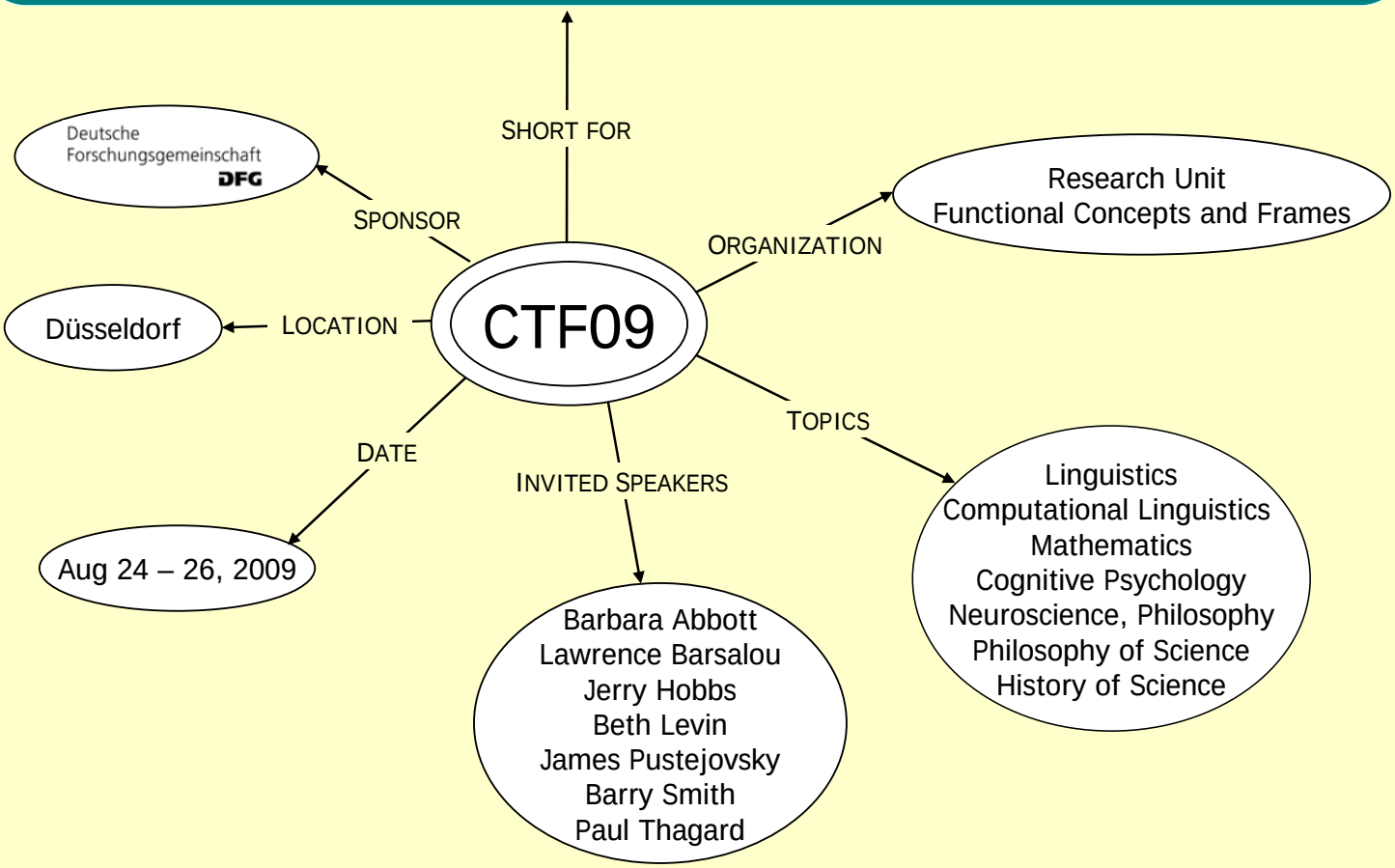
# Concept Types and Frames in Language, Cognition and Science




# Program & Abstracts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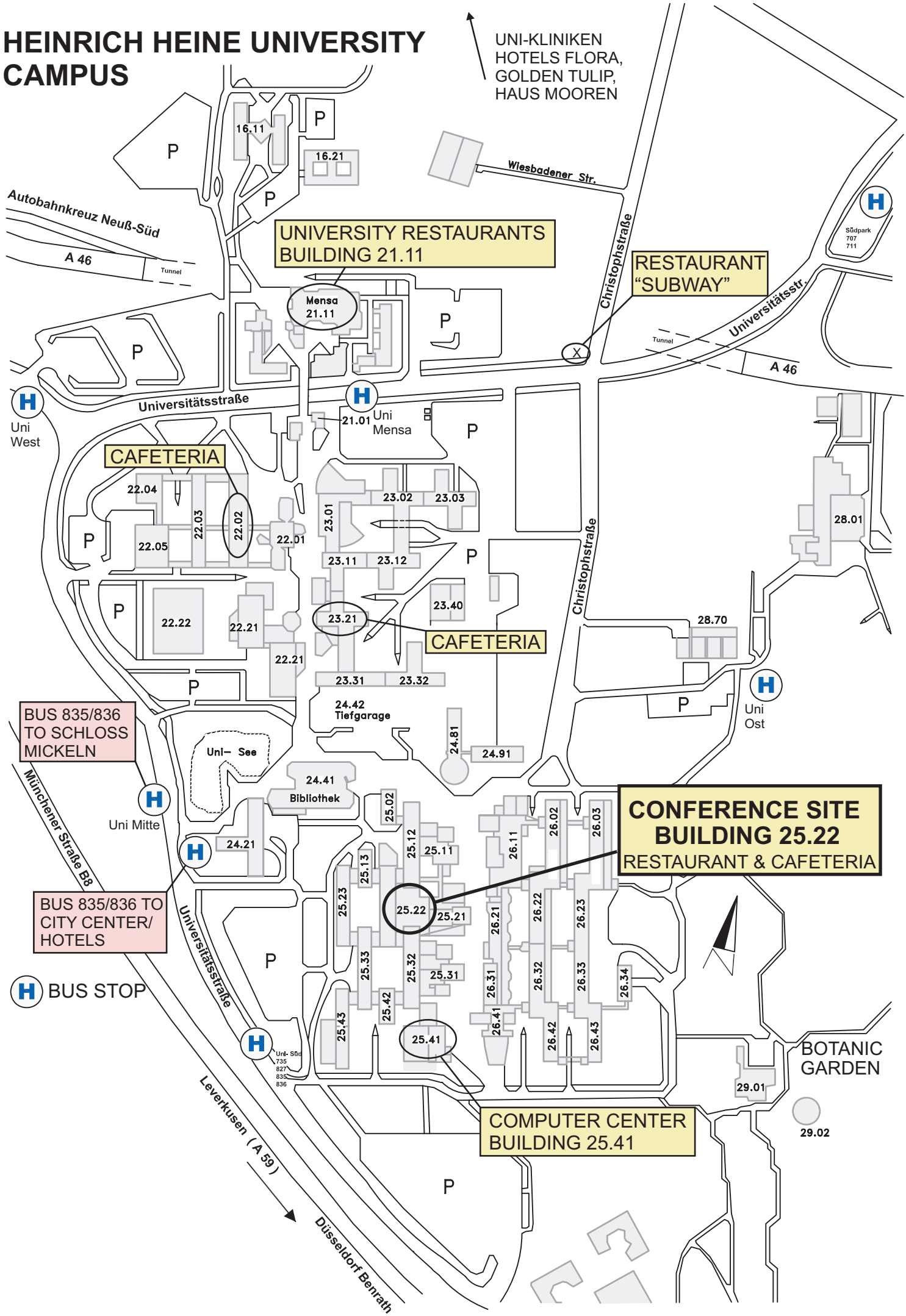
Wiebke Petersen
Tim Riebe

# HEINRICH HEINE UNIVERSITY CAMPUS



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# Welcome

Welcome to the 2009 international conference on **Concept Types and Frames** at Düsseldorf, and welcome to the city of Düsseldorf and its university. The interdisciplinary conference is organized by the Research Unit FOR 600 "Functional Concepts and Frames", a collaboration of nine research projects financed by the German Science Foundation (Deutsche Forschungsgemeinschaft, DFG), and it is the second such conference after CTF07.

FOR 600 investigates the significance of distinguishing different types of concepts, in particular functional concepts as opposed to other types. Functional concepts constitute a remarkable linguistic type, both in terms of grammar and semantics. Their inherent relationality in combination with inherent referential uniqueness gives rise to highly specific grammatical characteristics that relate this type of nouns to the grammar of possession and definiteness. Semantically, functional nouns comprise expressions for unique relations, constitutive parts and attributes of all sorts. This property connects functional concepts to Barsalou frames and similar structures: functional concepts represent the type of concepts that figure as attributes in frames. Given the fundamental role frames play in cognition, science, philosophy and knowledge organization, the focus on functional concepts opens a linguistic perspective on these disciplines, and, vice versa, a philosophical and cognitive perspective on language.

The present research unit includes projects from general linguistics, computer linguistics, mathematics, neuroscience, philosophy and medical history. We hope to be able to extend this group into a Collaborative Research Centre (Sonderforschungsbereich) on "Structures of Representations in Language, Cognition and Science" to be started in 2011. This step would open up the perspective of including substantially more projects and extending the research over a period of up to twelve years. If we succeed, there will be a series of biennial conferences on this topic at Düsseldorf.

We would like to thank the invited speakers and all the other participants who contribute to what I expect to be another interesting and exciting conference, as inspiring as the one we had in 2007. May this be the beginning of long-lasting cooperation and mutual inspiration.

In the name of all participants, I would like to thank the organizing team, Thomas Gamerschlag, Doris Gerland, Anna Grabowski, Rainer Osswald, Wiebke Petersen and Tim Riebe, as well as all the others that have been, and will be, taking care of those hundreds of things necessary for turning such a meeting into a pleasant and successful event.

Sebastian Löbner
Speaker of the Research Unit

# General Information

**Conference Site**

Location: Universität Düsseldorf campus, building 25.22, lecture halls 5D-5H

**Conference Office**

Opening hours: Monday to Wednesday: 8:00-19:00 h
Location: building 25.22
Phone: +49 211 81-10623

**Conference website**

http://www.phil-fak.uni-duesseldorf.de/fff/fff-conference-ctf09/

**Website of the Research Group**

http://www.phil-fak.uni-duesseldorf.de/fff/

**Copies**

If you need to make copies of handouts or transparencies, please contact our staff in the conference office.

**Internet**

W-LAN is widely available on the university campus. If you bring your own notebook, you can get a free access code at the conference office. Furthermore, we provide some computers at the conference office exclusively for our conference participants.

**Important telephone numbers**

| | |
|---|---|
| Deutsche Bahn (German Railways) | +49 118 61 |
| Rheinbahn (local public transport) | +49 1803 50 40 34 |
| Flughafen Düsseldorf International (airport) | +49 211 42 10 |
| Taxi | +49 211 333 33 *and* +49 211 194 10 |
| *Emergency* | |
| Police | 110 |
| Fire/Ambulance | 112 |

## Guided Tour
## Media Harbor Düsseldorf

On Tuesday, August 25th, before the conference dinner, there will be a guided tour through the Media Harbor Düsseldorf (en.wikipedia.org/wiki/Düsseldorf-Hafen). The tour will start at 5:15pm and last about two hours. We will meet in front of the 'Rheinturm' (Rhine Tower; en.wikipedia.org/wiki/Rheinturm_Düsseldorf), Stromstr. 20. The meeting point can be easily reached by public transport from the university campus: From the campus take bus 835 (toward 'D-Comeniusplatz') or 836 (toward 'D-Am Seestern') and get out at 'D-Landtag/Kniebrücke' after 15 minutes. From there it is a 5 minute walk to the Rhine Tower, which you cannot overlook.


map taken from www.openrouteservice.org

## Conference Dinner

The conference dinner will take place in the restaurant 'Zum Trompeter' on Tuesday, August 25th at 7:30pm. 'Zum Trompeter' is only a 5 minute walk from the Kirchplatz bus/street-car stop and easy to get to from both the recommended hotels and the campus. People taking part in the guided tour will be taken to the restaurant after the tour.

From the campus take bus 835 ('D-Comeniusplatz') or 836 ('D-Am Seestern') to 'Kirchplatz'. Follow "Friedrichstraße" (towards city centre) for about 10 m and turn left into "Fürstenwall". After 500 m the restaurant 'Zum Trompeter' is on your right hand side.

**Restaurant 'Zum Trompeter'**
**www.zum-trompeter.de**
**Fürstenwall 66**
**40219 Düsseldorf**
**Tel. +49 211 39 36 98**

# Pubs & restaurants

**On the campus**

*Mensa*, bldg. 21.11, open 11:30 - 14:00
*Café Bistro Uno*, next to Mensa, open 8:00 - 17:00
*Campus Vita*, next to Mensa, open 11:30 - 22:00
*Café Medizinische Fakultät*, bldg. 22.02, open 8:00 - 17:00
*Cafeteria Philosophische Fakultät*, bldg. 23.21, open 8:00 - 17:00
*Cafeteria Mathem.-Naturwissenschaftl. Fakultät*, bldg. 25.31 open 8:00 - 17:00
*Mensa Mathem.-Naturwissenschaftl. Fakultät*, bldg. 25.31, open 11:30 - 14:00

**Within walking distance from campus**

*Scotti's*, Christophstr. 2
*Subway*, Christophstr. 59
*Pizzeria Bella Italia*, Moorenstr. 68
*Pizzeria Piccola Ergo*, Himmelgeister Str. 108
*Weise*, Himmelgeister Str. 117

**Downtown Düsseldorf**

Chinese

*Rosengarten*, Karlstr. 76 (city centre)
*Tsun-Gai*, Bahnstr. 72 (city centre)
*Dim Sum Gourmet*, Brunnenstr. 13 (Bilk)

French

*Robert's Bistro*, Wupperstr. 2 (Hafen/Unterbilk)
*La Bouillabaisse*, Neustr. 31 (Altstadt)

German

*Haus Suitbertus*, Suitbertusstr. 193 (Bilk)
*Bender's Marie (Muschelhaus)*, Andreasstr. 13 (Altstadt)
*Bug*, Zollhof 13 (Hafen)
*En de Canon*, Zollstr. 7 (Altstadt)
*Meckenstocks*, Elisabethstr. 82 (Bilk)
*Zwölf Apostel*, Bilker Allee 87 (Unterbilk)
*Reusch*, Erftstr. 20 (Hafen)

German Tavern/Brewhouse

*Brauerei Schumacher*, Oststr. 123 (city centre)
*Brauerei Im Füchschen*, Ratingerstr. 28 (Altstadt)
*Brauerei Im goldenen Kessel*, Bolkerstr. 44 (Altstadt)
*Brauerei Zum Schlüssel*, Bolkerstr. 45 (Altstadt)

*Brauerei Frankenheim*, Wielandstr. 16 (city center)
*Brauerei Uerige*, Bergerstr. 1 (Altstadt)

Greek
*Taverne Kreta*, Fürstenwall 61 (Bilk)
*Pegasos*, Friedrichstr. 50 (Bilk)

Indian
*Ganesha*, Luisenstr. 3 (Friedrichstadt)

Italian
*Pulcinella*, Ratingerstr. 4 (Altstadt)
*Gallo Nero*, Binterimstr. 27 (Bilk)
*Via Appia*, Flügelstr. 56 (Bilk)
*Mario's*, Friedrichstr. 125 (Bilk)
*Il Mercato*, Friedrichstr. 59a, (Bilk)

Japanese
*Kikaku*, Klosterstr. 38 (city centre)
*ManThei*, Bachstr. 1 (Bilk)
*Naniwa*, Oststr. 55 (city centre)
*Fuga (Japanese Snacks)*, Stoffelerstr. 5 (Oberbilk)

Korean
*Arirang*, Stresemannstr. 46 (city centre)
*Korea Haus*, Bismarckstr. 66 (near central station)
*Seoul*, Kirchfeldstr. 59 (Friedrichstadt)
*Silla*, Berger Str. 12 (Altstadt)

Libanese
*Libanon-Restaurant*, Berger Str. 19 (Altstadt)
*Byblos*, Markenstr. 7 (Oberbilk)

Mexican
*Bandido*, Adersstr. 46 (Friedrichstadt)

Mongolian
*Mongo's*, Zollhof 10 (Hafen)

South African
*Bobotie*, Brunnenstr. 43 (Bilk)

Spanish

*El Toro*, Adersstr. 81 (Friedrichstadt)
*El Gitano*, Schneider Wibbel Gasse 5 (Altstadt)
*Las Tapas*, Schneider Wibbel Gasse 4 (Altstadt)

Thai

*Baan Thai*, Bergerstr. 28 (Altstadt)
*Mekong*, Friedrichstr. 121 (Friedrichstadt)

Turkish

*Güzel Voyage*, Konkordiastr. 85 (Unterbilk)

Vietnamese

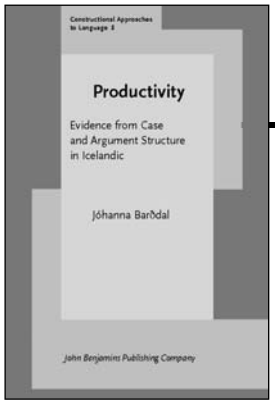
*Khanh's Lilly,* Friedrichstr.132 (Bilk)

Pub/cafe with food

*Café Modigliani*, Wissmannstr. /Friedenstr. (Bilk)
*Tigges*, Brunnenstr. 1 (Bilk)
*Destille*, Bilker Str. 46 (Altstadt)
*Ohme Jupp*, Ratingerstr. 19 (Altstadt)
*En de Canon*, Zollstraße 7 (Altstadt)
*Marktwirtschaft*, Benrather Str. 7 (Altstadt)
*Zur Uel*, Ratingerstr. 16 (Altstadt)
*Lot Jonn*, Kopernikusstr. 94 (Bilk)
*Cafe Bild &'s art*, Brunnenstr. 44 (Bilk)

Other

*Fischhaus (fish specialties),* Bergerstr. 3-7 (Altstadt)
*Miss Moneypenny*, Brunnenstr. 2a (Bilk)
*Cemo (cheap but delicious)*, Bilker Allee 178 (Bilk)
*Ugly Deluxe,* Karolingerstr. 80 (Bilk)
*Florabar*, Kronenstr.65 im Floragarten (Bilk)




# Constructional Approaches to Language

*Book series*

Edited by Mirjam Fried and Jan-Ola Östman

ISSN 1573-594X

The series brings together research conducted within different constructional models and makes them available to scholars and students working in this and other, related fields.

The topics range from descriptions of grammatical phenomena in different languages to theoretical issues concerning language acquisition, language change, and language use. The foundation of constructional research is provided by the model known as Construction Grammar (including Frame Semantics). The book series publishes studies in which this model is developed in new directions and extended through alternative approaches. Such approaches include cognitive linguistics, conceptual semantics, interaction and discourse, as well as typologically motivated alternatives, with implications both for constructional theories and for their applications in related fields such as communication studies, computational linguistics, AI, neurology, psychology, sociology, and anthropology.

**Editorial contact:** fried@ujc.cas.cz and jan-ola.ostman@helsinki.fi, joostman@ling.helsinki.fi

## Productivity

Evidence from Case and Argument Structure in Icelandic

**Jóhanna Barðdal**
**University of Bergen**

Productivity of case and argument structure constructions is a new and emerging research field within cognitive-functional linguistics. An investigation of the use of the term *productivity* in linguistics reveals at least three subconcepts, namely those of 'extensibility', 'regularity' and 'generality'. The focus in this study is on the extensibility concept, while generality and regularity are regarded as derivatives, affiliated with extensibility by association.

**[Constructional Approaches to Language, 8] 2008. xiii, 209 pp.**
**HB 978 90 272 1830 8 EUR 95.00**

## Germanic Future Constructions

A usage-based approach to language change

**Martin Hilpert**
**Freiburg Institute for Advanced Studies**

This study offers a Construction Grammar approach to the historical development and modern usage of future constructions in English, German, Dutch, Danish, and Swedish. A special focus lies on the main verbs that occur with these constructions.

**[Constructional Approaches to Language, 7] 2008. ix, 205 pp.**
**HB 978 90 272 1829 2 EUR 95.00**

## Locative Alternation

A lexical-constructional approach

**Seizi Iwata**
**Osaka City University**

The aim of the present volume is two-fold: to give a coherent account of the locative alternation in English, and to develop a constructional theory that overcomes a number of problems in earlier constructional accounts. The lexical-constructional account proposed here is characterized by two main features. On the one hand, it emphasizes the need for a detailed examination of verb meanings. On the other, it introduces lower-level constructions such as verb-class-specific constructions and verb-specific constructions.

**[Constructional Approaches to Language, 6] 2008. xiv, 239 pp.**
**HB 978 90 272 1828 5 EUR 99.00**

## Constructional Reorganization

**Edited by Jaakko Leino**
**University of Helsinki**

The book is a collection of articles which bring together the framework of Construction Grammar and the constantly changing language system. It connects the latest developments in grammatical theory and Construction Grammar with empirical findings and data, language-specific research traditions, and cross-language issues. It is aimed at linguists interested in Construction Grammar, constructional approaches to grammar more generally, language variation and change, and the internal architecture of grammar.

**[Constructional Approaches to Language, 5] 2008. vi, 155 pp.**
**HB 978 90 272 1827 8 EUR 99.00**

## Grammatical Constructions

Back to the roots

**Edited by Mirjam Fried and Hans C. Boas**
**Princeton University / University of Texas at Austin**

This volume brings into focus the conceptual roots of the notion 'grammatical construction' as the theoretical entity that constitutes the backbone of Construction Grammar, a unique grammatical model in which grammatical constructions have the status of elementary building blocks of human language, thus giving the book a rich empirical dimension that draws on authentic data from typologically diverse languages.

**[Constructional Approaches to Language, 4] 2005. viii, 246 pp.**
**HB 978 90 272 1824 7 EUR 115.00**

## Construction Grammars

Cognitive grounding and theoretical extensions

Now available in paperback

**Edited by Jan-Ola Östman and Mirjam Fried**
**University of Helsinki / Princeton University**

This volume extends the traditional domain of Construction Grammar (CxG) in several directions, all with a cognitive basis. It also gives informative accounts of how the notion 'construction' is developed in approaches that are conceptually close to, and relatively compatible with, CxG: Conceptual Semantics, Word Grammar, Cognitive Grammar, Embodied Construction Grammar, and Radical Construction Grammar.

**[Constructional Approaches to Language, 3] 2005. viii, 325 pp.**
**HB 978 90 272 1823 0 EUR 115.00**
**PB 978 90 272 1826 1 EUR 36.00**

## Construction Grammar in a Cross-Language Perspective

Now available in paperback

**Edited by Mirjam Fried and Jan-Ola Östman**
**Princeton University / University of Helsinki**

This volume gives an easily accessible, yet comprehensive, sophisticated, and example-rich introduction to Construction Grammar as it has been developed from the early 1980's by Charles J. Fillmore and his associates.

**[Constructional Approaches to Language, 2] 2004. vi, 209 pp.**
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**PB 978 90 272 1825 4 EUR 33.00**

## Functional Constraints in Grammar

On the unergative–unaccusative distinction

**Susumu Kuno and Ken-ichi Takami**
**Harvard University / Tokyo Metropolitan University**

This book examines in detail the acceptability status of sentences in five English constructions, and elucidates the syntactic, semantic, and functional requirements that the constructions must satisfy in order to be appropriately used.

**[Constructional Approaches to Language, 1] 2004. ix, 242 pp.**
**HB 978 90 272 1821 6 EUR 99.00**

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# NEW JOURNAL

## Constructions and Frames

Edited by Kyoko Ohara and Kiki Nikiforidou


*Constructions and Frames* is an international peer-reviewed journal that provides a forum for construction-based approaches to language analysis. Constructional models emphasize the role of constructions, as conventional pairings of meaning and form, in stating language-specific and cross-linguistic generalizations and in accounting equally for regular and semi-regular patterns. Frame Semantics, which has become a semantic complement of some constructional approaches, elaborates the analysis of form-meaning relationships by focusing on lexical semantic issues that are relevant to grammatical structure. The preoccupation of constructional theories with meaning allows for natural integration of grammatical inquiry with semantic, pragmatic, and discourse research; often coupled with corpus evidence, this orientation also enriches current perspectives on language acquisition, language change, and language use.

*Constructions and Frames* publishes articles which range from descriptions of grammatical phenomena in different languages to constructionally-oriented work in cognitive linguistics, grammaticalization theory, typology, conversation analysis and interactional linguistics, poetics, and sociolinguistics. Articles that explore applications to or implications for related fields, such as communication studies, computational linguistics, lexicography, psychology, and anthropology are also invited.

The aim of the journal is to promote innovative research that extends constructional approaches in new directions and along interdisciplinary paths.

**ISSN: 1876-1933 (print) / 1876-1941 (electronic)**



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# PLENARY TALKS

## The indefiniteness of definiteness

BARBARA ABBOTT

(Michigan State University)

This paper explores various criteria and conceptions of definiteness, arguing that the category is irremediably (although not hugely) vague.

In the early days of transformational grammar, the property of definiteness came to the attention of linguists as one which prevented the felicitous occurrence of an NP[1] in focus position (i.e. following *be*) in a non-enumerative existential – illustrated in (1).

(1) a. There is/are a/some/few/several/many dog/dogs in the yard.
b. *There is Bill/him/the dog/that dog/every dog in the yard.
c. *There are most/all dogs in the yard.

By this criterion, proper names, definite and demonstrative descriptions, and pronouns are definite. Most linguists would probably agree with those classifications. This test also marks (strongly) quantified NPs as definite; that classification is more problematic. An NP like *most dogs* is not intuitively definite (although the fact that *most* is a morphological superlative invites further investigation). Then too, quantification has usually been seen as inconsistent with reference, while definiteness is often taken to be essentially the same thing as referentiality. This latter conflict applies not only to NPs with *most*, but also those with a universal quantifier (*all*, *every*, *each*) – hereinafter universally quantified NPs will be referred to as "the universals".

Russell's (1905) famous analysis of definite descriptions distinguished them from indefinites in requiring there to be at most one entity meeting the descriptive content of the NP. On a natural extension of this view, the universals fail to be definite by missing the existential requirement. On the other hand more recently the kind of uniqueness which separates definites from indefinites has been seen as a property pertaining to addressee's abilities, rather than a semantic relation between text and target. Unique identifiability, or individuation, is taken to be the correct criterion by many (e.g. Hawkins 1991, Birner & Ward 1998, Kamp 2001). This extension of Russell's view would include the universals.

The competing familiarity theory of Heim (1982, 1983), Roberts (e.g. 2003), excludes the universals. However it has been shown to be problematic by, e.g., Löbner (1985), Abbott (1999, 2008).

Sandwiching Russell, Frege (1892) and Strawson (1950) argued that definite descriptions presuppose the existence of a referent. However they seem to differ on the universals, where Strawson suggests a similar presupposition for them, but Frege presumably would not. This kind of position is extended in an interesting way in the work

of Löbner (2000), according to which definites, but not universals, result in a presupposition of integrity.

Barwise & Cooper (1981), assuming a semantics where NPs are uniformly analyzed as denoting generalized quantifiers (sets of sets), proposed the necessary existence of a nonempty intersection as a suitable definition of definiteness. The requirement of necessary nonemptiness was included so as to exclude the universals from the category. (Although most universals have a nonempty intersection, some (e.g. *every unicorn*) do not; corresponding definite descriptions (e.g. *the present king of France*) were considered by Barwise & Cooper to be undefined.) Their reason for wishing the exclusion of universals from the category of definiteness stemmed from their assumptions that (a) the embedded NP in a partitive must be definite, and (b) universally quantified NPs are barred from that position. Both of these assumptions, however, are faulty, as shown by the examples in (2).

(2) a. Ants had gotten into <u>most of some jars of jam Bill had stored in the basement</u>. [= Abbott 1996, ex. 10a]
b. <u>One half of all dentists who chew gum</u> prefer Trident.

