COGNITIVE STRUCTURES 2018
Linguistic, philosophical and psychological perspectives

Program and abstracts
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The program committee of CoSt18

Hana Filip  
Kurt Erbach  
Thomas Gamerschlag  
David Hommen  
Peter Indefrey  
Tobias Kalenscher  
Laura Kallmeyer  
Timm Lichte  
Sebastian Lübner  
Peter Sutton  
Gottfried Vosgerau  
Henk Zeevat  
Alexander Ziem

The organizing committee of CoSt18

Thomas Gamerschlag  
Lena Hierl  
Tim Marton  
Laura Wellschmiedt

Contact
Heinrich-Heine-Universität  
Institute for Language and Information  
Collaborative Research Centre 991  
Universitätsstraße 1  
40225 Düsseldorf  
Germany

Email: cost18@phil.hhu.de
Welcome

Dear participants,

Welcome to the 2018 international conference “Cognitive Structures: Linguistic, Philosophical and Psychological Perspectives” (CoSt18) at Heinrich Heine University Düsseldorf! The conference is organized by the Collaborative Research Centre (Sonderforschungsbereich) CRC 991 “The Structure of Representations in Language, Cognition and Science” which is funded by the German Science Foundation DFG and presently comprises nineteen research projects.

The Cost18 conference is a follow-up of Cost16 which took place two years ago at the same place. Both conferences continue a series of four successful “Concept Types and Frames” (CTF) conferences which were held in Düsseldorf in 2007, 2009, 2012 and 2014. These conferences were initiated by the DFG Research Unit 600 and later on organized by CRC 991. CoSt18 and CoSt16 clearly stand in the interdisciplinary tradition of these previous conferences. However, we decided to change the conference title due to a slight shift in focus of the CRC in the second funding period and to open it up for an even broader audience. Hopefully, the series will be continued with a seventh conference in 2020 and more biannual successor conferences in the third funding period.

The conference is intended as a platform for the interchange of different perspectives on the nature of cognition. It aims at bringing together approaches from various disciplines such as semantics, computational linguistics, psycholinguistics, philosophy of mind, philosophy of science, and experimental psychology. A special focus will be on formal and representational issues and the question of how aspects of concept formation in science, cognition, and the description of natural language semantics can be captured in an adequate way. Therefore, we have particularly chosen contributions based on frameworks which put special emphasis on cognitive plausibility and naturalness. The result is a truly interdisciplinary and balanced conference program of state-of-the-art research.

The conference is financed by the German Science Foundation (DFG). I am grateful to all those contributing to the success of the conference including among others the presenters, the reviewers, the program committee and the organizational team. I am sure that the conference will be inspiring for all of us and lead to fruitful cooperation and numerous new ideas.

Laura Kallmeyer
Director of the Collaborative Research Centre
General Information

Conference Site
Location: Universität Düsseldorf campus, building 25.21, lecture halls 5B,5G,5H

Conference Office
Opening hours: Wednesday to Friday: 8:00-18:00 h
Location: Building 25.21

Conference website
http://cognitive-structures-cost18.phil.hhu.de

Website of the Collaborative Research Centre
http://www.frames.phil.uni-duesseldorf.de

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

Internet
W-LAN is available for the conference, log in details will be provided on site.
If you need a notebook or any help, we will assist you at the conference office.

Important telephone numbers
Deutsche Bahn (German Railways) +49 (0) 180 5 99 66 33
Deutsche Bahn (train schedule) +49 (0) 800 1 50 70 90
Rheinbahn (local public transport) +49 (0) 1803 50 40 30
Flughafen Düsseldorf International (airport) +49 (0) 211 42 10
Taxi +49 (0) 211 333 33 and +49 (0) 211 999 99

Emergency
Police 110
Fire/Ambulance 112
Conference Dinner

The conference dinner will take place in the restaurant ‘Libanon’ on Thursday, September 13th from 7:30pm on. ‘Libanon’ offers a variety of vegetarian & vegan & unhealthy meaty dishes and is located in Düsseldorf’s Altstadt district.

From the campus (‘Uni Ost/Botanischer Garten’) take U-Bahn U73 or U79 and get off at ‘Heinrich-Heine-Allee’. Leave the station through the exit labeled ‘Wallstraße’. Follow Wallstraße until you reach Bergerstraße. Turn left and you will find the restaurant Libanon at the left hand side.

The cost is 25,00€ for menu and will be collected in advance at the registration desk. Drinks will have to be paid for separately on-site. If you haven’t already registered online for the conference dinner but would like to attend, please note that the number of participants is limited and contact the registration desk before Wednesday, 5pm.

Libanon Restaurant, Express & Patisserie
Berger Str. 19-21
40213 Düsseldorf
www.libanon-restaurant.de
Pubs & Restaurants

On the campus

Mensa, bldg. 25.31 open 11:30 - 14:00
Café Bistro Uno, next to Mensa, open 8:00 - 15:00
Campus Vita, next to Mensa, open 11:30 -15:00
Café Medizinische Fakultät, bldg. 22.02, open 8:00 - 15:00
Cafetería Philosophische Fakultät, bldg. 23.21, open 8:00 - 15:00
Cafetería Mathem.-Naturwissenschaftl. Fakultät, bldg. 25.31 open 8:00 - 15:00

Within walking distance from campus

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

Downtown Düsseldorf

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

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

Greek
Taverne Kreta, Fürstenwall 61 (Bilk)
Pegasos, Friedrichstr. 50 (Bilk)
Sankt Suitbertus, Suitbertusstr. 193a (Bilk)

Indian
Ganesha, Luisenstr. 3 (Friedrichstadt)

Italian
Gallo Nero, Binterimstr. 27 (Bilk)
Via Appia, Flügelstr. 56 (Bilk)
Lupo, Friedrichstr. 125 (Bilk)
Il Mercato, Friedrichstr. 59a, (Bilk)

Japanese
Kikaku, Klosterstr. 38 (city center)
Naniwa, Oststr. 55 (city center)

Korean
Arirang, Stresemannstr. 46 (city center)
Koreahaus, Bismarckstr. 66 (city center)
Shilla, 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
Cape Town, Brunnenstr. 43 (Bilk)

Spanish
El Gitano, Schneider-Wibbel-Gasse 5 (Altstadt)
Las Tapas, Schneider-Wibbel-Gasse 4 (Altstadt)

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

Vietnamese
Scaramangas, Oberbilker Allee 31 (Bilk)

Pub/cafe with food
Café Modigliani, Wissmannstr. 6. (Bilk)
Tigges, Brunnenstr. 1 (Bilk)
Destille, Bilk Str. 46 (Altstadt)
Ohme Jupp, Ratinger Str. 19 (Altstadt)
En de Canon, Zollstraße 7 (Altstadt)
Zur Uel, Ratinger Str. 16 (Altstadt)
Lot Jonn, Kopernikusstr. 94 (Bilk)

Other
Bender’s Marie (Muschelhaus), Andreasstr. 13 (Altstadt)
Fischhaus (fish specialties), Berger Str. 3-7 (Altstadt)
Miss Money Penny, Brunnenstr. 2a (Bilk)
Cemo (cheap but delicious), Bilker Allee 178 (Bilk)
Ugly Deluxe, Karolingerstr. 80 (Bilk)
Florabar, Kronenstr. 65 im Floragarten (Bilk)

Tavern/Brewhouse
Brauerei Schumacher, Oststr. 123 (city center)
Brauerei Im Füchschen, Ratinger Str. 28 (Altstadt)
Brauerei Im goldenen Kessel, Bolkerstr. 44 (Altstadt)
Brauerei Zum Schlüssel, Bolkerstr. 43 (Altstadt)
Brauerei Frankenheim, Wielandstr. 16 (city center)
Brauerei Uerige, Berger Str. 1 (Altstadt)
Plenary Talks

What’s cognitive about rat empathy?

INBAL BEN-AMI BARTAL
(University of California Berkeley)

In the rat helping test, rats help a trapped conspecific by opening a door to a restrainer and releasing the trapped rat. It typically takes the free rat a few days to learn how to open the restrainer door. Once learned, the door-opening behavior is repeated quickly and consistently on following test sessions (Ben-Ami Bartal et al., 2011). Why do rats help the trapped rat? Rats, like people experience negative affective arousal (i.e. a stress response) when they observe a trapped rat in distress. One hypothesis is that rats are acting out of a basic form of emotional empathy, helping the other rat in order to reduce their own distress. I will present behavioral and neural data of rats tested for helping behavior suggesting that something more complex might be going on.


Events and their context

NICOLA GUARINO
(ISTC-CNR)

The notion of event appears to be intimately connected to that of context. Indeed, describing an event does not mean just saying that something happened, but also adding details about the context of what happened, mentioning other things that were present besides the core event participants, or other events that occurred at the same time. So, in our ordinary talk events have a rich cognitive structure, with a foreground and a background: the former includes the core participants, while the latter the event context. I will present in this talk an ontological account of events according to which they are understood as perceived, situated, cognitively constructed entities, emerging from our sensory experience through a mechanism of focused attention. Indeed, the term ‘event’ comes from the Latin verb ex-venire (to come out). I will consider the two arguments of this verb as referring to temporal occurrences (perdurants) of different kinds, reserving the term ‘event’ to perceived entities, and the term ‘scene’ for the underlying reality.
Beyond semantics proper

PETER HAGOORT
(Max Planck Institute for Psycholinguistics)

Scope-taking strategies and the order of clausal categories in German Sign Language

DANIEL HOLE (joint work with FABIAN BROSS)
(University of Stuttgart)

The scope order of clausal categories has been claimed to be universal. In this talk we adopt a universalist cartographic approach to clausal syntax. By discussing several CP-internal categories (e.g., speech-act markings, evaluation, epistemic modality, or scalarity), IP-internal categories (e.g., volition and deontic, as well as other kinds of modality, or several outer aspects), as well as VoiceP-internal categories (lower aspectual categories such as frequentative aspect II or cerelative aspect II) we illustrate a striking regularity in strategies of scope-taking in German Sign Language (DGS): The wider/higher the scope of a clausal operator is, the more likely its expression will occur with a high body part by way of layering. Namely, descending from the eyebrows to the lower face, tentatively to the shoulders, and finally switching to manual expressions. For intermediate operators a left-to-right concatenation strategy is employed, lower categories are expressed by way of a manual right-to-left concatenation strategy. The lower aspectual categories find layered expression within the manual sign. Hence, we propose a highly regular natural mapping of the scope-order of clausal categories onto the body. This sort of mapping can also be observed in other sign languages and may turn out to be universal.

Cascades – A fundamental structure of cognitive representations?

SEBASTIAN LÖBNER
(Heinrich Hein University Düsseldorf/CRC 991)

This talk is about simultaneous multiple categorization – not in the sense of levels of generality, but in a different sense we all know if we are given a few examples:

- We may flip a switch (one type of action) and doing so switch on the light (another type of action), doing that we might lighten up the room, we might wake up the baby sleeping in the room, we might ruin our own night (three more types of action)
- Someone may keep the door open, thereby letting some other person pass, thereby doing them a favor.
- A player shoots a ball and thereby scores a goal.
- A customer hands a piece of paper (which happens to be a 10 Euro bill) to somebody, thereby paying for something, and doing so, purchasing that something.
- I say something wrong, and thereby offend somebody, or mislead them, or betray something, or give the death-blow to a relationship.

In each of these examples, there is one doing, but this one doing constitutes at the same time as many different types of act as are mentioned in the examples (and more than these). If we regard a flipping of a switch simultaneously as a token of turning on the light, of lightening up the room, of waking up the baby, of ruining our night, we categorize the same action multiply. This phenomenon was first observed and investigated by the philosopher Alvin Goldman, in the first part of his 1970 *Theory of Human Action*. The multiple categorization of action is primarily a matter of tokens-of-a-type. The coalescence of types for one doing is not conceptually or logically necessary. It comes about only under complex circumstances. For example, if the light switch is defect, or no bulb in the lamp, or if the baby is not sleeping in the room, or is in the room, but awake, the coalescence of categorizations described will not come about. Goldman observes that there is a dependency relation between the multiple categorizations; lightening the room depends on turning on the light, which depends on flipping the switch, and all this depends on the circumstances. The relation between the tokens of act types realized in one doing is irreflexive, asymmetric, and transitive, and thus gives rise to a tree structure. Due to the asymmetry of the relation, the acts organize into levels. Goldman calls the upward relation, for example between flipping the switch and turning on the light, “level-generation”: under the given circumstances, a token of the type ‘flip the switch’ “level-generates” a token of the type ‘turn on the light’ which level-generates a token of the type ‘lighten the room’, etc.

