym, i.e. grafting, as far as French is concerned, functions on both levels of specificity. What is more, it is own co-hyponymy because it covers both medical procedures, the one involving organs as well as the one involving tissue. The same could be said for Croatian and Hungarian, only this time it is the conceptual metaphor of transplantation that is used in all cases. For lack of a more general metaphor covering both procedures, transplantation is the hyperonym of the metaphor covering the procedure involving organs in English. This complex situation clearly shows that when contrasting languages with respect to their use of conceptual metaphors in this area one should be careful not to mix up levels, and this is where a hierarchically organized repository based on an ontology comes in to help carry out contrastive analysis by matching counterparts in an appropriate way.

It is also interesting to point out here the existence of what might be termed metaphor homonymy. Both the transplantation and the grafting metaphor entail a more general metaphor PEOPLE ARE PLANTS. In its non-metaphorical use the verb *to transplant* means 'replant (a plant) in another place.' It can be also used in the sense of 'relocate', and then applies to people as well (as in *She is a New Yorker who recently transplanted to the West Coast*). In the case of grafting, in its literal sense, one part of a plant, the scion, is united with the stock, which is another plant. However, the conceptual metaphor PEOPLE ARE PLANTS is also instantiated in expressions like:

(1) a. *We saw the withered old woman*.[2]
b. *The curious kid is a budding scientist*.

The two types of the PEOPLE ARE PLANTS metaphor do not really share much, except for the central mapping PLANT → HUMANBEING, all the other mappings are different, and the same is true of the context in which they are used. Helped by the underlying ontology, the repository should be able to resolve this, recognizing the fact that the two belong to different levels and that in the medical context, we actually have a more specific version, PATIENTS ARE PLANTS, which of course entails the more general one, PEOPLE ARE PLANTS.

There is even more variation down the hierarchy: there is a whole series of conceptual metaphors targeting the transplanted organ. It can be conceptualized metaphorically as a living organism:

2. https://metaphor.icsi.berkeley.edu/pub/en/index.php/Metaphor:PEOPLE_ARE_PLANTS. Accessed on 17 February 2017.

(2) *When I feel that my kidney is complaining, I stop working.*

(3) *It's alive! It throbs. If it does not move, your kidney has a problem… when it needs water, it knocks.* (Shimazono 2013)

A transplanted kidney may be conceptualized as a baby, or as a foster child:

(4) *Oh yes, it's part of me – it's me, it's me. I even call it my baby… it's really a special part of me! I felt I must be responsible for this other person's kidney.*

In some cases, the transplanted organ is seen as spare part, which means that human (body) is metaphorically construed as a machine:

(5) *… heart is a pump*

(6) *It actually will be just like cars: Well, gosh, the radiator is broken, or won't live long: out with it, put a new one in.* (Schweda & Schicktanz, 2009)

There are also some innovative variations on this theme, i.e. (TRANSPLANTED) HUMAN BODY PART IS A MACHINE:

(7) *I want "Mercedes" lungs, or else I want to die (…) I don't want a "Lada".* (Schweda & Schicktanz, 2009)

The ontology upon which the repository is built could also help identify such expressions as being metaphorical.

Summing up this case study, we can say that we have uncovered some differences between metaphorical systems of various languages that bear witness to differences in their hierarchical architecture. Languages may nominally share conceptual metaphors of the nominally same type, as well as exhibit their linguistic realizations that nominally appear identical. What is more, some languages may lack some hierarchical levels in their systems, or articulate the same level slightly differently, i.e. in a more specific way. This shows that building a repository based on a metaphorical system of a single language we may run the risk of missing some points (i.e. levels and elaborations) that may crop up later and require modifications, and would certainly challenge its comparability with other such repositories. While a cross-linguistic comparison can detect such mismatches, their true depth can be checked by means of an ontology model in order to adapt the structure of the repository so as to make it flexible enough to accommodate the incorporation of new data and also make it cross-linguistically compatible, greatly facilitating its potential alignment with other repositories within a multilingual framework.

2.2 Time metaphors: Moving time vs. moving ego

There are many ways in which time can be metaphorically conceived, as resource (*We're out of time*), as money (as a special case of the former, as in *Yesterday is a*

cancelled check; tomorrow is a promissory note; today is the only cash you have, so spend it wisely, Kay Lyons), as container (*We usually took what takes about a month of preparation, and* we did it in five *days*), human (*Time is a great teacher, but unfortunately it kills all its pupils*, Hector Berlioz; *Prince, I warn you, under the rose,/ Time is the thief you cannot banish*, Phyllis McGinley, "Ballad of Lost Objects") as well as motion (TIME IS MOTION), etc. According to the relevant static or dynamic reference point, metaphorical models of time can be classified as Ego-Reference-Point models, where the Ego's location is the "now", or as Time-Reference-Point models, where earlier event are in front of later events (cf. Núñez and Sweetser, 2006; Moore, 2014).

When it comes to the Ego-Reference-Point models, it is usual to draw a distinction between Moving-Time and Moving-Ego metaphors (Clark, 1973; Gentner, 2001; Evans, 2003; Lakoff, 1993; Lakoff and Johnson, 1980, 1999; Traugott, 1978). We make use of the former when we conceptualize time events as moving with respect to a fixed observer from front (future) to back (past) as in:

(8) *Christmas is approaching.*

(9) *Holidays are coming.*

(10) *New Year is coming to us soon.*

(11) *Time passes so quickly.*

(12) *The summer went by.*

Time is viewed here as an object moving with respect to the observer, and the metaphor can be fully spelled out as TIME PASSING IS MOTION OF AN OBJECT.

The latter metaphor is exemplified by:

(13) *We are approaching Christmas.*

(14) … we are coming to holidays *and we have more traffic to deal with…*

(15) *As we are getting closer to the end of the year…*

(16) *Those sad days are behind us.*

(17) *Thanksgiving is looming on the horizon.*

Grady (1997b: 119) allows (though reluctantly) both of these metaphors to be primary ones. Recognizing them as primary also means that they are very likely to be universal, i.e. they are to be found in very many languages (Grady 1997a: 228). Moore (2013: 87) notes that

> … the Moving Ego and Moving Time metaphors have been observed in various unrelated languages around the world, and according to conceptual metaphor theory, part of the explanation for this type of widespread crosslinguistic

commonality is that the experiential basis of the metaphor is available in all of the relevant cultures around the world.

Moore (2014: 13) states that "Moving Ego and Ego-centered Moving Time occur repeatedly – with the same inference patterns – in language after language around the world," but only gives examples from various languages for the latter.