Although Barwise & Cooper's (tacit) rationale was faulty, the main issue – whether or not the universals should be included with the more familiar members of the category of definite NPs – remains unresolved. There are ways in which the universals are like proper names, definite and demonstrative descriptions, and pronouns, and ways in which they are not.

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[1] I use "NP" as many linguists now use "DP".

Abbott, Barbara. 1996. Doing without a partitive constraint. In Jacob Hoeksema, ed., *Partitives: Studies on the syntax and semantics of partitive and related constructions*. Berlin: Mouton de Gruyter, 25-56.

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Barwise, Jon & Robin Cooper. 1981. *Generalized quantifiers and natural language. Linguistics and Philosophy 4*: 159-220.

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Kamp, Hans. 2001. Presupposition computation and presupposition justification: One aspect of the interpretation of multi-sentence discourse. In Myriam Bras & Laure Vieu, eds., *Semantic and pragmatic issues in discourse and dialogue: Experimenting with current dynamic theories*. Oxford: Elsevier, 57-84.

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Roberts, Craige. 2003. Uniqueness in definite noun phrases. *Linguistics and Philosophy 26*, 287-350.

Russell, Bertrand. 1905. On denoting. *Mind 14*, 479-493.

Strawson, P.F. 1950. On referring. *Mind 59*, 320-344.

## Frames in Perceptual Symbol Systems

LAWRENCE BARSALOU

(Emory University, Atlanta)

The conceptual frames that underlie human knowledge typically exhibit four properties: (1) argument-value structure, (2) conceptual relations between arguments, (3) constraints between values, and (4) recursion of frame structure in elements of (1), (2), and (3). Although the frames that underlie knowledge are often assumed to be rigid, they are probably highly statistical, dynamical, context-sensitive, and adaptive. Frames also appear open-ended, with the potential content of a given frame – its arguments, values, relations, constraints, and recursion – being infinite. The brain could implement frames in a variety of ways, including classic symbolic notation and various statistical architectures. Perceptual Symbol Systems offers an alternative perspective, proposing that frames originate in the higher-order structure of the brain's modalities for perception, action, and introspection. These modalities appear to contain the structure of frames intrinsically, and may be the source of frames in knowledge and language. The properties of non-rigidity and open-endedness follow naturally from this account, given that infinite forms of a frame can be constructed from a single image. Modest behavioral and neural evidence currently supports this proposal. Much more evidence is needed, along with detailed computational models.

## Deep Lexical Semantics

JERRY HOBBS

(University of Southern California/Information Sciences Institute)

In the project I describe, we have taken a basic core of about 5000 synsets in WordNet that are the most frequently used, and we have categorized these into sixteen broad categories, including, for example, time, space, scalar notions, composite entities, and event structure. We have sketched out the structure of some of the underlying abstract core theories of commonsense knowledge, including those for the mentioned areas. These theories explicate the basic predicates in terms of which the most common word senses need to be defined or characterized. We are now encoding axioms that link the word senses to the core theories. This may be thought of as a kind of "advanced lexical decomposition", where the "primitives" into which words are "decomposed" are elements in coherently worked-out theories. In this talk I will focus on our work on the 450 of these synsets that are concerned with events and their structure.

## Types of Verb Meanings: Manner, Result, but Not Both?

BETH LEVIN

(Stanford University)

Much current work on verb meaning distinguishes a root, or core meaning component, from an event schema, representing a basic event type, although this idea finds different implementations in different frameworks. In this talk I examine some consequences of the assumption that a root has an ontological type chosen from a limited number of options. I review lexical semantic evidence for providing a root with an ontological type, focusing on the classification of nonstative verbs from various lexical fields into manner and result verbs – a distinction implicated in language acquisition, as well as in argument realization.

Intuitively speaking, manner verbs specify a manner of carrying out an action (*hit, run, sweep*), while result verbs specify the coming about of a result state (*arrive, break, clean*). I then turn to the observation that nonstative verbs generally seem to either be manner verbs or result verbs, and argue that the observed complementarity of manner and result reflects a constraint on the meaning that a verb can lexicalize. In support of this constraint, I present detailed case studies intended to defuse two purported exceptions to manner/result complementarity cited in the literature: the verbs *cut* and *climb*.

## Evidence for frames from human language

SEBASTIAN LÖBNER

(University of Düsseldorf)

One of the major assumptions on which the work of the local research unit is based is Barsalou's conjecture that the structure of the mental representations used in the human cognitive system is that of frames. A frame in Barsalou's sense is a structure that assembles and coordinates information about objects to be represented as a recursive network of attributes with values specified (more or less specifically) and constraints that relate the attributes and their values to each other. One central point of the notion of frame employed in Barsalou's theory is the functional character of the attributes involved: rather than representing arbitrary relations between nodes of the frame, they assign unique values to nodes, e.g. a unique shape, color, price, origin, name, purpose etc. to the object to be described.

If Barsalou's conjecture is correct, it is to be expected that language, as one of the most prominent productions of the human mind, reflects the structural organization of human cognition. In order to investigate this aspect of the conjecture, we will take a look at language from the traditional perspectives of form and content:

- Do linguistic forms, from sounds to grammatical sentences provide evidence that they are based upon, and combined into, units that can be considered frames of a certain constrained constitution? This is what is to be expected if it is frames and recursive combinations thereof that the human mind is able to operate on.

As to linguistic content,

- Can propositions, or more generally, linguistic meanings, as they are presumably represented in the mind be considered to have the structure of Barsalou frames?
- Is there evidence in the lexica of human languages that shows that the human cognitive system, to the extent that its contents can be verbalized, actually works with frame-like representations?

## Conceptual Constraints on the Language of Space and Time

JAMES PUSTEJOVSKY

(Brandeis University)

Language models of qualitative spatial relations and motion tend to focus on cross-linguistic differences and semantic universals of spatial concepts. As equally interesting and important, however, is the question of how the logical interpretations of spatial expressions in language translate into spatial logics for reasoning, inferencing, and planning tasks that are addressed routinely in the qualitative spatiotemporal reasoning community. In this talk, I look at how spatial relations between objects change over

time and how this change is characterized by language. I will first focus on change-of-location predicates, and how spatial Aktionsart is both lexically encoded and derived compositionally through adjunct modification. Spatial change predicates fall broadly into two semantic classes: external_move and internal_move. Both classes exhibit the full range of Aktionarten (event classes) through composition. We then illustrate how the meaning of motion (and change-of-state) expressions can be expressed as topological and topometric transformations within an extended Line Region Intersection Calculus. This will be referred to as a spatiotemporal frame. I then provide a linguistic semantics of these spatial predicates using a Dynamic Interval Temporal Logic. I discuss the limitations of this model for handling intentional motion predicates, such as "chase" and "avoid". Next, this language is extended to model change-of-state predicates more generally. Finally, the resulting logic provides a model of interpretation for the behavior of "gating predicates" as studied in Generative Lexicon Theory, as will be demonstrated.

## The Relation Ontology

BARRY SMITH

(University of Buffalo)

An important long-term goal of information-based natural science research is to find a means of expressing experimental data and scientific theories in a common computable form. A more immediate sub-goal is to establish methods for tagging scientific journal articles in such a way as to make their content computationally processable. For this we shall need not only systems for entity identification but also a set of standard logically defined relations (such as instance-of, part-of, causes, subtype-of) between these entities. The Relation Ontology (RO) has been designed by philosophers and biomedical researchers to address this latter need. We describe the rationale of RO, and show how it is being applied to the expression and logical integration of information in a variety of domains in biology and elsewhere.

## Creative Conceptual Combination

PAUL THAGARD

(University of Waterloo)

Many kinds of creativity, from scientific discovery to artistic imagination, can be understood as novel combination of concepts.

Using an account of concepts as patterns of firing in neural populations, this talk describes a new model of conceptual combination, including the AHA! emotional experience that accompanies creative breakthroughs.

# SECTION TALKS

## Semantics of "Arguments" in Terms of FrameNet Frames: A Corpus-Based Study

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It is a trivial fact that for understanding natural language expressions it is not sufficient to know literal (dictionary) lexical meanings and compositional rules. Relevant parts of meaning are often not explicitly expressed but recoverable from the context or from general knowledge shared by a language community. There are many debates in lexical semantics about what kind of world knowledge actually belongs to the meaning of a lexeme. There exists multiple linguistic evidence showing that the semantics of arguments can help to predict implicit predicates. One of the most studied phenomena that Pustejovsky [4] has called logical metonymy is illustrated by the examples (1) and (2).

(1) *John finished the book*
(2) *a complicated question*
(3) *a student boycott*
(4) *News agency X about the conflict...*

In the case of logical metonymy an implicit predicate is inferable from particular verb-noun and adjective-noun pairs in a systematic way. Thus, (1) plausibly means *John finished reading/writing the book* and (2) plausibly means *a question which is complicated to answer*. There are other linguistic phenomena requiring knowledge about predicates associated with a potential argument. For example, this knowledge can be applied for inferring a relation between parts of a compound (e.g. (3) plausibly means *boycott declared by students*) or for recovering a meaning of a preposition (e.g. (4) plausibly means *News agency X informs/reports about the conflict...*).

The most influential account of implicit predicates is provided by the Generative Lexicon theory, GL [4]. According to GL the meaning of a noun includes a qualia structure consisting of four roles: constitutive, agentive, formal and telic. For example, the lexical meaning of *book* includes *read* as telic role and *write* as an agentive role. Although GL offers promising a lexical semantic theory, it has several shortcomings concerning NLP applications. Since the GL qualia roles are very abstract it is sometimes difficult to determine which qualia should express a particular relation, cf. experimental data in [1]. GL qualia seem to be the most appropriate for describing semantics of nouns. However, lexemes from other open word classes can also imply predicates. For example, *an eloquent man* probably means *a man who speaks eloquently*.

We propose to describe relations between potential arguments and associated predicates in terms of semantic roles. The present study rests upon frame semantics [2]. The lexical meaning of predicates in frame semantics is represented by *frames* which describe prototypical situations. Every frame contains a set of roles corresponding to the participants of a situation. Predicates with similar semantics evoke the same frame. Theoretical speculations of frame semantics are realized in a lexical resource called FrameNet (FN), *http://framenet.icsi.berkeley.edu*. We use FN as a reference source for representing argument-predicate (AP) relations. Similar to [3], our approach is based on the assumption that predicates can be omitted in a discourse if they are highly predictable from the semantics of the corresponding arguments. Our goal is to find for a lexeme *l* the most plausible tuples of the form <*l, r, F, p*> such that *l* frequently occurs as an argument of a predicate *p* and fills a role *r* in a frame *F* which is evoked by *p*, for example <book, TEXT, READING, read>.

In order to learn AP-relations automatically, we exploited SALSA (*http://www.coli.unisaarland.de/projects/salsa*), a newspaper corpus for German which was manually annotated with FrameNet frames. In order to extract AP-pairs from SALSA we 1) find an open word class head for every constituent corresponding to a role filler; 2) resolve possibly existing pronominal anaphora. SALSA (approximately 700 000 tokens) is too small to compute a reliable co-occurrence model for distinguishing between rare and frequent pairs. In order to compute confidence rates for the extracted AP-pairs we used an unannotated newspaper corpus of 145 million words.

Around 30 000 tuples were extracted from SALSA. The procedure was evaluated quantitatively against human judgments obtained experimentally. The experiment was designed in line with [1]. The subjects were asked to provide short phrases such that every phrase consists of one of the 30 cue words and a predicate associated with this word (for example, *Buch* 'book' *ein Buch lesen* 'to read a book'). These phrases were normalized and manually annotated with FN frames, e.g. *ein Buch lesen* –$[Buch]_{\text{TEXT}}$ $[lesen]_{\text{READING}}$. Every cue word was treated by three subjects. AP-pairs shared by all subjects constituted a gold standard. In order to evaluate our procedure with respect to this gold standard, we calculated $F_{max}$, the maximal value of *F*-measure achieved for the points of an optimal precision-recall curve, cf. [1]. The resulting $F_{max}$ value of 0.44 was achieved.

In order to check whether the calculated confidence rates correspond to human intuition, we have estimated correlation between automatically assigned confidence rates and human judgments. The participants were asked to rate the phrases generated from extracted AP-pairs with respect to their "naturalness" using a scale from 0 to 3. The correlations coefficients values are 0.28 (Pearson), 0.20 (Kendall) and 0.26 (Spearman), all are significant, with *p*-values equal to 0.001, 0.003 and 0.003, respectively.

Based on the results of the experiments, we conclude that the proposed procedure is able to extract intuitively reasonable relations. This study presents only first steps towards using semantically annotated corpora for automatic relation extraction. There are several ways to improve the proposed procedure such as a) implementation of a more advanced anaphora resolution algorithm, b) splitting German compounds, c) investigation of additional confidence measures.

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## Functions vs. Events in the Semantic Structure of Adjectives

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Already Aristotle suggested that adjectives like *skilful*, *good*, or *talented* modify relative to some "function" of the argument and differ in this respect from adjectives like *blond*, *nude*, or *aged*. This intuition comes up in the fact that *skilful violinist* is interpreted as *skilful qua/as a violinist*, whereas *blond violinist* is not, since one cannot be blond as a violinist. Apparently, the *qua/as*-phrase indicates the relevant function in the Aristotelian sense.

However strong this intuition might be, it is by far not clear how the notion of "function" should be conceived and formalized. Siegel (1976) formalizes the idea of modification relative to a function in terms of *intensional* modification, i.e., *qua*-adjectives are supposed to modify the intension of the noun predicate rather than individuals in its extension. In a more recent approach Larson (1998) argues instead that these adjectives modify the Davidsonian event parameter in the semantic structure of nouns, which corresponds to some functional activity. Similarly, Pustejovsky (1995) treats them as event predicates that apply selectively to the telic quale of the noun containing an event.

A flaw of these approaches is that the relevant function is provided by the lexical meaning of the modified noun – as its intension or an event parameter. However it has been shown that *qua*-adjectives can modify relative to any function suggested by the context (cf. Beesley 1982). For instance, *skilful violinist* may also mean 'skilful in playing chess' in the context of a chess school which specializes in teaching musicians. Neither the intension of *violinist*, nor its event parameter can provide the intended function of playing chess. Besides, adjectives like *skilful* can modify what is called 'semantically bare nouns', such as *man* or *person*, whose semantics does not provide a function (which forces these approaches to assume ambiguity of *qua*-adjectives, i.e., to be able to modify both intensions and extensions or, alternatively, both events and individuals).

Another serious flaw of existing theories is the fact that they do not provide reliable tests to distinguish between the two adjectival classes. Substitution failure of coextensional terms has been commonly used to identify intensional adjectives (cf. Parsons

1968), however it suffers from the fact that supposedly non-intensional gradable adjectives like *tall* or *heavy* pass it because of switches in the standard of comparison.

I suggest that it is not the lexical meaning of the modified noun, but the *conceptual representation* of its referent that provides a relevant function. The conceptualization of the referent is constructed anew in each context and includes a number of properties, some of which are provided beforehand by the general world knowledge about the referent, while others arise in the discourse. Some of these properties are functions in the sense of Aristotle, i.e. are habitual activities like *playing the violin*, whereas others are states, such as *being blond*. Furthermore, I claim that *qua*-adjectives predicate over functions, rather than modify individuals relative to functions. Moreover, they are able to modify any of the functions provided by the conceptual representation of the referent. This accounts for the skilful-qua-chess-player-interpretation and for the fact of modification of semantically bare nouns. Thus, the semantic representation of the sentence *David is a skilful violinist* would be as follows:

(1) ∃f[skilful(f) & theme(f,david) & violinist(david)]

According to (1), David is a violinist who is skilful *at* carrying out some function f, which may be *playing the violin*, but also any other function David has in the context in question.

Functions of the referent, which are modified by *qua*-adjectives implicitly, can be made explicit in the form of verbal predicates. If the analysis in (1) is correct, it should be the case that adverbial counterparts of *qua*-adjectives can modify functions when explicated as verbal predicates. This prediction is born out, as illustrated below:

(2) Peter is a skilful violinist.
≈ Peter plays the violin/plays chess/… **skilfully**.

(3) John is a successful businessman.
≈ John does business/… **successfully**.

On the contrary, adjectives usually considered as typical instances of intersective adjectives do not allow adverbial paraphrases, for example:

(4) Peter is a tall violinist.
≠ *Peter plays the violin tallly.

(5) John is a blond businessman.
≠ *John does business blondly.

The assumption that functions have a separate ontological status and should be distinguished from events and states receives support from the following facts. It appears that the test of adverbial paraphrases is sensitive not only to functions, i.e., habitual activities, but also to processes also denoted by verbal predicates. Adjectival stage-level predicates, such as *drowsy* or *drunk*, also allow adverbial paraphrases:

(6) Peter is a drowsy guard.
≈ Peter is guarding **drowsily**.

(7) John is a drunk driver.
≈ John is driving **drunk**.

Still, drowsy and sober predicate over events, rather than functions. One's being drowsy does not depend on her being a guard, it rather applies to a certain event in time, the agent of which happens to be a guard. Thus the semantic representation of the sentence Peter is a drowsy guard looks as follows in the neo-Davidsonian notation (cf. Parsons 1990):

(8) ∃e[**drowsy**(e) & **theme**(e,peter) & **guard**(peter)]

The suggestion that adjectives in (2) and (3) predicate over functions rather than over events is also reflected by the fact that they can combine with the *at/in V-ing* construction, which provides the nominalization of the function, while adjectives in (6) and (7) cannot:

(9) Peter is a skilful violinist.
≈ Peter is skilful in playing the violin.
(10) John is a drowsy guard.
≠ *John is drowsy in guarding.

Thus, based on this data I propose that *qua*-adjectives, such as *skilful*, predicate over functions that are entities ontologically different from Davidsonian *events* used to model stage-level predicates.

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## Using Frames to Solve the Problem of Vagueness

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A central datum of the problem of vagueness is that the location of a sharp boundary cannot be located for some concepts. I show that this is a result of developing frames with a capacity to adapt to changes. The project is inspired by a case in artificial intelligence - engineers building soccer-playing robots faced the challenge of designing a system of colour classification that could adapt to changing lighting conditions. I create a general frame theory that captures the solution the AI engineers present. A key feature of the system turns out to be a double-edged sword; its adaptability limits the

degree of precision that a sharp boundary can be located, which is a hallmark of the phenomena of vagueness in the conceptual behaviour of humans. Consequently, I show how frame systems of this sort are biologically plausible. Furthermore, I argue that this motivates a unique explanation of a long-standing problem to explain our ignorance of sharp boundaries and the appearance of a vague concept's fuzziness.

Engineers in AI have been challenged to build soccer-playing robots that can distinguish between the field, goal, ball, and other players.[1] A particularly difficult problem arises in colour classification (a primary method of distinguishing the listed features). What doesn't work is to predefine a subdivision of colour space and then calibrate it to the lighting conditions of an arena - algorithms that rely on this static colour classification quickly run into difficulties when the lighting changes. What does work is designing an algorithm that provides robots with the ability to adapt to changing lighting conditions. Such an algorithm has been developed and is named "The Automatic Color Training Algorithm", or the ACT algorithm for short (Heinemann et al., 2007).

The basic task of ACT is to create a fast and automatically training (and retraining) look-up table that dynamically maps colours in the environment to different colour classes, even when major changes in lighting occur. ACT can be described in the following way. Given some arbitrarily chosen number of colour classes, the algorithm detects clusters of incoming light inputs. Consequently, certain input frequencies (the colour of the field, the opposing players shirts, etc.) are more exemplar-like than others given their rate of occurrence. The algorithm then creates an exemplar list and combines that with a rule that, together, determines the acceptable values for each colour class (i.e. the extension of each colour class). The algorithm then compares incoming colour values to values in the class and then recalculates the class to reflect those colour values. So, if the incoming values significantly change over time (due to a change in lighting, for example), the corresponding colour class updates to reflect that change.

The AI example can be generalized using frames which represent the behaviour of sortal concepts of representational systems with finite cognitive resources; the concepts finitely represent an infinite extension, and they are adaptive because they update to track changes in an environment. Updating can be represented by allowing frames to shift the range of values of an attribute during frame processing. This means that as new cases are evaluated for membership, new attribute-value sets are constructed when those cases are included. The construction of new attribute-value sets means a change in membership conditions, for the range of values for some attribute has shifted. Consequently, the classificatory dispositions of the system update since a change in an attribute's values means a change in what the system is disposed to count as a member. A system's capacity to adapt its classificatory dispositions is advantageous for when it needs to interact with a changing environment. Both the ACT robots and our own conceptual behaviour exhibit this capacity.

A notable feature of these adaptive systems is that they are unable to fix boundaries when testing for their location. This means that whenever a case (e.g. object or value) is evaluated as a member of some attribute, the frame representing that attribute updates by shifting (even just slightly) the range of values. So, *even if* the boundaries of some vague concept were sharp, the boundary shifts as cases near the boundary are

checked. Consequently, the degree of precision that a concept's boundary can be located is bounded by the degree of its adaptability (i.e. how quickly and how much it updates). That is, since checking a case can cause a shift, the location of a boundary can only be flanked to a bounded degree of precision (where flanking is the selection of a member and a non-member).

At least from a first person perspective then, it appears that there are no sharp boundaries for vague concepts because locating a sharp boundary requires a higher degree of precision than the adaptability of the concept allows. Thus, the inability to locate sharp boundaries is predicted - for both humans and ACT robots - because the highlighting of relevant cases in the extension (either by changes in the environment or by mere contemplation) shifts or expands the extension to include new cases (previously not included) in virtue of how the system needs to be constructed for adaptability. This is analogous to the observer-effect: by checking the extension, the system hereby alters it.

This account of our inability to locate sharp boundaries provides a unique explanation to a particular problem in the study of vagueness. Epistemicists argue that our concepts do have sharp boundaries, but that we are ignorant of them (Williamson, 1996). Most objections against epistemicism are based on evidence that sharp boundaries cannot be located (Sorensen, 2005). But even in a system of concepts with sharp boundaries, the adaptability of the concepts lead to the result that sharp boundaries cannot be located. Such objections are thus well blocked since the same appearances (i.e. an inability to located sharp boundaries) are side-effects of engineering adaptive (but sharp bounded) representational systems with a theory of frames.

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[1] See RoboCup (www.robocup.org). It is an international research initiative targeted to combine technology from artificial intelligence and robotics. The ultimate goal is to create soccer-playing humanoid robots that can eventually play at a competitive level with human players.

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# Conceptual differentiation and inheritance an object-oriented approach

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There are different processes in which the effective semantic contribution of a word to the meaning of an utterance varies under the influences of different contexts. These processes' results include Weinreich's (1964) *complementary ambiguity*, processing of Pustejovsky's (1995) *dotted objects*, and Cruse's (2004) *facets* and *microsenses*.
A prominent example for different facets is the meaning of newspaper in (1), from Pustejovsky (1995):

(1) a) *Mary spilled coffee on the newspaper*. (newspaper → physical object)
b) *John got angry at the newspaper*. (newspaper → content)

It is possible that *newspaper* in both sentences refers to the same object. Following Cruse's (2004) definition, facets are discrete but non-antagonistic readings of a word. This is demonstrated by the acceptability of (2):

(2) *John spilled coffee on the newspaper because he got angry at it*.

Different facets characteristically point to distinct ontological types (cf. Cruse 2004; in our example 'physical object' vs. 'content'). This has been captured through multiple inheritance, as in Briscoe, de Paiva & Copestake (1993) or Pustejovsky (1995).
Facets represent aspects of the same object, and have so far – primarily, if not exclusively – been investigated with relation to the meaning of nouns and hence in the domain of objects. The question arises whether there is a comparable phenomenon in relation to verbal semantics and the realm of events. Prima facie, (3) taken from Keenan (1984) is an example:

(3) a) *John cut his arm / his foot*.
b) *John cut his nails / his hair / the lawn.*
c) *John cut his cake / the roast*.
d) *John cut a path (through the field) / a tunnel (through the mountain)*.

In this example, cut denotes a slightly different type of event each time. In (3a) John slit the undergoer (his arm/foot), in (3b) the undergoer (nails/hair/lawn) is shortened or trimmed, (3c) indicates that the undergoer (cake/roast) is divided into smaller pieces, while in (3d) the cutting results in the emergence of the undergoer (path/tunnel) as an entity leading through some other object. However, in all cases *cut* can be taken to mean something like 'afflicting a structural change with a sharp-edged tool'. What the structural change is and what thus the resultant state of each cutting event is, depends on the undergoer of the event and hence on the direct object the verb *cut* takes.
In a process such as the one exemplified by *cut*, additional conditions are imposed on the original concept expressed by the lexical meaning, resulting in a further specification of what the word denotes (Löbner 2002). Bierwisch (1982) calls this process *conceptual differentiation*. These differentiations seem to lead to a proliferation of seman-

tic meanings in the lexicon. Blutner (1999) proposed a pragmatic account in which the lexicon is highly underspecified and the conceptual differences are explained by a variant of the principle of division of pragmatic labour (Horn 1984). But this principle only accounts for diachronic tendencies, and leaves the structure of the mental lexicon open.

Is conceptual differentiation of verbal meaning a structural counterpart of the process resulting in facets? More specifically, is it a case for multiple inheritance? A closer look reveals that it is not. We are not dealing with facets of the same event that point to distinct ontological types (such as 'physical object' vs. 'content' for the facets of *newspaper*), but with different events that are all children of a common superordinate event concept. Therefore, single but not multiple inheritance prevails.

The following phenomena support our claim: (1) As has been noted by Keenan (1984) and already indicated above, the meaning differentiations of verbs only depend on one of their arguments. In general, this is the direct object for transitive verbs, and the subject for intransitive verbs – or, on a semantic level, the undergoing participant of the event. (2) The differentiated senses cannot differ for objects which belong to the same ontological domain and share the same level of abstraction (*John cut the finger/hand/arm/shoulder*). (3) That the differentiated senses are not facets is also supported by the pragmatic oddity of the following coordinations (in contrast to the acceptability of (2) above):

(4) *John cut his finger and his elbow.*
*?John cut his finger and his cake.*

(5) *John cut a stone and a diamond.*
*??John cut a stone and a finger.*

But how then is it possible to account for the dependencies on the undergoer of the event? We argue that an object-oriented approach is the key to this problem and apply object-oriented methods to linguistic semantics (following the lead of Schalley 2004). In object-orientation – the most successful paradigm in computer science – objects such as the potential undergoers of events are described not only via attributes and attribute-value pairs, but include specifications of their 'behaviour' in the 'operations' slot (which can, via a multi-level architecture and recursion, be mapped into frame representations, cf. Schalley 2007). For instance, a general cutting event would be defined for a physical object, and more specific physical objects such as 'lawn' would include a further specification of what cutting means with regards to them. This exactly corresponds to conceptual differentiation: additional conditions and specifications are imposed on the more general concept of cutting for more specific undergoers. Thereby, single inheritance is implemented while differentiation due to dependence on the undergoers ensues at the same time.

In this approach, the classical frame-based representation of objects is extended by adding operations information. For linguistics, this has the surprising consequence that events are, while generally being rather abstract concepts, substantiated in the specification of their undergoers. Or put differently: verbal meaning is concretised in the lexical entries of their direct objects. We will discuss the advantages and ramifications of such an approach, also relating this to previous accounts such as Pustejovsky's

(1995) qualia structure, and address the question how it might be possible to determine what has to be included in the operations slot.

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# A frame-theoretic account of inferential evidentials based on German perception verbs

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In the past decades there has been an increasing interest in evidentiality, understood as grammaticalized source of information. In the course of this process, a number of mostly typological studies have arisen, which have a strong focus on evidentiality encoded by grammatical markers, i.e, by verbal affixes or modal auxiliaries (Chafe & Nichols 1986, Willett 1988, de Haan 1999, Aikhenvald 2004 among others). However, as recently argued by Whitt (2009) in a comparative corpus study of English and German, perception verbs such as German *klingen* 'sound' in (1) are another lexical means to express evidentiality. Thus, beside the non-inferential use of *klingen* in (1a), in which a directly perceived auditory quality is ascribed to the subject referent, *klingen* can also be used to mark inferential evidentiality (1b-d):

(1) a. *Seine Stimme klingt dumpf.* 'His voice sounds muffled.'
b. *Die Wand klingt massiv.* 'The wall sounds solid.'
c. *Die Sonate klingt schwierig.* 'The sonata sounds difficult.'
d. *Seine Nase klingt verstopft.* 'His nose sounds congested.'