Goldman considers the notion of level-generation an “intuitive notion”. Clearly the relation between the tokens-of-a-type in the examples given is immediately intuitive. We all know it very well: we know that under circumstances, tokens of one type of action constitute, or amount to, tokens of other types of action. We categorize what we or others do in multiple ways all the time; nothing anybody does, it appears, is adequately categorized if it is categorized in only one way. For example, if we think of somebody doing something intentionally, we categorize what they are doing as the action as such of some type, as well as in addition, as the pursuit of the intention to act that way, and very likely also as the attempt to achieve some goal or other by doing so. This already constitutes three levels of simultaneous action categorization – notwithstanding the very likely possibility that the action by the other may be in itself multi-level, such as lighting up the room, which in the given example involves at least three levels.

Goldman calls the tree-structures of act-types produced by level-generation “act-trees”. We introduce the more general term “cascade” for these structures because we do not want to restrict its application to acts and action. Following Goldman’s argumentation in his reply to contemporary critiques, we consider the notion of level-generation as a conceptual, or cognitive notion; we take Goldman’s theory of human action essentially as a theory of the categorization of human action. Goldman shows that we categorize human action more often than never simultaneously in multiple ways.
We want to put forward, in this talk, a radical conjecture: The formation of cascades is a fundamental, ubiquitous, conceptual mechanism that, under circumstances, links categorizations of the same into a complex, ordered conceptual structure. Very likely, cascade formation is not restricted to the categorization of action. It also carries over to our categorization of others and of objects.

In order to substantiate this assumption, the talk will present evidence from verb semantics that shows that cascaded concepts for action are written into the lexical semantics of thousands of verbs, are achieved by systematic means of word formation and grammatical constructions. Cascades project elementary doings not only to levels of how to practically achieve more abstract things like lightening the room by switching on the light, but also project to levels of social interaction (for example, communicating by producing speech sounds, buying by paying), and to emotional levels (like pleasing somebody by doing a favour). Examples will be presented that illustrate how categorization in terms of the roles of persons and objects is connected to action cascades.

Cascades, it appears, are a fundamental ubiquitous structure of conceptual representations in human cognition, a structure basically grounded in action. While theories of categorization focus on the one categorization of things, allowing, though, for different levels of generality, it appears that simultaneous categorization of one thing in multiple ways is fundamental and essential for the understanding of cognitive representation.

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**Attitude Reports with Attitudinal Objects**

**FRIEDERIKE MOLTMANN**
(Centre Nationale de la Recherche Scientifique)

This talk will elaborate the view that clausal complements of attitude verbs do not stand for propositions but rather act semantically as predicates of attitudinal objects, entities like claims, promises, assumptions, and hopes. The talk will show how the view applies to different types of attitude verbs and other sentence-embedding predicates and discuss what sort of syntactic structure best goes along with it.

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„The cognitive architecture of social understanding including a new solution of the paradox of false belief understanding“

**ALBERT NEWEN**
(Ruhr-Universität Bochum)

It will be argued that a central tool of early cognition are object files and situation files. They can be developed early as basic mental representations which furthermore unfold in ontogeny until we develop full-blown representations of desires, beliefs and other propositional attitudes. In this cognitive development, we are dealing with one central challenge, namely the paradox of false-belief understanding: if infants pass the implicit
false belief task (FBT) by nonverbal behavioural responses like looking or helping behaviour why do they nonetheless fail the explicit FBT till they are 4 years old? Starting with the divide between pragmatic and cognitive account of the development of false-belief understanding, I argue that we need to consider both, pragmatic and cognitive factors to account for the development of children’s Theory of Mind (ToM) ability. A second challenge is raised by discussing the helping behaviour versions of the FBT. I argue that the common two-stage accounts are inadequate: we need to presuppose three central stages in a rather continuous development. Using the recent mental files account, I will provide a new account of the development of ToM ability by describing the changes of the structure and organization of mental files including the systematic triggering role of types of situations. Thereby it is possible to unfold a pragmatic mental file (PMF) account as a new and adequate solution to the paradox of false-belief understanding. This is at the same time a key example of cognitive development which is usually shaped by the two factors, namely the reorganization of mental representations and modifications of the embedding of the cognitive system in the environment.

“By”: A vindication of the Anscombe thesis

KJELL JOHAN SÆBO
(University of Oslo)

Recent work in event semantics sheds new light on the by locution, and one analysis can be shown to imply a vindication of the Anscombe thesis, according to which the locution is about one event under two descriptions. The key element in this analysis is that the two descriptions do not correspond one-to-one to the two predicates on either side of by; rather, one corresponds to the merge of the two individual predicates. The central arguments against the thesis, while relevant and strong given the assumptions behind them, can now be seen to rely on a fallacious assumption.

The Anscombe thesis (aka the Anscombe-Davidson or the Davidson-Anscombe thesis) has it that if you signal by whistling, there is one event, act, or action which is both a signalling and a whistling. In Anscombe's words (1957: 46), there is one action with two descriptions; in Davidson's (1963: 686), you do one thing of which two descriptions are given. In the formulation of Wilson and Shpall (2012),

**The Davidson/Anscombe thesis**

(1) If a person F-s by G-ing, then her act of F-ing = her act of G-ing.

The large literature on the thesis reflects that it has had considerable appeal but also that there are rather strong reasons for rejecting it. I want to argue, however, that in the light of recent work in event semantics, it is possible to distinguish two versions of the thesis, the traditional version and a novel one, and that central counterarguments only apply to the former. I will also argue that the novel version of the thesis is preferable on independent grounds.

My aim is thus to vindicate the Anscombe(-Davidson) thesis, if not in the form of (1), which states an identity between an F act and a G act. Identity remains essential, but in the version I will be defending, it is to hold between an F-by-G-ing act and a G act, so that the counterpart to (1) would be (2):
(2) If a person Fs by G-ing, then her act of [F-by-G-ing]-ing = her act of G-ing.

The unifying notion is that one event satisfies two different descriptions. But while the two descriptions have traditionally been taken to be the predicate F in the matrix clause and the predicate G in the by clause, I will argue that the two relevant event descriptions in the sentence are the predicates F-by-G-ing and G. In fact, I will argue that F is not an event description at all, so that the traditional conception of the thesis rests on a fallacious assumption.

(3) is a fairly precise formulation of what I will be referring to as the A(nscombe-) D(avidson) thesis as it has traditionally been conceived:

(3) AD thesis classic version
A sentence $x \phi$-s by $\psi$-ing is true only if there is one event which satisfies both $\psi$ and $\phi$.

By minimal contrast, the alternative conception I propose is (4):

(4) AD thesis modern version
A sentence $x \phi$-s by $\psi$-ing is true only if there is one event which satisfies both $\psi$ and $\phi$ by $\psi$-ing.

While maintaining the intuition behind the original thesis, the move from (3) to (4) impregnates it against central counterarguments. Building on Danto (1965), Goldman (1970), Bennett (1994) and Sæbø (2016), I will first motivate the move from (3) to (4), providing evidence that $\phi$ is a higher-level act type in the sense of Löbner (2018), more specifically, that it is not an act description but an operator over act descriptions, and arguing that by $\psi$ is a device for saturating the argument slot of such operators. Then, I will show how this move enables us to steer clear of the key reasons for rejecting the AD thesis, countering, in turn, the argument from asymmetry (Goldman 1971), the argument from time (Davis 1970), the argument from agency, and an argument from sum events (Schnieder 2009).

This talk introduces a set of concrete hypotheses, backed up by computational implementations, on what linguistic structures are needed for language understanding and production. Concretely, I will introduce the basics of Fluid Construction Grammar (FCG) and demonstrate its basic operations in parsing and formulating utterances using the FCG web-interface (Steels, 2017). FCG captures fundamental notions of construction grammar, in the sense that meaning-form pairs (i.e. constructions) are the central units of grammatical representation. Constructions are represented as schemas. They are applied in language processing by matching and merging operators and heuristic search.

The talk also discusses the role of meta-level processing for repairing or extending grammars formulated in FCG and how FCG has been used in experiments on the emergence and evolution of grammar (Steels, 2017).

Section Talks

The role of context in disambiguating -er nominalizations

CURT ANDERSON & MARIOS ANDREOU
(Heinrich-Heine-Universität Düsseldorf)

Introduction In this paper we study the role of context in disambiguating the readings of deverbal -er nominalizations. It is well-known that -er nominalizations can have a number of readings (Rappaport Hovav & Levin, 1992; Lieber, 2004; Lieber & Andreou, 2018). The data below demonstrate the readings relevant for this paper. (1) exhibits an Agent nominalization, (2) shows an Instrument nominalization, and (3) shows a Patient nominalization. Patient nominalizations have been claimed to be absent or non-productive, and so (3) is of particular interest to us.

(1) That guide was a proper, very in depth, training guide on how to fry food, so rather than having a de-skilled work force, they have very well trained fryers to fry their food... (Google)

(2) For a machine as elaborate and well-thought-out as this fryer, the thermometer was a disappointment. (COCA)

(3) What a wonderful fresh chicken!! [...] I think he looks great and will be a delicious fryer. (Google)

Our goal is to examine how context guides interpretation of the nominalization. Using Frame Semantics (Petersen, 2007; Löbner, 2014; Kallmeyer & Osswald, 2014) to formalize contextual information and the lexical semantics of the lexical items involved, we show how context fixes reference along two dimensions: conceptual properties of the referent (e.g., whether it denotes food or an animal) and the semantic role of the referent (Agent, Instrument, and Patient). Before we turn to the role of context, we present the frames for fry and chicken, which are needed for our analysis.

Change of state verbs Change of state verbs such as fry allow for Agent, Patient, and Instrument -er nominalizations. Figure 1 gives the frame for fry, which has a bipartite structure comprised of a CAUSE and an EFFECT. Fry causes its Patient argument to have a cooked state at the end of the event.

Arguments come with certain requirements: Agents must be animate and volitional, while Patients must be non-volitional. Instruments must be non-animate. The direct object of fry can refer to either raw material (e.g., raw meat) or the product (cooked food).
We model nominalization as a shift of the referential node of the frame (Kawaletz & Plag, 2015). Thus, Agent, Instrument, and Patient nominalizations are treated as a shift of the referential node to the values of the AGENT, INSTRUMENT, or PATIENT attributes.

Food and the chicken frame  Chicken denotes a multilevel frame structure (see Figure 2), extending Anderson & Löbner (to appear). Animal frames include reference to concrete, physical objects representing the animal and its flesh; ANIMAL and MEAT attributes map between these levels. Food (for humans) is an abstract concept; what is considered food depends on conditions such as personal preferences and socio-cultural norms regarding what counts as edible in which circumstances. Therefore, food is a candidate for an object at the social level of the ontology. Social objects must be grounded by physical objects, and are generated via humans considering one object to count as another in certain circumstances (Anderson & Löbner, to appear; Searle, 1995). An attribute FOOD, generalized from Anderson & Löbner’s C-CONST, encodes these notions.

We turn next to showing how context interacts with these frames in producing the nominalizations.

-er and context  Context guides the nominalization towards a particular interpretation by contributing restrictions through the selectional properties of modifiers and predicates; the Agent, Patient, and Instrument readings in (1) arise naturally from these restrictions.
Abstracts

Agent  In (1), the adjective well-trained requires an animate entity. Thus, the referent of fryer must be fixed as either the Agent (animate), or a possible animate Patient. World knowledge (e.g., knowledge of the food and cooking frames) includes knowledge that humans are not typically fried. Context further specifies the interpretation of the -er nominal by reference to a (necessarily human) work force, thus ruling out a Patient interpretation and being consistent with an Agent interpretation.

Instrument  Fryer is interpreted as a machine in (2), based on the surrounding syntactic context. The type hierarchy specifies machines as being non-animate, and hence unsuitable as Agents. Additionally, the FOOD attribute is not compatible with machines, since no part of a machine is typically considered food. Therefore, only Instrument is compatible with the information supplied.

Patient  Context serves two functions in (3): It makes accessible the CHICKEN frame, which allows reference to both animal and food. Then, fresh and delicious guide the interpretation to the food level of the frame (given Figure 2). The Patient reading is most natural due to reference to food.