Let us now take a look at some examples from Croatian:

(18) a. *Božić se približava*. 'Christmas is approaching'
b. *Približavamo se Božiću*. 'We are approaching Christmas'

(19) a. *Bliži se Uskrs*. 'Easter is getting nearer'
b. *Bližimo se Uskrsu*. 'We are nearing Easter'

Apparently, Croatian exhibits both types of Time metaphors. However, some combinations of motion verbs and temporal nouns do not agree with the Moving-Ego metaphor in Croatian:

(20) a. *Praznici dolaze*. 'Holidays are coming'
b. **Dolazimo praznicima*. 'We are coming to holidays'

In addition to that, there are also clear differences in the frequency of the use of the two metaphors, the expressions of the Moving-Ego being quite rare, to say the least. In order to check this observation, we performed searches using Google as well as hrWac, a web-based corpus. We are well aware of numerous risks related to quantitative data obtained by means of Google searches, as well as of the limited range of our queries. However, they are not to be understood as absolute indicators, but rather as pointing into certain direction, which was actually our goal here. What we were concerned with here was to show the peripheral nature of the Moving-Ego metaphor in Croatian, and later in Hungarian, too. The low number of hits in the case of this type of metaphor cannot be seen as weakness of our procedure. Just on the contrary, these low scores, as opposed to the relatively high scores for the Moving-Time metaphor, just go to prove our point here. As can be seen from Table 2, the number of hits from the web corpus is lower, which indicates that in such a case the probe by means of Google searches is justified as a last resort solution. Admittedly, the queries were quite rigid and limited in range, but including other possibilities (other lexemes, other orderings) would not change much, as the frequencies can reasonably be expected to be even lower.

In short, sentences such as (11b) and (12b) are acceptable as translations, i.e. they are structurally and functionally equivalent to their English models, but they are not of the same weight as their English models. They are not natural choices and certainly sound more marked than (11a) and (12a). It is therefore not

Table 2. Differences in the frequency of some instances of the Moving-Time (MT) and the Moving-Ego (ME) metaphors in Croatian.

	Google*	hrWac**
"Božić se bliži" 'Christmas is getting closer' (MT)	3,070	25
"Bližimo se Božiću" 'We are getting closer to Christmas' (ME)	5	0
"Božić se približava" 'Christmas is approaching' (MT)	1,040	9
"Približavamo se Božiću" 'We are approaching Christmas' (ME)	114	0
"Nova godina je pred/ Nova je godina pred" 'New Year is in front of' (MT)	112/24	17
"pred Novom smo godinom/smo pred Novom godinom" 'we are in front of New Year'(ME)	2/0	0/0
"došla je Nova godina"/ "Nova godina je došla" (MT)	56/51	0/0
"došli smo do Nove godine" / "došli do Nove godine" (ME)	2/3	0/0

* Exact Google queries were performed in which quotation marks were used as operators forcing Google to return only the exact matches of what is enclosed within them.

** This is a web corpus collected from the .hr top-level domain. The current version of the corpus (v2.0) contains 1.9 billion tokens and is annotated with the lemma, morphosyntax and dependency syntax layers (Ljubešić & Klubička 2014).

surprising that the Moving-Ego metaphor is often replaced in translation by the Moving-Time metaphor.

Hungarian is in this respect very similar to Croatian. More or less literal translations of the English examples (1) and (6) are acceptable, as shown by (14) a. and b., respectively (cf. also Kövecses 2005: 52):

(21) a. *Rohamosan közeledik a Karácsony*. 'Christmas is approaching apace'
b. *Lassan közeledünk a Karácsonyhoz*. 'We are slowly approaching Christmas'

However, translations of similar examples with a more typical motion verb apparently do not agree with the Moving-Ego metaphor in Hungarian:

(22) a. *Jönnek az ünnepek*. 'Holidays are coming'
b. **Az ünnepekhez jövunk*. 'We are coming to holidays'

The Moving-Ego is not compatible even if we have just implicit movement:

(23) a. *Mindjárt itt a karácsony*. 'Christmas is almost here'
b. **Mindjárt karácsonynál vagyunk*. 'We are almost at Christmas'

There is again a clear pattern concerning the differences in the frequency of use of the two metaphors – as in Croatian –, sentences illustrating the Moving-Ego metaphor are outnumbered by their counterparts with the Moving-Time, where both are available:

Table 3. Difference in the frequency of the Moving-Time and the Moving-Ego metaphors in Hungarian

	Google
"közeledik a Karácsony" 'Christmas is approaching'	173
"közeledünk a Karácsonyhoz" 'We are approaching Christmas'	79
"Karácsony rohan" 'Christmas is rushing'	17
"rohannunk Karácsonyhoz" 'we are rushing towards Christmas'	0
"Húsvét jön" 'Easter is coming'	126
"Húsvéthez jövünk" 'We are coming to Easter'	0

Additional evidence that the Moving-Ego metaphor is less productive in Croatian than in English are the results of a small-scale investigation reported in Brdar & Brdar-Szabó (2017: 196f). In an informal translation task 20 MA students majoring in English at the University of Osijek (either 2nd or 3rd year), whose mother tongue is Croatian, were asked to provide a most natural sounding translation of the following text (our focus was on the adverbial clause of time in bold in the middle of the pasaage):

(24) *Loyal supporters of Nourish, Creaseys Chartered Accountants of Lonsdale Gardens, Tunbridge Wells recently supplemented their monthly donation with the thoughtful addition of Easter Eggs. As Assistant Client Manager Louise Tunstall explained: "**As we were approaching Easter** it occurred to us that many local families would not be able to afford Easter Eggs so we asked everyone here whether they would like to donate some kind of Easter treat as well as the usual food items. Everyone was really enthusiastic about the idea and we ended up with a really good collection.*
[http://www.nourishcommunityfoodbank.org.uk/docs/Nourish_Community_Foodbank_-_Apr_14.pdf, accessed on 1 February 2017]

The students, who had not been exposed to any cognitive linguistics course, were told that this task formed part of a wider research on translation practice. The majority of students, i.e. 16 out of 20, did not provide a translation that follows the original as closely as possible when it comes to the the clause with the Moving.Ego metaphor. They changed the role of the Croatian equivalent of Easter, *Uskrs*, in their translations, promoting it to the subject of the corresponding adverbial clause:

(25) *Kako se približava Uskrs, …*
'As Easter is approaching'

Only 4 students followed in their translations the original as closely as possible:

(26) *Kako smo se približavali Uskrsu….*
'As we were approaching Easter'

When another group of 10 students were asked to translate (24) back into English, none of the respondents provided the original, *As we were approaching Easter*, but only *As Easter is approaching/getting nearer*, etc.

This means that our translators exhibited an interesting pattern – although two variants are in theory available in both languages, offering the possibility of pairing them in a 1:1 way, they clearly preferred the variant in which time is moving metaphorically in both languages.

On the basis of these results, and with the background knowledge of relevant literature as well as the existing figurative repositories of English, one could get the impression that there is a grave difference between English on the one hand, and Croatian and Hungarian on the other, in this respect.

Although we have so far assumed that the two metaphors are statistically speaking on equal footing in English, this is not borne out by a Google query, as can be seen in Table 4 below. It is clear that there are differences here, too, but the proportions are different from what we find in Croatian and Hungarian.