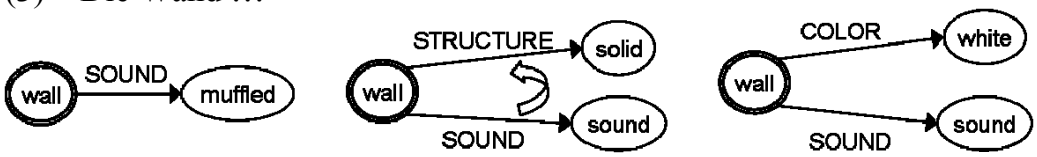
In all of the examples in (1b) to (d), *klingen* expresses that there is auditory evidence for the statement made up of the subject and the predicative complement of the perception verb. In (1b) the claim that the wall is solid, is inferred from the way it sounds. Likewise, in (1c) and (d) the properties ascribed to the sonata and the nose are based on auditory evidence. As stated by Whitt (forthc.), all the evidential uses of *klingen* found in his corpus study are instances of inferential evidence as opposed to other types of evidentiality such as hearsay and non-inferential uses as in (1a). However, apart from these distributional facts there has been no analysis of how the process of inference in inferential evidentials works. A proper analysis has to explain why the awkward examples in (2) are ruled out:

(2) a. *Die Wand* §*klingt/ist weiß.* 'The wall §sounds/is white.'
b. *Die Sonate* §*klingt/ist lang.* 'The sonata §sounds/is long.'
c. *Seine Nase* §*klingt/ist sommersprossig*. 'His nose §sounds/is freckled.'

The awkward combinations of *klingen* and predicative complement in (2) cannot be excluded by a mismatch between the sort of the subject referent and the sortal restrictions of the verb or the predicative complement. As shown by the corresponding copula sentences, the predicative phrase can be combined with the subject. Moreover, the examples in (1) demonstrate that *klingen* can select the subjects that appear in the awkward sentences in (2). Obviously, the *klingen*-sentences in (2) are ruled out not because of a violation of sortal restrictions but because they are instances of non-admissible inferences.

The inferential use is not confined to verbs of auditory perception. Verbs such as *aussehen* 'look (like)', *schmecken (nach)* 'taste (of)', *sich anfühlen* 'feel (like)', *riechen (nach)* 'smell (of)', which refer to sense modalities other than SOUND, can also be used as inferential evidentials. In our talk, we present a frame-theoretic account which covers the inferential and non-inferential use of perception verbs of any sense modality. Following Barsalou (1992), we define frames as recursive attribute-value structures which are represented as directed labeled graphs with the arcs corresponding to attributes and the nodes to their values (cf. Petersen 2007). As illustrated in (3), attributes such as SOUND, STRUCTURE, COLOR constitute cognitive dimensions of the represented object (wall) and assign unique values (e.g., muffled) to them. Furthermore, we assume that frame signatures capture the knowledge about admissible frames by restricting the set of appropriate attributes and their values for object classes. Given our frame model, the admissible inferential and non-inferential uses of perception verbs are captured as constraints on attributes assigned to the subject referent, the verb and the predicative complement. More precisely, we assume that the perception verb encodes a single, specific attribute, we refer to as 'dimension'. This dimension is determined by the sense modality the perception verb is connected with, e.g., the dimension encoded by *klingen* is SOUND.

(3) Die Wand …




(a) ... *klingt dumpf* (b) ... *klingt massiv* (c) § ... *klingt weiß*

In the non-inferential use in (3a) the predicative complement specifies a value along this dimension. The inferential use in (3b) is characterized by a mismatch between the predicative complement and the dimension encoded by the verb: *massiv* 'solid' in *klingt massiv* 'sounds solid' is not a possible value inside the dimension of sound. However, the value belongs to a different dimension, namely STRUCTURE, which can be inferred from SOUND, since the sound produced by tapping on an object is determined by its physical structure. The inference can be described as a dimensional shift from SOUND to STRUCTURE. For a dimensional shift to be admissible, minimally the constraint must hold that the subject referent exhibits both the dimension encoded by the verb and the dimension which belongs to the value specification. In addition, for a given subject referent the constraint must be fulfilled that the implicit dimension is inferable from the one explicitly encoded by the perception verb. In our model, we encode the information about admissible inferences in our frame signature. The frame in (3c) demonstrates why the latter constraint is indispensable. It shows a white wall with unspecified sound characteristics. But although the wall fulfills both sortal restrictions of *klingt weiß*, namely being white and having a sound, the frame in (3c) cannot be inferred from *klingt weiß* since the color of an object is not inferable from its sound.

We will argue that a frame analysis is ideally suited for the treatment of inferential evidentials since a proper analysis requires explicit reference to object dimensions, which can easily be represented as frame attributes. In addition, the device of frame signatures, which we apply to identify admissible inferences, is well-established in frame-theoretic models. In our talk we will also present more intricate examples including dimensional shifts involving more than one inference step like *schmeckt alt* 'tastes old', where the attribute AGE can be inferred from TASTE via FRESHNESS. Other complex dimensional shifts involve attributes not attached to the same node as in *seine Stimme klingt traurig* 'his voice sounds sad'. Here, *traurig* 'sad' can be analyzed as the value of the attribute MOOD, which is not attached to the voice-node but to the node of the owner of the voice, while SOUND is an immediate attribute of voice. Hence, the inference goes from an immediate attribute of the subject referent to a deeper embedded attribute. The representations in our frame-based account are sufficiently expressive to capture complex instances of dimensional shifts since the attributes involved in inferences are explicitly represented in frame representations.

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## Pathways to definiteness: Possessives with non-possessive function

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The basic function of possessive constructions is to encode a certain kind of relationship between two entities (Barker 1995). This relationship can be indicated in several ways. Languages belonging to the Uralic language family realize possession with different constructions such as case, word order and conjunctions. However, all these languages have the ability to mark possession with a possessive suffix on the possessed entity. In addition to their use as possessive markers these suffixes adopt a further function: Since most Uralic languages lack articles some of them extended the function of their possessive suffixes and seem to use them to indicate definiteness. This is not limited to a particular suffix but to the singular forms:

(1) Udmurt:
*turyn-ez* *čeber*
grass-POSS3SG beautiful
'The grass is beautiful.'

(2) Selkup:
*Qoltyt* *qanyqqyn* *anty* *totta,*
river bank.on boat stands
'A boat stands on the riverbank,'

*anty-ty* *lapykə:l* *e:ŋa.*
boat-POSS3SG oar.without is
'the boat doesn't have an oar.'

(3) Mari:
*tuδə-n* *wüt-šö*
he-POSS3SG water-3SG
'the water'

(4) Komi:
*Vęr-ad* *lįmj-įd* *sįlema* *n'in*
forest-INESS.POSS2SG snow-POSS2SG melted already
'In the forest the snow has melted already.'

(5) Ostyak:
*Tăm xuj-em xăĺśa jŏxtəs?*
this man-POSS1SG where come.3SG
'Where did this man come from?'

This phenomenon of the so called non-possessive use of possessive suffixes rises different interesting questions: Are these suffixes actually definiteness-markers? If so, why do some languages grammaticalize possessive suffixes as definiteness markers instead of demonstratives as the Indo-European languages did? What is the starting point of this grammaticalization and what pathway is taken? Why is the non-possessive usage not restricted to a particular possessive suffix?

Some of these questions are already partly debated in the literature but mostly left open. Fraurud (2001) observes that the grammaticalization of demonstratives starts with an extensive use of the forms within direct anaphora. (*On the hill there is a little cottage. This/the cottage was built in 1865.*). The pathway of possessive suffixes begins with the extensive use within associative anaphora (*On the hill there is a little cottage. The/Its roof is leaking.*). Although her assumption seems to be hold Fraurud fails to explain the distribution of the suffixes. Schroeder (2006) states that where 2nd and 3rd person singular possessive suffixes have the determining function their distribution has the function to express aspects of the opposition between anaphoric and nonanaphoric reference. This is only true for at least two of the respective languages. Nikolaeva (2001) calls attention to the fact that the use of possessive suffixes as definite articles cannot simply be affiliated to definiteness since they are utilized with non-definite NPs or generics as well or even with NPs which are already marked for definiteness (as in (5)). Nikolaeva distinguishes three basic non-possessive meanings denoted by the possessive affixes, namely identifiability, associative relationship and emphasis, but leaves open, if this distinction goes along with the distribution of the suffixes.

In my paper I will show that the possessive suffixes of the respective Uralic languages are on the pathway to definiteness. They are found in different stages of grammaticalization and are by far not stable indicators for definiteness. But they already exhibit most of the properties which are traditionally assumed for definite articles. The application and the distribution of 2nd and 3rd person possessive suffixes as definite articles match Löbners (1979, 1985) noun type classification. This classification is based on the crossclassification of conceptual uniqueness and relationality of nouns. Depending on whether they are relational and/or unique or not nouns can be assumed as sortal, individual, relational or functional nouns. Functional nouns can be understood as outstanding because they are double marked in the sense that they are inherently unique and relational (*mother, head*). Löbners noun type classification does not only apply to the lexical noun type but to the usage of the noun in a given context. Hence a primary sortal noun (which is classified as non-relational and non-unique) as *a table* can shift to a functional noun when speaking of *the table in my kitchen*.

Löbner (1998) states that in any case of associative anaphora, the head noun is interpreted as a particular kind of functional concept which requires specification of its possessor argument for determining its referents in a given context. Since the use of

possessive suffixes within associative anaphora seems to be the starting point of grammaticalization (as mentioned before) the pathway to definiteness becomes obvious: nouns with a possessive suffix are interpreted not only as relational but as refering to a unique referent in a given context. Though the original interpretation of sentences as (4) can be assumed as "The forest known by you" or "The forest you have walked through". In sentences (1)-(3) the possessive suffixes do not establish this kind of relation between the topic of the sentence and the hearer but link the topic to a more general knowledge which is available to the hearer.

The distribution of the 2nd and 3rd person possessive suffixes seems to resemble the lexical type of the noun in use: if the referent of the noun is inherently unique it can be understood as semantically definite and gets marked with the 3rd person possessive suffix. The 2nd person possessive suffix indicates that the noun is pragmatically unique, that is, its referent is only unique within a given situational context. Since the suffixes are not fully grammaticalized as definiteness markers their distribution sometimes differ from clear-cut distinction.

Hence the use of the possessive suffixes provides an example of a so far little observed pathway to definiteness which seems to end up in a kind of fine-grained definiteness-marking correlating with conceptual noun types.

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# Classifying Adjectives for Attribute Learning: an Empirical Investigation

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## 1 Introduction

Adjectives can be considered highly important connectors at the interface between language and knowledge representation. In the vital fields of ontology learning and knowledge acquisition from text, the linguistic properties of adjectives are harnessed

for the purpose of learning attributes, i.e. the constitutive components of a concept (cf. Almuhareb (2006), among others). In such a learning scenario, the particular problem to be solved consists in associating an adjective with an appropriate attribute. For instance, *red* denotes a possible value of the attribute COLOR.

From a cognitive perspective, attribute learning can be regarded as an important gateway towards the formulation of frames, which are the basic units of conceptual representation according to Barsalou (1992).

As a prerequisite for learning attributes from adjectives, we propose to perform a classification step that is intended to separate adjectives denoting attribute values from others that exhibit different semantic properties.

## 2 Classification Scheme

For this classification task, we initially adopted a tri-partite classification scheme distinguishing *basic*, *event-related* and *object-related* adjectives that has been proposed by Torrent (2006) for Catalan and is similar in spirit to the ontologically motivated scheme used by Raskin and Nirenburg (1998).

**Basic Adjectives.** Basic adjectives are analyzed to denote values of an attribute of an entity. These values are either discrete values of an attribute, such as *rectangular*, which is a value of an object's attribute SHAPE, or predications over sets of discrete values, such as *young,* which denotes a range of possible numerical values.

(1) rectangular box ↔ SHAPE(box)=*rectangular*
(2) young girl ↔ AGE(girl)=*young*

One well-established test for the class of adjectives we refer to as basic relies on explicit coocurrences of the respective adjective with the ontological attribute it predicates (Almuhareb, 2006; Woods, 1975):

(3) the red table ↔ red is the COLOR of the table
(4) the big mouse ↔ the mouse has a/is of a big SIZE

**Event-related Adjectives.** Event-related adjectives can be characterized in terms of an event the referent of the noun takes part in. Thus, the adjective essentially functions as an adverb modifying this event, as shown in the following examples:

(5) fast horse ↔ horse that <u>runs</u> fast
(6) eloquent person ↔ person that <u>speaks</u> eloquently

**Object-related Adjectives.** This class comprises adjectives that are morphologically derived from a base noun $N_{base}$. As is illustrated by the following examples and paraphrases, $N_{base}$ refers to an entity acting as a semantic dependent of the head noun $N$. Note that $N_{base}$ cannot be interpreted as an attribute of $N$.

(7) economic crisis$_{[N]}$ ↔ crisis of the economy$_{[Nbase]}$
(8) political debate$_{[N]}$ ↔ debate on politics$_{[Nbase]}$

**Class Ambiguities.** The most notable ambiguities among the classes of this tripartite classification scheme hold between event-related and basic adjectives. Consider the following competing analyses for *fast horse*.

(9) fast horse ↔ horse that runs fast
(10) fast horse ↔ VELOCITY(horse)=*fast*

We hypothesize that this ambiguity can be traced back to the difference between such attributes that are inherent to a certain entity and others that depend on the presence of certain other properties (e.g., the property of being *fast* could not be awarded to a horse in absence of its ability to *run*). Thus, for the annotation experiment described in Section 3, we provided our annotators with the following inference patterns for distinguishing event-related adjectives from basic ones:

(11) ENT's property of being ADJ is due to ENT's ability to EVENT.
If ENT was not able to EVENT, it would not be an ADJ ENT.

Note that this criterion is closely related to the distinction between *attributes* and *roles* as purported by Guarino (1992). From this perspective, event-related adjectives denote roles while basic adjectives denote attributes.

## 3 Annotation Experiment

In order to validate the tri-partite classification scheme presented above, we ran an annotation experiment with three human annotators. We compiled a list of 200 high-frequency English adjectives from the British National Corpus (BNC). For each of these adjectives, we randomly extracted five example sentences from the written section of the BNC. Thus, the annotation set presented to the annotators contained 1000 items in total.

The task of the annotators consisted in labelling each of these items with one of the labels BASIC, EVENT, OBJECT or IMPOSSIBLE. The latter was supposed to be used in case the annotators were unable to provide a label (due to spurious examples or insufficient contexts).

The total agreement between the three annotators in terms of Fleiss' Kappa (Fleiss 1971) amounts to $\kappa = 0.404$. From our point of view, this can be considered as fair agreement, given the difficulty of the task.

| | BASIC | EVENT | OBJECT | IMPOSSIBLE |
|---|---|---|---|---|
| κ | 0.368 | 0.061 | 0.700 | 0.452 |

*Table 1: Category-wise κ-values for all annotators (tri-partite classification)*

Table 1 displays the overall agreement figures broken down into the four class labels. These figures suggest that the main source of disagreement between our annotators is the problematic distinction between the classes BASIC and EVENT. This is corroborated by a thorough analysis of the cases of disagreement.

## 4 Re-Analysis

This observation led us to re-analyze our experiment with respect to a bi-partite classification scheme, where we collapsed the BASIC and EVENT classes. We argue that this re-analysis is feasible under an assumption which acknowledges that there is a wide variety of *linguistic* realizations of the fact that certain properties are present in

an entity, while abstracting from the specifically *ontological* difference between attributes and roles. More precisely, the pattern given in (9) can be considered a valid paraphrase of the state of affairs that a particular horse has the property of being fast.
Re-analyzing our annotations in this way improves the overall agreement to κ = 0.69. The detailed agreement figures for the bi-partite classification are displayed in Table 2:

| | BASIC+EVENT | OBJECT | IMPOSSIBLE |
|---|---|---|---|
| κ | 0.696 | 0.701 | -0.003 |

*Table 2: Category-wise κ-values for all annotators (bi-partite classification)*

## 5 Discussion

These results lead us to conclude that the tri-partite classification scheme for adjectives as proposed by Torrent (2006) is affected by profound ambiguity issues. In particular, we found that, on our data, human judges had severe difficulties in distinguishing basic (i.e. attribute-denoting) adjectives from event-based ones, which are supposed to denote roles. Investigation of particular examples may lead us to deeper insights into the problems of this classification. As yet, our empirical results suggest that the distinction between attributes and roles may not be reflected clearly enough in the linguistic context, and therefore it is difficult to operationalize this distinction in a corpus-driven account for the determination of adjective meaning.

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# Definitely functional? Concept Types in Context

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In our talk we argue that nouns can be distinguished into four basic types with respect to the referential properties encoded in their lexical entry (cf. Löbner 1979, 1985): functional nouns (such as *mother, head*), relational nouns (*sister, friend*), individual nouns (*pope, sun*), and sortal nouns (*flower, table*). The distinction applies crosslinguistically. Sortal and relational nouns are conceptually not inherently unique in the sense that the number of possible referents is not restricted to one in a given context. In contrast, individual nouns and functional nouns are conceptually inherently unique. Furthermore, relational and functional nouns are inherently relational. In this view, functional nouns are double-marked: they are inherently unique and relational (cf. 1a).

| | non-unique reference | unique reference |
|---|---|---|
| non-relational | SORTAL NOUNS<br>indefinite<br>non-possessive | INDIVIDUAL NOUNS<br>definite<br>non-possessive |
| relational | RELATIONAL NOUNS<br>indefinite<br>possessive | FUNCTIONAL NOUNS<br>definite<br>possessive |

*Table 1: Types of nouns and unmarked types of determination*

Due to their referential properties, functional and relational nouns typically occur with possessive constructions, in contrast to sortal and individual nouns. Whereas sortal and relational nouns are typically used indefinite, individual and functional nouns occur with definite determination (cf. table 1). For the classification of a noun as a certain concept type it is essential to observe polysemy, since meaning variants of polysemous nouns may differ with respect to their referential properties and hence belong to different concept type classes (cf. 3a vs. 3b/c). Although nouns are conceptually predisposed for use in accordance with their underlying types, they may also be shifted to uses differing from their underlying types. Shifts require appropriate context conditions, such as e.g. giving up the inherent one-to-one relation between the possessor and the possessee (cf. 1b):

Standard German:

(1a) *Sein* *<u>Kopf</u>* *war* *kahl.* (functional)
POSSPRON.3SG.MASC head was bold
'His head was bold.'

(1b) *Die* *Hydra* *hat* *viele* *Köpfe.* (relational)
DEF Hydra has many head.PL
'The Hydra has many heads.'

On the basis of language data from standard German, regional varieties of German, and Hungarian we will argue that uses of nouns follow systematic patterns in two ways: (i) When a noun is used in accordance with its underlying type it occurs with determination of its respective class. (ii) When a noun is used differing from its underlying type, it undergoes a systematic type shift and occurs with (language specific) determination of the class it has been shifted to. Our analysis provides evidence for the assumption of underlying concept types and systematic shifts by indications from typologically diverse languages. Some regional varieties of German (e.g. Ripuarian, Frisian) for example exhibit two definite articles. Their distribution goes along with the uniqueness distinction of nouns: Inherently unique (individual/functional) nouns typically occur with the weak definite article (cf. 2a), sortal and relational nouns take the strong definite article when used definite (cf. 2b).

Ripuarian (examples from Hartmann 1982):

(2a) *Dr* *kop* *dät* *mer* *weh* (functional)
DEF.WEAK head does me ache
'My head aches.'

(2b) *Dat* *kenk* *es* *am* *jriene* (sortal, shifted to individual)
DEF.STRONG child is PROGR cry
'The child is crying.'

Hungarian provides evidence for the relationality distinction:

Meaning variant: *anyag* 'material (of)':

(3a) *Drága* *táska-k* *anyag-a* *gyakran* *bör* (rel.)
expensive handbag-PL material-POSS3SG is.often leather
'The material of expensive handbags is often leather.'

Meaning variant: *anyag* 'material':

(3b) *Egy* *cipő* *több* *anyag-ból* *van* *csinálva* (sortal)
INDEF shoe several material-from is made
'A shoe is made of several materials.'

(3c) *A* *cipész elad-ja* *az* *öszess* *anyag-já-t* (sortal, shifted to relational)
DEF shoemakersell-3SG DEF all material-REL-POSS3SG-ACC
'The shoemaker sells all his material.' [because he gives up his store]

The noun *anyag* has two different polysemous variants, (3a) in the sense of 'material of something', (3b) in the sense of 'material'. The variants differ regarding their relational properties, (3a) as denoting a part-whole relationship is an inherently relational noun, whereas (3b) is a sortal noun. In (3a) *anyag* is used according to its underlying type, in (3c) the noun is shifted from its sortal type to a relational use. This shift is

marked by the additional morpheme -j- on the possessive suffix. The use of this morpheme is restricted to the sortal variant of the noun and indicates that the relationality is not conceptually given. In our talk we will argue that such systematic patterns in typologically diverse languages support the assumption of underlying types as of type shifts.

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Löbner, Sebastian (1985): Definites. *Journal of Semantics* 4. 279-326.

## Semi-supervised learning of conceptual noun types

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We present an approach for semi-supervised learning of conceptual noun types in free text. Nouns can be distinguished into four basic conceptual types with respect to their referential properties encoded in their lexical entry (cf. Löbner 1979, 1985): sortal nouns (such as *bag, flower*), relational nouns (*friend, sister*), individual nouns (*sun, pope*) and functional nouns (*mother, meaning*). Unlike sortal and relational nouns, individual and functional nouns are inherently unique; they have only one possible referent in a given context (cf. table 1). In contrast to sortal and individual nouns, relational and functional nouns are conceptually relational. According to this classification, functional nouns are double-marked: they are inherently unique and relational. Grammatically, the four types typically occur with certain kinds of determination. Sortal and relational nouns have a disposition for indefinite determination, individual and functional nouns for definite determination. Since the referents of relational and functional nouns are defined by the relation to their respective possessors, these types typically occur in possessive constructions (cf. 1a, 2b, 3b). Although in spoken language a possessor does not always need to be realized syntactically but may e.g. be available from the context we expect that in texts the arguments are either saturated by a morphosyntactically realized possessor or by associative anaphora (as shown for a sample in Löbner 1998). We also expect that a noun is typically used according to its respective conceptual type since this is the unmarked case. In turn, the statistical variation of different morphosyntactic contexts of a noun may be indicator of its respective conceptual type. These characteristics may consequently be used for an automatic learning of conceptual noun types in free text.

| | **–inherently unique** | **+inherently unique** |
|---|---|---|
| **–relational** | Sortal nouns | Individual nouns |
| **+relational** | Relational nouns | Functional nouns |

*Table 1: Conceptual noun types*

For the classification of a noun as a certain type it is essential to observe polysemy. Meaning variants may have differing referential properties (see e.g. Sommerfeld & Schreiber 1983 for differing valences of German meaning variants) and hence differ regarding their respective conceptual types. Furthermore, in language use we also find that nouns are not used according to their conceptual type but in a shifted reading. These shifts are often marked morphosyntactically and require appropriate context conditions, such as e.g. giving up the inherent one-to-one relation between the possessor and the possessee (cf. 1b, 3b)

(1) a. *The meaning of the word is unclear.* functional concept
b. *The word* time *has several meanings.* relational reading

(2) a. *It was a hard time for me with sisters.* relational concept
b. *My sister lives in Seattle.* functional reading

(3) a. *Mary is Peter's mother* functional concept
b. *A mother should not smoke.* generic/sortal reading

*Meaning* in (1a) is used as an FC, in (1b) transferred into a relational reading by giving up referential uniqueness. In (2a) *sister* is used as an RC. In (2b) contextual information (*my*) is added about which sister is referred to; this specification allows it to clearly identify the referent of the expression (given that all other referents of the expression are identified). Without context information that triggers a differing interpretation, *my sister* is interpreted as *I have only one sister and she lives in Seattle*. Hence *sister* in this context has a functional reading. (3a) shows *mother* used according to its underlying functional type. (3b) has a sortal reading since *mother* is used in this context in a generic way.

The analysis suggests that shifts between conceptual noun types are possible by systematic processes which are accompanied by morphosyntactical indicators. We will show that data from different languages and statistic data from a German corpus support the noun type distinction.

We will now discuss a framework for semi-supervised learning of concept types combining bootstrapping with maximum entropy models. Learning is grounded on morphosyntactical context features obtained by full parsing. Maximum Entropie Models (MEM, cf. Ratnaparkhi 1998) provide a framework for supervised learning which can be embedded in a framework for semi-supervised learning like bootstrapping. MEM are used to model the conditional probability of classes $a \in A$ given sets of contextual features $b \subseteq B$.

(3) $$p(a \mid b) = \frac{1}{Z(b)} \prod_{j=1}^{k} \alpha_j^{f_j(a,b)}$$

Every binary feature $f_j : A \times 2^B \rightarrow \{0, 1\}$ combines a class $a \in A$ with a set $b \subseteq B$, for example:

(4) $$f_1(a,b) = \begin{cases} 1 \; if \; a = FC \wedge \{poss, definite\} \subseteq b \\ 0 \; else \end{cases}$$

MEM model the conditional probability $p(a|b)$ as the combined evidence of active binary features $f_j$. Since the $\alpha_j$ are real numbers in $[0 \ldots \infty]$, we need a normalization factor $1/Z(b)$ to obtain a well formed probability function with $\Sigma_a \, p(a|b) = 1$. There is no analytical method to compute the feature weights $\alpha_j$ but from the various iterative approximation algorithms to get them we use use *Generalized Iterative Scaling* (GIS, cf. Ratnaparkhi 1998). The features we use include *part-of-speech* and *word lemmata* of tokens to be classified as well as of context words, *number*, types of *possessive constructions*, *word suffixes* and some more. Most of the required features are obtained by full parsing with *fdg* for German (www.connexor.com) which provides us with dependency trees. We perform some postprocessing to identify the different types of possessive constructions.

Supervised learning methods require manually annotated training data which might be expensive and hard to acquire. *Bootstrapping* is a method for semi-supervised learning where a small set of annotated training data is used as a starting point to learn a classifier in supervised fashion which is then used for automatical annotation of large amounts of new data. These can subsequently be used to update the previously learned classifier. For bootstrapping we use the Yarowsky algorithm (Yarowsky 1995) which is organized in two loops. In the inner loop, the original algorithm learns a classifier with decision lists considering rules like "If instance *x* contains feature *f*, then predict label *a*" (Abney 2004). The outer loop uses a subset of rules with highest confidence to annotate new data, which are subsequently fed back to the inner loop. The loop stops when the resulting classifiers do not differ significantly. Instead of decision lists we integrate MEM in the inner loop and its seems that the binary features of MEM have almost the identical form of the rules used by Yarowsky. So we can use the same strategy to include only the most successful binary features to obtain a high precision classifier. This classifier is then used in the outer loop to annotate new text which serves as a new training sample for the inner loop, where the set of useful features is iteratively expanded. Finally, the resulting classifier can be used to automatically classify conceptual noun types in free text.