Additionally, even though it’s often claimed Patient readings with -er nominalizations are unproductive, we nevertheless find shifts to both Patients in both initial and result states, uncooked versus cooked meat. (3) shows reference to the result, while (4) shows reference to the uncooked initial state.

(4)  [...] Step 7 Birds are processed as whole fryers or roasters or are cut into pieces ... (Google)

Conclusion  We show how context interacts with the frames for fry and chicken in order to produce either an Agent, Instrument, or Patient nominalization, and reference to humans, machines, animals, or meat. Our analysis extends readily to other examples such as griller and roaster. These case studies give us insight into the compositional processes involved in determining the space of interpretations of -er nominals in context.

Automatic clustering and the lexical semantics of cooking adjectives

CURT ANDERSON, OLIVER HELLWIG, & WIEBKE PETERSEN
(Heinrich-Heine-Universität Düsseldorf)

Introduction In this paper we investigate the lexical semantics of nouns and adjectives related broadly to cooking and food preparation using automatically generated clusters of adjectives. By examining the adjective clusters that are the output of the clustering algorithm, we can discover fine-grained classes of adjectives based on their lexical semantics, and build semantic descriptions of these classes using Frame Semantics (Löbner, 2014; Petersen, 2007). Our work thus provides a case study in how computational linguistic methods can be profitably used to inform theoretical semantic research.

Method Adjective–noun pairs were obtained by parsing the 2013 English news dump from www.statmt.org (Bojar et al., 2014) and extracting the lemmas of all sequences of the form JJ–[NN|NE|NNS]. In this way, 1,048,653 A+N pairs with 8,392 adjective lexemes, 17,560 noun lexemes, and 430,256 unique combinations of A+N were obtained. Adjectives and nouns were clustered using the BidirClus method (Petersen & Hellwig, 2016). Output clusters were then manually examined and extracted for theoretical analysis.

Clusters of adjectives Clusters in our data are based on the concept underlying the adjective. Thus, we analyze our clusters based on their lexical semantics. Our discussion here focuses on two major groupings: adjectives highlighting the result state of cooking, and adjectives related to the result state of non-cooking food preparation.

Cooking result states A major cluster in our data includes adjectives that specify the result state of a cooking process (Table 1), with many of these adjectives being deverbal. We find two main classes of cooking verbs, the SIMMER class and the FRY/BROIL/BAKE class. The SIMMER class involves applying heat to food while the food is in a liquid. The FRY/BROIL/BAKE adjectives also involve applying heat to the food item. Moreover, many also specify an instrument that is used in the course of the cooking (i.e., pan-fried and a pan).

Additional support for this being about the result state comes from crispy. Although crispy looks to be an outlier, due to it not being deverbal, we argue that it is evidence for a class based on conceptual properties, due to crispy naming the result state of the cooking process.

<table>
<thead>
<tr>
<th>Type</th>
<th>Adjectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMMER</td>
<td>stewed, curried</td>
</tr>
<tr>
<td>FRY/BROIL/BAKE</td>
<td>undercooked, pan-fried</td>
</tr>
<tr>
<td>subtype:</td>
<td>grilled, baked, fried, roasted, deep-fried, crispy</td>
</tr>
</tbody>
</table>

Table 1 Result state of cooking clusters
The subspecifications regarding methods of cooking here are also partial support for Lehrer’s (1969) distinction between cooking verbs related to simmering and others related to frying, broiling, and baking; simming verbs are distinguished from other classes in that they entail the use of a non-oil, non-fat liquid that the food is cooked in.

*Food preparation* We find adjective clusters related to non-cooking methods of food preparation, the PREPARE and CONTAINER food preparation adjective clusters (Table 2). These clusters are based on methods used to prepare/preserve food, but not cook it. The PREPARE class entails a change of state in the food item, while the NON-INTEGRAL subclass specifies that this change of state affected the physical integrity of the food item. The CONTAINER class also specifies a method of preparation, but differs from the PREPARE class in not entailing a change of state, but rather, entailing that the food is stored in a container. All adjectives in these classes are deverbal.

<table>
<thead>
<tr>
<th>Type</th>
<th>Adjectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREPARE</td>
<td>pickled</td>
</tr>
<tr>
<td>subtype: NON-INTEGRAL</td>
<td>sliced, diced</td>
</tr>
<tr>
<td>CONTAINER</td>
<td>tinned, canned</td>
</tr>
</tbody>
</table>

*Table 2 Food preparation clusters*

A frame semantics for semantic cuisine We formalize the differences between these classes of adjectives using frames, recursive attribute–value structures (Löbner, 2014; Petersen, 2007).

Most adjectives we examine are deverbal in nature and inherit their verb’s frame. We therefore adopt the basic form for change of state verbs in Kallmeyer & Osswald 2014, where CoS verbs have a bipartite frame structure inspired by event decomposition approaches to verb meaning (Rappaport Hovav & Levin, 1998). Cooking and food preparation verbs are thus elaborations on the verbal CoS frame given in Figure 1. The corresponding adjectives are modeled as variants of the CoS frame in Figure 1, and the adjective–noun combination as a unification of the adjectival and nominal frames. Below we sketch several examples.

*Crispy chicken* and *pan-fried aubergine* can be assigned partial representations as in Figures 2 and 3. In these representations, the adjective has specified aspects of the basic CoS frame; *crispy* specifies that the result state is crispy, while *pan-fried* specifies that the result state is fried, plus that the frying was done in a pan (the INSTRMT attribute). The result state of *crispy* in *crispy chicken* is held by the skin of the chicken, an inference from world knowledge.

*Stew* differs from other cooking verbs in requiring the presence of a liquid for the patient to be cooked in (the IN attribute), demonstrated in Figure 4. *Canned* differs from
cooking verbs in that the causation event is not cook (or one of its subtypes), but put. Verbs like canned minimally entail that the result state is one where the food item is in a can (see Figure 5).

**Figure 4 Frame for "crispy chicken"

**Figure 5 Frame for "pan-fried aubergine"

**Figure 6 Frame for "stewed goat"

**Figure 7 Frame for "canned peaches"

### Conclusion

This works shows how frames for one particular (broad) semantic field—food and cooking—can be profitably investigated via clustering methods. By using these automatically discovered clusters, conceptual differences between different classes of adjectives can be teased apart, and these clusters can in turn inform theoretical inquiry.


Frames in discourse

KATA BALOGH
(Heinrich-Heine-Universität Düsseldorf)

The way of distributing information is one of the core aspects in the interaction of sentence structure and interpretation: the information structure of the sentence. The goal of this talk is to present a model of discourse processes and related concepts of information structure. The proposed model builds upon the basic assumptions of a frame-based representation of semantic and conceptual knowledge based on Kallmeyer & Osswald (2013), Petersen (2015) and Löbner (2017).

Information structure concerns the way communicating agents organize information within a discourse. In verbal communication, context and grammatical form determine the informational content of an utterance together. Natural languages provide various formal means to signal what the essential contribution of an utterance is to the shared knowledge of the interlocutors, generally referred to as the Common Ground [CG] (Stalnaker, 2002; Krifka & Musan, 2012). The CG is a constantly changing abstract object, updated by each step in the discourse. In a broad sense, information structure is defined in terms of information packaging (Chafe, 1976) and its basic categories: the ways how information is transferred between the interlocutors. Under this broad understanding, general cognitive categories are defined that reflect the interface between the mental representations (information states) as conceptualization of the CG and the universe of the discourse. Such cognitive categories are givenness and aboutness that are often considered as primitives.

Modeling concepts of information structure constitutes a modeling of communication acts and discourse processes where referential structure and information update are of central importance. This calls for a cognitively plausible framework. Frame semantics builds upon the hypothesis that the human cognitive system works with a uniform format of representation that is argued to be a frame format (Löbner 2015; following Barsalou, 1992, Barsalou & Hale, 1993).

In my talk, I will introduce a first proposal of a discourse-model using frame-semantic representations. Content words evoke concepts (represented as frame structures), while function words lead to special operations on or structuring of these concepts. The proposed model is built upon the formal definition of frames as base-labelled typed feature structures following Kallmeyer & Osswald (2013). The discourse universe is built upon a sequence of utterances, where each utterance is represented in terms of discourse objects, formally defined as an ordered set of discourse referents and a frame (Fig.1), where the discourse referents are all linked to base-labelled nodes in the corresponding frame. This linking is represented by cross-labelling. The determiners (articles) in the noun phrases play a crucial role in marking whether a discourse referent is newly introduced
or it is an old (or anaphoric) one. The basic definite-indefinite distinction\(^1\) can be captured by representing the discourse objects as ordered triples where the first set contains the newly introduced referents and the second set contains the anaphoric/old referents.

\[
\begin{array}{c}
\text{\textquote{a girl}} \\
\langle \{x\}, \emptyset, \text{GENDER} \to \text{female} \rangle
\end{array}
\quad
\begin{array}{c}
\text{\textquote{the girl}} \\
\langle \emptyset, \{x\}, \text{GENDER} \to \text{female} \rangle
\end{array}
\]

**Figure 1.** Discourse objects.

This representation shares important basic insights with the corresponding DRT representation of the sentence, however, as I will argue, a frame-based characterization of the conditions of the referents has various advantages (for example, for bridging anaphora and situational anaphora).

The sentence-level representation \(\langle \mathcal{N}, \mathcal{A}, F_s \rangle\) registers the newly introduced referents \(\mathcal{N}\), the anaphoric referents \(\mathcal{A}\) and the content of the sentence as a frame \(F_s\). The immediate discourse context is formally defined as a pair of discourse referents already introduced and a frame representation of the information given at that point of the discourse: \(\langle R, F_c \rangle\). Updating the context with an utterance is defined in terms of union on the sets of referents and unification of frame structures: \(\langle R, F_c \rangle \cup \langle \mathcal{N}, \mathcal{A}, F_s \rangle = \langle R \cup \mathcal{N}, F_c \sqcup F_s \rangle\).

Anaphora resolution is captured by the constraint stating that for all referents \(r \in \mathcal{A}\) the corresponding base-labelled node \(n\) in the frame \(F_s\) in the sentence-frame must be unified with a base labelled node \(m\) in the context-frame \(F_c\) \((F_c \sqcup F_s)\) under \(n = m\).

\[s_1: \text{A girl slapped a man.} \quad s_2: \text{She smiled.}\]

\[c_1 = c_0[s_1] = \langle \emptyset, F_c \rangle \cup \langle \{d^e, d^x, d^p\}, \emptyset, F_s1 \rangle = \langle \{d^e, d^x, d^p\}, \rangle\]

\[c_2 = c_1[s_2] = \langle \{d^e, d^x, d^p\}, \rangle \cup \langle \{d^e',\}, \{d^c\}, \rangle\]

\[c_2 = \langle \{d^e, d^x, d^p, d^e'\}, \rangle\]

**Figure 2.** Example context update and anaphora resolution.

\(^1\) For the current proposal, we keep the simple distinction of definite and indefinite NPs as corresponding to old and new referents respectively, however, a more fine-grained representation of different levels of givenness is required and is under investigation (to model, e.g., the rich article system in Lakota).
Aboutness topic is represented both at the sentence-level and in the immediate discourse context as a distinguished element in the set of referents. In my talk, I will discuss in detail the modeling of the effects of topic selection to anaphora resolution and other discourse processes. In modeling the CG, a core distinction is made between the immediate common ground [ICG] and the general common ground [GCG] (Krifka & Musan, 2012). The ICG or local discourse context is represented in a way that the central component is the result of the update by the each sentence, and the other component registers the sentence level contribution of the utterances and their coherence relations. These relations play an important role in interpretation. The two phenomena where these relations are particularly influential are anaphora resolution and disambiguating focus structure. The architecture of the model of the ICG includes a level of representation of coherence relations. The GCG is defined as a set of constraints that reflect world knowledge and certain conventional meanings.


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**Continuing topic and topic shift in Hungarian and Lakhota**

**KATA BALOGH & ROBERT D. VAN VALIN, JR.**

(Heinrich-Heine-Universität Düsseldorf)

In this talk, we introduce a model to capture two strategies of reference tracking: *continuing topic* and *topic shift* in the discourse-configurational language (É. Kiss, 1995), Hungarian and the non-configurational language, Lakhota (Ullrich, 2016). For modeling the
discourse-semantics of the given phenomena, we propose a dynamic (update) model based on frame-semantic representations (Kallemeyer & Osswald, 2013, Petersen, 2015, Löbner, 2017). The syntactic representations are built upon the framework of Role and Reference Grammar (Van Valin, 2005).