Table 4. Differences in the frequency of some realizations of the Moving-Time and the Moving-Ego metaphors in English (as of December 2, 2018)

	Google
"as Christmas approaches"	344,000
"as we approach Christmas"	43,200
"Christmas is coming"	25,400,000
"we are coming up to Christmas"	108,000

We shall return to these two time metaphors in 3.6 below. For the moment, let us just state that we have demonstrated some obvious cross-linguistic differences that require our attention. Needless to say, this analysis is on purpose left sketchy and incomplete (cf. Brdar & Brdar-Szabó 2017 elaborates the situation in a wider context and provides some suggestions as to how it is motivated, chiefly by linking the observed distribution to some other metaphor-related phenomena, specifically the availability of the fictive motion constructions), but it serves a methodological purpose here, which is to demonstrate a challenge posed to metaphor repositories

and underlying ontologies. They should be flexible enough to accommodate as much data as possible (including visual metaphors and metaphors cropping up in sign languages and gestures), but also to show differences in their complexity and circumstances of their use (including frequency, as well as cultural and structural constraints).

3. Towards a larger picture

What these case studies demonstrate is that conceptual metaphors cannot be always neatly assigned to particular levels in a hierarchical system, and that given clusters or families of conceptual metaphors cannot always be easily separated from each other. What is more, a given conceptual metaphor or metonymy may be absent, or nominally present in a given system but have a different status, i.e. be more or less well entrenched and interconnected with other metaphors or metonymies. In a cross-linguistic perspective, languages can be compared with respect to their metaphor use only if we bear in mind all the time a larger picture, i.e. if we are aware of the hierarchical status of the metaphors in question in the figurative system of a given language. How we arrive at this system is one of the central questions in cross-linguistic comparison of figurative language use, but also in constructing a metaphor repository of any language (if it is to be working and comparable with other such repositories). In practice, the metaphorical system of English has been often used as such a near-universal *tertium comparationis* in spite of the fact that it is very likely that it is not optimally elaborated in all areas. It is of course possible to conflate two or more (or any number of) such networks, English being one of them, in the hope that the end result would be a sort of language-independent or universal hierarchically organized inventory of conceptual metaphors.

One of the problems with this is, as shown by the two case studies above, that adding a single metaphor, let alone a whole metaphorical network of a language, may significantly change the whole "universal" organization and call for substantial revisions in the sense that equivalence links across languages may be in need of constant rewriting due to the fact that another intermediate level of specificity may appear in the hierarchy. A system with a subsystem of, say, metaphors for X exhibiting two hierarchical levels of specificity is not commensurable as such with a subsystem in another language that exhibits only one level, they need to be brought into correspondence in terms of hierarchical levels. Another problem may be that "vertical" links between certain metaphors and more basic (primary) metaphors underlying or motivating the former may appear in one or more languages, but be lacking, i.e. not evident in other languages. More or less the same sort of problems may arise due to the introduction of a novel metaphor in a language.

A further difficulty is that metaphors resist an approach that would treat them as compact objects that can be assigned a single position in the hierarchical network. It is true that they are typically grouped around the target domain when discussed or presented, as if they were members within a category, because some happen to share the same source domain, but they are conceptually complex relational objects, involving two domains. So to say, they are "here and there, or between here and there" in a network, and the target domains need not be at the same hierarchical level, as amply shown by the first case study.

This seems to indicate that a system serving as a *tertium comparationis* (TC) for the alignment of repositories cannot be exclusively based on a simple conflation of the existing, more or less exhaustively described metaphorical systems. The system that might function as a TC, or a universal repository, is only viable if it is based on some sort of ontological system, serving as an axis along which actually attested metaphor systems can be decompressed and arranged into levels, occupying certain portions of metaphorical space.

3.1 An ontology model of lexical concepts and constructions

As a tertium comparationis (TC) for the analysis of metaphors we propose an *Ontology Model of Lexical Concepts and Constructions* (henceforth abbreviated as OMLCC). The OMLCC models the knowledge derived from lexical concepts and constructions according to the meta-theory of emergent ontological relations in the world. The epistemology of this meta-description of lexical concepts and their relations assumes that lexical concepts refer to the perceived, experienced and conceptualized things in the material, psychological and social domain. For instance, the lexeme *water* refers to the material chemical substance that is the main constituent of rivers, lakes, and oceans, and of the fluids of most living organisms, prototypically perceived by humans as a transparent liquid.[3] On the other hand, the lexeme *happines* refers to the positive psychological state that can be only subjectively experienced (National Research Council 2014). Furthermore, the lexeme *Christmas* refers to the conventionalized and socially agreed set of social identities, ritual interactions, traditional narratives, political institutions and historical cultural models. It is obvious that each of these lexemes refers to a particular domain with different ontological properties and implicit relations.

The question we need to address at this point is: can we sort those properties in a hierarchical manner? If yes, what would be the most appropriate scientific meta-theory behind such an endeavour? The ontological description in the

3. https://en.wikipedia.org/wiki/Water (visited on 1.3.2017).

OMLCC is based on the Complex dynamics system theory (Licata & Sakaji 2008, Clayton, 2006; Larsen-Freeman & Cameron 2008), while its hierarchical structure is organized in terms of the Emergence principle (Bar-Yam, 1997; Emmeche et al., 1997; Perak & D'Alessio, 2013).

The main characteristic of the Complex system theory is that entities emerge as self-organized systems of multiple interrelated components forming networks with varying levels of 'dynamic stability' and emerging properties. The OMLCC seeks to capture this organization as formalized conceptual knowledge about the entities, properties and their relations in the world and (super-) impose a lexical and constructional layer of language specific knowledge upon it.

The ontology of embodied conceptual knowledge is formally organized as a set of entities with properties that are interlinked by its relations (interactions) and their properties (Figure 1):

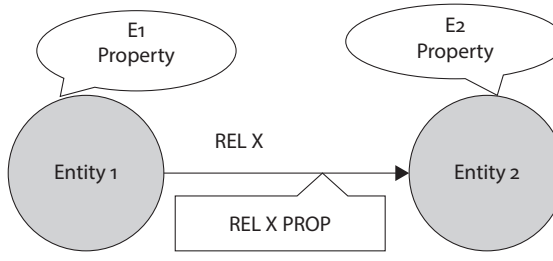

Figure 1. Basic conceptual structure of reality consisting of the (a) entities, (b) properties, (c) relation between entities and (d) properties of relation.