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# Natural color categories are convex sets

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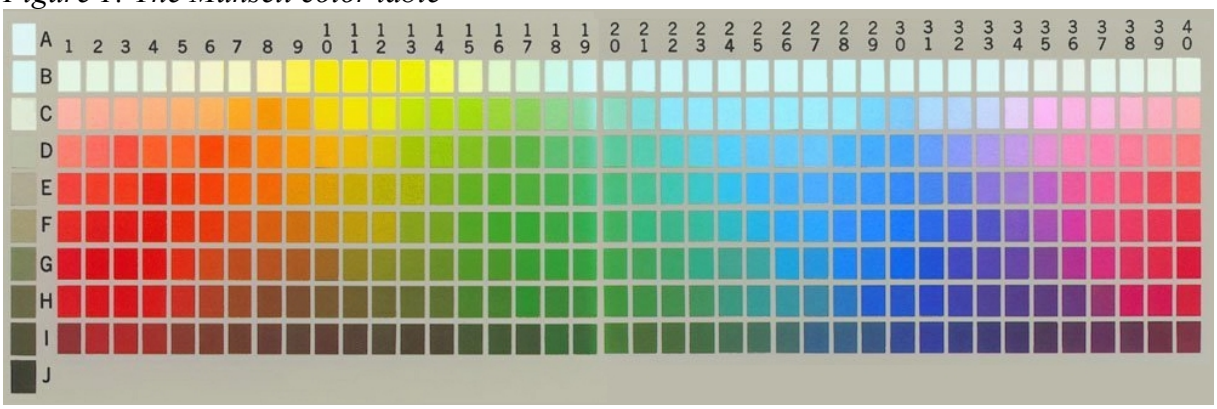
In Gärdenfors (2000) it is claimed that the extension of simple properties are convex regions in some conceptual space. The semantics of color terms lends itself readily to test this claim, (a) because the dimensionality of the underlying domain is non-trivial but well-investigated by cognitive psychologists, and (b) because the World Color Survey (WCS; see http://www.icsi.berkeley.edu/wcs/data.html) contains a large amount of fine-grained empirical data about the semantics of color terms in many typologically diverse languages.

The WCS is a research project that collected typological data on color categorizations across languages of the world. The raw data are freely accessible from the web. The researchers asked 2,616 informants from 110 languages around the world about their basic color vocabulary. For this task, 330 Munsell chips were used. The Munsell grid is given in Figure 1. Each informant had to assign each of these 330 colors to one of the basic color terms of their native language.

*Figure 1: The Munsell color table*




Each informant had to assign each of these 330 colors to one of the basic color terms of their native language.

So each informant supplied a partition of the color space into discrete categories. If Gärdenfors is right, we expect these categories to be convex sets. However, an inspection of the data reveals that the categories that are induced by single speakers are not even continuous (in the 2D-representation of the color space from Figure 1) in many

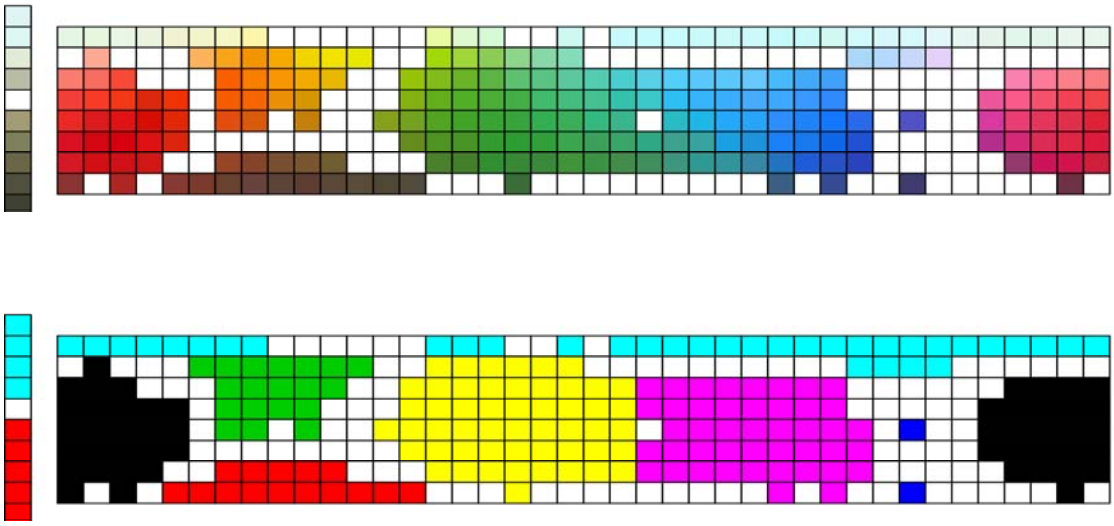
cases. Averaging over all informants of one language produces clearer patterns. On the other hand, we do find a good deal of interindividual variation within the speakers of one language, which are due to idiolectal differences as well as to difference preferences in the presence of synonymy and hyperonomy.

To reduce these effects as far as possible, we defined the extension of a given color term of some language L as those Munsell chips were there is a sufficient amount of inter-speaker consistency. More precisely, we identified for each color term T the Munsell chip C where the number of informants that used T to refer to T is maximal. This number is called $T_{max}$. The extension of T was defined as the set of chips where at least $.4xT_{max}$ many speakers used T to refer to it. It turned out that these extensions are always continuous in the 2D-Munsell space.

Using this methodolgy, the color vocabulary of a single language is not always a partition because we find many cases of synonymy and hyperononmy. Removing synonyms and hyponyms manually, we ended up with an exhaustive partition of the Munsell space in 104 of the 110 languages of the WCS.

Despite all cross-linguistic variation, these partitions display a high degree of consistency. (This fact is hardly surprising in view of the many typological universaly of color naming that have been identified in past thirty years; see Kay and Regier 2003 for a recent discussion.) It is also apparent crosslinguistic variation is stronger in some regions of the color space than in others. To quantify this, we constructed a similarity matrix by counting for each pair of Munsell chips how many of the above-mentioned 104 partitions put them into the same category. To this matrix we applied a cluster analysis and removed all Munsell chips from consideration that are at the periphery of the thus obtained clusters. The remaining chips are displayed in Figure 2.

*Figure 2: Munsell chart without cluster peripheries*

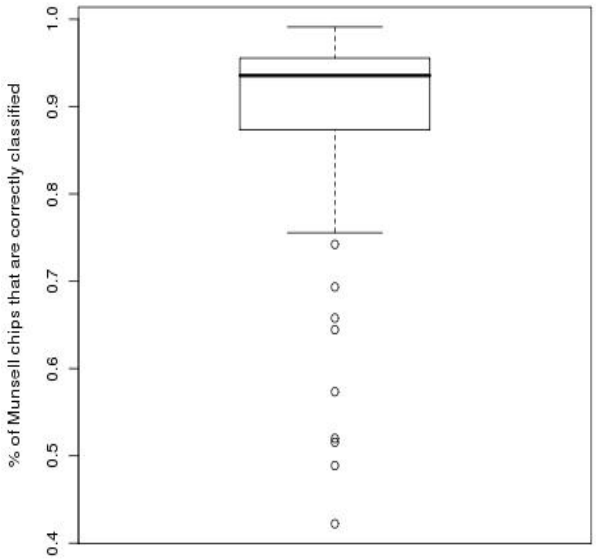


The clustering algorithm splits them into seven categories, which essentially correspond to the extensions of the English terms *white, black, red, green, blue, yellow*, and *purple*.

As next step, we tested whether these 7 categories are convex sets. Following the standard assumptions from the literature, we assumed that the underlying conceptual space of color cognition is the 3D CIELAB space (see Wyszecki and Stiles 1967). Using support vector machines, we found the optimal linear separator between each pair of categories. The predicted extension of a category was defined as the intersection of the six half-spaces that resulted from the six linear separations from competing categories. We found that with the exception of two misclassifications (out of 225 Munsell chips), the seven clusters that were induced empirically from the WCS data are in fact convex sets in the CIELAB space.

As final step, we checked whether the partitions that are imposed by the individual languages are convex sets. Again we restricted attention to the 225 chips shown in Figure 2, but now we used the categorizations from the individual languages as basis for the training of the support vector machines. We found that on average, 89.1% of the chips were correctly classified by the optimal convex partition. As can be seen from Figure 3, the median success rate is actually as high as 93.6%. The lower mean is due to ten outliers.

*Figure 3*




To put things in qualitative terms, we found that of the 110 language from the WCS, 94 languages induce convex partitions of the CIELAB color space. This is a striking confirmation both of Gärdenfors' theory and of the assumption that the CIELAB space is an adequate representation of the conceptual space underlying our color cognition.

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# The Definiteness Effect and a New Classification of Possessive Constructions

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In this presentation, we will propose a new classification of readings of possessive constructions. Contrary to the traditional distinction between alienable and inalienable possession based on nouns, a new classification emerges based on the readings of the possessive verb *have*: the Definiteness Effect (DE) in possessive constructions is dependent on the readings of the possessive verb *have* cross-linguistically. This allows us to integrate an information structural account of possessive construction meanings by Tham (2006) as a part of our classification. Finally, we show that the DE in *there*-constructions, but not the one in possessive constructions is related to the information structure.

First, we show that the occurrence of DE in possessive constructions is NOT predictable from the meaning of the object NPs only. Rather, we claim that the "possessive" interpretation and the "holding" interpretation of the verb are to be separated out and that concomitantly, DE arises only with the "possessive" interpretation, but not with the "holding" interpretation.

It has apparently been accepted that there would be a strong correlation between the DE observed in English possessive constructions and inalienable possession expressed by the object of *"have"*, while the effect would not be relevant to alienable possession denoted by the object. These facts lead many researchers to formulate that DE is due to inalienability (de Jong (1987), Keenan (1987), Partee (1999)).

(1) John has a/*the sister.
(2) John has a/the book.

DE arises, however, even when a non-relational noun is used as an object expressing alienable possession.

(3) Q. What will you give to Eliza for her birthday ?
A. Eliza has {a/#the} mirror, so I won't give one to her.

The same holds for Japanese possessive constructions with "*i-ru*" and "*ar-u*" (the counterpart to "*have*"). In (4), a relational noun is used as the object expressing inalienable possession and DE arises. However, DE can also arise with a non-relational noun in the object position expressing alienable possession in (5).

| | | | |
|---|---|---|---|
| (4) Kanojyo-ni-wa | (*sono) | ototo-ga | iru. |
| she-DAT-TOP | the | brother(s)-NOM | be |
| 'She has the brother.' | | | |

| | | | |
|---|---|---|---|
| (5) Kanojyo-ni-wa | (*sono) | okane-ga | aru. |
| she-DAT-TOP | the | money-NOM | be |
| 'She has the money.' | | | |

By contrast, sometimes DE does not arise even when relational nouns are used as the object describing an inalienable possession:

(6) John has the sister as a dance-partner.

These facts should be problems for any previous approaches, where DE in possessive constructions is assumed to be due to the notion of inalienable possession expressed by an object. Thus, we propose that DE arises when the construction (or verb) has a "possessive" interpretation, whereas it does not arise when the construction (or verb) has a "holding" interpretation.

(7) John has a wife of his own.

The sentence in (7) expresses an inherent property of disposition attributed to the subject. We call this kind of interpretation a "possessive" interpretation. This interpretation can be obtained also in using a non-relational noun expressing alienable possession as in (8):

(8) Eliza has a car.

The examples (9)-(10) describe that the possessor can avail himself of the possessee, but cannot claim ownership to it, which Heine (1997) calls temporary possession. We treat this kind of interpretation a "holding" interpretation. Again, this interpretation can be obtained using both alienable and inalienable possession described by an object.

(9) Eliza has a mirror, but it doesn't belong to her.
(10) Ann has a sister as her secretary, but she doesn't have a sister of her own.

DE arises when a "possessive" interpretation is obtained, while it does not when a "holding" one is obtained, as shown in the contrast between the examples (11)-(3A) and (12A)-(13).

(11) # John has the sister (of his own).

(3) Q. What will you give to Eliza for her birthday ?
A. Eliza has {a/#the} mirror, so I won't give one to her.

(12) Q. What can I use to hold these papers down?
A. Eliza has {a/ <u>the/ John's} mirror</u>.

(13) Anne has <u>Bill's sister</u> as secretary.

Secondly, the English possessive constructions with "holding" interpretation are polysemous. Tham (2006) argues that the meaning of *have* can be distinguished based on the informational status of the object when DE does not arise. We follow Tham's suggestion and apply his distinction to our "holding" *have*. When the object conveys new, focus information for the addressee, the English construction is assumed to be focal and "presentational":

(14) Q: Who can help John?
A: He has <u>Sally</u>.

In contrast, when the object carries old, presuppositional information, the construction acquires a special, control meaning, which is perhaps attributable to the verbal interpretation of *have*:

(15) Q: Where is my umbrella?
A. John has it.

In this connection, we claim that a cross-linguistic contrast can be observed with respect to the "holding" *have*: In Japanese, only the focus reading of "*i-ru*" and "*a-ru*" can be found. The control reading is not available wih these verbs (the related examples not cited here due to space limitation).

If our proposal for the new classification of readings of possessive constructions is correct, it shows that the "presentational" *have* is just a part of the whole picture. *There*-constructions are known to be used for the "presentational" purpose (i.e. the argument in question conveys new, focus information for the addressee). Therefore, we finally conjecture that there is a functional and motivational difference between the DE in possessive constructions and in *there*-constructions. DE in *there*-constructions is due to its presentational function of the postverbal noun and the information structure of the construction is involved, while DE in possessive constructions both in English and Japanese is not related to the information structure of the complement.

In fact, the object in possessive constructions can convey old (as in (17)) as well as new (as in (16)) information. We show that the same holds for Japanese also.

(16) Q: What type of wife does John have?
A: He has a beautiful wife.
(cf. It is a beautiful wife that John has.)

(17) Q: Who has a {wife / lover}?
A: John has a {wife/lover}.
(cf. It is John who has a wife.)

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# Actional classes and valence-changing derivations

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**Goals**. This paper reports on a project that aims at establishing actional classes of verbs (a.k.a aspectual classes, eventuality types, situation types, lexical aspect, etc.) in a less studies language and at identifying effects of valence-changing derivations, cauativization and anticausativization, on actional characteristics of verbal predicates.
**Data**. Data for the study come from Karachay-Balkar, a Turkic language spoken in the Caucasus.
**Actional classification.** We propose a novel technique of identifying actional classes whereby an actional characteristic of a verb is a pair of sets of actional meaning labels characterizing its two basic aspectual forms. Meanings labels are listed in (1). The Preterite of the verb *zaz* 'write' in (2), given its two interpretations in (2.1) and (2.2), is characterized by two meaning labels {process, entry into a state}. Present of *zaz* 'write' in (3) is assigned a single label {process}. The complete actional characteristic of *zaz*, (4), is thus a set of two sets {{process, entry into a state}, {process}} or, in short, {ES P; P}. The rationale behind this technique consists of two parts. First, we reject a common (often tacit) assumption that Vendler's quadripartition (states, activities, accomplishments, achievements) is logically universal, hence in every language the whole set of predicates should fall into Vendlerian classes. Rather, we are trying to identify actional classes on empirical basis. Secondly, we have to solve the problem of indirect access (Zucchi 1999, Kratzer 2003), a.k.a. the problem of circularity (Ebert 1995, Tatevosov 2002). Actionality of a non-inflected verbal predicate is not accessible to direct observation, being only indirectly visible through the behavior of different inflected forms of that predicate. To find out about actionality, one has to subtract the semantic contribution of tense and aspect operators from the meaning of the whole. But to figure out what this semantic contribution is, one has to know about actionality. The technique outlined here enables us to avoid complications related to the problem of indirect access: the actional class of the whole predicate is established on the basis of actional properties of its inflected forms without any premature assumptions about its non-inflected construal. Finally, to avoid complications related to aspectual composition (Verkuyl 1972, 1993, Krifka 1989, 1992, 1998 and much related work) we only take into account predicates in which argument positions are saturated by quantized nominal arguments in Krifks'a terms. Basic actional classes in Balkar are listed in (5).

**Non-culmination, causativization and anticausativization**. The technique outlined above allows us to determine systematic actional relations between causatives and corresponding non-derived intransitives, one the one hand, and between anticausatives and corresponding non-derived transitives, on the other. For the sake of space we only discuss here non-derived verbs, causatives and anticausatives that fall within {ES P; P} (weak telic) or {ES; P} (strong telic) classes. The difference between the two is that former verbs, unlike latter verbs, possess not only telic, culminating reading (ES) of perfective forms, but also a non-culminating process reading (cf. (2a-b)). Crucial

generalizations are as follows. Causativization of a strong telic {ES; P} unaccusative verb creates a weak telic {ES P; P} transitive verb, where a non-culminating P-interpretation is a failed attempt, (6a-b). Causativization of a weak telic {ES P; P} unaccusative verb, (7a-b), creates a weak telic {ES P; P} verb, where a non-culminating P-interpretation comes in two varieties: it can either be a failed attempt (7b.1) or a partial success, (7b.2). Anticausativization shows a reverse pattern.

To account for the range of interpretations of causatives and anticausatives we propose a syntactic decompositional analysis of event structure extending and modifying that of Ramchand 2008. We suggest that both causative and anticausative morphology merge as v. The causative introduces a causing activity subevent with underspecified descriptive properties. The anticausative binds existentially the causing activity subevent and externalizes a process in the denotation of the complement VP.

**Examples**

(1) State (S)
Process (P): non-stative eventuality does not have or doe not reach culmination
Multiplicative process (MP): same as process except that atomic subevents it consists of can be referred to by the same event description
Entry into a state (ES): eventuality culminates yielding a result state
Entry into a process (EP): eventuality culminates yielding a result process

(2) kerim qaRyt **zas-ty**.
Kerim letter write-PST.3SG
*1. Kerim wrote a letter. <ES>*
*2. Kerim spent some time writing a letter. <P>*

(3) kerim qaRyt **zaza** **edi**.
Kerim letter write.IPFV COP.3SG
*Kerim was writing a letter. <P>*

(4) *zaz* 'write': {ES P; P}

(5) Actional classification

***1. Telic verbs***

1.1. Strong telic verbs: <ES; P>: *cyq* 'go out', *kir* 'enter', *Ol* 'die', *syn* 'break_intr', *zet* 'reach'.
1.2. Weak telic verbs: <ES,P; P>: *ac* 'open', *acy* 'go sour', *aSa* 'eat', *eri* 'melt_intr'
1.3. Punctual verbs: <ES; – >: *tap* 'find'

***2. Process verbs***

2.1. Atelic verbs: <P; P>: *izle* 'look for', *qyjna* 'torture', *saqla* 'wait', *tUrt* 'push', *zawa* 'rain'
2.2. Ingressive atelic verbs: <EP,P; P>: *cap* 'run', *zUz* 'swim', *soz* 'pull', *uc* 'fly', *kUl* 'laugh'

***3. Stative verbs***

3.1. States: <S; S>: *zaSa* 'live', *este tut* 'remember'

3.2. Inceptive stative verbs: <ES,S; S>: *awru* 'ache', *bil* 'know', *kOr* 'see', *qorq* 'be afraid'

***4. Bi-telic verbs:*** <EP ES P; P> *qycyr* 'shout', *ulu* 'yowl', *zan* 'burn'

***5. Multiplicative verbs***

5.1. Pure multiplicative verbs <ES, MP; MP>: *cajqa* 'rock', *sekir* 'jump', *zOtel et* 'cough'

5.2. Multiplicative-process verbs <ES,MP,P; MP,P>: *syzRyr* 'whistle', *uppa et* 'kiss'

***6. Complex types***

<ES, S; P> *ary* 'get tired', *bol* 'become', *qal* 'stay', *tas bol* 'get lost'
<ES, P, S; P> *aRar* 'whiten', *bat* 'sink', *unut* 'forget', *zabyS* 'stik, glue'
<ES, P, S; P, S> *bux* 'hide', *buzla* 'freeze', *oltur* 'sit', *tur* 'stay', *tut* 'keep, catch', *zat* 'lie'

(6) a. *syn* 'break_intr': {ES; P}
*butaq eki minut syn-dy.
branch two minute break-PST.3SG
*'The branch broke for two minutes.' <*P>

b. *syn-dyr* 'break-CAUS': {ES $\mathbf{P}_{\textbf{failed attempt}}$; P}
alim butaq-ny eki minut syn-dyr-dy.
Alim branch-ACC two minute break-CAUS-PST.3SG
'Alim tried to break the branch for two minutes.' <$P_{\text{failed attempt}}$>

(7) a. *eri* 'melt_intr': <ES, **P**; P>
kusok buz-nu eki minut eri-di.
piece ice-GEN two minute melt-PST.3SG
'The piece of ice was melting for two minutes (, but didn't melt to completion).' <$^{OK}$P>

b. *eri-t* 'melt-CAUS': <ES, $\mathbf{P}_{\textbf{partial success, failed attempt}}$; P>
alim kusok buz-nu eki minut eri-t-ti.
Alim piece ice-GEN two minute melt-CAUS-PST.3SG
1. 'For two minutes, Alim was trying to melt the piece of ice, {but didn't melt it to com pletion}'. <$P_{\text{partial success}}$>
2. 'For two minutes, Alim tried to melt the piece of ice, {but it was so cold that Alim failed completely}'. <$P_{\text{failed attempt}}$>

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## Uniqueness of the definite article in terms of a frame

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In previous research, the use of the singular definite article (*the* in English, *le*/*la*/*l'* in French) has often been explained by uniqueness theory, that is, the singular definite requires the existence of one and only one entity meeting the description. This theory seems to coincide well with intuition. However, there are observable instances of the singular definite which seem to escape the uniqueness requirement, as follows.

(1) As soon as my cousin arrived in Santiago, she broke her foot and had to spend a week in *the hospital*. (Birner & Ward, 1994)
(2) Quand j'étais à Paris, je me suis tordu la cheville et je suis allé à *l'hôpital* pour me faire soigner. (When I was in Paris, I sprained my ankle and I went to *the hospital* to receive treatment.)

Despite the fact that the interlocutor cannot identify uniquely the referent of *the hospital* in (1) or *l'hôpital* in (2) because of the existence of several hospitals in Santiago or in Paris, the use of the singular definite is perfectly appropriate. Some linguists, such as Birner and Ward, claim that this use of the singular definite presents counterexamples to the uniqueness theory. Others, such as Epstein (1999) and Abbott (2001), assert that the example of *the hospital* in (1) does not refer to a particular hospital in reality but refers to a *unique 'role' hospital* within a "city frame", which contains "hospital, park, bank, …etc." as stereotypical elements, and this satisfies the uniqueness condition. While there is agreement with the premise of a unique role within a cognitive frame, it will be argued in this study that the cognitive frame supporting the felicitous use of the definite *the hospital* in (1) and *l'hôpital* in (2) is not a "city frame" as Epstein and Abbott assert, but a "medical care frame" which includes "doctor, nurse(s), hospital, …etc.". This argument is evidenced in the following examples:

(3) [in Paris, a member of a movie camera crew] La semaine dernière, on est allés {à **l'hôpital* / dans *un hôpital*} pour tourner une scène. (Last week, we went to {**the hospital* / *a hospital*} to film a scene.)

(4) [in Paris, an engineer] Hier, je suis allé {à **l'hôpital* / dans *un hôpital*} pour réparer le circuit électrique. (Yesterday, I went to {**the hospital* / *a hospital*} to do some wiring.)

The speaker cannot use the singular definite **l'hôpital* or **the hospital* in (3) nor in (4), because a "movie filming frame", evoked in (3), contains "director, cameraperson(s), projector(s), scenario, actor(s), …etc." as stereotypical roles, but not "hospital". Equally, the "wiring frame", evoked in (4), includes "wiring diagram, screwdriver(s), pliers, …etc." as roles, but not "hospital". Neither "movie filming frames" nor "wiring frames" admit the use of the definite *l'hôpital* / *the hospital* as a unique role within their respective cognitive frame. If the presence of a "city frame" were presumed in all of the examples (1) to (4), as the Epstein and Abbott stance would suggest, we should use the definite *l'hôpital* / *the hospital* in (3) and (4) as well as in (1) and (2), but this is not the case. We can conclude, therefore, that the use of *l'hôpital* / *the hospital* as a singular definite is allowed not due to a "city frame" but owing to a "medical care frame" or a "surgery frame" containing "hospital" as a unique role. The same argument can be applied to the following examples:

(5) Je vais passer {à *la banque* / dans *une banque*} pour retirer de l'argent. (I'll stop at {*the bank* / *a bank*} to withdraw some money.)
(6) Je vais {à **la banque* / dans *une banque*} pour passer un entretien d'embauche. (I'll go to {**the bank* / *a bank*} for a job interview.)

If the definite *la banque* / *the bank* in (5) is felicitous, it is neither because there was typically only one bank when this usage was first established, as Abbott claims using the term *traditionally unique items*, nor because a "city frame" contains a "bank" as a stereotypical element. The acceptable use of the definite *la banque* / *the bank* in (5) results from the presence of a "frame for withdrawing money" evoked, which includes "a bank, a cash card, an ATM, etc." as stereotypical roles. On the other hand, the use of the definite **la banque* / **the bank* is not appropriate in (6), because the "frame for a job interview" called up in (6) does not contain "bank" a priori.

The cognitive frame in the examples provided here is therefore not a fixed idea such as a "city frame", but a flexible notion, which is evoked by the context of the utterance or the circumstances.

This presentation, rested on these findings, introduces a new interpretation of the definition of a role within a cognitive frame. The enigmatic use of the singular definite article in English and in French is also explained based on uniqueness as a role within a cognitive frame.

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## Definite article asymmetries and concept types: semantic and pragmatic uniqueness

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According to Löbner (1985) all definite descriptions are construed as functional concepts. In other words, any definite noun phrase (for example, *the moon, the begin of the conference*) can be assigned exactly one referent. A crucial distinction within Löbner's theory is that between semantic and pragmatic uniqueness. By semantic uniqueness it is meant that the reference of an NP is unambiguous for reasons independent of the context or situation (hence semantic reasons), while pragmatic uniqueness refers to those uses of NPs that refer unambiguously only due to the given context of utterance, as in, e.g., deictic or anaphoric use. The goal of the talk is to exploit this distinction in order to motivate a number of asymmetries with regard to the use or non-use of the definite article(s) in various languages.

Among the better-known examples is the absence of the article in configurational uses of (otherwise sortal) nouns as functional concepts, as in *go to school, at court, be in hospital/prison*; similarly, in the German equivalents the article is fused with the preceding prepositions as in *zur* (to-DEF.DAT.FEM) *Schule gehen*, *im* (in-DEF.DAT.NON_FEM) *Krankenhaus/Gefängnis sein*, whereas full article forms are required in case of pragmatic uniqueness.

The various splits one encounters can be assigned to one of the following two types:

(i) Pragmatic uniqueness is marked by the definite article, whereas semantic uniqueness is unmarked. For example, in both English and German, functional concepts are often found as bare nouns in the singular, as in *the items differ in shape, colour, and size*. As a diachronical corollary, the use of the article tends to spread from pragmatic to semantic definiteness, eventually also covering those concepts where it is of little functional load, as is the case with proper names for persons in colloquial German. Moreover, the use of demonstrative pronouns as definite articles in some West Slavic languages tends to cover precisely the contexts pragmatic uniqueness (see Breu 2002 and Scholze 2007 on Upper Sorbian).

(ii) Pragmatic and semantic uniqueness is morphosyntactically distinguished by different article forms. Lakhota with its two definite articles *ki* and *k'ʊ* is a case in question.

Likewise, the phonological contrast of weak and strong definite articles in Frisian (Ebert 1970) as well as many dialects of German (in particular, Ripuarian and Alemannic; see Schroeder 2006 on the former and Studler 2004 on the latter) can be shown to reflect the same distinction.

The talk will underpin and further elaborate on this distinction by providing case studies for each of the two kinds of splits:

– the diachrony of Georgian: In the earliest Old Georgian text, while the article occurs fairly systematically in contexts of pragmatic uniqueness (especially anaphoricity; cf. also Boeder 1997), it is hardly found in contexts of semantic uniqueness. Only in later sources is the domain of the use of articles extended so as to occur also with underlying lexical functional concepts, where it is semantically redundant. The situation is mirrored by the later decrease of article uses: they are most stable where they are not redundant, that is, in contexts of anaphoric definiteness.

– Dutch, with its weak article forms *de* (utrum gender) and *het* (neuter) in addition to the strong forms *die* and *dat*, respectively. (The latter forms are traditionally referred to as demonstrative pronouns.) A study on the basis of selected novels reveals that the form distinction corresponds to semantic and pragmatic definiteness, respectively.