We propose a frame-based model of the cognitive process of discourse interpretation, where next to the information updates reference tracking is of central importance. Certain morphosyntactic choices depend on whether the given NP expresses a continuing topic or a topic shift. In pro-drop languages, it often determines the choice between a zero morpheme and a noun phrase or demonstrative pronoun. Consider the following Hungarian examples based on the ‘Frog Story’ (Mayer, 1967).

(1) A kisfiú kergette a béka-t,  
the boy chased the frog-ACC

‘[The boy]TOP chased the frog,’

a. aztán el-ugrott egy faágra.  
then PRT-jumped a branch

‘and then he jumped away to a branch.’

b. #aztán a kisfiú el-ugrott egy faágra.  
then the boy PRT-jumped a branch

‘and then the boy jumped away to a branch.’

c. aztán a béka/az el-ugrott egy faágra.  
then the frog/that one PRT-jumped a branch

‘and then the frog/that one jumped away to a branch.’

In (1), the sentence topic is the referent of the boy. The continuations illustrate different morpho-syntactic choices. In (1a), the subject NP is dropped, coded as zero, expressing the continuation of the sentence topic. In this case, a full NP is out (1b). In (1c), the sentence topic is shifted to the referent of the frog and this is signaled by either the demonstrative az ‘that’ or the NP a béka ‘the frog’ in topic position.

Similar examples can be found in Lakhota, a head-marking language. In Lakhota, pro-drop is used extensively, and the inflected verb alone can form a complete sentence. Lakhota has two definite articles: kiŋ ‘the’, which can be used to refer to referents in the immediate discourse context (physical environment, old referents, associative anaphora), while k’uŋ can only be used in a noun phrase referring to an explicitly mentioned discourse antecedent.

(2) a. Wičháša waŋ1 wa-náse-Ø1-I naŋ

‘A man1 went hunting, and he1 was cutting up [his game], and here a woman a

él hi-ná<Ø2>žiŋ k’eyaš átayaš a<Ø2>yúta-šni (...)  
there arrive-stand<3SGA> but entirely look.at<3SGU>-NEG

‘A man1 went hunting, and he1 was cutting up [his game], and here a

woman2 arrived and stood there, but he1 didn’t look at her2 at all (…)’

b. (...) naŋ waŋná Ø1-khi-gniŋ-kta

and now 3sgA-arrive-go.back-POT
The two protagonists in the story (‘The Stingy Hunter’) are introduced as indefinite NPs; the man (the hunter) is zero coded from the second clause on and is the continuing topic until the second clause in (2b) in which the woman is coded by $N k’uŋ$, signaling that she is the new sentence topic. When the hunter returns to being the sentence topic seven clauses later, he is referred to by $N k’uŋ$.

In our talk, we introduce the details of our frame-based model providing the sentence-level representation and a model of the immediate discourse context. The frames used in our representations are defined as base-labelled typed feature structures following the approach of Kallmeyer & Osswald (2013).

The sentence-level representation (see example (3)) registers both the newly introduced ($N$) and the anaphoric discourse referents ($A$), and the content of the sentence, represented by a frame ($F_s$). The discourse referents are anchors for reference in the given discourse. All discourse referents are linked to base-labelled nodes in the corresponding frame, the link represented by cross-labelling. In the example below, for example, the discourse referent $d^x$ is linked to the node labelled $x$ in the frame.

(3) The boy chased the dog.

$$\langle N, A, F_s \rangle = \langle \{d^x\}, \{d^x, d^y\}, (e, chase, \text{AGENT} = \text{child}(x), \text{PATIENT} = \text{frog}(y), \text{GENDER} = \text{male}) \rangle$$

The local context is formally modeled as a pair $\langle R, F_c \rangle$ of the set of discourse referents $R$ and a frame representation $F_c$ of the information given at that point of the discourse. Updating the context with an utterance, $\langle R, F_c \rangle[\langle N, A, F_s \rangle]$, adds the newly introduced referents to the discourse ($R \cup N$) and the context-frame is extended by the sentence-frame via frame unification ($F_c \sqcup_{f\in F_s} \sqcup_{f\in \delta F_s} F_s$). Anaphoric referents are constrained as their corresponding base-labelled nodes in the sentence-frame must be unified with a base-labelled node in the context-frame, hereby expressing anaphora resolution.

Topic selection is represented both at the sentence-level and in the immediate discourse context as a distinguished element in the set $N$ or $A$ and in $R$. The process of continuing topic can be captured similarly to anaphora resolution together with a constraint that it must be resolved as the previous topic. The process of topic switch explicitly states a change of the topic selection during the update process. In our talk, we will introduce the details of the processes sketched above together with the syntax-semantic
interface of the morpho-syntactic strategies. We will discuss language specific issues, examples from Hungarian and Lakhota, as well as generalizations on the phenomena of continuing topic and topic switch.


Concepts as event types

ARVID BÅVE
(Stockholm University)

I here explore Wayne Davis’s (2003) proposal that concepts and (Fregean) propositions are event types. I argue that this simple (if unobvious) proposal lends itself to an attractively simple yet powerful overall theory of concepts, which, together with plausible auxiliary assumptions, immediately answers several fundamental questions about concepts.

I take concepts to be constituents of thoughts (propositions), and I take all concepts to be either syntactically simple or complex, the latter being composed ultimately of simple concepts. Each concept belongs to some syntactic category (predicative, propositional, individual, propositional-operator, and so on) and I take propositions, the objects of the attitudes, to be simply concepts of the propositional category. For simplicity, I will assume here that the syntactic categories are those of first-order logic.

The theory I want to advance holds that:

(1) Concepts are mental event types
(2) To undergo such a mental event is to entertain the relevant concept
(3) Complex concepts are act-types of conjoining, in a certain sense, the concepts immediately involved in the concept in question.
(4) A concept is individuated by its entertaining (i.e., undergoing) conditions, to the effect that it plays a certain inferential (conceptual, functional) role

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I will argue that (1)-(4) constitute a very simple theory with considerable scope. Its simplicity is partly due to the fact that (2)-(4) can be motivated on the basis of claim (1) plus independently plausible assumptions.

Claim (2) answers the question, “If concepts are event types, what kind of event types are they?” An obvious way of answering this question goes by saying what it is to undergo the relevant event type. I propose, then, that to undergo a concept is to entertain it. While it is not customary to speak of entertaining concepts, I intend this to be understood in analogy with entertaining propositions. I argue that other event types related to propositions (asserting, judging, assuming, etc.) would be arbitrary as candidates for being identified with undergoing concepts. Entertaining is non-arbitrary because it is the most general event type, in the sense that any other event type related to a proposition entails entertaining it.

This does not entail, however, that it is possible to entertain a (non-propositional) concept in isolation; perhaps one can do so only in the course of entertaining proposition. It is perhaps also not possible to merely entertain a proposition, i.e., to entertain it without performing some other mental act upon it (e.g., judging, assuming, etc.). Perhaps it is even the case that assuming, asserting, judging, etc., are merely ways of entertaining propositions. This would explain why they all entail entertaining.

This theory is an instance of the now-popular “act-type theory of propositions” of Scott Soames (2015). Hanks’ (2015) theory is similar, but identifies the propositions with judgings, rather than entertainings. Both of those theories are Russelian, however, whereas mine is Fregean, i.e., it takes propositions to be built up of concepts rather than objects, properties, and relations.

On a Fregean conception, it is reasonable to assume that propositions are the same general kind of entity as the concepts that constitute them. Thus, if propositions are event types of entertaining in the sense explained, concepts are, too.

Claim (3) should be thought of as following directly from the claim that concepts are event types plus the obvious claim that complex concepts are “built out of” and constituted by less complex concepts, ultimately simple ones. If complex concepts are event types, as per (1), complex concepts must be event types thus involving simpler event types. My claim that a complex event type is an event (or act) type of conjoining its constituent simpler concepts (in a certain order) should be seen as a stipulation. We could say that conjoining is just that multigrade relation R such that the event type of entering R with the concepts x, y, z, … in that order = the complex concept whose immediate constituents are x, y, z, … (occurring in that order). With the further assumptions that all concepts are syntactically like those of first-order logic and that the first relatum of conjoining is always an incomplete concept, followed by concepts saturating it, we immediately get a handy way of referring to complex concepts. Let E[x, y₁, …, yₙ] be the act type of entering relation x to entities y₁, …, yₙ (in that order). Letting “C” abbreviate “conjoining”, and using small caps refer to simple concepts, we now have identities like,

the proposition that John loves Mary and Socrates is wise =
= E[C, and, E[C, love, John, Mary], E[C, wise, Socrates]],

etc.

Claim (4) follows from (1) and (2) together with the plausible assumption that event types can be individuated by the conditions of undergoing them (just as, e.g., properties
can be individuated by the conditions of instantiating them). While this idea is compatible with a truth-theoretic individuation of concepts, it lends itself especially well to Conceptual Role Semantics (CRS). Claim (3) is of course similar to Peacocke’s view that concepts can be individuated by their possession conditions, but (3) has an advantage in that it is so obvious, given (1) and (2), how to answer the question, “Why can concepts be individuated by their entertaining conditions? An analogous move on behalf of Peacocke’s theory, as we will see, has considerable problems. The CRS concept individuations made available via claim (3) can take the following form:

\[ x \text{ entertains (undergoes) } C \text{ iff } x \text{ undergoes some event type } e, \text{ such that } e \text{ plays role } R \text{ in } x, \]

where “\( e \) plays role \( R \) in \( x \)” stands proxy for a complex open sentence, which can be varied in many ways, corresponding to the many different CRS proposals. To illustrate, an individuation of and might be roughly of the form,

\[ x \text{ entertains (undergoes) and iff } x \text{ undergoes some event type } e, \text{ such that, for all } p, q, \text{ whenever } x \text{ believes } E[e,p,q] \text{ and } \ldots, x \text{ will believe } p \ldots \]

where the variables “\( p \)” and “\( q \)” can unproblematically be bound by first-order quantifiers ranging over propositions. Complex concepts are individuated by their undergoing conditions, which are simply to the effect that one conjoin the constituent concepts in the right order.

This view lends itself to more plausible versions of such theories proposed in the psychological literature about perceptual similarity spaces (Gärdenfors), prototypes, and bodies of knowledge (Prinz). These theories identify concepts with these various entities. What is right about them, in my view, is that some concepts can only be individuated by appeal to one of these entities. For instance, the concept \( \text{cat} \) can only be individuated by reference to the perceptual similarity space related to cats.

But the connection between concepts and these entities cannot be identity. For concepts are very easily accessed, whereas the other entities are not. Also, the identity theses fail to acknowledge the obvious role that belief plays in connecting concepts with these other entities. To wit, the obvious way in which concepts are connected to similarity spaces is, roughly, that perceptions with parts belonging to one of the relevant similarity spaces tend to produce a relevant belief (e.g., the belief that there is a cat in front of one, if one has a perception involving the similarity space of cats).

The event type theory offers a more plausible way of individuating concepts in terms of similarity spaces, prototypes, or bodies of knowledge:

\[ x \text{ undergoes/entertains } \text{cat} \text{ iff: } x \text{ undergoes some event type } e \text{ such that } x \text{ is disposed, for every mental demonstrative } d, \text{ to believe } E[C,e,d] \text{ when undergoing a perception in which } d \text{ is “in” } \text{CAT}. \]

\[ x \text{ undergoes/entertains } \text{electron} \text{ iff: } x \text{ undergoes some event type } e \text{ such that } x \text{ believes (most of) the propositions, } E[C,\ldots,e,\ldots], E[C,\ldots, e, \ldots], \ldots \]

(Here, one of these propositions might be the proposition that every electron has negative charge, and so on.)
These individuations of concepts also provide a reply to Machery’s complaint that concepts, on these theories, end up as too disparate to be a useful posit. For on the above account, all concepts are event types of entertaining, individuated by their entertaining conditions, which are, in turn, to the effect that the event type plays a certain cognitive roles. Their disparity concerns merely the difference of these roles.


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**From ad hoc concepts to ad hoc applications**

**TAMARA DOBLER**

(University of Amsterdam)

There are many examples of language use where to understand what someone has said by using a given sentence – and when what was thus said would be true, – one needs to look beyond what is encoded in the sentence itself (what is known simply by knowing what the sentence means). In many cases, knowing a (broader) context in which the sentence is uttered is necessary to get to what the speaker intended to say or imply (i.e. to infer the so called explicature or implicature). Still, the context-dependence of (the intended) content on context can be cashed out in various ways.