This structure with nodes (E) and their properties {E property}, as well as relations between nodes [REL] and their properties {REL property} can be instantiated in a statement about the world, such as: (ENTITY1: *Marco*{PROPERTY: *little*}) – [REL X: *kicks*{REL X PROP: *violently*}] -> (ENTITY2: *rock*{PROPERTY: *small*}). The ontological relations can be represented in knowledge representation formats such as semantic web or property graph models (Guarino, 1998; Van Harmelen et al. 2008; Arp et al. 2015; Robinson et al. 2015; Yadav et al. 2016). Following the Cypher graph property notation,[4] the entities in OMLCC are classified as nodes inside brackets () with label :Concept, while the additional information is stored inside braces {} in the key: 'value' manner as properties of the node. The relations are labelled inside square brackets [ ], and the information about properties of the relation is stored inside braces in the key: 'value'.

4. The notation follows the Cypher graph property modelling and query language developed for the Neo4j graph property database: https://neo4j.com/developer/cypher-query-language/.

On the level of lexical representation of conceptual knowledge, every entity, property and relation is coded in terms of lexical concepts. The lexical concepts specify a part of the conceptual structure and create a symbolic form-meaning pairing. The linguistic structure of symbolic coding creates new type of form-to-form, or word-to-word relations.

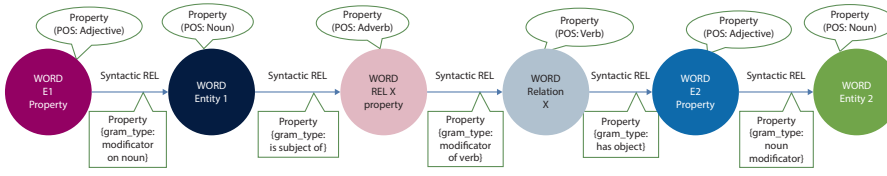

Figure 2. Schematic representation of lexical concepts referring to the embodied knowledge about entities, properties and relations in ontological reality. This is a representation of the graph property notation schema

(:Word{name:little, POS:adjective}) – [:SyntacticRelation{gram_type:modificator}]->(:Word{name:Marco, POS:noun}) – [:SyntacticRelation{gram_type:is_subject_of}]->(:Word{name:kicks, POS:verb}) – [:SyntacticRelation{gram_type:is_modified_by}] -> (:Word{name:violently, POS:adverb}) – [:SyntacticRelation{gram_type:hasObject}] -> (:Word{name:ball, POS:noun}) – [:SyntacticRelation{gram_type:is_modified_by}]->(:Word{name:small, POS:adjective})

The emergent ontological reality of the lexical level is created by symbolic coding of conceptualized entities, properties and relations into nodes (Figure 2). The lexemes referring to entities are typically coded as nouns, their properties are coded as adjectives; verbs refer to the ontological relation between entities, and adjectives refer to their ontological relation properties. This word-to-word structure produces patterns of syntactic relations and their semantic properties. For instance, each lexeme in a string of words '*Marco*, '*kicks*, '*ball*' activates some knowledge related to the latent activation of the embodied knowledge. The knowledge of the lexeme is dependent of the prototypical affordances: what can you the thing do, what can you do with the thing, what is it like, or: who is typical subject/object of the process, etc. Syntactic relations between lexemes highlight some of their properties and construe the relations between concepts. The linguistic creativity emerges not so much from the possibility to name and refer conceptual elements of the reality as much from the symbolic possibility to construe congruent or incongruent relations between these conceptual elements.

The capability to create new types of perspectivization and conceptualizations of existing ontological relations is essential for the creation of the conceptual metaphor and figurative language at large. For instance, a word-to-word structure like

Christmas is arriving construes ontologically incongruent mental simulation of a moving social entity. The ontological fact that *Christmas* is not a typical MOVER, does not render this construal impossible to conceptualize, or less ungrammatical, or even pragmatically deviant. On the contrary, this ontological incongruence, a fictional departure from the contingent constraints of the world, we argue, is the core creative feature of the figurative language that a metaphor repository should capture and structurally represent.

3.2 Emergent hierarchy of concepts

The main idea of the OMLCC structure is that lexical concepts (form-meaning pairings) and constructions (pairings of form-meaning pairings) refer to the entities or concepts that vary in their concreteness and complexity. The concreteness and complexity of the entities is hierarchically ordered as a function of emergence. The entities are connected with in-class and mereological relations (Winston et al. 1987; Varzi 2014). The constituent entities $X_{1...n}$ and emergent entity Y are connected via merological relations that could be fundamentally (but not extensively) expressed: $X_{1...n}$ isPartOf Y and Y hasParts $X_{1...n}$. The emergent entity Y is a relatively stable construction of some parts $X_{1...n}$ and has novel properties Y{Py} not observed on the level of the constituents $X\{Px\}_{1...n}$. The OMLCC is thus organized as a hierarchical system starting with the ontologically more basic entities giving rise to the more complex, emergent, entities, properties and processes.

3.3 The structure of the emergent ontology model

Based on distinct epistemic and ontological features (Searle 2008), the OMLCC has four major distinctive superclasses (see Table 5).

Table 5. Major ontological superclasses

Superclass	Property		Lexical concept
(0) Existence			
(1) Material	ONT: OBJ	EPIST : OBJ	*water, gravity, wood,*
(2) Psychological	ONT: SUBJ	EPIST: SUBJ	*perception, feeling*
(3) Socio-cultural	ONT: OBJ	EPIST: SUBJ	*celebrating, Christmas, religion*

The existence superclass is logically presupposed to all other classes, although it can experientially be verified only through inferential process. The next superdomain, matter, consists of sub-domains referencing distinctly ontologically and epistemologically objective things, such as atoms, complex objects, mechanical forces, thermodynamic processes, biological entities, etc. These are mostly

Table 6. Structure of 16 emergent classes in the Ontological Model of Lexical Concepts

Class	Structure
01. Existence	A (Entity) exists
02. Emergence	A (Form) becomes B (Transformation)
03. MaterialStructure	A (Part) 1…n isPartOf B (Whole), B (Whole) hasParts A1…n (Part); MeronymicRelation: {stuff – object, component—(complex) object, member – collection}
04. Spatial	A(Figure) is_in_spatial_relation_to B(Ground); MeronymicRelation: {place – area}
05. Force	A(Force Structure) influences (by mechanical / liquid / thermodynamic force) B (Patient); MeronymicRelation: {portion – mass}
06. Motion	A (Mover) moves propelled by (Force) (on) B (Path/Patient 03-04) with (Instrument/ Vehicle 03); MeronymicRelation: {mover – path}
07. SequenceActivity	A (SequenceActivity Entity) has sequence (3–6); MeronymicRelation: {feature – event}
08. InformationSystem	A (InformationSystem Animate) {self-sustaining structure, organism} acts/reacts (to) B (Environment 1–8)
09. Perception	A (Perceiver 8–11) perceives 9 (with_instrument_of_perception 8) B(object of perception 1–8)
10. Affect	A (Experiencer 8–14) experiences (with_organs_of_affect_experience 8) B (experience / quality / affect state / emotion 10)
11. Cognition	A (Cogitor 8–14) remembers, reasons, thinks 11 B (Mental_Representation / Categorization / Cognitive Appraisal 11)
12. SocIdentity	A (Person 8–14) identifies as B (Social Identity 12)
13. SocBehaviourInteraction	A (Person.Agent 8–14) behaves, performs B (Social interaction/ritual 13) with (Instruments_of_action)
14. SocCommunication	A (Person.Agent.Communicator 8–14) communicates with B (Reciever 8–14) about C (theme 1–14) on D (conventionalized code)
15. SocCulturalInstitution	A (SocCulturalInstitution) is set of conventionalized (B Convention) and institutionalized (C institution) norms (D norms) expressed in communication, interaction, behaviour and identity, maintained by the socially distributed institutional power (E social power), mandated by some cultural model of representation
16. CulturalModel	A (Cultural Model) is a set of values connected with material structures, experience, social events and rituals, narration, belief systems, individual and social values, institutions shared by agents/members of the Social community in some locality (Locality B) and in some historical span (Historic span C)