In analysing the relevant data, particular attention will be paid to more subtle cases of uniqueness such as non-lexical functional concepts (in particular, nouns preceded by ordinals or superlative adjectives), as well as definite associative anaphora (a phenomenon also known as 'bridging'). This latter kind of definite description combines properties of pragmatic uniqueness (by virtue of anaphoricity) and semantic uniqueness (by virtue of involving a functional concept). It is therefore expected that the phenomenon gives rise to variation both between languages and within individual languages/varieties as to the use of articles (cf. also Schwarz 2008). I show that this is indeed the case, but that nevertheless the generalization emerges that languages with a split of type (i) tend to use (rather than leave out) the article, like they do in contexts of pragmatic uniqueness, whereas languages with a split of type (ii) tend to use the weak article, i.e., the one used with semantic uniqueness. It is proposed that the cross-linguistic variation in the uses of definite articles can be described in terms of the spreading along a concept hierachy that is defined by the narrowness in the choice of possible referents.

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## Frame Semantics and Lexical Decomposition – A Case Study of Cognition Verbs

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In the context of verb semantics, the notion of frame is nowadays mostly associated with the research program known as Frame Semantics initiated by Charles Fillmore. Words, in one of their senses, are linked to frames, which are schematic cognitive structures that represent a speakers' knowledge of the described situation or state of affairs. Moreover, the relationships between word senses and lexico-syntactic patterns are systematically recorded, and each of these patterns has its components indexed with specific parts of the associated frame (Fillmore & Atkins, 1992). Frame Semantics has been put into practice in the FrameNet project, which provides a three-layered description of valency patterns in terms of frame roles, grammatical function, and phrase type (Fillmore, 2007). FrameNet has first and foremost descriptive goals in that its rationale is to collect valency patterns based on extensive corpus annotation. Its modelling assumptions are encoded in the definition of the frames and their interrelations and, to a certain extent, in the chosen grammatical functions. FrameNet does not presume any theory of the syntax-semantics interface. At best, a *post hoc* analysis may reveal generalizations about how certain frame roles are realized syntactically.

In the talk, we will contrast this approach with predictive or 'projectionist' positions that take lexical-semantic representations as a basis for explaining the syntagmatic realization of arguments. Specifically, we will focus on decompositional approaches of verb meaning. A good part of these approaches can be traced back to Dowty's Aktionsart-based system (e.g. Rappaport Hovav & Levin 1998), which in turn borrows from the work of early generative semanticists and from Vendler's aspectual classes. A recent, elaborate version of this type of approach is described in Van Valin (2005), where the representational inventory consists of a small number of Aktionsart-operators such as CAUSE, INGR, and BECOME and an ad-hoc chosen vocabulary of primitive semantic predicates like **do**, **believe**, **feel**, etc. Thematic relations, the pivots of syntactic argument realization, are defined in terms of the argument positions of the semantic predicates occurring in decompositions.

Our goal is to reconcile decompositional representations of this sort with the idea of a frame-based representation of verb meaning. We adopt the representational assumption of Barsalou and Hale (1993) that frames provide a suitable model for conceptual representation. Frames in this sense are essentially recursive attribute value structures with co-occurrence constraints; they are thus more flexible and expressive than those used in FrameNet. We sketch how frames, understood this way, can be employed to model hierarchical event structure representations that are capable of integrating additional constraints on the arguments or the result, for instance. In particular, this enriched representation can overcome the critique that traditional decompositional schemes are often unable to represent differences in meaning between similar verbs.

We present a preliminary study of applying this program to a subset of cognition verbs in English, German, and French. Verbs of cognition such as *know*, *remember*, *imagine*, or *realize* provide a good touchstone for verb semantics and argument linking. Firstly, they cover most of the Aktionsart classes: *know* is stative, *learn* describes an accomplishment, *recognize* an achievement, *ponder* an activity, and *remind* is causative. Secondly, cognition verbs have a rich set of argument realization patterns at their disposal, most prominently finite and infinitival complements, but also nominal and adpositional phrases. Thirdly, they show interesting coercion effects such as aspectual shifts (e.g. *suddenly remembered* vs. *was remembering*) and the integration of a direct object into a semantically selected propositional argument (e.g. *forgot his hat*).

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# Ontological Analysis of FrameNet for Natural Language Reasoning

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In recent years, the NLP research has shown that semantic knowledge plays an important role in solving tasks which require reasoning, such as question answering, information extraction etc. Much attention has been paid to the development of the lexical-semantic resources. Two of these resources, namely WordNet (*http://wordnet.princeton.edu*) and FrameNet (*http://framenet.icsi.berkeley.edu*), have been widely involved in various NLP systems. FrameNet (FN) has a shorter history in applications than WordNet, but lately more and more researchers demonstrate its potential to improve the quality of question answering (Shen & Lapata, 2007) and recognizing textual entailment (Burchardt et. al, 2007). However, the resource still has several considerable shortcomings. For example, in previous studies it was found that low coverage of the current version of FN makes its successful application to the real textual data difficult, see (De Cao et. al, 2008). We want to make a further step in the direction of improving FrameNet for the goals of natural language reasoning and take a look on the conceptual structure of the resource. FrameNet is based on frame semantics (Ruppenhofer et. al, 2006). The lexical meaning of content words in FN is represented in terms of frames which describe prototypical situations spoken about in natural language. Every frame contains a set of frame elements corresponding to the participants of the described situation. Semantic relations, such as inheritance, causation, precedence, are defined on frames. In this study we show that in addition to incompleteness FN suffers from conceptual inconsistency which can prevent appropriate inferences. In order to discover and classify conceptual problems in FN we investigate the FrameNet-Annotated corpus for Textual Entailment, FATE (Burchardt & Pennacchiotti, 2008). Then we propose a methodology for improving the conceptual organization of FN. The main issue we focus on in our study is axiomatization and restructuring of the frame relations. The proposed methodology is based on ontological analysis which presupposes linking frames to categories in a formal ontology. The benefits of using axiomatized ontologies for constraining computational lexical resources have been demonstrated in the literature, see e.g. (Prévot et. al, 2009). In this study we concentrate on improving FN reasoning capabilities by means of an axiomatized ontology, that is DOLCE (*www.loa-cnr.it/DOLCE.html*), an ontology which has been developed in order to capture the categories involved in natural language and common-sense beliefs. For supporting ontological choices we apply different measures of similarity between frames, see below.

The proposed methodology for the improvement of the resource basically consists of the following steps:

1. discovering and classifying conceptual problems in FN through investigating the FATE corpus;
2. clustering frames for identifying those which concern related concepts in order to make ontological analysis easier by focusing on specific domains of FN;
3. performing ontological analysis which implies
   - clarification of the ontological status of frames (linking frames to DOLCE),
   - an analysis of the inner decomposition of frames in frame elements,
   - a study of the inheritance relationship between frames,
   - an analysis of further semantic relations, such as precedence, perspective on, etc., fostering an axiomatization of them;
4. checking whether the improved relational structure of FN gives advantages with regard to recognizing textual entailment.

The FATE corpus is manually annotated with frame and role labels. It consists of the 800 (*T*, *H*) entailment pairs. We have analyzed the cases when *T* was known to entail *H* (400 pairs) applying the frame matching strategy (see e.g. (Shen & Lapata, 2007)) aiming to find out whether the frame annotation is sufficient for establishing entailment. In 170 cases matching was possible. For 131 pairs this approach does not work because of a) annotation disagreements and b) different conceptualizations of *T* and *H* resulting in incompatible framings which makes it impossible to infer entailment for these pairs on the basis of frame relations. For 99 pairs the same facts in *T* and *H* were represented by different frames which are related semantically and could be mapped on each other with the help of reasoning. FN relations enable correct inferences only for 17 such pairs. We have focused on this last group of 99 pairs and categorized problems in FN preventing correct frame mapping as

- incompleteness of relations,
- problems in the inheritance structure and
- missing axiomatization of the relations.

For discovering semantic relations between frames that are missing in FrameNet as well as for clustering frames into conceptual scenarios for every two frames *f1* and *f2* we apply similarity measures based on:

- overlapping frame elements in *f1* and *f2*,
- co-occurrence of *f1* and *f2* in frame-annotated corpora,
- distribution of lexemes evoking *f1* and *f2* in corpora.

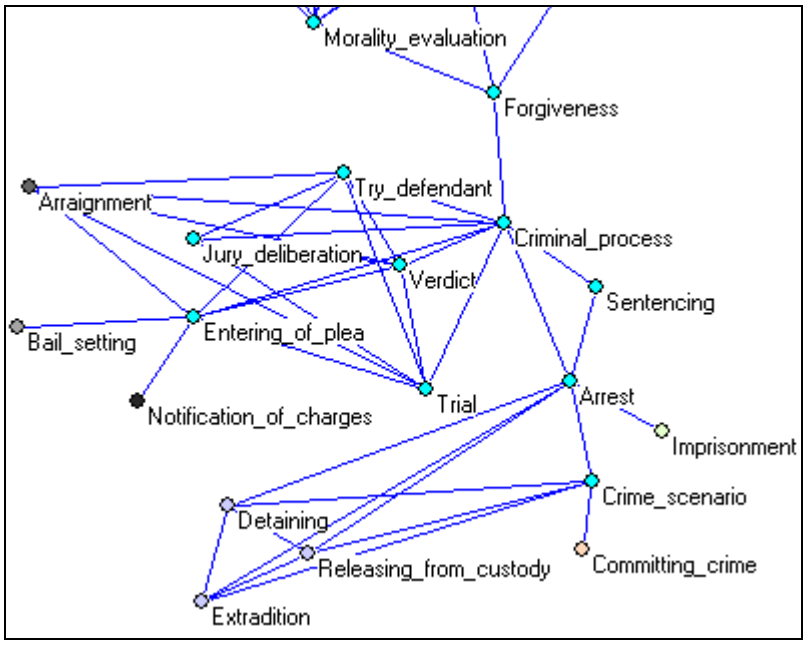


*Figure 1. Example of clusters obtained using overlapping frame elements.*

At present the described research on improvement of the conceptual structure of FrameNet for the goals of reasoning is in its initial stage. In this talk we will present conceptual problems discovered in FrameNet with the help of FATE as well as the improvement methodology and the preliminary results of frame clustering.

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## A Formal Interpretation of Frame Composition

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As Barsalou (1992) points out, frames understood as recursive attribute-value structures form the general format for the content and structure of concepts in human cognition. The attributes in a concept frame are the properties or dimensions according to which the respective object is described. Their values are specified with varying preci-

sion either recursively by structured frames or by atomic ones. Formally, frames can be viewed as directed graphs where the edges stand for the attributes of a frame and the nodes depict their values. In our talk, we discuss a graph-based representation of frames and its interpretation in predicate logic. On the basis of possessive constructions we will show how frames can be composed into more complex ones, describe that in a graph-based frame formalism and interpret it in predicate logic.

Building on Löbner (1985), concepts can be categorized into four concept types with respect to relationality and referential uniqueness. *Sortal concepts* (e.g. *stone*) denote classical categories and have no unique referents. An *individual concept* (e.g. *Mary*) denotes a specific entity, thus it has a unique referent. *Proper relational concepts* (e.g. *friend*) have no unique referents and they are defined by a relation to a second entity (e.g. *friend of Mary*) which is usually called *possessor*, although the relation is not necessarily an ownership-relation. *Functional concepts* (e.g. *age*) have a unique referent dependent on the potential possessor they are related to (e.g. *age of John*). Together, the last two concept types form the class of relational concepts. Petersen (2007) shows how the different concept types are reflected by the structure of the corresponding concept frame graphs.

A basic form of composition occurs when the possessor argument of a relational concept (proper relational or functional) is saturated. Löbner (p.c.) claims with respect to the classification above that relational concepts behave uniformly: For all functional concepts the result of the composition depends on both dimensions of the type of the possessor argument, such that the result is exactly of the type of the possessor, while the composition with proper relational concepts depends just on the relational dimension, resulting in proper relational or sortal concepts.

In our talk, we will discuss Löbner's claim and argue that the composition in possessive constructions can be adequately described in terms of frames: Saturating the possessor argument of a relational concept is analyzed as *unifying* the argument node in the relational frame with the central node of the possessor frame. As none of the other nodes is affected by this form of composition, we can directly show that the resulting frame is of the concept type Löbner's claim predicts.

In order to deepen our understanding of frame composition, we will introduce a formal interpretation of frames in predicate logic. By comparing the frames for the relational concept and its possessor concept with the frame for the result of the composition, we can give a predicate logic formulation of what happens when frame nodes are unified. From this, we will gain a better logical understanding of the compositional semantics of possessive constructions.

As an outlook, we will consider how frames may be helpful in approaching the widely discussed problems of understanding the complex semantics of possessive constructions. Among these are clarifying the different kinds of relations expressed by possessive constructions such as ownership (e.g. *John's car*), kinship (e.g. *John's brother*), or part-of relations (e.g. *John's head*) (Partee & Borchev 2003) or explaining the switch from lexical to pragmatic readings as in *the girl's teacher* in the lexical sense of "teacher of the girl" or in the contextually triggerd sense of "teacher she has married" (Vikner & Jensen 2002). A promising approach to solve these problems lies

in explaining them by type coercion (Pustejovsky 1995). In our talk, we will concentrate on one specific kind of coercion, namely type shifts from one concept type to another. Such shifts can be modelled neatly in the frame format.

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## Enhancing Roget's Thesaurus with Semantic Tags

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In the 1950s Margaret Masterman was a pioneer of natural language processing (NLP) and artificial intelligence (AI). Her research is mainly published in technical reports and was to some degree forgotten until Wilks published an edition of her work (Masterman, 2005). One of her ideas was to use Roget's Thesaurus (RT) as a tool for representing what she called "semantic transformations" (and what would be called "conceptual structures" in modern terminology) for the purposes of machine translation (or "mechanical translation" in the terminology of her time). Recently, the relevance of her thesaurus research has been investigated with respect to modern applications and found to be highly relevant from a modern viewpoint (Priss & Old, 2009).

In this talk, we are revisiting Masterman's idea of attaching "semantic tags" to the entries of RT. In our usage "semantic tags" refers predominantly to frames, but includes the tags that already exist in RT. Although RT contains a similar coverage of English words to WordNet, its classification structure is predominantly suited for human usage, and not NLP. This is because many linguistic details are implied, not explicit. Currently the only systematically applied tags in RT indicate the part of speech of a word and a division of words into antonymic categories (which is already less consistently represented). RT further contains a long list of connotational tags, such as "colloquial, philosophical, slang, dialectic, jocular, etc", which, however, only apply to a small subset of the words. In order for RT to become a more general-purpose NLP resource, similar in style to WordNet (which is a long-term goal of our research), the tags need to be more systematically and consistently applied.

Modern search engines, such as Google, often fail to accurately retrieve documents for prepositional queries. For example, a search for "food Provence" or for "definition

semantics" will retrieve documents relating to "food of the Provence" and "definition of semantics", respectively. But it is difficult to retrieve an "example of componential semantics" if there is no document which contains that exact phrase because a non-phrasal search for "componential semantics" and "example" will retrieve documents that contain the words "componential semantics" and "for example". These kinds of queries need NLP techniques for grammatical analysis, but also dictionaries that contain basic semantic tags or frames for each word. We believe that a semantically tagged electronic dictionary is an essential tool for improving the NLP capabilities of search engines.

The idea for this research is to investigate automatic means for adding semantic tags to RT. These means are based on the use of Formal Concept Analysis (FCA) lattices and subcategorisation frames. This approach was first suggested by Basili (1997) and subsequently used in similar form by Cimiano (2003) for ontology construction, by Priss (2005) for semantic classification and by Stepanova (2009) for the acquisition of lexico-semantic knowledge from corpora. Basili's idea is to identify verb subcategorisation frames by classifying verbs based on their argument structures as derived from a corpus. Basili then constructs FCA concept lattices (Ganter & Wille, 1999) from the verbs and their arguments. These mathematical lattices are a means for deriving classifications (in this case of verbs) in a manner that naturally groups similar items and forms a generalisation/specialisation hierarchy. Similar FCA techniques have been successfully used in a variety of linguistic applications (Priss, 2005), for example, by Dyvik (2004) for constructing dictionaries from a bilingual corpus. With respect to the FCA techniques, Stepanova's (2009) approach is similar to Basili's, but she uses these techniques in combination with a different set of other linguistic tools. She mainly exploits the implied categorical information of genetive phrases from corpora to build a concept-oriented lexicon for use in a question answering system. Our idea is to apply similar FCA-based techniques to the problem of enhancing the semantic tags of RT.

We are predominantly interested in techniques that are reasonably fast and cheaply to implement (making use of already existing linguistic and FCA software and freely available resources, such as WordNet, dictionaries and corpora). Since RT contains about 200,000 entries (i.e. words that occur in a specific sense in RT), manual tagging of RT would be very expensive and time consuming. Automatically derived semantic tags are not expected to have the same kind of quality as manually derived tags, but can be obtained quickly and cheaply. The main research question of this talk is to determine the most promising techniques that result in meaningful semantic tags for RT. In particular, it is important to determine which tags are easy to derive, which tags already exist in RT and only need to be extended, and which tags are promising for the use in NLP tasks.

This talk starts with a brief overview of the historical background, the FCA technologies that are used and of the current structures that are available in an electronic version of RT. The details of FCA-based linguistic corpus processing will be discussed, and our up-to-date results in this research will be presented.

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# How syntax constrains non-literal language

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## Menu

### Aperitif

Recent research in neurolinguistics points towards the fact that non-literal and metaphorical language is processed in different cortical regions compared to literal language. The processing of metaphorical language corresponds to an activity in the right hemisphere, often after the N400 which is associated with coarse semantic processing or overall semantic integration and expectancy, contrasting syntactic processing that occurs earlier (around N200).

The data used in various experiments are not selected according to current results from syntactic theory, nor do they reflect the relation between syntactic and semantic processing in a systematic way. It is the purpose of this paper to provide a theoretical classification of non-literal language, focusing on what types of syntactic constructions allow what types of metaphors based on the underlying types of concepts.

### Main course

Various results from lexical pragmatics (Blutner (1998), Carston (2002)) and semantics (Maienborn (2009)) converge on a main claim how ad-hoc terms and non-literal language are possible: an underspecified semantic representation is enriched by pragmatic strengthening. However, the exact notion of what kind of variables or features are affected has not been specified (e.g., Carston argues that certain features of the literal concept are selected; Maienborn claims that the ad-hoc concept is specified via the valuation of a variable).

The central claim of this paper is that metaphor is due to a feature mismatch (cf. Prinzhorn (2005)) that is forced to be interpreted and repaired by pragmatics . The shape of the features is provided by grammar, offering various types of mismatches. I will investigate how the distinction of Gentner (1988) (*attributional metaphors* which are based on common object attributes vs. *relational metaphors* focusing on common relational structure) is reflected in grammatical structure.

Attributional metaphors, which express a novel, unexpected property of an object, correspond to feature mismatches on the noun. In particular, the grammatical information contained in the lexical structure of verbs (cf. Rappaport Hovav & Levin (1998), Ramchand (2008)) poses considerable restrictions on possible non-literal interpretations. For example, one source of feature mismatches is the different specification for animacy/mental involvement (cf. Prinzhorn (2005)). This is manifested when animate nouns function as instruments, non-animate ones as agents (*The printer is eating the paper.*), as well as in the animacy restriction on dative arguments (*The editor sent Philadelphia the article.*[1]). Attributional metaphors arise within various syntactic constructions (copular constructions, objects of verbs, instruments, locations and possessors).

Relational metaphors, on the other hand, involve the creation of one or the comparison of two predicates. If B in *A is B* refers to an individual (e.g., a definite NP or a proper name), B is coerced into a predicate. Other examples of relational metaphors (*Plant stems are drinking straws for thirsty trees.*[2] ) include indefinites/bare plurals in both the subject and the predicate position, thus comparing two properties explicitly.

Relational metaphors can only arise within copular construction, since it must be possible to transfer a complete relation between two concepts. Relational metaphors cannot arise with objects of verbs, instruments, locations and possessors, since one part of the relation is already specified: the syntactic construction determines that the relation between the two concepts in question is a relation of possession, location or instrument etc. In this way, the type of syntactic construction restricts the possible ad hoc concepts that may arise due to pragmatic strengthening.

**Dessert**

*Example - Attributional Metaphor*: *Instruments* Assuming that instruments are licensed by the CAUSE- operator, all noun phrases that occupy the SpecCAUSE position are interpreted as instruments, regardless whether they are animate or not.

(1) Gretel is obstructing the oven with the witch.

(2) $\lambda x\ \lambda y\ \lambda z\ \lambda(s)$ [DO(x, CAUS E(y[ −anim] , OBSTRUCT(z)))] (s) (oven) (witch[+anim] ) (Gretel)

The feature mismatch [+animate] on the witch and [-animate] on the Spec-CAUSE is repaired by pragmatics: it is the body of the witch that is obstructing the hatch.

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[1] Example due to Oehrle 1976.

[2] Example due to Verbrugge and McCarrell 1977.

Blutner, R. (1998). Lexical Pragmatics. *Journal of Semantics 15*(2), 115-162.

Carston, R. (2002). Thoughts and Utterances: The Pragmatics of Explicit Communication. Oxford: Blackwell.
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Maienborn, C. (2009). Building event-based *ad hoc* properties: On the interpretation of adjectival passives. In A. Rister & T. Solstad (Eds.) *Proceedings of Sinn und Bedeutung 13*.
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## Converging evidences on the eventivity of Italian nouns

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([1]University of Pisa, [2]ILC-CNR)

Defining what is an event noun is not an easy task: this notion is widely based on deverbal nouns as morphologically marked items. Nevertheless some deverbal nouns are not purely eventive and other event nouns are not morphologically derived, i.e. do not have a corresponding verb. For instance, the deverbal noun *costruzione* [building] is well known to alternate between an eventive reading, the act of building, and a result object reading. On the other hand, nouns like *guerra* [war], *pace* [peace] or *cerimonia* [cerimony] do not have a corresponding verb and "unlike tables, crystals, or cows, can occur begin, and end, can be sudden or prolonged – they are, in a word, events and not objects." (Vendler 1967:141).

Most previous research (Grimshaw 1990, Zucchi 1993) on the status of event nouns and methods for their identification have mainly concentrated on nominalizations, i.e. the morphological process of creating a noun from a verb, but providing this kind of definition for an event noun cannot assure a well balanced description of this notion.

One intuitive way to deal with this problem is to characterize contextually an event noun: traditional semantic analyses (Kiefer 1988) exploit a limited set of tests based on the occurrences with peculiar (aspectual) verbs, adjectives (1a.), modification by temporal adverbs (1b.) or by temporal prepositions (1c.) but are not fully satisfying because they don't asses the ultimate import of these syntagmatic cues in determining the degree of eventivity of a noun.

1a. The frequent trips were a nuisance.
1b. The destruction of the city in only two days appalled every one.
1c. During the party, John left.

Our study is an attempt to shed light on this complex semantic concept. On the basis of an extended corpus analysis we have identified an exhaustive list of verbal and adjectival cues of eventivity for Italian nouns.

Since we support the idea that theoretical semantic concepts should be cognitively plausible (Pustejovsky 1995), we have compared the results of the corpus analysis with speakers' judgements and lexicographic information on eventivity. Following Hoey's (2005) theoretical characterization of the psycholinguistic notion of priming, according to which every word is mentally primed for collocational use and our knowledge of it includes its cooccurrences features, comparing the speakers' representations and corpus information is essential to understand the regularity of the lexical structure. In particular, under this perspective a lexical item is primed for eventivity when its cooccurrences with specific triggers are statistically relevant.

The aim of our work is to verify the relevance of syntagmatic cues in determining the dynamic behaviour of nouns along the eventivity *continuum*. To test our working hypothesis, we have collected a data set of 200 nouns taking into account these two parameters:

- the opposition between morphologically marked nominalizations (e.g. *costruzione* [construction], *occuppazione* [occupation], *pestaggio* [beating], *frenata* [braking], *avvio* [start]) and morphologically unmarked ones, i.e. nominalization by means of zero morphemes (e.g. *accusa* [prosecution], *disegno* [drawing], *corsa* [run]). This subset of morphological nouns have been extracted by keeping into account morphological suffix productivity (Gaeta 2004);
- nonderivational nouns (e.g. *guerra* [war], *assemblea* [meeting], *barone* [baron]).

Table 1 reports the data set composition:

| | |
|---|---|
| non-derivational nouns | 101 |
| morphologically marked nominalizations | 56 |
| non-morphologically marked nominalizations | 43 |

*Table 1 – Data set composition*

The 200 nouns data set has been enriched with three different kinds of information, namely:

- Extraction of the eventive reading(s) from a lexical resource, such as ItalWordNet, and from a online Italian dictionary (Dizionario De Mauro). The two resources are very different in terms of their structural organization: for instance, by exploiting the internal semantic relationships in IWN, the identification of unclear eventive readings of the synset glosses was performed by looking for the node EVENT among the hyperonyms. On the contrary, the dictionary consultation does not offer such a possibility;
- eventivity judgements: we have asked 7 subjects to classify the 200 nouns on an eventivity scale ranging from 1 to 5, where 5 represents the maximum eventive reading and 1 the absence of eventive readings;
- the use of normalized frequencies of occurrences of the data set with the identified syntagmatic features, composed by 37 verbs (e.g. *annullare* [to cancel], *programmare* [to plan]) and 39 adjectives [e.g. *frequente* [frequent], *imminente* [imminent]),

which are triggers of the eventive reading of nouns. The cooccurrence frequencies of the 200 nouns have been obtained by means of queries from the 380 million tokens corpus of "La Repubblica".

Comparing the Spearman's correlation coeffiecient between these three variables we have found highly convergent results between speakers' judgments and the values based on syntagmatic cues (rho= .731). On the other hand, the correlation between the lexicographic information and the syntagmatic cues is less relevant (rho= .516 and .607), because of the incompleteness of the lexical resource and low-frequent, non eventive senses codified in the dictionary. Moreover, speakers' judgements correlate more with the syntagmatic cues for non morphologically derived nouns with respect to morphologically marked ones.

According to these results, morphological information is important but not decisive for the notion of event noun. As a consequence, we believe that a measure of eventivity for Italian nouns based on syntagmatic cues could be useful for detecting this semantic type in corpora.

Corpus La Repubblica: http://dev.sslmit.unibo.it
Gaeta, L. (2004), Nomi d' azione. In Maria Grossmann & Franz Rainer (eds.), *La formazione delle parole in italiano*, Tubingen, Niemeyer, 2004, pp. 314351.
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## A Frame Approach to Metonymical Relations in some common Types of German Word Formation

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According to Radden and Kövecses (1998: 39), "metonymy is a relation between two contiguously related conceptual entities". In word formation, metonymies are mainly associated with so called possessive compounds (bahuvrihi), but they are not confined to them. Thus, it will be claimed that metonymy can rather be considered to underlie a much broader range of word formation phenomena, including not only possessive compounds, but also deverbal nouns, so called synthetic compounds and what will be called "frame compounds". The proposed analysis makes use of meaning representation by frames, i.e. recursive attribute-value structures in the sense of Barsalou (1992), because frames provide a tool to describe metonymies in a much more precise way than it is afforded by rival, especially formal semantic approaches.

The attributes in Barsalou frames are the general properties or dimensions by which an object (or category) is described, where the frame specifies concrete or more general values for the attributes (cf. Petersen 2007: 151). In Figure 1, the central node of the frame is labelled "car" since the frame represents the concept ›car‹. The referring node is marked by a double circle.