According to relevance theoretic lexical pragmatics (Sperber and Wilson 1986, Sperber and Wilson 1998, Wilson and Sperber 2002, Wilson and Carston 2007, Carston 2002), the concept expressed by the use of a word in a context often diverges from the concept that is lexically encoded and represents the word’s standing meaning. On a radical version of this view (Carston 2012, Casasanto and Lupyan 2015) lexically encoded concepts are altogether eliminated; in as much as truth-conditions are supposed to be constituted solely by (the contents of) these ad hoc constructed concepts, “why insist that words encode concepts?” (Carston 2012: 617). Instead it is proposed that a word (qua type) is associated with a ‘grab bag’ of encyclopaedic information stored in the long term memory out of which a contextually constrained, ad hoc concept is constructed online each time the word is tokened. An ad hoc concept is, just like a lexical concept, understood to be an atomic metal particular with an externalist semantics (Carston 2010: 165). One radical consequence of this view is that standing lexical semantics is no longer deemed ‘conceptual’ (and a fortiori compositional) in as much as ad hoc concepts fulfil the role of constituting explicatures. Hence, their presence in the semantic theory opens a door to meaning eliminativism.
In this paper I question the motivation for introducing ad hoc concepts as a way to account for the contextually variable truth-conditions of sentences. Instead I propose an alternative account which explains intuitively shifting truth-conditions by the selective attention mechanism rather than by postulating ad hoc concepts. Like relevance theoretic pragmatics, I maintain that only partial information from a long term memory that is associated with a concept is activated on an occasion of utterance and that this is the main reason for the effect of variable truth-conditions. However, this effect can be explained more conservatively without postulating ad hoc concepts. We can assume, for instance, that healthy rational agents selectively attend (see also Smith 2010) only to a portion of a concept’s extension, motivated by achieving practical goals.

My argument for practical goals requiring selective attention relies on evidence from Travis cases. As these cases illustrate, not every situation that makes the sentence true is conducive to a certain practical goal. For instance, the leaves being non-naturally green is not conducive to the goal of doing a botanical experiment with such leaves (see Travis (2008): 100). Since on different occasions different goals may be pursued, situations with higher goal-conducive potential are preferred to those with lower (which are thus passed by). And with goals shifting so does our selective focus on goal-conducive situations, creating an appearance of shifting truth-conditions. However, although our attention shifts, truth-conditions, on this view, remain invariant. The proposal therefore preserves classical conceptual (externalist) semantics: a word lexically encodes a concept whose extension remains invariant. Moreover, the apparent cross-contextual shift of a concept expressed by a word is explained as a consequence of our practically motivated selective focus on a goal-conducive part of the encoded concept’s extension.

A further support for the proposed view comes from the analysis of communication disorders. I show that my proposal is compatible with weak central coherence theories (Frith 1989, see also Happé 1993) that explain pragmatic language impairments (e.g. autism and social communication disorder) as inability to screen out contextually inappropriate interpretations (cf. Happé 1994: 100). On my proposal, pragmatically impaired individuals don’t entertain different concepts compared to pragmatically competent individuals but instead are free from contextual constraints, and exhibit behaviour that is not goal or purpose driven. In other words, on the current proposal, they are not considered semantically or conceptually incompetent (as they would be if ad hoc concepts were constituents of their explicatures) but are rather unable to ignore those truth-makers with sub-optimal goal-conduciveness potential.

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**What’s happening? Biases in the visual perception of event scenes and their descriptions**

**YULIA ESAULOVA, SARAH DOLSCHEID & MARTINA PENKE**

(University of Cologne)

Language provides its users with a number of possibilities when it comes to producing an utterance. The choices language users make are often driven by the environment they interact with and follow particular patterns. The present study examined visual and conceptual aspects of depicted event scenes as potential sources for systematic variations in scene descriptions.

There is some evidence that when speakers’ visual attention is directed to the patient and not the agent, they are more likely to produce passive voice sentences (e.g., Gleitmann, January, Nappa & Trueswell, 2007). At the same time, there seems to be a preference for spatial representations of events, such that agents are typically positioned to the left of patients (e.g., Chatterjee, Southwood & Basilico, 1999). This study investigated whether and how these two visual properties may interact affecting language production. In addition, a number of voice and word order variations have been explained by prominence effects of animacy, where animate entities are perceived as more prominent than inanimate ones and thus are more likely to be assigned subject/agent roles (e.g., Lamers & de Swart, 2012). Whether these prominence effects may be modulated by visual information was another question addressed in this study.

Native speakers of German (N = 44, mean age = 23.43 years, SD = 3.01) were tested in a picture description task while seated in front of a computer screen with an eye-tracker. The pictures depicted scenes where an animate agent performed an action on either an animate or an inanimate patient. Patients were situated to the right or to the left of agents (Figure 1) and half of them were preceded by a short visual cue (see Figure 2). Depicted referents were controlled in syllable length and were comparable in size, visual complexity and distance within which they were situated from each other across items. The portrayed transitive interactions involved no direct contact and the corresponding verbs had balanced profiles in terms of their likelihood to occur in active and passive voice frames. Participants were instructed to describe each picture using one sentence.
The results show that scenes with left- rather than right-positioned patients lead to longer speech onset times ($F(1, 43) = 6.46, p = .015$) and a higher number of passive sentences ($F(1, 43) = 5.48, p = .024$). In addition, passive utterances occurred more often for scenes with animate rather than inanimate patients ($F(1, 43) = 8.41, p = .006$).Animate patients and patients occurring to the left of agents were more likely to be fixated prior to speech onset compared to inanimate patients ($F(1, 43) = 64.56, p < .001$) and those positioned to the right of agents ($F(1, 43) = 54.63, p < .001$). Cueing of patients did not have an effect on either speech onset times or the number of passives, however, the analyses of eye-tracking patterns revealed more initial saccades to patients after they were cued than when they were not ($t(43) = 4.83, p < .001$).

Our findings demonstrate that visual and conceptual properties of event scenes influence different aspects of language behavior. Both the initiation of utterances and the voice selection were mostly affected by the positioning of patients in event scenes, thus revealing participants’ bias to expect agents to the left of patients in visual scenes. Possible processes underlying left-agent preferences may involve an alignment between the linear representation of thematic roles and the serial planning of speech, thus relating to agent-first preferences (e.g., Jackendoff, 2002). Moreover, voice selection was sensitive to the animacy of thematic roles, so that more passive utterances were produced for scenes where both arguments were animate. Participants therefore displayed a bias to perceive animate roles as better fitting subject functions than inanimate ones. This is in line with prominence theories suggesting that animate entities are more likely to be realigned as subjects in sentence-initial positions than inanimate ones. The discussion of findings integrates cognitive and linguistic models relating differences in linguistic output to attention and prominence effects.


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**Composing the meaning of light verb constructions**

**– a frame account**

JENS FLEISCHHAUER & THOMAS GAMERSCHLAG
(Heinrich Heine University Düsseldorf)

Complex predicates formed of a semantically “light” verbal head and a noun or verb which contributes the major part of the meaning are frequently referred to as ‘light verb constructions’ (LVCs). Sequences of this type have been attested for various and typologically unrelated languages such as Japanese, Persian, Italian, English, Dutch and
Hindi/Urdu. Based on the definition above, the so-called German ‘support-verb construction’ (‘Funktionsverbgefüge’; von Polenz 1963, Winhart 2005 among others) can also be characterized as a light verb construction. In this construction, illustrated in (1), a variety of frequent verbs functions as light verbs which are combined with NPs/PPs carrying the major part of the meaning.

(1) die Erlaubnis geben ‘give permission’, zur Verzweiflung bringen ‘drive to despair’, Beachtung finden ‘be taken notice of’, eine Bemerkung machen ‘make a remark’, aus dem Umlauf ziehen ‘withdraw from circulation’

Although the meaning of an LVC is often conventionalized and idiomatic, a large number of light verb constructions is semantically compositional (Nunberg et al. 1994). One piece of evidence supporting such a compositional view is that LVCs form “families” (Nunberg et al. 1994, Sag et al. 2002). Thus, in instances of LVCs formed with a specific verb regular interpretational patterns can be identified as illustrated below for LVCs with the posture verb stehen ‘stand’:

(2) unter Beobachtung stehen ‘to be under surveillance’, vor dem Ruin stehen ‘to face ruin’, in Blüte stehen ‘to be in blossom’, außer Zweifel stehen ‘to be beyond doubt’

In line with the heavy use of stehen, LVCs formed with this verb express stative predications (‘being in a certain state’). Moreover, parallel to heavy stehen the LV selects a PP with a spatial preposition specifying a particular relation between the meaning of the PP-internal noun and the subject. For instance, unter N stehen ‘under N stand’ means ‘being undergoer of a process denoted by N’ so that unter Beobachtung stehen can be paraphrased by the passive ‘being observed.’ By contrast, vor N stehen ‘in front of the N stand’ has the interpretation that someone is almost in the state denoted by N. In the third example, in indicates that the state expressed by the noun holds of the subject referent whereas in the fourth example außer is used to express that the state predication does not hold of the subject referent.

The different uses of posture verbs are well-described from a cognitive as well as a formal/representational point of view (Gibbs et. al 1994, Kaufmann 1995, Lemmens 2005, Gamerschlag et al. 2013 among others). In the talk, we will present a case study of LVCs with the posture verb stehen ‘stand’ which builds on the insights of these works. Starting from the frame analysis of the literal uses of posture verbs proposed by Gamerschlag et al. (2013), we will show how the meaning components of the literal uses are systematically exploited in the different interpretational patterns – meaning families – of stehen-LVCs. In particular, we will discuss the effect of the choice of the preposition and how it interacts with the meaning of the LV and the noun.

Since the variant of frame semantics adopted in our analysis allows for a uniform representation of nouns, verbs and prepositions (Barsalou 1992, Petersen 2007), we can make explicit reference to all the relevant meaning components of LVCs in a single format.

References


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**Acting intentionally in Frames**

**EKATERINA GABROVSKA & WILHELM GEUDER**

(SFB 991, Heinrich Heine University of Düsseldorf)

**Introduction.** The analyses of agent-related adverbial classes (e.g. mental-attitude) frequently mention the necessity of intentional agents, but rarely discuss what it means for an agent to be acting intentionally (cf. Wyner 1998, a.o.). We propose a frame analysis which adopts a new attribute specifying an action-plan. Our notion of an action-plan is inspired by Goldman’ (1970) theory of human action. In this way we capture the impact of modifiers, like German absichtlich (‘intentionally’), on the event’s intentional component.

**Action-plans.** Goldman (1970) assumes ‘action-plans’ to be at the base of an analysis of intentional action. His starting point is the observation that agents can actually do several things in one when acting: for example, giving a signal by waving one’s hand (Goldman 1970: 50). The act-token of giving a signal is generated by the act-token of waving one’s hand. These act-tokens are connected in terms of a ‘by’ or ‘in’ relation, which is an asymmetric, irreflexive, and transitive relation, called ‘level-generation’. The lower-level actions are the methods of realizing the higher-level ones. The relation captures that an act under circumstances generates another act by the same agent. Goldman considers action-plans as the same kind of construct: hypothetical acts of an agent connected by level-generation. If an act of an agent is intentional, then it is realized as conceived in her action-plan, where the latter consists of the agent’s action-want and a set of beliefs concerning the methods of realization of that want (Goldman 1970: 57-59).

Consider the example: John turns on the light by flipping the switch (cf. Goldman 1970: 23). If John is to turn on the light intentionally, then he has to want to turn it on.
This action-want of John, i.e. the want to do a certain act, is seen as the triggering component of his action-plan (see Goldman 1970: 49ff). John can further have different options for turning the light on (use the switch, use a remote control, etc.), but as he decides to use the switch, he has to believe that this is a method likely to realize his want in view of the given circumstances. If John succeeds in realizing the action as conceived in his action-plan, then the action is intentional. We think that such correspondences between action-plans and real actions are at the core of the meaning contribution of most agent-related modifiers.

**Action-plans in Frames.** We formalize Goldman’s action-plans in frames, where a frame is a recursive attribute value structure (Petersen 2007, Löbner 2017), using the notion of ‘cascades’ proposed by Löbner (ms.) as a more general term for Goldman’s ‘act-trees’. Cascades are applied for the analysis of the lexical meanings of action verbs; according to Löbner, the meanings of most action verbs require a cascade representation.