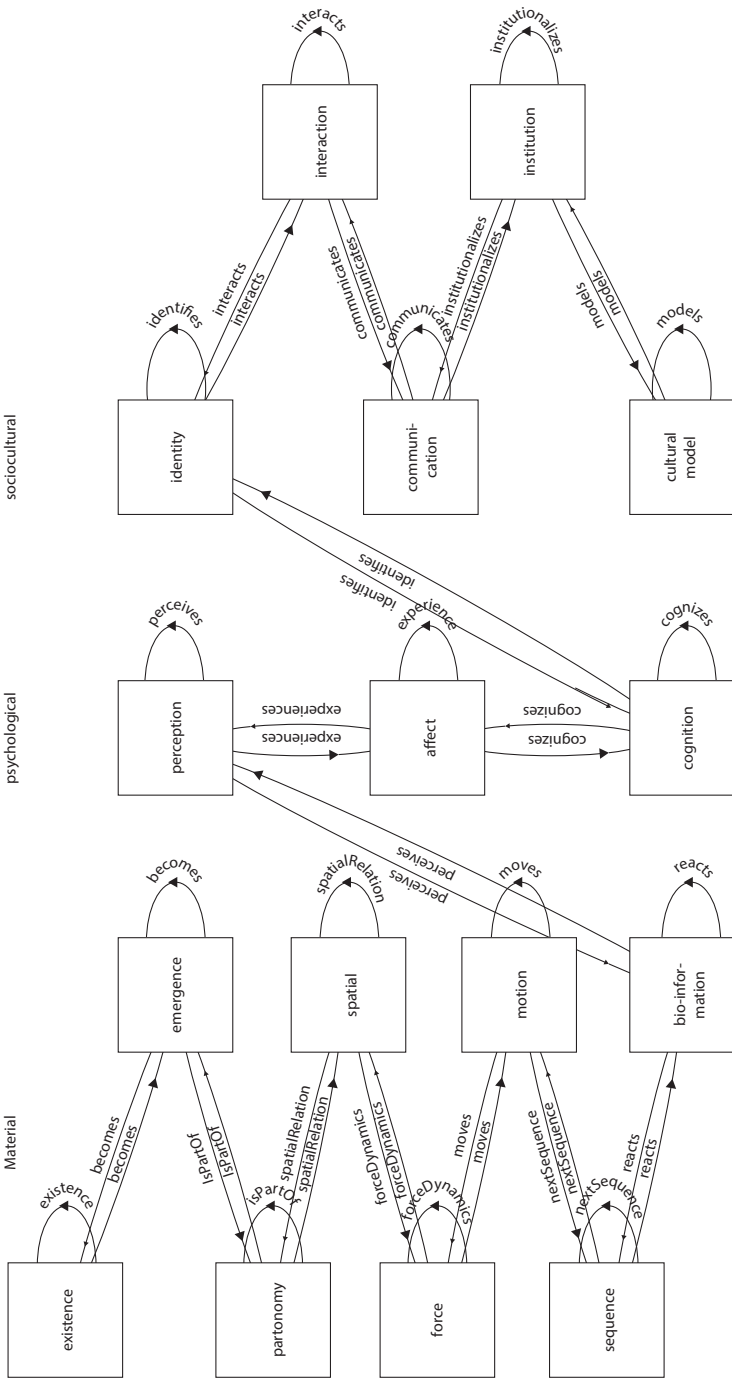

Figure 3. Schematic bottom up and top down interaction between classes in the OMLCC

the phenomena described by the empirically oriented natural sciences, but also objects that are created by natural evolution of those phenomena or objects produced by human manipulation of matter. Between these subdomains there is also a hierarchical organization. The next psychological superdomain emerges from the distinctive organization of the matter (biological processes) within an (living) systems providing it with ontologically and epistemologically subjective qualities of perception, affective states, and cognitive appraisals. These domains reference categories of perception, experience, interpretation and comprehension giving rise to the socio-cultural superdomains.

Socio-cultural entities emerge from the individual's material interaction with its environment and sociocultural representation of its psychological experiences. These are dynamical and highly complex relations relying on the ontologically objective but epistemologically subjective interaction and communication strategies that form the basis of social identities, collective consensus, conventions and cultural models. In the further process of classification, classes are schematically subclassified according to 16 emergent classes (see Table 6).

The important feature of the emergence is the notion of bottom-up, self-referral and top-down causal relations between the members of the classes in the model (see Figure 3).

3.4 Classifying concepts and creating mereological relations in OMLCC

The process of ontological modelling requires classification of entities, properties and processes according to their emergent ontological and epistemic status, as well as their prototypic property and relational restrictions. The schematic classification of entities establishes (prototypical) categorical relations: ENTITY X is a Material | Psychological | Socio-Cultural Concept. For instance, a schematic concept MOVER: is represented in the following manner:

(:Concept {name: 'mover', ontological_status: '06.Motion', description: 'An entity that moves along the path propelled by some force.'}).

The concepts are related by class and merological relations, forming an ontological network of concepts. For instance:

(:Concept{name: 'pusher', ontological_status: '06.Motion', description: 'An entity that uses force to push an object along the path.'}) – [:Is_type_of {source: 'ConceptNet, Open Multilingual WordNet'}]-> (:Concept{name: 'mover', ontological_status: '06.Motion', description: 'An entity that moves along the path propelled by some force.'})

The resources for developing ontological network of concepts can be modelled using schemas from various sources including semantic knowledge bases such

as: ConceptNet[5] (Speer & Havasi 2013), OpenCyc,[6] DBpedia,[7] Yago,[8] BabelNet,[9] Wikidata,[10] Wiktionary[11] and related tools of Semantic web,[12] as well as formal ontologies or more specific conceptual databases. The challenging part is to fit the various taxonomies and concepts that often overlap in a unifying complex system approach. This overlapping problem has already generated various frameworks such as Ontology mapping service that assist in mapping between different but related ontologies. Part of the solution is to retain the meta-data about the resources and accommodate for the differences in relations by description of the ontological model they represent, as is the case with ConceptNet database.