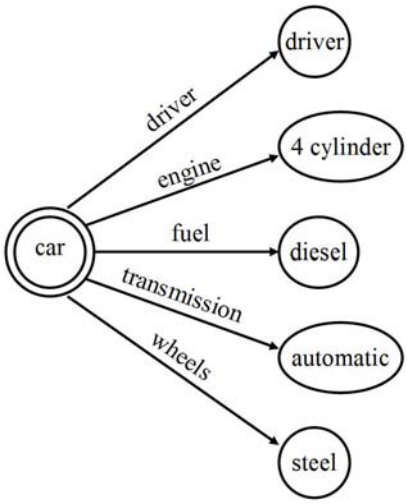


*Figure 1*

In light of Barsalou's theory, metonymical shifts can be explained by a simple frame transformation: the reference shifts from the central node to another node which is linked to it. This shift may be lexicalized (such as *vote* which can refer to the suffrage of a person as well as to the occasion of voting as a whole) or it may be triggered by context. Figure 2 illustrates the interpretation of the sentence *The university is situated in the centre of the city*.[1]

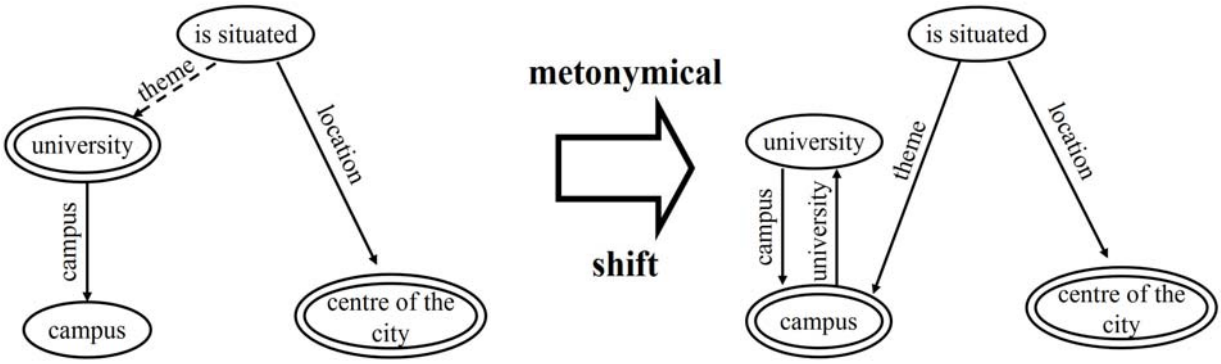


*Figure 2a* *Figure 2b*

Note, that there is a bidirectional link in Figure 2b that ensures the unique reference of the metonymy. As the analysed examples affirmed, metonymical shifts are possible only if such a bidirectional link exists.

The non-metonymical meaning of the compound *Glatzkopf* ("bald head" "head") results from the unification of the frames that represent the meanings of the constituents of the compound, i.e., the frame activated by the constituent *Glatze* is integrated

in the frame activated by the constituent *Kopf* (Figure 3a). The bahuvrihi interpretation is the result of a metonymical shift (Figure 3b).

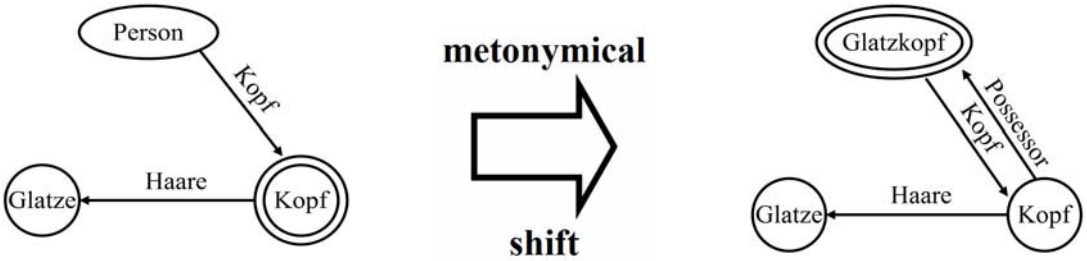


*Figure 3a* *Figure 3b*

***Legend:*** *Glatze "bald head"; Kopf "head"; Person "person"; Haare "hairs"; Possessor "possessor"*

The nominalization of verbs by the suffix *-er* results in a referential shift, too: reference switch, inter alia, from event to agent (*fahren* "drive" > *Fahrer* "driver"), to experiencer (*betrachten* "view" > *Betrachter* "viewer"), or to instrument (*bohren* "drill" > *Bohrer* "drill"). All these relations are metonymical and the referential shift can be described by frames. Figure 4 shows the nominalization of the verb *spielen* ("to play").

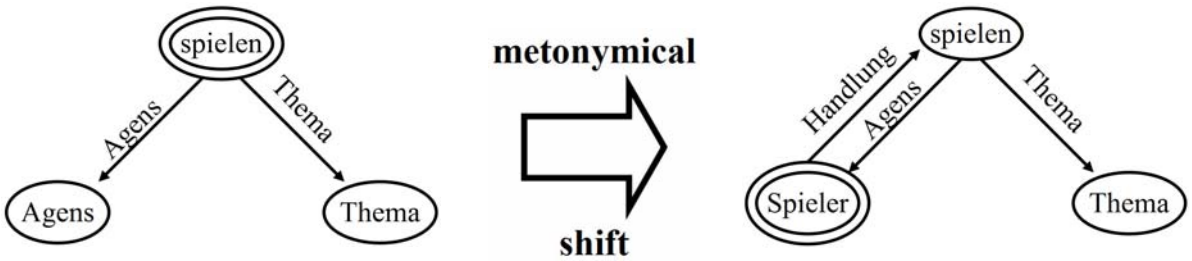


*Figure 4a* *Figure 4b*

***Legend:*** *Agens "agent"; Handlung "action"; spielen "to play"; Thema "theme"*

Synthetic compounds obviously operate on metonymical relations that are given by the attributes in verb frames. Figure 5 shows the interpretation of the compound *Klavierspieler* "piano player". Here, the frame activated by *Spieler* contains an attribute HANDLUNG (ACTION) specified by a concrete value (Figure 5a). This value activates a frame of playing in which the frames of *Spieler* and *Klavier* are integrated (Figure 5b). Surely, there is no metonymical shift, but the relation between the frames of *spielen* and *Spieler* is metonymical.

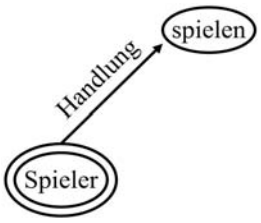


*Figure 5a*

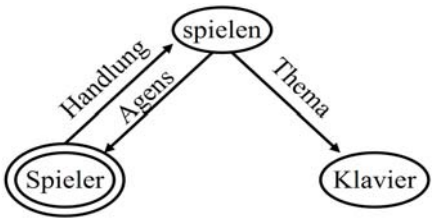


*Figure 5b*

***Legend:*** *see Figure 4; Spieler "player"*

At least, there is a further type of compound we suggest to call "frame compound" combining the meanings of the two constituents by integrating them into a verbal frame, where the integrating frame is inferred, or re-constructed from the component frames. Figure 6 illustrates the frame interpretation of the compound *Suppenlöffel* "soup spoon". Again, there is a metonymical relation between the frames activated by the constituents of the compound and the frame of eating (Figure 6a) so that the compound is interpreted as "a spoon for eating soup" (Figure 6b).

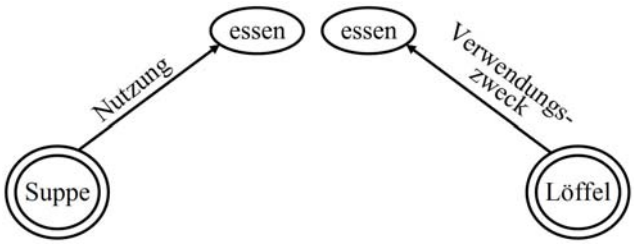


*Figure 6a*

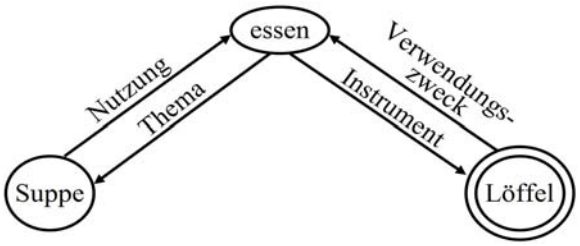


*Figure 6b*

***Legend:*** *Suppe "soup"; Nutzung "capacity"; Löffel "spoon"; essen "to eat"; Verwendungszweck "usage"; Instrument "instrument"; Thema "theme"*

There are several (German) compounds whose meanings can be explained close to the examples mentioned above. On this account, we postulate to regard metonymical shifts and metonymical relations as general patterns of word formation. Frame representations afford to make these patterns explicit in concrete manner.

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[1] The example is borrowed from Löbner (2003).

Barsalou, Lawrence (1992): Frames, Concepts and Conceptual Fields. In: Lehrer, Adrienne; Kittay, Eva F. (eds.): *Frames, Fields, and Contrasts. New Essays in Semantic and Lexical Organization*. Hillsdale, NJ: Erlbaum, pp. 21 – 74.

Löbner, Sebastian (2003): *Semantik. Eine Einführung*. Berlin: de Gruyter.

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## The Caloric Concept under a Frame-Theoretic Spotlight

GERHARD SCHURZ & IOANNIS VOTSIS

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In this talk we conduct a frame-theoretic investigation of the respects in which the central concept of the caloric theory of heat has survived into modern accounts of thermodynamics despite the theory's demise in the latter half of the nineteenth century. We will first present a brief account of the development of the caloric theory as well as that of its competitor, the motion theory of heat. We will then compare the two theories' explanatory and predictive successes, paying particular attention to the role their central concepts played in facilitating those successes. The comparison will be performed to evaluate the epistemic and metaphysical claims made by traditional scientific realists and instrumentalists concerning whether or not (i) some parts of the caloric theory are in some sense approximately true and (ii) the term 'caloric' can be said to refer to a modern counterpart posit. We will test these claims against those stemming from our own structural realist conjecture. Ultimately, we hope this study of the caloric will give us a more complete picture of what happens to scientific concepts, classification systems and ontologies after a scientific revolution.

Although primitive versions of the two theories of heat go back to antiquity, it was not until the eighteenth century that the study of heat begun to flourish. Lavoisier developed the first sophisticated caloric theory of heat able to explain and predict phenomena. Caloric was conceived as a special kind of substance responsible for heat phenomena. It was taken to be an imperceptible or at least hardly perceptible fluid that could only be measured indirectly via its intimate relation with temperature. More precisely, it was thought that the addition of caloric to a body raised its temperature, while its subtraction lowered it. At around the same time, a sophisticated version of the motion theory of heat was being developed. Heat, according to this theory, was simply a consequence of the motion of (ordinary matter) particles. Although both theories had their measure of success (and failure), it was the motion theory of heat that emerged victorious sometime in the latter half of the nineteenth century. Today the motion theory or 'kinetic theory' as it is better known lies at the heart of our best theory of thermal phenomena, i.e. statistical thermodynamics.

Is there some respect in which the caloric theory and its central concept survived into modern accounts of heat phenomena? Several answers have been proposed. Laudan (1977), for example, takes the caloric theory of heat to be a paradigmatic example of a genuinely successful theory that turned out to have no truth content and whose central theoretical term does not refer. Laudan suggests that this is a widespread phenomenon in the history of science and urges a pessimistic meta-induction: Since past explanatorily and predictively successful scientific theories have eventually been dis-

carded, we have inductive evidence that our current theories will also be discarded one day. In reaction to the pessimistic meta-induction, traditional scientific realists attempt to show that only those theoretical components that are responsible for any success enjoyed by the rejected theories survive theory change. In other words, they attempt to show that the historical record provides grounds for optimism. Most realists agree that certain parts of the caloric theory were indeed approximately true but they disagree on whether or not its central theoretical posit somehow refers to a modern day counterpart entity. For example, Psillos (1999) argues that the term caloric does not refer to anything because it was not genuinely central to the caloric theory's successes.

We plan to evaluate the claims made by Laudan and Psillos and compare them to our own structural realist conjecture. According to this conjecture there is a structural correspondence between certain parts of the caloric theory and statistical thermodynamics. This in effect means that certain aspects of the caloric theory survived theory change because they contain objective structural information about heat phenomena. To assist us in our task we will make use of a structural correspondence theorem found in Schurz (2009). Provided certain rather natural conditions are satisfied, the theorem establishes correspondence relations between the successes and truth-content of past theories and those of their successors. In so doing, the theorem also establishes an indirect reference relation between the relevant terms of successive theories. We conjecture that the relevant conditions are satisfied in the transition from the caloric theory to statistical thermodynamics and hence that a strong case can be made that some aspect of the caloric concept has survived theory change.

Frame theory is especially suited to reveal structural correspondence relations between scientific theories and hence to help us test the aforementioned conjectures. The main reason for this is that it lucidly explicates the central categories and concepts which underlie scientific theories in the form of recursive systems of attributes. In the case at hand, frame theory shall be used to model how those parts of the caloric theory that were responsible for its successes correspond to parts of statistical thermodynamics. Based on the chemical reaction frames developed in Schurz (2007) we will construct a frame for the description of thermodynamical reactions which is common to the caloric theory and the thermodynamic theory of heat. That will hopefully throw some light on the extent to which the caloric concept corresponds to current concepts in statistical thermodynamics like that of kinetic energy. Drawing on Chen (2003) we will also study by frame-theoretic means the ontological transition from the substance concept of caloric to the dynamical property concept of kinetic energy. Finally, we hope that all of this will present clues as to how frame theory can be extended in order to accommodate the more dynamical aspects of scientific theory development.

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Psillos, S. (1999). *Scientific realism*: *How science tracks truth*. London: Routledge.

Schurz, G. (2007). The conceptual frames of scientific theories: Structure, reference, and historical dynamics. Paper presented at the Duesseldorf CTF07 conference, publication in preparation.
Schurz, G. (2009). When empirical success implies theoretical reference: A structural correspondence theorem. *British Journal for the Philosophy of Science*, 60, 101-133.

## Diachrony of Stative Dimensional Verbs in French

BRIGITTE SCHWARZE & HANS GEISLER

(University of Düsseldorf)

Stative dimensional verbs like *peser* 'weigh' and *coûter* 'cost' serve to express so called functional concepts, i.e. concepts which are describable in terms of a function f(x)=y.[1] Accordingly, stative dimensional verbs specify a dimension or attribute (like WEIGHT and PRICE) of an object and allow for the external realization of the value the object acquires along this dimension; cf.:

(1a) *L'ordinateur pèse 2 kilos.*
x f y
(1b) *L'ordinateur coûte 700 dollars.*
x f y

Stative dimensional verbs (henceforth SDVs) are particularly relevant to scientific discourse and all kinds of expository texts which try to impart depersonalized, objective knowledge.

In the present paper we try to delineate the historical development of SDVs which evolve from verbs encoding sensory-motor concepts like, for instance, main body postures (2a) or elementary hand actions (2b):

(2a) Lt. *stare* 'stand' → Lt. *constare* 'stand together'/'come to stand' (of a balance) → Fr. *coûter* 'cost'
(2b) Lt. *ponere* 'lay down' → Lt. *componere* 'put together' → Fr. *être composé/se composer de* 'be composed of'

The development of SDVs is propelled by associative processes such as metonymy and metaphor. These processes rely on gestalt principles of perception (figure and ground, proximity or contiguity, similarity etc.) and can be specified for every step in concept development.[2] For example, starting with a transitive Lt. verb such as *ducere* 'drag', the semantic changes motivated by metonymies consist in a gradient loss of agentivity through shifting the agent out of its canonical subject role and through profiling non-canonical roles, such as Instrument, Location, Source, Path and Goal, into subject position (3c). Metaphors, on the other hand, enable domain mapping of functional concepts (3d):

(3a) Lt. *alqd ducere* 'drag sth' → Lt. *alqm mecum duco* 'I drag sb with me' —$^{\text{meton}}$→ 'I lead sb' → VLt. *alqm conducere* 'lead sb'

(3b) Fr. *conduire qn* (*par la main*) (*sur un chemin*) (*à l'école*) 'lead sb (by the hand) (on a way) (to school)'
(3c) —$^{\text{meton}}$→ *le chemin* (*nous*) *conduit à l'école* 'the way leads (us) to school': ['(the way) gone' → 'goer'] resp. [Path → Ag]
(3d) —$^{\text{metaph}}$→ *cette politique conduit à l'échec* 'this strategy leads to desaster': [Path = Method]

Unergative and unaccusative verbs which denote elementary movements, such as *go*, *run*, *fall*, transform in a similar way. Like with transitive verbs, less prominent components in the original event frame become highlighted, and one specific attribute is finally isolated. Starting from a complex event verb, the associative processes even allow to single out different attributes leading to different dimensional readings. For French *descendre* (< Lt. *descendere* 'go down' < Lt. *scandere* 'jump up'/'climb') there are at least three SDV readings that can be distinguished:

(4a) ORIGIN: *Elle descend d'une ancienne famille./L'homme descend du singe.*
(4b) GRADIENT: *La route descend à pic.*
(4c) DEPTH: *Le puits descend à 40 mètres.*

The SDV reading given in (4a) is metaphorically motivated. The underlying conceptual metaphor is GENEALOGY IS A PATH. The relevant aspect of the *descendre* concept is that *descendre* is a movement that implies a change of location of the subject referent leading from a starting point A down to B. The starting point is overtly expressed when *descendre* is followed by a prepositional phrase introduced by *de* (e.g. *descendre du grenier* 'go down from the loft'). Transferred to the concept of genealogy *descendre de* acquires a purely relational meaning. Since movement is lost, it serves to express the 'starting point', i.e. origin of the subject referent.

The SDV reading in (4b) which is based on a transitive use of *descendre* arises out of a metonymical shift parallel to the one observed in (3c) above. In case of *descendre* the coding of the Path argument in the subject position leads to the isolation of the downwards orientation (=GRADIENT); accordingly, the adverbial which in the underlying event frame would serve to express the manner of the downwards movement (e.g. *descendre rapidement/en courant* etc.) turns out to express the value that the object acquires along this dimension (i.e. measure of GRADIENT).

Finally, the reading given in (4c) is best interpreted as the outcome of a metaphorical transfer. Due to its downwards orientation *descendre* can be applied to subterranean vertical cavities such as wells and shafts. From the point of view of the observer, objects of this nature are essentially characterized by the directional dimension 'down' (or 'having depth'). Now, *descendre à* which originally serves to express the endpoint of the downwards movement (e.g. *descendre à la cave* 'go down to the cellar'), allows to specify the value the object acquires along the dimension of depth.

In the present paper special attention will be paid to the correlation between source concepts and dimensional readings: We will demonstrate that at least some dimensions, e.g. CONTENT, ORIGIN and CAUSE, are linked to specific source concepts and that the meaning changes leading to the SDV readings are usually motivated by common types of metonymies and metaphors that remain stable over time (cf. Traugott &

Dasher 2002 on the notion of "invited inferencing"). Therefore, they occur more than once within a given language and alike in different languages.

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[1] For the notion of 'functional concept' cf. Löbner (1979), (1985).

[2] There is a whole wealth of contemporary literature dealing with the different associative processes and their relevance in (synchronic) language variation and (diachronic) change. For comprehensive discussions which especially draw on French and other Romance Languages cf. Blank (1997), Waltereit (1998) and Koch (2001).

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## Towards a non-representational semantics

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The current study (1) explores and criticizes the conception assuming that there is a core meaning in human semantic processing and (2) challenges the representational view of semantics in general.

Instead of a core meaning, a conception is proposed according to which meaning is a cognitive on-line generated structure where two kinds of information are used to generate a coherent semantic structure: (1) situational information and (2) experiential resources and constraints. .

The paper consists of two parts.

In the first part, a definition of core meaning is explored. Core meaning is characterized as a representational, highly abstract and fixed semantic prime remaining constant during the processes of semantic extension, e.g., in polysemy processing the conception of core meaning assumes that if a language user processes a polysemous word he/she always has a constant semantic core which is extended in every concrete act of meaning assignment (for some classic views on core meaning see: Ruhl, 1989, Caramazza & Grober, 1976).

In the second part of the paper, empirically confirmed and theoretically plausible alternatives to core meaning are explored. Two kinds of evidence against core meaning are provided. They can be summarized in the following two theses.

**(a) Meaning is a cognitive structure generated on-line using wide range of situational and experiential resources; (b) Meaning-generation is more syntactically constrained than usually assumed.**

Three strands of evidence are used to justify the thesis (a):
1. Meaning generation is influenced by bodily experience and environment (Glenberg, 1997, 1999, Glenberg, Jaworski, Rischal, & Levin, 2007, Gibbs, 2003, 2006, 2007)
2. Meaning is conceptually structured according to agent's experience (Murphy, 2004)
3. There is no mechanism according to which the semantic core is accessed during the polysemy processing (Klein & Murphy, 2001, 2002).

In the context of on-line meaning generation the level of representation is discussed. In the current paper it is assumed that there is no strong amodal level of representation. Two types of contexts in semantic processing are, however, to be distinguished: First, abstract situations or situations based in the long-term memory of the agent. In these situations meaning is constructed in simulating the situations or deriving abstract concepts from the simulations based in perceptual experience (see the empirical evidence by Barsalou, Santos, Simmons, & Wilson, 2008, Simmons, Hamann, Harenski, Hu, & Barsalou, 2008, Solomon & Barsalou, 2004). A modal dynamic representation based on long-term memory exists at this level.

The second type of context to be explored is referential situations (semantically processed objects are in the immediate context of the agent). In case of referential situations, meaning is on-line generated without significant representational resources. In both types of contexts the interaction between agent and environment is presupposed as a crucial factor of meaning articulation. Meaning "consists of the set of actions the individual can undertake in that situation. The set of actions is determined by the goal-directed mesh of affordances." (Glenberg et. al., 2007, 223) Individual modifies the meaning in a particular situation according to his or her experience and bodily configuration.

The subsequent assumption follows from the previous argumentation and holds in both types of contexts: If every situation determines meaning so that (1) individual derives meaning according to the situation-specifics and his/her bodily configuration and (2) if individual also co-involves his/her experiential resources, then there is no sense in speaking of a fixed core meaning. (See several kinds of evidence: Glenberg, 1997, 1999, Glenberg et. al., 2007, 223, from a different point of view: Klein & Murphy, 2001, 2002).

The second thesis against a core meaning - b. meaning-generation is more syntactically constrained than usually assumed – is explored in using a modified construction-based approach (Goldberg, 1995, 2006; for a consistent empirical evidence see: Glenberg and his collegues) according to which syntax encodes event patterns and regularities. Instead of accessing a core meaning, semantic processing is syntactically constrained.

In conclusion, the status of representation is discussed. If meaning arises online (and not on the level of representation), one can ask: Where can meaning be found if there is no level of representation? To put it in other words: where is meaning located? The role and status of representation in cognitive processing can be viewed in various ways. Roughly there are two main options: to accept a level of representations or to

reject it. There are several mixed options as well. Even if one accepts a view of semantics with representation, there are still several possibilities. On the one hand, there is a classical AI tradition assuming that representation is static, amodal and symbolic; on the other hand, we can also think of representation as flexible, modal and dynamic (Barsalou, 1993, Barsalou, 1993, Rogosky & Goldstone 2005, Spivey, 2007).

It is also possible to think about cognition and semantics without the representation at all – meaning is generated on-line involving situational and experiential resources but not generating a separate level of representation (phenomenological tradition, J.J. Gibson's tradition and several other conceptions in cognitive sciences would agree on this aspect for the most part). Also embodiment research (e.g., Gibbs, 2003, 2006, 2007) emphasizing the role of bodily, sensory-motor experience in semantic processing is, to a great extent, an evidence for a non-representationalist view of semantics emphasizing that meaning is generated in perception and cognitive processes on-line.

In the presentation it will be argued that flexible, modal conception of representation and representationless semantics and cognition are not mutually exclusive. We can think of, e.g., M. Spivey's and L. Barsalou's conceptions as compatible with the conception of meaning without representation in several aspects. Even if we assume meaning as generated on-line without any representation, it does not exclude that there are certain representational resources (neural or other) necessary for semantics.

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# Where does my fear lead me…

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The interaction of emotion and language plays an important role in semantics and cognitive science (Kövecses, 1989 / Niemeier, 1997 / Schwarz-Friesel, 2007, etc.). The present paper is an attempt to look into patterns of use and variation concerning the conceptualisation of negative emotions with a special focus on "fear" in French, English, German, Spanish and Italian.

Analysing the semantic field and syntactic structure of "fear" (and related concepts) in these five European languages the following questions will be tackled: the first will concern the 'nominal' the second the 'metaphorical' and the third the 'verbal' realisation of the concept of "fear".

## 1. What is the concept of "fear" and what happens to that concept when it is transferred into another language (e.g. ger. *Angst,* lat. *timor,* gr. *phobos*)

'Fear' is not only an emotional response to threats and danger, but also one of our most important survival mechanisms. The concept of 'fear' shares a number of characteristics with other cognitive and emotional states such as *worry, anxiety, terror, horror, panic, phobia, caution, paranoia, hysteria, etc*. Linguistic evidence shows that the original concept of 'fear' has changed over the centuries (< gr. *deos [~fear of the future]* and *phobos [fear of an immediate danger],* lat. *timor* > *timid,* etc.) and continues to be influenced by historical and cultural circumstances (de Romilly, 2007). In general 'fear' can be conditioned, based on experience, gender specific, real or imaginary. 'Fear' can be *good* (positive) and bad (negative). In literature and music, 'fear' is represented as something that can *grow, come, go, disappear, die, get older, be faced, etc*. or as an emotion which can *be childish, blind, human like, etc.*

The different linguistic realisations of 'fear' in a languages illustrate very well that 'fear' is not only a concept with many subcategories and nuances (Fries, 2000) but also a very productive linguistic element working within different language registers, *e.g*. ger. *Ängstlichkeit, Angst, Bammel, Befangenheit, Beklommenheit, Beklemmung, Entsetzen, Fracksaußen, Furcht, Fürchten, Furchtsamkeit, Grauen, Grausen, Heidenangst, Höhenschwindel, Horror, Panik, Phobie, Scheißangst, Scheu, Schiss, Schreck, Sorge, Unsicherheit, Verzagtheit, etc.*

Therefore, it is very interesting to diachronically analyse the changes the original concept underwent and to point out the semantic shifts the original concepts suffers (e.g. hyperonym → hyponym) when borrowed into another language.

2. **Are there any differences in regards to the salience or prominence of specific source metaphors across certain European languages?**

It will be shown (with the help of a psychiatric corpus) that 'fear' is such a 'strong' concept that the term "fear" is most of the time avoided in narrative situations and that mental images are instead used to linguistically encode 'fear'. These mental images focus mainly on the symptoms caused and the body parts affected by fear *e.g. mouth [widely opened, shut and dry], breath [breathless or hurried], eyes [wide open], eyebrows [raised], body [motionless], heart [beats quickly, violently, etc.], skin [pale], muscles [shivering], etc.* The majority of the fear-metaphors are transparent (*e.g. in Angstschweiss ausbrechen, Blut und Wasser schwitzen, die Angst im Nacken sitzen haben, die Hosen gestrichen voll haben, weiche Knie bekommen, das Herz rutscht in die Hose, das Herz bleibt stehen, Gänsehaut bekommen, die Katze über den Buckel jagen, kalte Füße bekommen, etc.*). Others are still semantically linked with these symptoms but nevertheless more opaque (*e.g. Manschetten haben, den Schimmel wild machen, etc.*) and can vary between different languages (*e.g. ger. Angsthase vs. it. fifone vs. fr. la poule mouillée vs. sp. el gallina, etc.*).

A close look at certain source metaphors across European languages might therefore be necessary in order to study the complexity and the range of mental images related to the concept of 'fear'.

3. **With which verbs can the concept of 'fear' be combined and why is it that in so many languages an analytic construction is preferred instead of a verbal realisation?**

The concept of 'fear' can be expressed with the help of nouns, adjectives, metaphors, etc. (Cislaru, 2009), but the verbal realisation of that concept is in many languages either restricted (e.g. *to fear*) or not possible (e.g. fr. *peur vs. j'ai peur*). In general a combination of a copula or an auxiliary is used in order to express 'fear' verbally (e.g., *I am scared*).