Following Löbner (ms.) cascades are second-order frame structures. The single level act-types are represented by first-order frames; in the cascade, they are related by the "genuine frame-to-frame relation" of "c-constitution", i.e. constitution under the given circumstances. If an act of type 1 level-generates an act of type 2, this results in the c-constitution relation between the frames for the two act-types.

We propose to analyze action-plans as cascades of hypothetical acts of an agent. Whenever an agent is acting intentionally, she has an action-want causing the real action as part of an action-plan which matches her acts. This match is modeled by a second-order frame comparator (cf. Löbner 2017), which applies to the hypothetical and the actual acts of the agent.

**Modifiers signaling intentionality.** We propose that the modifier absichtlich states that the action of the agent matches an element in her action-plan. This assumption is in accordance with Buscher’s (2016) treatment of the modifier as fixing the interpretation of predicates which could be interpreted as either intentional or unintentional to an intentional one, e.g. *das Licht anlassen* (‘leave the light on’).

(1) Ich habe das Licht absichtlich angemacht, damit die Katzen keine Angst haben.
   I intentionally turned the light on, so that the cats do not get afraid.

The connector *dámít* supplies the content of the agent’s intention in (1), i.e. the target of her action-want (I want to prevent that my cats get afraid). The want is achieved by leaving the light on, which can be an intentional or an unintentional action. The modifier *absichtlich* fixes the interpretation of *das Licht anlassen* and states that the agent acted with respect to her action-plan which consists of her want - to prevent that the cats get scared, and her beliefs that leaving the light on will prevent it.
A generalized model in frames which captures our example in (1) is illustrated in figure 1 below:

![Diagram of action model](image)

**Figure 1: Modelling *absichtlich***

Considering again the *turns on the light* example from Goldman the action-plan as well as the realization of the action are going to contain the (hypothetical) acts *flips the switch*, for example, as Act₁. These acts then generate the *turns on the light* acts, Act₂. Act₃ in our model represents the target of the action-want of the agent – *achieving that the cats are not afraid*.

The PLAN attribute in the frame together with the comparators connecting the respective action-plan and execution levels captures that due to *absichtlich* the event is interpreted as intentional.

The model can also capture the function of other modifiers demanding the participation of an intentional agent. An example is the adverbial *sorgfältig* (‘carefully’) which poses restrictions on the content of the agent’s want and the suitability of the available methods. The modifier relates this intention to the method suitable for the realization. The agent chooses which method is suitable for the realization of his intention with respect to his abilities as well as the circumstances and conventions/standards holding at the moment of realization, captured by the c-constitution relation.

**Outlook.** We assume that the proposed analysis can be used to capture the meaning contribution not only of *absichtlich* but also of other mental-attitude adverbials (e.g. *unabsichtlich* (‘unintentionally’) indicates a mismatch between the action-plan and the performance), as well as of other adverbial classes as suggested in Schäfer (2013). A good candidate is the class of agent-oriented manner adverbials, like *sorgfältig* (‘carefully’).

**References**


The inside and outside of event concepts: “Mental” adverbs and “agentive” adverbs

WILHELM GEUDER
(SFB 991, Heinrich Heine University of Düsseldorf)

So-called “agent-oriented sentential adverbs” (Maienborn & Schäfer 2011), for short “agentive” adverbs, constitute a long-standing unresolved problem in adverbial semantics, both with respect to their semantic analysis and the reasons for their regular alternation with manner uses:

(1) a. (manner) He played stupidly.
    b. (agentive) He stupidly played the ace [first.] (It was stupid of him to …)

Two types of analysis have been influential in the literature:

• Morzycki (2016: 216ff.) takes both variants as predicates of events which are also sensitive to “comparison classes”. This idea wrongly reduces the alternation to mere contextual variants, and ignores crucial differences in that the agentive variant has scope and is focus-sensitive, whereas the manner modifier is entirely scopeless.
• Piñón (2010) takes the agentive variant as a predicate of events just as the manner variant, but modifying a “higher verb”. His semantics for [ rudely VP] is:

(2) λx λe. ∃e’ (rude(e’) & decide(e’, x, [^VP(e, x)]) & cause(e’, e) & VP(e, x)

This analysis does capture the entailment of (1b) that the modified action results from a decision of the agent. The problem is that it aligns agentive adverbs with manner, and implicitly also with mental-attitude adverbs like intentionally (cf. Landman’s 2000 e-predication analysis). However, the latter are VP-adverbs and can occur in a stressed VP-final position just like manner adverbs. The contrast is shown in (3) with erroneously (mental adverb) and stupidly (agentive):
You erroneously attached an [old version] of the file.
That file was attached erroneously.
?? You were erroneous to attach that file.

You stupidly attached an [old version] of the file.
?? That file was attached stupidly.
You were stupid to attach that file.

The question arises as to which lexical semantic factor underlies the difference, and how we can be sure that erroneously could not be an agentive adverb. The present paper sets out to explain the differences between these adverb classes in terms of a frame model, i.e. a decomposition of word meaning as a network of functional attributes and their values (Petersen 2007, Lübner 2017). Such a framework is able to overcome the vagueness of standard neo-Davidsonian event predication seen in existing proposals.

It is immediately clear that manner adverbs will correspond to operations on an event’s attributes in such a frame representation. Mental-attitude adverbs, it will be argued, are anchored to a designated substructure in action frames, namely a bundle of AGENCY attributes, to be set apart from manner. Here, the talk will elaborate on the model already described in the talk by Gabrovska & Geuder. Mental-attitude adverbs, then, are characterised as a class by operations that compare the event description provided by the verb to the values of agency attributes, in particular action plans, awareness of the action, and decision alternatives. Crucially, this does not alter any values of attributes in the execution of the event, which would be the defining characteristic of manner modification.

Agentive adverbs bear many similarities to mental-attitude modifiers, especially the reference to decisions and the ability to take scope over the event description as a whole. What separates them and places them outside of the group of neo-Davidsonian modifiers, however, is that they evaluate an action with respect to information that is external to the attributes of an event frame. Note that (4a) does not trigger any entailments as to whether the agent was effectively pursuing their plan, or diverging from their plan; in contrast to (3a) it is completely neutral in this regard. Hence, stupidly evaluates (the occurrence of) P as leading to unwanted consequences in the context, and simultaneously explains P, and the agent’s choice to do P, from a disposition of the agent (Geuder 2002: 149ff. argues that all agentive adverbs have two components of this kind). Neither the causal efficacy of P nor any individual-level properties of the agent (stupidness) are themselves event attributes. The proposed analysis says that the evaluative meaning of stupidly can be framed as higher-order predication, i.e. information in the event frame is an argument of stupidly; in contrast, the event description seen with mental-attitude adverbs corresponds to an argument of other frame attributes (i.e., agency-related attributes).

In this way, it can also be explained why agentive adverbs have manner variants (produced by a lexical alternation): they are not frame-internal modifiers but place restrictions on the frame they combine with; mental adverbs do not alternate with manner uses because they already contribute to the event frame and are defined by meanings that are neutral to the manner component.

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Interaction, Appraisal, and Non-Verbal Social Signal Meaning

JONATHAN GINZBURG¹, CHIARA MAZZOCCONI¹ & YE TIAN²

¹Université Paris-Diderot (Paris 7), ²Amazon Research

Although laughter has been of interest to philosophers for millenia and in recent times studied extensively by psychologists, neuroscientists, and phoneticians, it has been assumed to lack propositional content (Glenn & Holt, 2013). Ginzburg et al. (2015) provide extensive evidence to the contrary, on the basis of its stand alone uses as a response or follow up to questions and assertions, and its intra-utterance use to effect scare quoting. Two basic meanings are postulated for laughter, one involving the person laughing expressing her enjoyment of the laughable l, the other expressing her perception of l as being incongruent, analyzed in terms of a clash between a general inference rule (a topos) and a localized inference (an enthymeme) (Breitholtz and Cooper, 2011). Ginzburg et al. show how these meanings in combination with pragmatic reasoning, enable to deduce various functions such as seriousness cancellation (of an assertion or query), scare quotation, and acknowledgment.

In this paper we (i) generalize Ginzburg et al.’s argument to other non-verbal social signals (NVSS) such as smiling, frowning, and sighing on the basis of data exemplified here by (1) and (2); (ii) point to an intrinsic problem for Ginzburg et al.’s proposal concerning laughter; (iii) sketch an interactive dynamic appraisal theory, which enables us to fix the problems concerning (ii), and to offer a unified account of NVSS meaning.

We mention here two pieces of data that apply to both laughter and other NVSSs. The first is that the NVSSs trigger implicatures, in an entirely analogous way to verbal utterances:

(1a) Smile reaction to joke |= joke not very funny. (quantity)
(1b) Child: And my sister’s hamster died. Uncle: (laughs/smiles) Child (to her- self): This guy cares about nothing. (relevance)

The second concerns irony or simulation: irony/simulation can affect laughter, smiling, or crying (but not frowning, see below); in all cases, there is a composition of a basic meaning of the NVSS with a meaning roughly paraphrasable as ‘I don’t really mean this’. This is exemplified in (2a,b):

(2a) A: And we were only give two macaroons each. B: (Mock cries).
(2b) MR. WHITE: You talked to Nice Guy Eddie? Why the fuck didn't you say that in the first place? MR. BLONDE: You didn't ask. MR. WHITE: Hardy-fuckin-har. (From the film: Reservoir Dogs)

Ginzburg et al.’s account of laughter relies on an incongruity/enjoyment dichotomy. Anon (2018) carried out an extensive corpus study of more than 1000 tokens of laughter in the BNC and DUEL corpora, found no laughs that correspond to (pure) enjoyment; roughly, 70% of laughs relate to humor-based incongruity, 20% to social incongruity, and 5% to non-incongruous functions relating to social cohesion. More crucially, the account offers no means of capturing the fact that most incongruity–based laughter expresses the laugher’s enjoyment of the laughable.

We show how to integrate Scherer’s component process model (CPM) of appraisal (Scherer, 2009) with the dialogical framework KoS (Ginzburg, 2012)—like all current models of appraisal CPM is not integrated with language understanding which would enable NVSS to interact with verbal input. Within CPM an agent evaluates events she perceives and their consequences by means of a number of criteria or stimulus evaluation checks (SECs) (e.g., Is the event intrinsically pleasant or unpleasant, independently of my current motivational state? Who was responsible and what was the reason? Do I have sufficient power to exert control if possible?).

We incorporate appraisal by postulating that dialogue gameboards, the public part of information states in KoS, keep track of an additional repository mood—a weighted sum of appraisals. In this way mood represents the publicly accessible emotional aspect of an agent that arises by publicly visible actions (such as NVSS), which can but need not diverge from the private emotional state. The resulting type of DGBs is given in figure 1. We treat each appraisal, following Scherer, as an n-field type, each field corresponding to a stimulus evaluation check and update Mood componentially:
All NVSS content involves a triggering event $l$; different NVSSs involve distinct predicates, distinct updates and ranges of arousal; we exemplify here several simplified instances involving in/decrementation of pleasantness or the triggering of a question, when this is unresolved:

(i) laugh:
precondition: $1 : \text{event}$
effect: $\text{Precons.DGB.pleasant} = \text{Precons.DGB.pleasant} + \theta$

(ii) smile:
precondition: $1 : \text{event}$
effect: $\text{Precons.DGB.pleasant} = \text{Precons.DGB.pleasant} + \theta$

(iii) sigh:
precondition: $1 : \text{event}$
effect: $\text{Precons.DGB.pleasant} = \text{Precons.DGB.pleasant} - \theta$

(iv) frown:
precondition: $1 : \text{event}$
effect: $\text{MaxQUD} = \text{MaxQUD} + \theta$

We use the unified meaning/appraisal theory sketched in figure 2 to explicate: (i) the laughter/smile scalar implicature (1a) above; (ii) the force of ironic laughter; the lack of ironic frowning: since frowning leads to an interrogative update it cannot be negated, (iii) All NVSS trigger clarification requests (CRs)— seeking a value for $l$; in the BNC
laughter CRs outnumber smile CRs by one order of magnitude; laughter CRs can also involve resolution of the enthymeme triggering incongruity.


Intensions and Extensions – two sides of the conceptual coin, or different forms of conceptual memory?