3.5 Modelling lexical concepts and words

The lexical concepts of a language are thought as symbolic entities with formal structure and conceptual content. The formal structure is expressed as a language specific canonical form of a word (lemma), while the conceptual content is defined with regards to the reference to the underlying conceptual network. The lexical concepts are therefore modelled as nodes with label (:Lemma) and language specific properties {language:", POS:", …} that have referential relations [:Refers_to] to an entity or a concept in the ontological network.

(:Lemma{name: 'mover', language: 'English', POS: 'noun', ontological_class: '06. Motion', description: 'An entity that moves along the path propelled by some force.'}) – [:Refers_To{type_of_relation: 'semantic'}]-> (:Concept{name: 'mover', ontological_class: '06.Motion', description: 'An entity that moves along the path propelled by some force.'})

The words in a language are modelled as expression of lemmas with different morphosyntactic properties that can also be further described in relation to the conceptual structure (see Figure 4):

5. http://conceptnet.io/.

6. http://www.opencyc.org/.

7. http://wiki.dbpedia.org/.

8. http://www.mpi-inf.mpg.de/departments/databases-and-information-systems/research/yago-naga/yago/.

9. http://babelnet.org/

10. https://www.wikidata.org/wiki/Wikidata:Main_Page

11. https://www.wiktionary.org/

12. https://en.wikipedia.org/wiki/Semantic_Web.

(:Word{name: 'movers', language: 'English' POS: 'noun', gramaticalNumber: 'Plural', description: 'Multitude of entities that move along the path propelled by some force.'}) – [:IS_lexical_expression_of] –> (:Lemma{name: 'mover', language: 'English', POS: 'noun', description:' An entity that moves along the path propelled by some force.'})

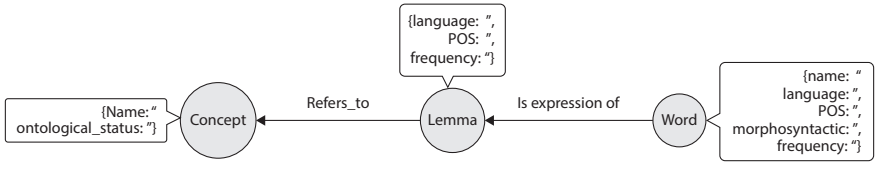

Figure 4. Concept – Lemma – Word schema of OMLCC

3.6 Identifying metaphorical constructions

The identification of the metaphor in the OMLCC approach is formalized as a violation of or an incongruence between the ontological properties construed by the lexicogrammatic constituents within a construction. This in itself is not a new idea (Halliday 1985). The innovativeness of the approach is the attempt to conceptually represent the ontological structure of the world and to use it as a *tertium comparationis* for the prototypical functional semantic comparison of syntactic constructions. This taxonomy provides an ontological model of human knowledge about material, psychological and social entities in a nonreductive approach while allowing for a continuous scientific upgrading of particular network domains.

The purpose of the OMLCC's Concept-Lemma-Word structure is to identify classes, formalize ontological relations between the lexicogrammatic constituents of the linguistic constructions and explain semantic and pragmatic implications. The lexicogrammatic semantic relations between dependant lexemes in a construction can: (a) be ontologically congruent, or (b) violate the mereological structure. The congruent type is an instance of a profiling that construes the representative meronymic or classifying perspective on an entity, property or relation from a rich network of affordable relations. On the other hand, the ontological violation is defined as a non-existent ontological relation conceptualized between (at least) two lexical units that are syntactically joined and grammatically dependent in the linguistic construction. This type of relation is representative of metaphoric mapping. The metaphoric relation (function) between two entities (concepts) A and B can thus be expressed:

A is not B, A has not elements of B, but process A and B together and map some elements of B with A.

The important premise is that entity A maps the properties of the entity B by activating mereological structure of the entity B: B hasParts C….n. This means that metaphorical mapping relies on the established meronymic relations to form metaphorical extensions and create new meanings from the existing ones.

The formalisation of concept – lemma – word – construction referential structure enables us to study the metaphor as a conceptual phenomenon activated by at least two lexemes referring to concepts (entities, properties or relations) construed as dependently related in a syntactical construction. In a methodological sense this defines lexemes in a dependent grammatical relations as minimal units of the linguistic analysis. Almost any lexeme can trigger a metaphorical mapping if it is construed in a syntactic construction that conceptualizes relation incongruent with its meronymic properties, as shown in the case of noun-modifier construction *Mercedes lungs* in (7) or a host of similar examples analysed in Brdar (2017) that violate the typical classification constructions like:

(27) *I'm proud of it because Gibson is* ***the Mercedes of guitars****. It's not just any brand; it's the most high-profile guitar manufacturer in the world.*

The central step in the analysis and construction of the OMLCC is, therefore, to assess congruence or violation of ontological relations among dependent lexical components in the usage. For instance, an implied conceptual assertion ROCK FALLS realised by the linguistic construction *The rock falls*, is assessed as an ontological congruence:

(:Word{name: 'rock', POS:noun, ontological_class:03.MaterialStructure}) – [:SyntacticRelation{gram_type: 'is_subject_of', ontologicalCongruence: 'congruence'}]-> (:Word{name: 'falls', POS: 'verb', gramaticalTense: 'Present', gramatical}).

While the assertion ROCK WALKS, realised by the linguistic construction *This rock walks*, would be assessed as an ontological violation:

(:Word{name: 'rock', POS:noun, ontological_class:03.MaterialStructure}) – [:SyntacticRelation{gram_type: 'is_subject_of', ontologicalCongruence: 'violation'}]-> (:Word{name: 'walks', POS: 'verb', gramaticalTense: 'Present', gramatical}).

It is therefore sound to start the analysis from the point of meronymic and in class networks and then proceed to capturing ontological metonymic extensions and metaphoric violations of restrictions.

This analytic methodology relies on the identification and formalization of restrictions in the argument structure of dependent relations and processes, consistent with the specific conceptual knowledge. Going back to the examples (11), *Božić* '*Christmas*' is labelled as a noun that refers to the concept classified as 13. SocialInteraction.SocialEvent.AnnualFestival that involves merological relations

to 14. Communication.Texts.NewTestament, 15. SocioInstitutional.Religion. Christianity, 15. SocioInstitutional.State. State_hollidays, 12. SocialIdentity.ReligiousIdentity.Christian, among others. This means that social-cultural interaction named *Christmas* requires social interaction of human interactors identified as members of a Christian social group, motivated by cognitive appraisal of symbolically constructed socio-cultural model Christianity that promotes certain psychological values. However, *Christmas* is not a moving object of a 06. Motion class, required by the argument structure of the verb *approach*. The lexical expression (example 8) *Christmas is approaching*, as well as its Croatian equivalent expression *Božić se približava*, violates ontological relations defined by prototypical arguments of the verb *to approach*, as well as Croatian correspondent *približavati se*. The same is true for the Moving-ego type construction (13) *We are approaching Christmas*, because *Christmas* is not an (static) object that some moving interactor can approach. Depending on the type of the construction, the ontological violations trigger the metaphoric mappings from typical subject and object arguments of the verb *to approach* onto lexical concept *Christmas*. The sequences of material movement, psychological perceptions, feelings recognitions of identity and social interactions called *Christmas* are conceptualized in terms of advancing towards a distant object. The TIME is conceptualized in terms of SPATIAL DISTANCE metonymically profiling the meronymic relations: MOVING ON A PATH STANDS FOR SEQUENCE OF MOMENTS and SEQUENCE OF MOMENTS STANDS FOR TIME. The mappings are grounded in the human cognitive appraisal (11. Cognition.Pyschological_time) of the experience (10. Affect) and perception (9. Perception), performed by a biological organism (08. InformationSystem) of a particular sequential motion (07. Sequence.Moving_sequence).