In my paper I want to analyse the nature of the different possible combinations with 'fear + verb' (e.g. ger. Angst verspüren/kriegen/bekommen, in Angst geraten/ausbrechen (inchoative), in Angst versetzen, Angst einflössen/einjagen (causative), Panik schieben (durativ), etc.) and propose a hypothesis which will explain these restrictions and the missing of verbal counterparts (ger. *angsten, fr.*peurer, etc.).

<u>Analysed languages:</u> French, German, English, Spanish, Italian etc.

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# Philosophical Conceptual Analysis: The Move from Use to Meaning

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Important projects in conceptual analysis include the study of how we use concepts, what those concepts mean, to what and how they refer. Different branches of knowledge analyze the concepts that they find interesting, and these are often disparate. For the concepts that are *philosophically* interesting, the way a concept is *used* is relatively easy to discern, the meaning less so, and the objects of reference the most difficult (which is, I will argue, a result of normativity being involved). So while conceptual analysis is done in all fields, there is a special extra step involved when the focus is intrinsically normative concepts. It is through this normativity that philosophical conceptual analysis is to be justified from recent scepticism concerning the use and validity of intuitions (e.g., by Weinberg, Stich and Nichols, 2001, or Ladyman and Ross, 2007). Working towards this goal, I stumbled upon a more general account of conceptual analysis and interpretation that is as follows. When we interpret, whether perceived facts about the world or the communicatory signals we receive from others, we move intellectually from use to meaning and then to reference by interpretation. I argue that the key to understanding the way we interpret in general is to look at the way we interpret ourselves.

I argue that there is a common method by which we interpret a concept: Meaning is extrapolated from use via a principle of charity. I leave the task of extracting the referent of a concept from its meaning as an exercise in metaphysics, if it can be justified that metaphysics and language are related disciplines. I argue for a specific conception of interpretationalism which will both justify philosophical conceptual analysis and reliably yield meaning from use. I argue that a principle of charity which maximizes *truth* explains our actual linguistic practices better than one like Timothy Williamson's recent knowledge maximizing alternative, because our practice of self-interpretation is more truth-centered than knowledge-centered. I do not aim to provide an analysis of truth, but rather a simple descriptive account of the way communication works. Using this descriptive story I try to demonstrate the validity of my version, inspired by Davidson and Henry Jackman (2003). Trying to maximize knowledge goes too far by involving justification: a complex concept that is not as well suited as truth for the fast-as-lightning interpretation acts employed in communication. The majority of my

project is to continue where Davidson left off – what exactly does a principle of charity consist in, in what order are its operations carried out, and do we have any reason to believe that there is only *one* principle that is universal to all people? The role of logic, triangulation and language acquisition are examined in relation to the interpretation of others and is accounted for under the same general rubric: related tools and methods employed in grasping what we can of the world, although not necessarily by the same means in each case. Finally, some empirical consequences are considered with respect to areas for further research. If we want to capture human interpretation, which logic should we employ (e.g., classical, fuzzy, intuitionistic, paraconsistent, etc)? Which logic *do* we employ when we interpret (here it is useful to consider the question of logical pluralism – do we think there will be one logic that accounts for all possible legitimate inferences, or are different non-mutually reducible logics appropriate for different endeavours, as Poincaré thought about geometry)? How is it that we overcome meaning variance, if we do? What, if any, are the consequences for ontology? My method is to draw answers from the practice of *self*-interpretation as an easily investigable version of interpretation in general. I finish by claiming the same methodology can be applied to science: the way that scientists of a single paradigm understand one another and their experiments can provide the key to understanding how *communities* of scientists operating under a single paradigm communicate with and understand communities of different and competing paradigms.

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## Reference, Demonstrative Thoughts, and Visual Binding

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Thought and visual perception are tightly related: Perception often provides information that is the ground for perceptual thoughts, such as, for example, demonstrative thoughts. Demonstrative thoughts like 'This is a red-vertical line, 'That is a green-horizontal line', and so on, identify and refer to objects due to the information provided by sensory systems: Because of seeing, for example, a red-vertical line, one can demonstratively identify the object that is seeing *as* a red-vertical line. The information-link between sensory information and thought is thus necessary to sustain demonstrative identification.

Evans (1982) argues that those information-links are necessary, but not sufficient for sustaining demonstrative identification. This is because of the requirements a thought has to meet in order to satisfy the Generality Constraint. For the Generality Constraint, the identification of an object is related to the systematic ability to produce an infinite number of thoughts about that specific object. Thoughts are systematic, and therefore satisfy the Generality Constraint only if, given the thought *aRb*, a subject can also entertain the thought *bRa*. The essential structure of thought, thus, depends on our conception of the object of thought as existing unperceived. It follows that the justification of the Generality Constraint lies within the conceptual realm.

Some authors (see for example, Campbell, 2002) argue that the knowledge of reference perception is fundamental for the ability and development of conceptual thought. However, demonstrative reference is a pre-conceptual (sensory), and not a conceptual, capacity. Within this framework, and given the tight link between vision and demonstrative thoughts, I will consider whether the justification of the Generality Constraint can be grounded in the pre-conceptual visual processes. If this is the case, then the structure of thought depends on the structure of vision.

The systematic structure of thought, as described by the Generality Constraint, depends on the implementation in thought processes of a so–called structure of constituents, in which the constituents of a complex representation (i.e., thought) are tokened whenever the complex representation is tokened.

A theoretical model of the constituent structure of visual object representation is Barsalou's Perceptual Symbol System (Barsalou, 1999). Barsalou argues that a mechanism based on *frames* composed of visual symbolic representations can be the basis of object categorization in vision. A frame can be considered as a broad category that can be further decomposed in related concepts. For example, the concept APPLE

can be decomposed in its constituent concepts: COLOR, TEXTURE, SHAPE, etc. At the same time, each part can be further decomposed in more elementary constituents like, for example, GREEN, BROWN, SMOOTH, and ROUND. A similar decomposition of these primitive components seems to be neuronally implemented within the visual system: There are distinct topographic feature maps within early cortical visual areas that represent specific features (such as, color, motion, and orientation) and the specific location, at which these features occur in the visual world. Those features are then recombined to represent the object they belong to.

By analyzing the structure that underlies the visual binding of primitive features to coherently represent objects, I argue that vision implements a systematic structure of constituents. Specifically, I focus on the Feature Integration Theory of Attention (Treisman & Gelade, 1980): Shifting the focus of attention to an object location selects the features at that location within the topographic feature maps and thereby binds them into the representation of the object. The combination of primitive features by means of their location satisfies the requirement of a structure of constituents. Namely, the primitive features are simultaneously represented when an object is represented. This process is also systematic because the representation of structurally related visual scenes requires an explicit recombination of the same primitive features.

'Early' visual processes are systematic; does this imply that the structure of thought depends on the structure of visual processes? In order to address this question, I will consider how demonstrative thoughts are related to visual binding operations. I focus on a 'basic' form of reference: A subject that knows the reference of an object (to which the demonstrative refers to) by sensory experiencing that object. The ability to locate an object in space, and therefore refer to it, is often coupled with an attentional mechanism. The role of attention to link sensory and conceptual information has been considered either as a top-down selective influence on visual perception, or as a bottom-up, stimulus-driven selection process that constrains the kind of information that reaches the conceptual level.

If the information-link between vision and perceptual thought, by means of attention, turns out to be necessary and sufficient for object identification, then the Generality Constraint is justified by considering the systematic structure of visual object binding: We are able to identify the object in 'This is a red-vertical line' and 'That is a green-horizontal line', and to identify the structurally related recombination of those thoughts, because the identification of the terms in the demonstratives depends on the representation and integration of primitive features during the binding processes.

To conclude: Given the relation between attention and demonstrative reference and the systematicity of visual binding operations, I argue that the systematicity of thought (at least, the systematicity of perceptual demonstratives) depends on the systematic structure of vision. Thus, the justification of the Generality Constraint has to be found within the fundamental level of sensory processes.

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## Framing *the other community* in the Belgian press

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Politics and media in Belgium are split up along linguistic borders. The two main communities (Dutch-speaking and French-speaking) not only have their own substate government but also fully separate political parties and separate media. *Federal* politicians though have to represent the whole country and they appear or are referred to in the Dutch-speaking as well as in the French-speaking media. In 2007 however, the difficult and tough government formation which lasted for months after the federal elections, showed that the image of 'the other' on both sides of the linguistic boundary was significantly disrupted.

The objective of our presentation is to sketch the way politicians and political parties were represented in interviews in the Belgian press in the first six months of the formation period. As the so-called 'quality press' is likely to pay the most attention to political news coverage, we have limited our bilingual data samples to a selection of newspapers and weekly magazines which are generally considered to be quality publications, i.e. *De Standaard*, *De Morgen* and *Knack* for the Dutch-speaking side and *Le Soir, La Libre Belgique* and *Le Vif/L'Express* for the French-speaking part of the country. From these publications, we have collected all interviews in the period June-December 2007 with two politicians who are generally considered to be moderate (Yves Leterme of the Dutch-speaking Christian-democrat party and Didier Reynders of the French-speaking liberal party) and two politicians who represent outspokenly radical parties (Bart De Wever for the Dutch-speaking side and Olivier Maingain for the French-speaking).

The interviews will be analyzed along three different lines. In the first part a lexical analysis inspired by critical discourse analysis (Wodak, 1999) scrutinizes the way in which the politician represents himself, his party and other politicians and parties. As in written discourse the interview is the most direct way to collect the politician's authentic sayings, this analysis will allow us to reconstruct the image the politicians want to convey.

But as shown in Clayman and Heritage (2002), also the interviewer plays an important role in the representation which is being given in an interview. The structure of the interview is determined by the topic choices and the questions of the journalist. Interviews in the written press are examples of mediated discourse. The final text of an interview is a construction of the journalist, even if s/he tries to reproduce the original words of the interviewee exactly. A second part of the analysis will therefore focus on the interviewer's role.

A third and final part of the analysis will integrate the results of the first two parts in a framing analysis (Entman, 1993) of how these interviews represent the Belgian political situation and how they render ideologically determined visions as plausible as possible. We expect that in bipolar contrasts such as the North vs. the South of the country, members of opposite groups tend to revert to clichés or caricatures when representing 'the other'.

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## Indefinite Use of Functional Concept Nouns

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Sortal concepts (SCs) are one-place predicates which are inherently not unique and define their referent by its features. Functional concepts (FCs) are a subclass of relational concepts (RCs), i.e. they define their referent in relation to another entity. But in contrast to RC nouns such as *sister (of x)* or *part (of x)* which may have several referents in relation to the referent of x, FC nouns prototypically trigger (at least) two presuppositions: the presupposition of uniqueness (PU) and the presupposition of existence (PE) of the referent of the functional concept. That means that if the FC noun has a referent in relation to a given possessor in a concrete context, this referent will be the only one. E. g. any *physical object* has a *weight* which functionally relates a *value* to the object:

(1) weight: {x|x is an object} → {y|y is a value}

According to Löbner, the meaning of the definite article is to indicate that the noun is to be interpreted as a FC (Löbner 1979, 1985). For this reason, FC nouns typically carry the definite singular article in constructions like

(2) <u>the</u> length of the bridge is 80 metres

even if the whole NP headed by the FC noun doesn't provide a unique referent because the possessor remains unspecified like in

(3) <u>the</u> height of <u>a</u> tree doesn't exceed 70 metres.

Nevertheless, several Germanic and Romance languages allow for FC constructions which carry the indefinite article or occur in plural. Some of these can easily be explained. Thus, in

(4) My favorite coffee cup has <u>a</u> name

the indefinite article is due to the absence of the presupposition of existence. We are dealing here with an existential predication which is just about to establish the FC. And obviously, the plural form in a sentence like

(5) I have the weights of all the candidates on my list

is due to the plurality of possessors of which every single one is nevertheless assigned only one weight.

The aim of the talk is to explain the occurrence of the indefinite article in sentences with FC nouns which are not subject to an existential predication. I will argue that the use of the indefinite article or a predication over the FC referent can cause a shift from FC to SC, the FC noun being used to designate one of the possible values of the FC. This possibility of using an FC noun for its value has been observed by Guarino in his article on attribute and role classification (Guarino 1992).
The analysis comprises sentences such as

(6) *John* is <u>a</u> name
(7) *John* is <u>a</u> beautiful name

where the FC nouns will be assumed to be used in the sortal meaning of 'thing that can be used as a name'. I will then focus on *have*-constructions with the definite or the indefinite article like

(8) the bridge has <u>a</u> length of 80 metres
(9) the bridge has <u>the</u> length of a lorry

where (8) seems to be equivalent to a construction like (2).

In addition, differences between FCs such as *length* and *roof* will be enlarged on. Whereas in

(10) the bridge has got an enormous length

the FC carries a strong presupposition of existence, the presupposition of existence of *roof* in

(11) the bridge has got a long roof

depends on whether we assume a restrictive or a non restrictive reading of the attribute *long*.

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# *Sleep, boyfriend, African American, bear*… The frame-based analysis of the typology of metonymic euphemisms

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It is a well-known fact that metonymy is one of the main linguistic strategies of dealing with taboo-marked concepts (e.g., Blank 1999). For example, *sleep* and *go to bed* are very popular metonymic euphemisms for *have sex*. The same is true of *see* when used to refer to dating, e.g., *I know you're not married, but are you seeing anyone right now?* (Sullivan 2007: 260); etc. However, despite the recognition of metonymy as an important euphemistic strategy, there have been almost no studies on the typology of metonymic euphemisms, i.e., studies attempting to answer the following two questions: (1) Do metonymy-based euphemisms prefer a particular metonymic pattern (PART FOR WHOLE, WHOLE FOR PART, PART FOR PART); and if so, (2) is there a special reason for this?

In this presentation, I will attempt to fill the research gap by providing a systematic analysis of the metonymic motivation of 3000 English euphemisms listed in Holder's 1995 *Dictionary of Euphemisms*. Proceeding from the definition of metonymy as "a cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target, within the same frame, domain or ICM" (Kövecses and Radden 1998: 39) as well as from the distinction between default and non-default metonymies elaborated in ibid. (pp. 63-73), I will argue that the majority of metonymic euphemisms are PART FOR PART non-default metonymies—i.e., metonymies which are consciously recognized as expressions which do not mean what they literally stand for—violating the maxims IMPORTANT OVER LESS IMPORTANT and RELEVANT OVER LESS RELEVANT of the pragmatic principle of cognitive salience. For example, the motivation for the above mentioned euphemistic use of *sleep* is the fact that people who have sex often (literally) sleep together as well. This is a PART FOR PART metonymy since neither the vehicle concept SLEEP nor the target concept HAVE SEX is a meronym of one another. (Thus when people are sleeping, they are not having sex. And when they are having sex, they are not sleeping. Accordingly, the relationship between these two concepts cannot be based on inclusion of HAVING SEX into SLEEPING, or vice versa.) Instead, (1) both the former and the latter are elements of the frame ACTIVITIES THAT PREDOMINANTLY TAKE PLACE AT NIGHT; and, what is more important, (2) in the prototypical case, the target activity SEXUAL INTERCOURSE is usually followed by the vehicle activity SLEEPING, so that the latter can be easily understood as a metonym for the former.

As for the status of *sleep* as a non-default metonymy, it will be shown that the choice of the vehicle concept SLEEP is at odds with the maxims IMPORTANT OVER LESS IMPORTANT and RELEVANT OVER LESS RELEVANT: Physical sleeping is definitely not the most important and not the most relevant characteristic of having sex: the defining characteristic of the concept of having sex is [+sexual intercourse], not [+physical

sleeping]. However, since sexuality is a taboo-marked concept, the preference is deliberately given to a less important and a less relevant characteristic SLEEPING.

As we shall see, the same is also true of metonymic euphemisms which go back to all possible types of taboo (e.g., taboo of fear, taboo of awe, etc.). For example, the fact that African Americans are descendants of people from Africa is not the most important characteristic of African Americans: much more important is that they have black color. Likewise, honey-eating is not the most important characteristic of a bear. However, in Russian a bear is literally a honey-eater (Ullmann 1957: 184).

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## Induction from a single instance: incomplete frames

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Both in practical contexts and in the history of science "induction from a single instance" is a widespread phenomenon. Take an example from (Norton, 2003): knowing the melting point of one sample of bismuth was taken to be a sufficient reason to infer that all bismuth samples melt at this temperature. However, this inference pattern does not apply to all objects. To know the melting point of one sample of wax is not enough to conclude that all samples of wax melt at this point. So what makes the first inference valid, but not the second? Many authors, from J.S. Mill on, refer to some necessary background knowledge (see e.g. Mill, 1973; Weitzenfeld, 1984; Davies, 1988; Norton, 2003). If present, this knowledge enables one to draw the inductive conclusion.

Dynamic frames, as developed by Barsalou (1992), Barsalou & Hale (1993), and Barsalou (1993), have proven useful in describing the behavior of concepts in everyday life and in science (see e.g. Andersen et al., 2006). We will assume the reader is acquainted with this framework and argue that dynamic frames are also useful in accounting for the difference between correct and incorrect induction from a single instance. We will explain how the necessary background knowledge for correct cases of such an inference can be obtained in the context of an existing frame by the constitution of what we will call an "incomplete frame".

The basic idea of an incomplete frame is that some or even all taxonomical units generated by the frame are undecided with respect to values of a certain attribute

which is added to an otherwise complete frame. The incomplete frame thus obtained, however, *does* contain the information that each taxonomical unit has a fixed value for that attribute (it just does not tell us which one). This is sufficient for the plausibility of induction from a single instance. Once we know that each taxonomical unit is associated with a unique value for the new attribute, it is enough to use one exemplar of that taxonomical unit to find out which value this taxonomical unit is connected to. Incorrect cases of single instance generalizations are simply those that are not grounded in an incomplete frame.

An incomplete frame can be evoked by an observation of uniformity of one or more taxonomical units with respect to a certain assembly of properties. First, we come to believe that all objects from a given taxonomical unit have exactly one of those properties. At least two moves may lead to this observation: (i) induction of generalizations about some taxonomical units of a frame and the property, or (ii) a causal theory that connects an existing taxonomical theory with the property. Next, we notice that these properties can be naturally interpreted as falling under one possible attribute. At this stage, we introduce this attribute together with its values, but the frame is incomplete, because not all taxonomical units have been associated with appropriate new values for this attribute.

An incomplete frame, thus viewed, is an intermediate stage in the process of frame revision required by the type of knowledge acquisition we are concerned with. Thus, we start with a complete frame, use it to generate an incomplete frame by adding a new attribute, and finally use induction from a single instance to saturate it (match the old taxonomical units with the new values). Once the incomplete frame becomes saturated, we obtain a new frame, which is an extension of the original one.

On the other hand, an incomplete or even a saturated frame may be *rejected* as well, once new data are obtained. This is the case whenever a taxonomical unit of the frame turns out not to be uniform with respect to the new attribute or when the causal theory that justified the incomplete frame is rejected. In many such cases, useful information contained in the rejected frame can be retained by the introduction of a (complete or incomplete) frame that contains only a proper subset of the taxonomical units of the rejected frame.

This paper is a step towards a more general understanding of the evolution that dynamic frames undergo when faced with experimental data. Furthermore, it provides a means to understand an important phenomenon in terms of the Frame Theory. Our theses will be in line with a more formal approach to dynamic frames developed in (Urbaniak, 2009), and with forthcoming work on the relation between adaptive logics of induction (studied in Batens & Haesaert, 2001) and the dynamics of conceptual frames.

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# Adaptive Reasoning with Dynamic Conceptual Frames

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On the *classical theory of concepts*, to each concept corresponds a set of necessary and sufficient conditions for falling under that concept, a set of conditions that can be discovered by conceptual analysis. Arguably, the classical view is not an adequate picture of how concepts work in human cognition (Wittgenstein 1953 and Quine 1951 are the classics; see however more recent attacks launched from different positions: Fodor et al. 1999, Risch 1973, 1975a,b, 1978, 1983).

A few alternatives to the classical theory of concepts have been developed. One of the major and most recent accounts of concepts, inspired by the work of Rosch, employs the notion of a *dynamic conceptual frame* (the psychological evidence for the adequacy of this theory is surveyed in (Andersen et al. 2006, 47-52). One of the most well-known formulations of the theory has been provided in (Barsalou 1987; Barsalou and Hale 1993; Barsalou 1993; Barsalou and Yeh 2006). Motivated by the work of Kuhn (1974), certain applications to the history of science have been put forward and it has been argued that dynamic frames are a useful tool for accounting for scientific revolutions and conceptual frame incommensurability (Andersen et al. 2006).

Although very interesting developments of the theory can be observed, the logical aspects of the issue have not been investigated. The present work intends to make dynamic frames available to the mainstream methodology of formal logicians.

After a brief explanation of the structure of dynamic frames, I delimit a rather simple and yet interesting class of dynamic frames and develop a language which can be used to describe such frames by finite sets of formulas, which makes them computationally manageable (the motivation for my use of a propositional representation is

mainly methodological and does not go against the importance of non-propositional levels of representation, see Nersessian 1992 for a moderate position regarding these issues).

Then I go on to discuss a convenient way of capturing the way one reasons within a conceptual framework. The issue is crucial for our ability to model formally the phenomena that occur when we reason with conceptual background knowledge. The problems with reasoning within a conceptual frame arise when an anomaly (e.g. something that does not fit in any of the taxonomical units of our frame) is encountered. The problem is that an anomaly contradicts our beliefs stemming from our conceptual frame, and yet, we still want to be able to reason within our conceptual framework in order to localize the source of the problem and to revise the frame.

This means that classical logic is not fine-grained enough to help us handle such situations. In classical logic, everything follows from a contradiction (this is called "explosion"), and a contradictory set of premises is pretty much epistemically useless.

Ideally, upon encountering an anomaly, we would revise our frame and go back to the stage where we are able to reason classically. However, while we are trying to do that and decide how the frame should be revised, we have to be able to reason without explosion with data and beliefs available. Moreover, even upon revision it is still possible that we will encounter further anomalies, and our forms of reasoning should be prepared for this possibility.

A group of logics designed to handle contradictory sets of premises ("paraconsistent logics") have been developed (Priest1979; Priest and Routley 1983). Roughly, the idea is that paraconsistent consequence is weaker than classical consequence, and thus, it is not the case that any sentence whatsoever is a paraconsistent consequence of a contradictory set of sentences.

However, the problem with paraconsistent logics is that even though they avoid explosion, they not only restrict our deductive powers when it comes to problematic assumptions, but rather they do so with respect to all our premises. This means that if we went paraconsistent, we could reason within a frame even in face of an anomaly, but we would not be able to reason normally even if we restricted ourselves to the unproblematic part of our conceptual framework. This seems to be too high a price for avoiding explosion.

Thus, methodological considerations will point towards the need for a logical framework that avoids the problems that classical logic has when it comes to dealing with contradictions, and yet does not weaken the logic unnecessarily. I will argue that one of the most convenient logical paradigms to handle this sort of situations is provided by so-called adaptive logics, which not only satisfy the former condition, but also, in a sense, allow us to localize the anomaly.

I will explain what adaptive logics are in general and how they differ from classical and paraconsistent logics. Roughly, an adaptive logic adapts itself to the premises it is applied to: the correctness of some rules or steps depends on the choice of premises (some basic papers about adaptive logics are Batens 1995, 2004, 2007).

While reasoning using an adaptive logic we "swing between" two simpler logics, called the *lower limit logic*, **LLL**, and the *upper limit logic*, **ULL** (**ULL** being a

strengthening of **LLL**). The former comprises those rules we accept unconditionally, even when dealing with a contradiction. The latter includes also those steps that we conditionally accept: those, which we consider correct in circumstances devoid of anomalies. When no problematic formula is derived from a set of premises, we apply **ULL**, and once some premises turn out to lead to difficulties, we restrict ourselves only to those conclusions that we can derive from the problematic premises using **LLL**, even though we may still apply **ULL** to those steps which do not rely on the normal behavior (= falsehood) of those abnormalities that we know follow from the premises. This approach results in adaptive proofs being doubly dynamic.

They are **externally dynamic**, because most of adaptive logics are *non-monotonic*: once our premise set is extended by *new* input, we might have to cancel some of our previous conclusions if the new information makes some of our steps unreliable. They are also **internally dynamic** because even if we keep the premise set *the same*, it may turn out that a conclusion that we have drawn is no longer reliable once we achieve better insight into our premises and discover they are problematic.

Having provided this background information, I will move on to explaining how an adaptive framework suitable for reasoning within a dynamic frame may be constructed, and how, when we face an anomaly, it can help us to 'isolate' the problematic parts of our framework and reason normally with those parts of our frame which do not raise any suspicion.

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# The "Complex First" Paradox
# Why are Semantically Thick Words Acquired so Early?

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When one conjoins relatively well supported views on language acquisition and typology with frequently held views on the neural realization of meaning and some general principles of evolution and development, one seems to arrive at what I shall call the *Complex-First Paradox*. At its core is the question why concepts of substances, typically expressed by concrete nouns, seem to lexicalize ontogenetically and phylogenetically so early, even though they are apparently semantically far more complex than concepts that lexicalize later. The paradox consists of five propositions each of which seems plausible in its own right and is supported by empirical or theoretical reasons. The set of propositions – as is the nature of paradoxes – is apparently inconsistent, though, and thus points to an explanatory deficit in linguistic theory:

(P1) The meanings of concrete nouns, in ontogeny and (probably) phylogeny, are acquired earlier than those of many – eventually even all – other word classes.

(P2) The meanings of concrete nouns are substance concepts.

(P3) Substance concepts are semantically more complex and their neural realizations more widely distributed in cortex than those expressed by the other word classes in question.

(P4) For a cortically implemented syntax-semantics interface, the more widely distributed a concept's neural realization is, the more effort it takes to establish a link between the concept and some lexical expression thereof.

(P5) In ontogeny and phylogeny, capabilities demanding more effort, all other things being equal, develop and, respectively, evolve later than those demanding less effort.

The paradox should be conceivable now: Assume that the meanings of concrete nouns like *daddy*, *water*, and *cat* are indeed semantically more complex or, to use another word, thicker than the meanings of other word classes, e.g., adjectives like *blue*, *big*, and *bold*. If one accepts that meanings are mental concepts, the view is illustrated as follows: The substance concept [water] has not only perceptual components of various modalities like [transparent], [fluid], and [tasteless], but also components that relate to affordances like [to drink]. The attributive concept [blue], in contrast, seems to be relatively thin: it does not decompose into distinct conceptual parts and seems to pertain to the visual domain only.

Assume, furthermore, that conceptual complexity correlates with a wider distribution of the conceptual parts, respectively, their neural realizations in the cortex. One then expects the neural correlate of [water] to pertain to visual, tactile, gustatory, and action-related regions. In contrast, the correlate of [blue] seems to be bound to the visual cortex.

Following another of the assumptions, a word-to-meaning assignment ought to be more easily tractable for a cortically realized syntax-semantics interface if the neural correlate of the meaning is relatively local, rather than widely distributed. Consequently, the link between the adjective *blue* and the attributive concept [blue] should require less effort than the link between *water* and [water].

Take it as a quite general principle of evolution now that with regard to one and the same domain incrementally more complex capabilities *ceteris paribus* evolve later than simpler ones. There had to be feathers first, only then some reptile species could evolve wings. Vision could succeed in evolution only after light-detection had evolved. It seems to be a simple truth that lies behind it: *Natura non facit saltus*. There is an outright analogy in development: A child must have acquired the capability to hold a stick before it will be able to use a hammer. Children have to acquire simple closed syllables (CVC, e.g., *come*) before they are able to pronounce syllables with complex codas (CVCC, e.g., *cast*).

Given those assumptions, how can it be that the meaning of the noun *water* ontogenetically and phylogenetically still is acquired earlier than that of the adjective *blue*? Since the concept [water] is semantically more complex than [blue], its neural correlate should be more widely distributed, the link between the concept and its expression should imply more effort, and thus ought to be established later in ontogeny and phylogeny. Rather than the empirical claim made by the first proposition, we should on the basis of the other four assumptions expect that the meanings of concrete nouns, in ontogeny and phylogeny, be acquired *later* than those of other word classes. In the paper I would like to press the paradox a little further by putting forward arguments for each of the five propositions and rejecting objections against them. Even though my résumé will be rather pessimistic, I will conclude with some more speculative remarks on a potential solution.