JAMES A. HAMPTON & SAPPHIRA THORNE
(Psychology Department, City, University of London, UK)

A fundamental assumption of a computational account of concepts is the notion that the mind represents kinds of entity through some set of features. This idea underlies scientific classification schemes going back to Linnaeus and Aristotle, and while the ideal of a strict hierarchical taxonomy has often been found to be too constraining in many fields, it remains the case that we tend to think of categories of things in terms of the features or properties that they (more or less) have in common.

Within this theoretical account, there is an ordering of models in terms of their degree of logical structure. At one end would be “classically” defined terms based on logical rules, as found in domains such as the Law and the Mathematical Sciences. In the middle range would be schema-based models which include causal and other kinds of explanatory connection between properties, but where probabilistic categorization depends on a measure of degree of fit between the schemas representing the instance and the concept. The result is a similarity-based conceptual model where similarity will involve both relational and attribute matching (Markman & Gentner, 1993).

At the simplest level, there are concepts which simply require a degree of similarity based on attribute matching. An example is a study of artifact concepts (Hampton, Storms, Simmons, & Heussen, 2009) in which the conceptual features of an artefact (e.g. a museum) were divided into three sets – the appearance, the current use, and the originally intended use. Where an object lacked one or more features of a museum in the study, it would instead have the features of a contrast category, in this case a church. The results clearly showed that categorization was probabilistic, and that the likelihood of being classed as a museum was predictable by the sum of the three different matching features, with greater weight being attached to current use than the other two sets.
More recently, research has investigated the relation between features/properties and category membership at the level of individuals. Hampton and Passanisi (2016) demonstrated that in both a category typicality task (rating or ranking members for their typicality) and a feature importance task (rating or ranking properties for how important they are as a part of the concept’s meaning), one can find reliable individual differences. The curious finding of this paper was that the pairwise similarity of individuals on the typicality task was not correlated with their pairwise similarity on the importance task. Collapsed across several experiments, the effect size of the correlation was near to zero. This result raises important questions about how strong the connection is between the properties that a person endorses as part of their understanding of a category term, and the items that they consider to be typical of that category.

A further study (Djalal, Hampton, Storms, & Heyman, 2017) was able to show with a different methodology that a connection could be established between individual variation on the two tasks. Their approach had participants generate attributes to define a conceptual category, and then categorize a set of pictures as being in the category or not. With these two rather different tasks (the earlier study had rankings of property importance and rankings of typicality), it was possible to show that the properties that an individual themselves generated could be used to predict their own categorization behaviour better than that of other individuals. Conversely, properties that they did not themselves generate predicted the categorization behaviour of others better than their own categorization.

A new dataset, kindly provided by Daniel Levitis, offers a further way to test this question. Levitis, Lidicker, and Freund (2009) quizzed a large set of behavioural biologists about (a) which of 13 attributes defined behaviour and (b) which of 20 items they would categorize as behaviour. They concluded that people’s declarative knowledge about what constitutes the concept was often poorly related to their classification decisions, even for a concept that was so clearly a part of their professional world.

The dataset provides an opportunity to once more look at how individual variation in property judgments relates to individual variation in categorization. Our analysis shows that using the same methodology as Hampton and Passanisi, in this dataset there is after all a correlation between individual variation in intensions and extensions, as would be expected by schema or prototype models.

From this result it would appear that the difference between generating one’s own properties (Djalal et al.) and choosing from a list of properties (Levitis et al.) may not be crucial to the results. However intuitions of typicality (Hampton & Passanisi) may be tapping into a different store of conceptual memory, leading to the failure to correlate individual variation in their study.

Rethinking the Slur/Neutral Counterpart Relationship: 
Towards a Prototype Semantics of Slurs

JENNIFER HEAD
(University of Southern California)

People who use slurs often say things like this:

1. Obama is black, but he isn’t a n*****.
2. My boss is Jewish, but he isn’t a k***.
3. I’m gay, but I’m not a f*****.

They also often say things like this:

4. I don’t tip n*****s. [said to an Arab taxi driver]
5. They should tax the k***s on Wall Street [said about investment bankers]
6. The president won’t let f******s in the military. [said about an executive ban on transgender military personnel]

Indeed, some reflection (or a few minutes on Twitter) reveals that utterances of sentences like (1)-(6) are unfortunately commonplace, making up much of everyday slur use.

In this paper, I motivate and defend a view on which commonplace utterances like (1)-(6) feature semantically basic uses of slurs. Specifically, I offer a prototype semantics on which slurs, like other category expressions, lexically encode prototype structures, theoretically represented as sets of more or less stereotypical features, satisfaction of which admits of degree. On this view, two uses of a slur have the same semantic content when and because they encode the same ranked set of stereotypical features. Sentences (1), (2), and (3), then, feature uses of slurs with the same semantic contents as the uses of slurs in (4), (5), (6), respectively.

Most theorists are committed to the view that the uses of slurs in (1)-(6) must be nonbasic, or somehow semantically derived. This is because they analyze slurs in terms of their putative “neutral counterparts.” Putative neutral counterparts (hereafter, PNCs) are nonpejorative (social) group expressions that bear an intuitively close semantic relationship to paradigmatic slurs. For example, the intuitive neutral counterparts of ‘n*****’, ‘k***’, and ‘f*****’ are ‘black’, ‘Jewish’, and ‘gay’, respectively.

Most theorists, then, hold that the semantic contents of PNCs provide a reliable proxy for, or otherwise help fix, the semantic contents of the corresponding slurs. Call this the proxy assumption. A strong version of the proxy assumption is what Adam Croom (2015) calls

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1 This paper is about slurs, and unfortunately mentions many of them. Slurs are, by their nature, very offensive expressions. To reduce potential for harm, I have censored all of the slurs mentioned in this abstract with asterisks (*). Examples (1) and (4) are borrowed from Jeshion (2013a: 314-5).
2 Other prototype views of slurs have been given by Croom (2011, 2015) and Neufeld (manuscript).
3 Of course, speakers could use a neutral counterpart in an offensive way, as with a contemptuous intonation. Likewise, speakers could use a slur in an inoffensive way if the term has been appropriated within their community. For the purposes of this paper, I’ll set these kinds of uses aside.
coreferentialism\textsuperscript{4}, according to which slurs and their PNCs are coextensional and truth-conditionally equivalent. If slurs and PNCs are coreferential, then when slurs are predicted of a subset of the individuals picked out by their PNCs, as in (1)-(3), or to individuals who are not picked out by their PNCs, as in (4)-(6), the most plausible thing to say is that those slurs are being used in a polysemous or otherwise semantically derived way\textsuperscript{5}.

The proxy assumption and especially coreferentialism have obvious intuitive appeal. In particular, they offer elegant accounts of the intuitive relationship between paradigmatic slurs and their PNCs, which theorists have in turn used to explain a wide variety of phenomena\textsuperscript{6}. But coreferentialism also faces serious challenges. In particular, I argue that it has trouble accounting for intuitively slur-like expressions which behave just like paradigmatic slurs in the context of certain kinds of denials. The prototype semantics I propose better explains this behavior.

On my proposal, slurs lexically encode sets of similar but differentially ranked stereotypical features. That is, I propose that the semantic relationship between slurs and PNCs concerns, first, which prototypical features are encoded in the set and, second, how those features are ranked within the set. But even if, as I argue, most slurs and PNCs are not strictly coreferential, it does not follow that there is not significant overlap in their extensions. Indeed, the more similar the ranked sets of features encoded in a slur and its PNC are, the more overlap we should expect in their extensions. This explains why some slurs, especially paradigmatic ones, seem very closely related to their PNCs; some seem less closely related to their PNCs; and some, like ‘nerd’ and ‘chav’ do not seem to have any PNC at all. Consequently, the view affirms an important, if nonstandard, semantic relationship between slurs and their PNCs.

This relationship seems to generalize to other category expressions, including, for example, the movie genre terms ‘romantic comedy’ and ‘chick flick’. Many movies that are called ‘romantic comedies’ are also called ‘chick flicks’. However, some reflection on usage again suggests that the two expressions do not mean the same thing. For example, consider the 2016 remake of the film Ghostbusters, which featured an all-female cast. Though many people said things like (7) upon the movie’s release, it is doubtful that anyone said (8):

(7) The new Ghostbusters is a chick flick
(8) The new Ghostbusters is a romantic comedy.

This is easily explained if, as I propose, ‘chick flick’ and ‘romantic comedy’ encode similar but distinct sets of ranked features. While many of the features plausibly encoded in ‘romantic comedy’ are also plausibly encoded in ‘chick flick’, the features that are intuitively most important to membership in ‘chick flick’—e.g., being a film made (exclusively) for women and (so) not made for men—are not as important to membership

\textsuperscript{4} DiFranco (2015) calls this Neutral Counterpart Theory.
\textsuperscript{5} See Jeshion (2013a: 314-5) and Jeshion (2013b: 238-239, 251-253, n. 19).
\textsuperscript{6} e.g., how slurs differ from other pejorative expressions (Hom 2008; Camp 2013; Hornsby 2001); how they contribute to the compositional meanings of sentences (Williamson 2009; Whiting 2013; Jeshion 2013b; Bach 2014), and how they offend in the distinctive ways that they do (Anderson and Lepore 2013a, 2013b; Camp 2013; Bolinger 2015). Some theorists (notably, Hom (2008) and Richard (2008)) maintain that slurs have neutral counterparts that help fix their meaning, but deny that slurs have any non-empty extension. These theorists accept the proxy assumption but reject coreferentialism.
in ‘romantic comedy’. Indeed, the relative importance of these features seems critical for understanding why so many people thought (7) was true. For people who said things like (7) presumably did so because they judged that, despite its action plot, its all-female cast marked it as a film made for women—and that this was enough for it to count as a chick flick.

Though the view I offer preserves the intuitive relationship between slurs and PNCs, it also vindicates the intuition, suggested by sentences (1)-(8), that slurs and their PNCs often mean different things. Such explanatory resources, I conclude, make the view a plausible and powerful alternative to traditionally coreferentialist theories of slurs, as well as give us reason for optimism about the prospects of prototype semantics generally.


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**Framing weak definites: Stereotypical situations and morphological form**

**KLAUS VON HEUSINGER & FREDERIKE WEEBER**

(Universität zu Köln)

We discuss the referential properties and discourse behavior of weak definite noun phrases in German, such as zum Arzt gehen ‘go to the doctor’. We argue that the weak referential reading of weak definites is the result of an interplay of two independently contributing factors: (i) weak definites occur in a weak, i.e. stereotypical, context that
is even more conventionalized than a lexical frame, and (ii) weak definites are morphologically marked with the weak, i.e. morphological reduced, definite article. Our claim is supported by experimental evidence from a sentence continuation study.

Weak definites are definite noun phrases (NPs) that differ in their referential properties from regular definites: They do not imply global uniqueness of their referent, always take narrow scope, and allow for sloppy readings. For example, if we were to continue *and Ann, too* in (1a), we would assume that there were two different doctors. Also, unlike regular definites and indefinites, weak definites express enriched meanings and have a limited ability to establish discourse referents (Aguilar Guevara & Zwarts, 2010; Carlson et al., 2006). The contexts that trigger the weak reading of a weak definite, which we will refer to as weak contexts, (i) typically express a frame with a stereotypical situation, and (ii) must additionally have a conventionalized sense extension (Carlson et al., 2006) or telic role in a functional frame (Zwartz, 2014). If these two conditions are not met, the weak reading is disfavored. Thus, if we were to continue *and Ann, too* in (1b), we would assume that there was only one doctor.

(1) a. Peter went to the doctor.
   b. Peter complained to the doctor.

German has two types of definite articles, a strong and a weak form, and only the weak form always merges with various preceding prepositions (Nübling, 2005; Schwarz, 2009). For the strong form, merging is optional. It has been claimed that the strong form expresses anaphoric and situational readings, while the weak form expresses lexical or encyclopedically unique readings. Importantly, when a speaker uses the strong definite or indefinite article, the weak definite reading disappears (cf. (2)).

(2) a. Peter ging zum Arzt. Peter went to the weak doctor.
   b. Peter ging zu dem Arzt. Peter went to the strong doctor.
   c. Peter ging zu einem Arzt. Peter went to a doctor.

We conducted a production study and asked how stereotypical situations and weak morphological marking can affect the anaphoric potential of a NP. We took discourse anaphora as a measure of referent accessibility and the anaphoric potential of a NP as an index of referential strength.