From the point of emergent ontological hierarchy, this type of formal analysis of syntactic dependencies can capture deeper layers of semantic restrictions and their pragmatic implications. For instance, the verb *dolaziti* 'to come', as noted in the example (20) *Praznici dolaze* 'Holidays are coming', is not productive and frequent in the Moving-ego construal type: **Dolazimo praznicima* 'We are coming to the holidays'. This conceptual restriction is related to the semantic structure of the verb *doći* 'to come' that profiles a MOTION EVENT with a subject argument a MOVER that intentionally arrives at some PHYSICAL PLACE. The conceptual profile of the verb *doći* 'to come', however, structures some other restrictions: 'the intentionality of movement infers an effort by the mover and subsequent appreciation of the movement by another person with psychological states, expecting the mover'. The social (interaction) entities such as *holidays*, or *Christmas*, are unlikely to be conceptualized neither as some (a) 06. Motion PHYSICAL PLACE (OF ARRIVAL) nor (b) as 12. SocIdentity PERSON EXPECTING SOMEONE ELSE. The first conceptualization is ontologically too reductive, and the second one is an over-personification. This ontological restriction is implicit in the reasoning and low usage productivity of

the (18–19b) construction. On the other hand, the verb *približavati se* 'to approach' seems to require ontologically simpler moving entities that can be meronymically related to the 06.Motion.AdlativeMovement class that allows for a freely interchangeable arguments for conceptualizing Moving-Time (8–12) and Moving-Ego (13–17) perspectives.

The same type of ontological analysis can be performed on any dependant grammatical lexical units. The OMLCC bottom up approach to the schematization of metaphoric conceptualization would therefore capture more realistically the comparative cross-linguistic metaphoric variations, with much richer description of the processes that occur on a conceptual, lexical or constructional level of synchronic or diachronic comparison of metaphoric systems.

What is more, OMLCC could be used in tandem with the indirect two-step procedure for the identification of metaphorical expressions described in Brdar et al. (in press), in which we demonstrate that it is possible to turn our back to figurative "wheat" at the beginning of the process and attend to non-figurative "weeds" first, identifying and subsequently eliminating non-figuratively used expressions from further consideration. Testing the validity and soundness of this procedure in several small-scale case studies involving English and Croatian material, varying in terms of the amount of data from "big data" to fairly limited samples, we were able to achieve a surprisingly high success rate while making use of considerably leaner tools in identifying metaphorical expressions. Combining this procedure with the one described in the present chapter bears promise of an even higher degree of reliability.

4. Conclusion

In this chapter, we were concerned with some risks and challenges we face when constructing repositories of figurative language and with how insights gained in the course of contrastive research, exemplified here with two brief studies, as well as their integration with an ontological system can facilitate the work on such a repository. Such a combination of cross-linguistic comparisons and an ontological system in the background can, if not completely eliminate, then at least alleviate certain risks and challenges.

We first turned to the problem of adequate granularity of a repository, our starting research question, and demonstrated the usefulness of a contrastive perspective in the first case study in Part 2. Studying the system of conceptual metaphors used in the discourse on organ transplantation we have uncovered differences in the hierarchical architecture of metaphorical systems in various languages in the sense that nominally the same conceptual metaphors and their lexicalization may be shared but actually need not match in terms of the reference

or the granularity of the mapped conceptual domains. Some languages may lack reference to certain hierarchical levels in their systems, or articulate a particular level slightly differently, e.g. in a more specific way.

Such a state of non-universal granularity logically gives rise to our second research question about the scope of such a repository, i.e. should it limit itself to the coverage of just the set of conceptual metaphors and metonymies actually attested in a given language, or be broader. A repository capable of taking into consideration granularity gaps such as those uncovered in our first case study is preferable because: i. it is better suited to accommodate any changes in the system that might occur at a later stage, and ii. it is much easier to combine with comparable projects in the case of future work on a multilingual repository because of its cross-linguistic comparability.

In relation to the third research question regarding variable footprint of individual conceptual metaphors and metonymies and their lexicalizations in a given language, our second case study, on time metaphors, indicates that frequencies should be paid due attention. Repositories should take care not only of the hierarchical depth of the system, but also of the variable degree of the entrenchment of individual conceptual metaphors and metonymies, i.e. the conventionalization width, in order to help them avoid presenting a quantitatively skewed picture and to make them qualitatively fit for the inclusion within a larger multilingual repository.

While a cross-linguistic comparison can detect such mismatches, the underlying ontology, thanks to its network of relations, also has the potential of pointing to such misalignments. Their true depth can be checked by means of an ontology model in order to adapt the structure of the repository so as to make it aligned with other repositories within a multilingual framework.

On the basis of the observations in these case studies, we formulate some expectations of such a repository and present the architecture of Ontological Model of Concepts and Construction (OMLCC). Rather than just schematically linking metaphoric domains, the OMLCC seeks to capture the ontological and emergent conceptual organization as the embodied human knowledge about the entities, properties and their relations in the world, and (super)impose a referential lexical and constructional layer of language specific knowledge upon it. The OMLCC serves to classify and hierarchical organize the lexical concepts, while ontological networks map the mereological (paradigmatic and syntagmatic) relations established by the embodied knowledge about the world. Identification of the metaphorical extensions in various types of linguistic constructions and across languages is defined as violation of the ontological relations. OMLCC can be used to formalize complex system relations construed by syntactic-semantic constructions in multilayer type of networks enabling understanding of figurative language and distinctiveness in (cross)/language/cultural conceptualization.

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References

Arp, R., Smith, B., & Spear, A. D. (2015). *Building ontologies with basic formal ontology*. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/9780262527811.001.0001

Bar-Yam, Y. (1997). *Dynamics of complex systems* (Vol. 213). Reading, MA: Addison-Wesley.

Brdar, M. (2017). Intensification and metonymy in some XYZ constructions: From the Bible to Einstein. *LaMiCus – Language, Mind, Culture and Society*, 1, 110–134.