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# Building DRT Lexical Entries for Superlatives and Ordinal Numbers

CHARLES YEE

(Institut für Maschinelle Sprachverarbeitung, Universität Stuttgart)

This talk is concerned with the construction of semantic representations of utterances involving superlatives and ordinal number phrases, using the framework of Discourse Representation Theory (DRT) (Kamp & Reyle, 1993). I will describe the constructions of semantic representations, in the form of DRSs, for sentences involving superlatives and ordinals:

(1) Aconcagua is the highest mountain in the Americas.

(2) However, it is only the $26_{th}$ highest in the world.

The semantic construction process can be understood as two-part: A Syntax-Semantic and a Semantic-Pragmatic interface. The Syntax-Semantic interface begins with an input in the form of a syntactic tree generated by CFG (or alternatively, simple phrase structure rules commonly found in LFG or HPSG). Every leaf node of a tree consists of a lexical entry, while the intermediate nodes are the results of unifying lexical entries (or subordinate intermediate nodes) à la Blackburn and Bos' "λ + Box" framework (1999). A *Preliminary DRS* for a sentence is thus compositionally constructed and annotates the root node; it consists of the assertional as well as the presuppositional DRS representation of the sentence.

An important prerequisite for the Syntax-Semantic interface is the specification of the relevant lexical entries for the superlative operator '-est', and the ordinal expressions 'first', 'second', 'third', etc, as well as the contribution these entries make to the overall superlative and ordinal phrases ("the *highest* mountain", "the $26_{th}$ highest mountain"). A crucial aspect of both superlatives and ordinals is the presuppositions they trigger: A *comparison set*, a *comparison dimension* (Bos & Nissim, 2006), and a *contextual domain* in which the definite superlative/ordinal is uniquely identified (Kamp, Reyle & van Genabith, 2008, p.133-137). As in van der Sandt (1992), presuppositions are resolved in context only after the Preliminary DRS in which they are explicitly represented has been constructed. Anaphors under the presuppositional DRS of the Preliminary DRS will try to bind with antecedents in context or accommodate during the Semantic-Pragmatic interface. Here I will modify van der Sandt's resolution procedure by extending his notion of 'contexts'. Essentially, the contexts we will work with are to include also information that has not been expressed in the antecedent dis-

course: Information such as interlocutors' background and general world knowledge, information from the shared perceptual environment, elements associated with the utterance participants/time/location, and so on. The *Articulated Context* is a set of interacting DRSs that can be viewed as an explicit representation of the common ground (Stalnaker 1974). Components within the Articulated Context, such as the DRSs that represent General and Encyclopaedic Knowledge, will rely on external databases such as FrameNet and OWL ontologies.

Resolution of the presuppositions triggered by a definite superlative/ordinal phrase requires that there be a particular contextual domain (within the Articulated Context) where the superlative/ordinal can be uniquely identified. Often times this contextual domain is provided by the sentence itself, as in (1): "…in the Americas" and (2): "… in the world". However, this is not always the case. When a superlative/ordinal sentence lacks such specification and the available contextual resources fail to entail such a contextual domain, it must remain underspecified. In response to this, I will raise one instance of the superlative (and ordinal) where there is an ambiguity between absolute and comparative reading due to focus articulation (Szabolcsi, 1986):

(3) $[\text{JOHN}]_F$ climbed the (second, third, etc.) highest mountain.

(4) John climbed the (second, third, etc.) $[\text{HIGHEST}]_F$ mountain.

In (3), the 'highest mountain' is the highest amongst all the mountains climbed by someone in the salient context[1], while in (4), the 'highest mountain' is the highest in the world (or alternatively, the highest in the salient context). I will demonstrate that the difference between these two readings is essentially attributed to the selection of the appropriate contextual domain relative to the focus constituent. In addition, such information structure is a case in point where the contextual domain of the superlative/ordinal may be identified without any further hint.

---

[1] I am using the term salience loosely along the lines of David Lewis (1979).

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## Frames, Conceptual Spaces and Large Scale Theory Change

FRANK ZENKER

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This talk raises criticism beyond that of Thagard (2009) or Stanford (2008) with respect to recent applications of frames (Barsalou 1992, Barsalou and Hale 1993) by authors working in the philosophy of science, e.g., Andersen, Barker & Chen (2006), who seek to "explain" the incommensurability aspect of radical theory change, i.e., Kuhn's (1962) scientific revolutions, as *constraint violations*. I first compare frames to an alternative modelling tool, conceptual spaces (Gärdenfors 2000) and present one way of recovering the merits of the frame model in conceptual spaces, then argue that the latter is better suited in application to scientific concepts/ empirical theories.

Generally, by *providing* structure, both the frame and the conceptual spaces model yield *comparability* of predecessor and successor frame, whence the former model has been applied to change phenomena claimed to result in incommensurability-*as-incomparability* (Chen 2003, Chen and Barker 2000). In addition, and by respecting the metric of dimensions, conceptual spaces also yield *similarity* relations.

Comparing frame theory and conceptual spaces consists in transposing terminology, in order to show how the relevant notions of one model can be provided with an analogue in the alternative model. I shall demonstrate as much for (what I take to be) a *successful application* of the frame model, namely a simple case of *taxonomic* change: from Ray's 1678 over Sundevall's 1889 to Gadov's 1893 concept of BIRD, as discussed in Chen (2002) and Andersen, Barker, Chen (2006: 69-75).

Briefly, the proposed correspondences are as follows:

- An *attribute* corresponds either to one separate *dimension* (D) or an integral combination of Ds, e.g., colors can be modelled as points on a spindle.[1]
- A *value* of an attribute corresponds to a point or an interval on one or several Ds (in the +3 D case and depending on the metric, to a vector or a region).
- A *structural invariant*, e.g., between a bird's beak and its foot in Chen's (2002) example, may correspond to a correlation of Ds. Yet, insofar as such relations are shape-based, it is not implausible to assume a representation in like mode.[2]
- In the taxonomic case, a *constraint* simply corresponds to empty regions of a space. In other cases, e.g., "being a surgeon requires having gone to medical school" (Barsalou & Hale 1993: 128), the modelling of constraints is less clear.

In the frame model, attributes and values are ultimately linguistic entities, whence frames seemingly capture *anything* expressible in language. This is fine when representing taxonomic knowledge *based on binary features*. However, when the number values of an attribute is greater than two (i.e., when distinctions are more "fine grained"), deficits become apparent. For example, in frames, it will not be possible to re-

present *in a motivated way* that a region (in frame-terms: a value) on the dimension (attribute) 'size', such as 'medium', *lies between* 'small' and 'large'. Generally, when values are *not* bi-, but *n*-ary, i.e., when we speak of degrees of some magnitude, there is no *decent* way to capture the requisite ordering relation in a frame model.

To model scientific concepts, particularly of mathematical physics (e.g., mass, force, energy), and – perhaps eventually – *entire* empirical theories, one would like dimensions (i.e., "attribute value-structures") which take on the qualities of *ratio-scales*. Otherwise, one will not be able to respect that such concepts depend on and, at the same time, give rise to measurement results at this level of scale.[3]

Put bluntly, by their design, frames are not suitably equipped to *represent* knowledge beyond the taxonomic level other than doing so trivially, by drawing arrows which, basically, stand in for verbs. This, I conjecture, is the case, because frames have been *developed out of* feature lists with an intention to explicate information deemed to have remained implicit, notably relational information (cf. Barsalou 1992: 102). In doing so, the feature list model was ultimately retained. When you literally subtract constraints as well as invariants and, moreover, restrict attributes to binary values only, then you *have* a feature list model, rather than an analogue to it.

Therefore, frames appear (to this author) as linguistically enriched Aristotelian categories turned 90 degrees to the left. After all, what in the Aristotelian model (Taylor 2003) are features – noted *below* the category term and fronted either by a plus or a minus sign (e.g., MAN [+rational], [+animal]) – now appear as attribute-value combinations *to the right* of the category term. That is to say, frames are ultimately "pen and paper models" fit to code *feature-based* information in a two dimensional manner.

Finally, with respect to large scale theory change, I defend the following thesis.

*Weak version*: Compared with frame theory, it is (non-formally speaking) *easier* to model a large-scale change to an empirical concept in the conceptual spaces model, because the model *is built* to represent dimensions at the very level of scale used in the mathematical part of science.

*Strong version*: Only when modelling large scale changes in conceptual spaces do we obtain the *proper* result, namely one which allows, by using change operations defined on dimensions[4], to *generate* the conceptual space (not the symbolic formulas) of the predecessor theory into the successor theory.

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[1] Cf. Barsalou (1992: 26, fn. 1): "My use of 'attribute' is essentially equivalent to other theorists' use of 'dimension', 'variable', and 'slot'. I assume that all these terms are at least roughly synonymous".

[2] It is questionable, in what sense the knowledge claimed to be represented by a structural invariant (e.g., "that the back of a chair is typically *above* the seat" (Barsalou & Hale 1993: 125, *italics added*) should be considered *represented*, when all one does is draw a single pointed arrow with superscript 'above' between attributes.

[3] The orthodox picture of embedding an empirical into a mathematical relational structure, such that the former is already "out there" and, in some sense, independent of the latter, is naïve and false, yet deeply entrenched.

[4] Addition/deletion of Ds; change in integrality/separability; change in importance of D, change in metric.

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## Applying Frame Theory to Texts of Psychiatric Classification

JÜRGEN ZIELASEK & KARIN FAUERBACH & WOLFGANG GAEBEL

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LVR-Klinikum Düsseldorf, Germany)

We applied Barsalou's Frame Theory to analyse the structure of standard classificatory texts in psychiatry like the International Classification of Disorders, Chapter V (ICD-10), and the Diagnostic and Statistical Manual (DSM-V) comparing them with texts by Kraepelin and Bleuler which provide the basic terminology for today's psychiatric classification system. We studied the classificatory principles of "schizophrenia" as a prototype of mental disorders. Initial results suggest that although the texts of modern classification systems are highly operationalized and appear straightforward and simple, their internal structure is highly complex with sub-frame structures of divergent types emerging. Also, the comparison of both modern systems of classification shows that the differences are greater than just time-course differences or terminological differences. Finally, an initial analysis of classical texts by Kraepelin and Bleuler shows that their analysis requires the use of medico-historic information to analyse frame

attributes. We show that by applying Barsalou's Frame Theory, internal structures of standard classificatory texts in psychiatry become discernible. Thus, Barsalou's Frame Theory allows a novel standardized approach to analysing concepts of psychiatric classification.

## Anchoring Associative Anaphora through Frames

ALEXANDER ZIEM

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Anaphors are linguistic means to establish text coherence and text continuity. Since they are semantically underspecified, it is a cognitively demanding task to anchor anaphora in a conceptual element of the built-up text model. Even though, in contrast to other types of anaphora, associative anaphora have no explicit antecedents in a text or discourse, they establish systematic relations to concepts being already introduced in or inferred from the preceding text.

In current research, anaphora are addressed within different frameworks, including Generative Grammar, Functional Pragmatics as well as Cognitive Grammar and Construction Grammars (cf. Charolle, Kleiber, 1999; Schwarz, Consten, & Knees, 2006). In these frameworks, associative anaphora have become an increasingly influential research topic. There are, however, only a few in-depth studies addressing the cognitive anchoring process of anaphora. In the generative paradigm, anaphora are usually explained by means of highly abstract rules governing co-referential integrations (confer, e.g., Reinhart, 2006). Cognitive-linguistic approaches, however, have stressed that rather general cognitive mechanisms apply (e.g., instantiation, schematization, focussing, figure-ground alignment) and that cognitive domains or frames play a major role. From this point of view, both the acquisition of the competence to establish linguistic co-reference as well as the involved on-line operations follow schema-based conceptualization patterns (e.g., van Hoek, 2007; Matthews, Lieven, & Tomasello, submitted). Deviating from traditional investigations, cognitively orientated studies additionally emphasize that associative anaphora are phenomena in their own right (Cornish, 1999; Schwarz, 2006). Traditional approaches not only fail to explain the specific constraints governing the comprehension process of associative anaphora, they also tend to treat them as marginal subtypes of "prototypical" direct anaphora.

In this talk, following a frame-semantic framework (Ziem, 2008), I will shift the focus particularly on the question how anaphoric expressions are anchored in the text world. Roughly speaking, there are two competing views which aim at explaining the cognitive principles that establish indirect anaphoric reference. On the one hand, holistic approaches assume that the conceptualization process of anaphora is generally schema-based. On the other hand, modular approaches advocate a two- or three-level-model of semantic representation and hence presume a division of labour between semantic and conceptual information. On this basis, Schwarz (2000, pp. 98-117; 2006, pp. 9-10) argues that four "types of activation" need to be distinguished in order to

cope with the complexity of bridging anaphora. In particular, she maintains that referential relations are either (i) schema-based, (ii) inference-based, (iii) meronymy-based, or (iv) grounded on verb-semantic roles. Yet, this approach presupposes not only that different cognitive mechanisms are involved, but also that they are mentally processed in different ways.

Presenting selected results of both theoretical and corpus-based studies, I will argue that understanding associative anaphora generally relies on frame-based processes. It is thus neither necessary nor psychologically plausible to presume different cognitive schemas and mechanisms. I will introduce a frame-theoretical approach drawing back to a slightly modified and extended version of the early pioneer work of Marvin Minsky (1975), Charles Fillmore (1977) and Lawrence Barsalou (1992). The unified approach I will put forward considers the fundamental role of default values in the conceptualization process of associative anaphora. Minsky suggests that the structure of frames may be well described in terms of (i) slots – respectively "attributes" in the sense of Barsalou (1992) – and instances of slots, namely (ii) fillers, that is, "values" in Barsalou's terms, and (iii) default values. Default values are presupposed elements in the sense that a speaker/writer may presuppose them and a hearer/reader, in turn, may infer them. One central claim is that conceptualizing associative anaphora essentially entails co-referring default values of at least two evoked frames. Following Löbner (1998), I claim that associative anaphora predominately belong to the class of functional concepts serving either as (default) values or as attributes of the frame evoked by the antecedent. In cognitive terms, anchoring associative anaphora thus essentially implies either (i) an instantiation of the anaphoric element functioning as a (default) value in an attribute (slot) or (ii) a semantic expansion of the attribute-value structure provided by the antecedent frame.

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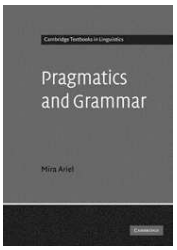


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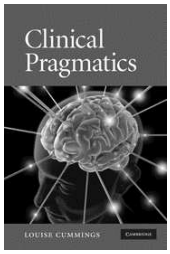


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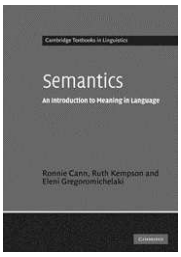


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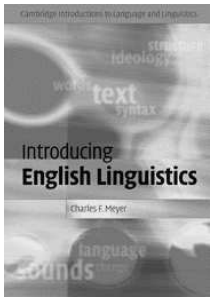


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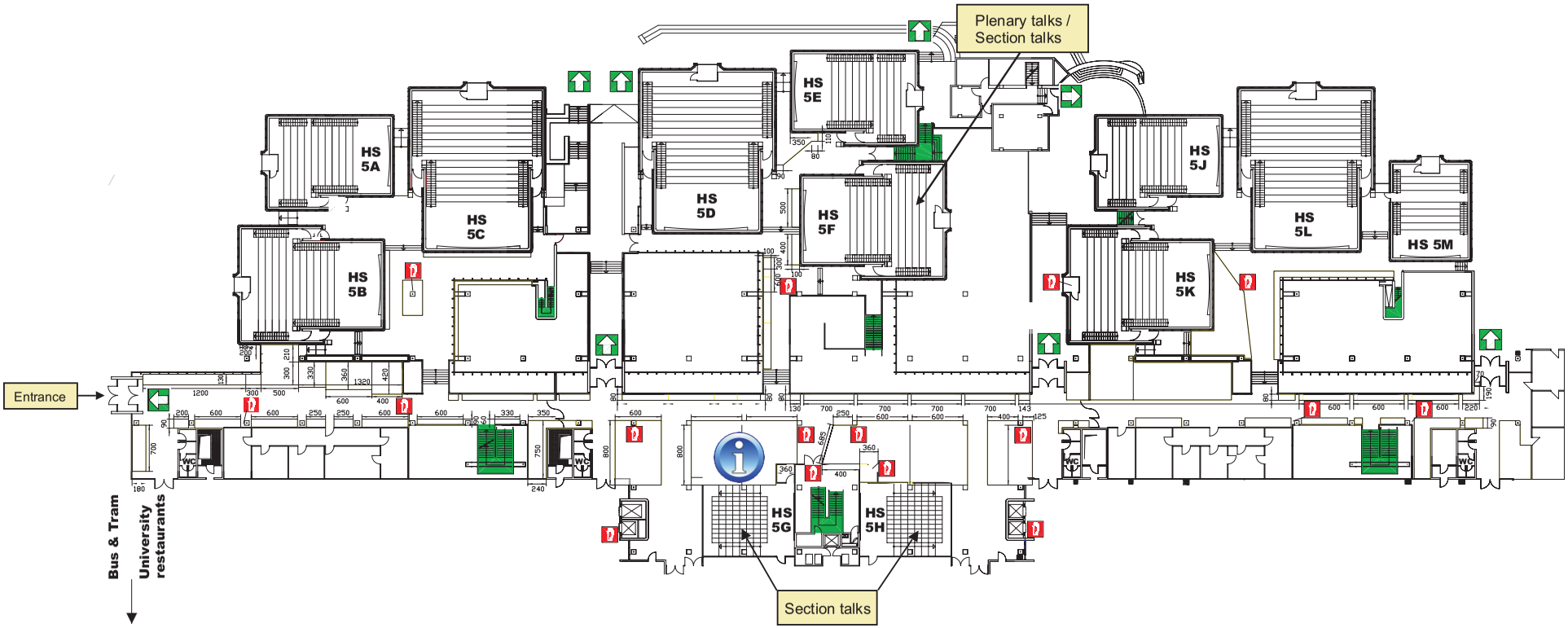


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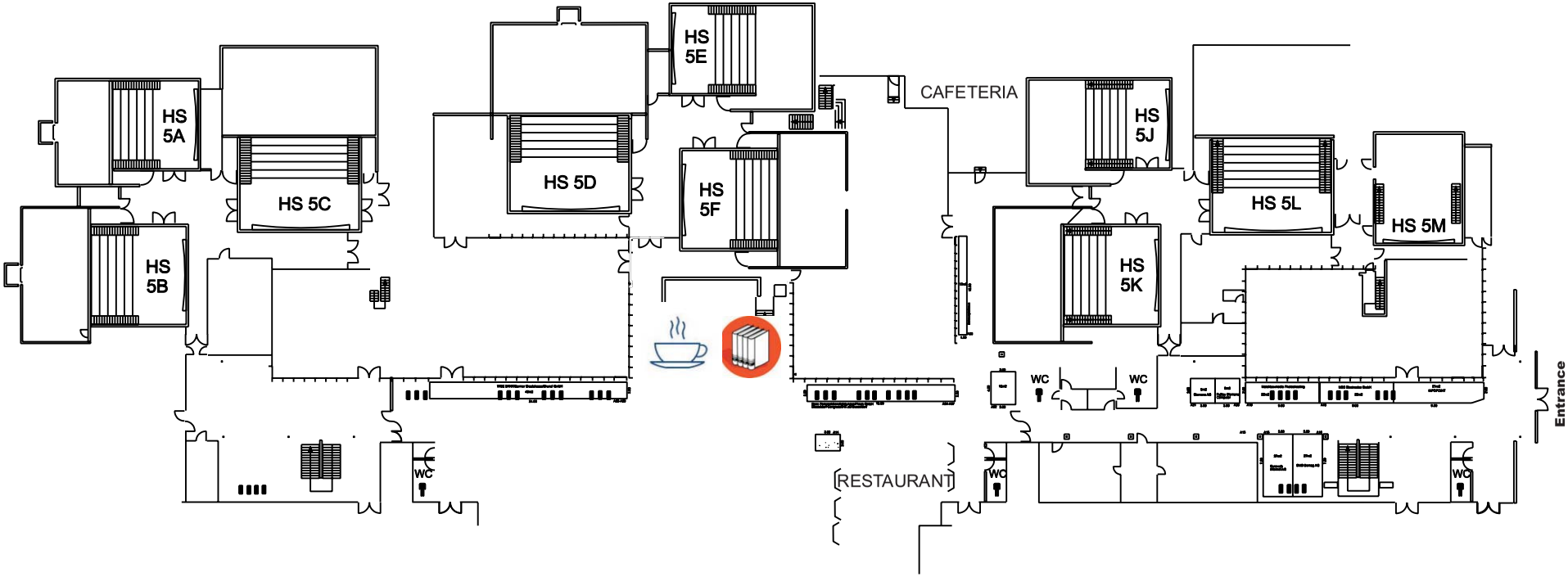


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| Monday, August 24th | | | |
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| 9:00-9:15 | OPENING (Lecture hall 5F)<br>**Bruno Bleckmann**, Vice Dean of the Faculty of Arts, HHU | | |
| 9:15-10:15 | PLENARY TALK I (Lecture hall 5F)<br>**Sebastian Löbner:** Evidence for frames from human language | | |
| 10:15-10:30 | ***Coffee break*** | | |
| | Lecture hall 5F | Lecture hall 5G | Lecture hall 5H |
| | **Reasoning with Frames** | **Metonymy & Metaphor I** | **Corpus-based Studies** |
| 10:30-11:10 | **R. Urbaniak**<br>Adaptive reasoning with dynamic conceptual frames | **D. Schulzek**<br>A frame approach to metonymical processes in some common types of German word formation | **T. Alexandrov & E. Ovchinnikova**<br>Semantics of "arguments" in terms of FrameNet frames: a corpus-based study |
| 11:15-11:55 | **R. Urbaniak & F. Van De Putte**<br>Induction from a single instance: incomplete frames | **L. Ströbel**<br>Where does my fear lead me... | **Ch. Horn & Ch. Rumpf**<br>Semi-supervised learning of conceptual noun types |
| 12:00-12:40 | **W. Petersen & T. Osswald**<br>A formal interpretation of frame composition | **A. Tokar**<br>Sleep, boyfriend, African American, bear…The frame-based analysis of the typology of metonymic euphemisms | **I. Russo & T. Caselli**<br>Converging evidences on the eventivity of Italian nouns |
| 12:40-14:00 | ***Lunch break*** | | |
| 14:00-15:00 | PLENARY TALK II (Lecture hall 5F)<br>**Lawrence W. Barsalou:** Frames in perceptual symbol systems | | |
| 15:00-15:15 | ***Coffee break*** | | |
| | Lecture hall 5F | Lecture hall 5G | Lecture hall 5H |
| | **Color & Categorization** | **Metonymy & Metaphor II** | **Lexical Semantic Resources** |
| 15:15-15:55 | **G. Jäger**<br>Natural color categories are convex sets | **A. Rothmayr**<br>How syntax constrains non-literal language | **E. Ovchinnikova et al.**<br>Ontological analysis of FrameNet for natural language reasoning |
| 16:00-16:40 | **B. Baumgaertner**<br>Using frames to solve the problem of vagueness | **T. Gamerschlag & W. Petersen**<br>A frame theoretic account of inferential evidentials based on German perception verbs | **U. Priss & J. Old**<br>Enhancing Roget's thesaurus with semantic tags |
| 16:40-17:00 | ***Coffee break*** | | |
| 17:00-18:00 | PLENARY TALK III (Lecture hall 5F)<br>**Barry Smith:** The relation ontology | | |

| Tuesday, August 25th | | | |
|---|---|---|---|
| 9:00-10:00 | PLENARY TALK IV (Lecture hall 5F)<br>**Paul Thagard:** Creative conceptual combination | | |
| 10:00-10:30 | ***Coffee break*** | | |
| | Lecture hall 5F | Lecture hall 5G | Lecture hall 5H |
| | **Frames in Philosophy & Science** | **Definiteness & Concept Types** | **Frames & Discourse** |
| 10:30-11:10 | **G. Schurz & I. Votsis**<br>The caloric concept under a frame-theoretic spotlight | **Ch. Horn & D. Gerland**<br>Definitely functional? Concept types in context | **Ch. Yee**<br>Building DRT lexical entries for superlatives and ordinal numbers |
| 11:15-11:55 | **F. Zenker**<br>Frames, conceptual spaces and large scale theory change | **A. Ortmann**<br>Definite article asymmetries and concept types: semantic and pragmatic uniqueness | **A. Ziem**<br>Anchoring associative anaphora through frames |
| 12:00-12:40 | **J. Zielasek et al.**<br>Applying Frame Theory to texts of psychiatric classification | **A. Terhalle**<br>Indefinite use of functional concept nouns | **M. Temmerman & E. Belsack**<br>Framing *the other community* in the Belgian press |
| 12:40-14:00 | ***Lunch break*** | | |
| | Lecture hall 5F | Lecture hall 5G | Lecture hall 5H |
| 14:00-14:40 | | **R. Oda**<br>Uniqueness of the definite article in terms of a frame | **A. Benz & A. Schalley**<br>Conceptual differentiation and inheritance: an object-oriented approach |
| 14:45-15:45 | PLENARY TALK V (Lecture hall 5F)<br>**Barbara Abbott:** The indefiniteness of definiteness | | |

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|---|---|
| 17:15-19:15 | ***Guided tour***<br>***Media Harbor Düsseldorf*** |
| 19:30 | ***Conference dinner***<br>***Restaurant "Zum Trompeter" (www.zum-trompeter.de)*** |

# Schedule

| Wednesday, August 26th | | | |
|---|---|---|---|
| 9:30-10:30 | PLENARY TALK VI (Lecture hall 5F)<br>**Beth Levin:** Types of verb meanings: manner, result, but not both? | | |
| 10:30-11:00 | ***Coffee break*** | | |
| | Lecture hall 5F | Lecture hall 5G | Lecture hall 5H |
| | **Verb Meaning I** | **Definiteness & Reference** | **Meaning & Representation I** |
| 11:00-11:40 | **R. Osswald & R. Van Valin**<br>Frame semantics and lexical decomposition – a case study of cognition verbs | **Y. Kobukata & Y. Mori**<br>The definiteness effect and a new classification of possessive constructions | **M. Stuart**<br>Philosophical conceptual analysis: the move from use to meaning |
| 11:45-12:25 | **E. Lyutikova & S. Tatevosov**<br>Actional classes and valence-changing derivations | **D. Gerland**<br>Pathways to definiteness: possessives with non-possessive function | **M. Tacca**<br>Reference, demonstrative thoughts, and visual binding |
| 12:25-14:00 | ***Lunch break*** | | |
| 14:00-15:00 | PLENARY TALK VII (Lecture hall 5F)<br>**Jerry Hobbs:** Deep lexical semantics | | |
| 15:00-15:15 | ***Coffee break*** | | |
| | Lecture hall 5F | Lecture hall 5G | Lecture hall 5H |
| | **Verb Meaning II** | **Adjectives & Attributes** | **Meaning & Representation II** |
| 15:15-15:55 | **B. Schwarze & H. Geisler**<br>Diachrony of stative dimensional verbs in French | **M. Hartung & A. Frank**<br>Classifying adjectives for attribute learning: an empirical investigation | **J. Skilters**<br>Towards a non-representational semantics |
| 16:00-16:40 | | **A. Alexejenko**<br>Functions vs. events in the semantic structure of adjectives | **M. Werning**<br>The "Complex First" Paradox. Why are semantically thick words acquired so early? |
| 16:40-17:00 | ***Coffee break*** | | |
| 17:00-18:00 | PLENARY TALK VIII (Lecture hall 5F)<br>**James Pustejovsky:** Conceptual constraints on the language of space and time | | |