Brdar, M., & Brdar-Szabó, R. (2017). Moving-time and moving-ego metaphors from a translational and contrastive-linguistic perspective. *Research in Language*, 15(2), 191–212. https://doi.org/10.1515/rela-2017-0012

Brdar, M., Brdar-Szabó, R. & Perak, B. (in press). Separating (non-)figurative weeds from wheat. In A. Baicchi (Ed.), *Figurative thought and language*. Amsterdam: John Benjamins Publishing Company.

Clark, H. H. (1973). Space, time, semantics and the child. In T. E. Moore (Ed.), *Cognitive development and the acquisition of language* (pp. 27–64). New York: Academic Press. https://doi.org/10.1016/B978-0-12-505850-6.50008-6

Clayton, P. (2006). Conceptual foundations of emergence theory. In P. Clayton & P. Davies (Eds.), *The re-emergence of emergence: The emergentist hypothesis from science to religion* (pp. 1–30). Oxford: Oxford University Press.

Emmeche, C., Køppe, S., & Stjernfelt, F. (1997). Explaining emergence: Towards an ontology of levels. *Journal for General Philosophy of Science*, 28(1), 83–117. https://doi.org/10.1023/A:1008216127933

Evans, V. (2003). *The structure of time: Language, meaning and temporal cognition*. Amsterdam: John Benjamins Publishing Company.

Gentner, D. (2001). Spatial metaphors in temporal reasoning. In M. Gattis (Ed.), *Spatial schemas and abstract thought* (pp. 203–222). Cambridge, MA: MIT Press.

Grady, J. (1997a). theories are buildings revisited. *Cognitive Linguistics*, 4, 267–290. https://doi.org/10.1515/cogl.1997.8.4.267

Grady, J. (1997b). *Foundations of meaning: Primary metaphors and primary scenes*. Ph.D Dissertation. Berkeley, Dept. of Linguistics, U.C.

Guarino, N. (1998). Formal ontology and information systems. In N. Guarino (Ed.), *Formal ontology in information systems: Proceedings of the first international conference (FOIS'98), June 6–8, Trento, Italy* (Vol. 46, pp. 3). IOS Press.

Halliday, M. A. K. (1985). *An introduction to functional grammar*. London: Arnold.

Kövecses, Z. (2005). *Metaphor in culture. Universality and variation*. Cambridge: Cambridge University Press.

Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 202–251). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139173865.013

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: The University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenges to western thought*. Chicago: The University of Chicago Press.

Larsen-Freeman, D., & Cameron, L. (2008). *Complex systems and applied linguistics*. Oxford: Oxford University Press.

Licata, I., & Sakaji, A. (Eds.). (2008). *Physics of emergence and organization*. Singapore: World Scientific.

Ljubešić, N., & Klubička, F. (2014). {bs,hr,sr}WaC – web corpora of Bosnian, Croatian and Serbian. In F. Bildhauer & R. Schäfer (Eds.), *Proceedings of the 9th Web as Corpus Workshop (WaC-9)* (pp. 29–35). Stroudsburg: Association for Computational Linguistics.

Moore, K. E. (2013). Frames and the experiential basis of the moving time metaphor. In M. Fried, & K. Nikiforidou (Eds.) *Advances in frame semantics* (pp. 85–108). Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/bct.58.03moo

Moore, K. E. (2014). *The spatial language of time: Metaphor, metonymy, and frames of reference*. Amsterdam: John Benjamins Publishing Company. https://doi.org/10.1075/hcp.42

National Research Council. (2014). *Subjective well-being: Measuring happiness, suffering, and other dimensions of experience*. National Academies Press.

Núñez, R. E., & Sweetser, E. (2006). With the future behind them: Convergent evidence from Aymara language and gesture in the crosslinguistic comparison of spatial construals of time. *Cognitive Science*, 30(3), 401–450. https://doi.org/10.1207/s15516709cog0000_62

Perak, B., & D'Alessio, S. P. (2013). Culture as an emergent property of the embodied cognition. In S. Puljar D'Alessio, & N. Fanuko (Eds.) *Avanture kulture: kulturalni studiji u lokalnom kontekstu*. Zagreb: Jesenski i Turk.

Robinson, I., Webber, J., & Eifrem, E. (2015). *Graph databases: new opportunities for connected data*. Sebastopol: O'Reilly Media, Inc.

Schweda, M., & Schicktanz, S. (2009). The "spare parts person"? Conceptions of the human body and their implications for public attitudes towards organ donation and organ sale. *Philosophy, Ethics, and Humanities in Medicine*, 4(4). https://doi.org/10.1186/1747-5341-4-4

Searle, J. (2008). Language and social ontology. *Theory and Society*, 7, 443–459.

Shimazono, Y. (2013). Accommodating a "foreign" organ inside the body: Post-transplant bodily experiences of Filipino kidney recipients. *Ars Vivendi Journal*, 3, 24–50.

Speer, R., & Havasi, C. (2013). ConceptNet 5: A large semantic network for relational knowledge. In I. Gurevych, & J. Kim (Eds), *The people's web meets NLP* (pp. 161–176). Berlin: Springer. https://doi.org/10.1007/978-3-642-35085-6_6

Traugott, E. C. (1978). On the expression of spatio-temporal relations in language. In J. H. Greenberg, C. A. Ferguson, & E. A. Moravcsik (Eds.), *Universals of human language* (vol. 3, pp. 369–400). Stanford: Stanford University Press.

Van Harmelen, F., Lifschitz, V., & Porter, B. (Eds.). (2008). *Handbook of knowledge representation* (Vol. 1). Elsevier.

Varzi, A. C. (2014). Mereology. *Stanford Encyclopedia of Philosophy*. https://plato.stanford.edu/entries/mereology/.

Winston, M. E., Chaffin, R., & Herrmann, D. (1987). A taxonomy of part–whole relations. *Cognitive Science*, 11(4), 417–444. https://doi.org/10.1207/s15516709cog1104_2

Yadav, U., Narula, G. S., Duhan, N., Jain, V., & Murthy, B. K. (2016). Development and visualization of domain specific ontology using Protege. *Indian Journal of Science and Technology*, 9(16). https://doi.org/10.17485/ijst/2016/v9i16/88524

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Metonymy and metaphor index

Author index

Subject index

This book describes methods, risks, and challenges involved in the construction of metaphor and metonymy digital repositories. The first part of this volume showcases established and new projects around the world in which metaphors and metonymies are harvested and classified. The second part provides a series of cognitive linguistic studies focused on highlighting and discussing theoretical and methodological risks and challenges involved in building these digital resources. The volume is a result of an interdisciplinary collaboration between cognitive linguists, psychologists, and computational scientists supporting an overarching idea that metaphor and metonymy play a central role in human cognition, and that they are deeply entrenched in recurring patterns of bodily experience. Throughout the volume, a variety of methods are proposed to collect and analyze both conceptual metaphors and metonymies and their linguistic and visual expressions.

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