We asked 90 participants to complete stories like the ones in (3) and (4) with one sentence in a natural way. Story fragments consisted of a context sentence and a sentence introducing exactly two human referents. While the subject of the second sentence was always a proper name, the critical NP always appeared inside a PP, which made the weak definite article visible. We manipulated two factors: (i) morphological form, which means that the referent in the PP was either introduced by the regular definite article, the reduced definite article, or an indefinite article, and (ii) context type where we tested stereotypical and conventionalized contexts, cf. (3), and non-stereotypical, i.e. regular contexts, cf. (4).

(3) **Weak context**
   The anxiety disorder was getting worse and worse.
   a. Frank went to the weak psychologist
   b. Frank went to the strong psychologist.
c. Frank went to a psychologist.  
When a picture fell off the wall, ____________

(4) **Regular context**

The anxiety disorder was getting worse and worse.

a. Frank complained to the *weak* psychologist
b. Frank complained to the *strong* psychologist.

Table 1 displays how often participants picked up the PP-referent anaphorically. Overall, participants mentioned the referent introduced within the PP less often in weak than in regular contexts, in particular when the referent was introduced with a weak definite article. Our regression analyses with re-mentions as dependent measure revealed a main effect of context \( p = .007 \) with more re-mentions overall in strong than in weak contexts and a reliable difference between weak definites and strong definites on the one hand \( p = .007 \) and weak definites and regular indefinites on the other \( p = .013 \), across contexts.

While we did not find an interaction of context type and morphological form in this study, preliminary results from a follow-up study suggest that these two factors might in fact interact. Regardless, the follow up-study also supports the view that stereotypicality of context strongly affects the degree to which a referent is mentioned again in discourse. We leave the exact nature of the effect of morphological form for further discussion.

<table>
<thead>
<tr>
<th>DP type</th>
<th>Context</th>
<th>regular</th>
<th>weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>full definite article</td>
<td>22% (109/498)</td>
<td>14% (71/492)</td>
<td></td>
</tr>
<tr>
<td>reduced definite article</td>
<td>16% (84/510)</td>
<td>11% (65/575)</td>
<td></td>
</tr>
<tr>
<td>indefinite article</td>
<td>20% (102/519)</td>
<td>16% (77/480)</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>19% (295/1527)</td>
<td>14% (213/1547)</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Number of mentions for PP-referent distributed over conditions

Overall, our data support the view that the referential properties of weak definites are driven by two factors: (i) the (non-)stereotypicality of the context they appear in and (ii) their specific morphological marking. Our results suggest that these two factors contribute to referential strength, which is mirrored in the anaphoric potential of weak definite noun phrases.

We present a novel task, of automatically assessing conceptual text complexity. Although text complexity measures that are based on syntax and vocabulary have been widely researched, there is a gap in understanding how the properties of concepts and the real world relations between them affect the perceived text’s complexity. We propose a series of features based on structured external knowledge bases, that are independent of syntax and choice of words, and we show that they are capable of capturing conceptual complexity of texts.

Introduction

Text understanding requires linguistic knowledge and a suitable cognitive base that allows the reader to mentally construct the intended meaning. Texts that target people with various intellectual disabilities, children, as well as language learners, must be controlled for their complexity. Most of the work in this area focuses on syntactic and lexical complexity (Shardlow, 2014). Syntactically complex texts usually contain long sentences with difficult syntactic structures. Lexically complex texts tend to use many infrequent terms that are unknown to particular classes of readers. A similarly important but much less studied type of textual complexity is the conceptual complexity. Texts that are conceptually complex might refer to difficult concepts that require specialised knowledge, or they simultaneously develop several weakly related ideas. Conceptual complexity is especially relevant to low-knowledge readers (Denton et. al, 2015, Arfe et. al, 2017).

Automated assessment of conceptual complexity requires a computer accessible representation of world knowledge. To this end, we use DBpedia (Auer et. al., 2007). Built on top of Wikipedia, DBpedia contains a concept entry for each Wikipedia article. These concepts are connected by relations from the Infobox sections of Wikipedia. DBpedia was previously used with success for a series of language understanding tasks such as computing semantic relatedness/similarity (Hulpuş et. al., 2015), word sense disambiguation (Usbeck et. al. 2014, Hulpuş et. al 2015) and document similarity (Schuhmacher and Ponzetto, 2014). We show that DBpedia can provide significant insights into conceptual text complexity.

Measures

Given a text document, our measures thoroughly defined and exemplified in (Štajner and Hulpuş, 2018), require that the document be linked to DBpedia. This step is achievable with any entity linking system. Having a concept annotated text, we examine three types of measures:

1. Knowledge Graphs-based Measures
2. Conceptual Relations-based Measures
3. Conceptual Relations with Semantic Links-based Measures

These measures are designed to capture the conceptual complexity of texts, and we show that they are capable of capturing the complexity of texts in a meaningful way.
1. **Single Concept Measures** score individual concepts. We measure the node degree, PageRank (Brin and Page, 1998) and clustering coefficient. Concepts have a high degree in DBpedia when they have many direct relations to other concepts in DBpedia. PageRank is a recursive measure of node importance in information networks. The assumption is that concepts that score high on these measures are likely to be known, and hence they negatively correlate with text complexity. As for clustering coefficient, it assesses if neighbours of a graph node are related among themselves. Intuitively, concepts that are more general (and hence simpler) tend to have lower clustering coefficient than more specific concepts.

2. **Pairwise Concept Measures** score pairs of concepts based on their semantic relatedness. The relatedness between two concepts is computed based on their connections in the knowledge graph. We use two measures: length of the shortest path and the exclusivity-based relatedness (Hulpuş et al., 2015). The idea is that when concepts mentioned in the same sentence/paragraph are closely related, there is less missing information that the reader must infer from her prior knowledge. For one document, we compute the average of the pairwise concept measures over sentences and paragraphs.

3. **Global Concept Measures** score how strongly interconnected multiple concepts are. To compute these measures for a text segment, we take all the concepts occurring in it, and extract the subgraph of DBpedia formed by all the paths between them. The global concept measures are properties of this extracted graph, such as the number of connected components, graph density, and average local clustering coefficient. The idea behind this analysis is that when the knowledge graph that interconnects all concepts in the sentence/paragraph is strongly/densely connected, it means that the text addresses very few or strongly related topics simultaneously, soliciting reduced reader inference and prior knowledge.

**Experiments and Results**

We now present the main experiments we conducted in order to prove the suitability of our proposed measure for computing conceptual complexity of texts.

**Setup**

Task. The task that we test our measures on is that of automatically identifying the simpler of two versions of the same text.

Data. We use the freely available English portion of Newsela Language Learners’ corpus (Newsela, 2016). The corpus contains five different versions of the same article, each on a different complexity level. We run our experiments on 200 original articles resulting in 1000 articles in total. As our task requires pairs of texts to be binary classified (class simpler if the first text version is simpler than the second one), for each article we obtain ten pairs of versions on different complexity levels.

**Results**

Table 1. shows the classifiers we used to test our approach, as well as their F-measure performance. The results are very promising, achieving over 0.8 F-measure on several classifiers when all features are used. The pairwise measures appear to be the most useful, closely followed by the global measures, indicating that the way concepts are related
is more relevant to determining conceptual complexity than the properties of the individual concepts.

<table>
<thead>
<tr>
<th>Classifier</th>
<th>All</th>
<th>Single</th>
<th>Pairwise</th>
<th>Global</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.75</td>
<td>.72</td>
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<td>Logistic</td>
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<td>.77</td>
<td>.60</td>
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<td>SVM</td>
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<td>.52</td>
<td>.77</td>
<td>.77</td>
<td>.60</td>
</tr>
<tr>
<td>JRip</td>
<td>.77</td>
<td>.57</td>
<td>.76</td>
<td>.72</td>
<td>.58</td>
</tr>
<tr>
<td>C4.5 decision tree</td>
<td>.77</td>
<td>.51</td>
<td>.75</td>
<td>.73</td>
<td>.57</td>
</tr>
<tr>
<td>RandomForest</td>
<td>.85</td>
<td>.70</td>
<td>.81</td>
<td>.79</td>
<td>.64</td>
</tr>
</tbody>
</table>

**Table 1. Classification results (weighted F-measure)**

**Conclusion**

We proposed a series of measures that can be used for assessing conceptual complexity of documents. We show that the way concepts that are referred in text relate to each other in external knowledge graphs such as DBpedia can discriminate between two versions of the same text, pointing out which one is conceptually simpler.


Rat ultrasonic vocalizations as social reinforcers – implications for a multilevel model of the cognitive representation of action and rats’ social world

TOBIAS KALENSCHER¹, LISA-MARIA SCHÖNFELD¹, SEBASTIAN LÖBNER¹, MARKUS WÖHR², MIREILLE VAN BERKEL¹, MAURICE-PHILIPP ZECH¹, MARIJN VAN WINGERDEN¹

(¹ Heinrich Heine University Düsseldorf, ² Philipps-University of Marburg)

Rats are social animals that live in groups and tend to display actions that benefit conspecifics. In a previous experiment, we have shown that rats exhibit mutual-reward preferences, meaning that they prefer choices that yield a reward to themselves and to a conspecific, over choices that yield a reward to themselves only, but not to the conspecific. Such mutual-reward preferences might be caused by reinforcing properties of ultrasonic vocalizations (USVs) that are emitted by the conspecific. In rats USVs are socio-affective signals with important communicative functions that can provide information about the current situation and/or state of the calling rat to other rats in its vicinity. Roughly, USVs of adult rats can be subdivided into two classes: 50-kHz USVs that are emitted during appetitive situations and 22-kHz USVs that are emitted during stressful and aversive situations. To test the effect of USVs on choice behavior, we trained rats to enter one of two compartments in a T-maze setting (Fig. 1).

Figure 1: T-maze setting to test the influence of USVs of the choice behavior in rats. Rats are placed in a start box and can choose freely to enter either a left or a right compartment. In both compartments, rats receive a food reward, paired with a different type of USV. Please note that in the current experiment only one rat was tested in the respective maze.

Entering either compartment yielded identical food rewards as well as playback of either 50-kHz USVs, which are expected to be appetitive and therefore potential positive reinforcers, or 22-kHz USVs predicted to be aversive and therefore potential negative reinforcers. In three experimental conditions, rats could choose between compartments yielding 50-kHz USVs versus a non-ultrasonic control stimulus (condition 1), 22-kHz USVs versus a non-ultrasonic control stimulus (condition 2) or 50-kHz versus 22-kHz USVs (condition 3). Results show that rats exhibit a transient preference for the 50-kHz
USV playback over non-ultrasonic control stimuli, as well as an initial avoidance of 22-kHz USV relative to non-ultrasonic control stimuli (Fig. 2).

Each testing day consisted of 16 trials, during which rats could choose between the USV-associated compartment and the control compartment. The above-mentioned preference for the USV-associated side was most pronounced during the early block of trials (trials 1-5), compared to the later blocks of trials (trials 6-10 and trials 11-16), in line with previous findings (Fig. 3). Our results support the hypothesis that USVs have (transient) motivating and potentially reinforcing properties that can influence the choice behavior of rats.

These results might have implications for understanding the structure of social cognition and learning in animals and potentially humans. The reaction of rats towards USVs can reflect a previously learned association of a certain type of USV with either a positive or a negative event. This type of learning can be explained by the cascade approach, which assumes that the cognitive representations of stimuli and actions are multilevel. The basic physical level of rat USVs is merely acoustic but USVs also possess emotional, motivational, and social significance to the rats. Behavior exhibited in the present experiment might consist of such multilevel representations of stimuli, which then, as a whole, guide action.
Toward a Semantic Classification of Norwegian Pseudocoordinations

FELIX KNUTH
(Heinrich-Heine-Universität Düsseldorf)

Norwegian pseudocoordinations are a grammatical construction in which two verbs form complex sentences which superficially resemble usual coordination of the kind \( V \text{ and } V \). However, these sentences exhibit several syntactic properties that set them apart from real coordination. For reasons of space, only two such properties shall be listed here:

1. In a pseudocoordination, the two verbs cannot be swapped (unlike regular coordination):

   (1) a. Barn-a sitt-er og skriv-er.
       child-DEF.PL sit-PRS and write-PRS
       'The children are sitting and writing.'

   b. *Barn-a skriv-er og sitt-er.
       child-DEF.PL write-PRS and sit-PRS
       '(intended:) The children are writing and sitting.'

2. Pseudocoordinations allow for objects of the second verb of the construction to occur in the clause-initial position of Norwegian main clause (shown in (a)), whereas this is impossible when it comes to real coordinations (b):

   (2) a. Bok-a sitt-er gutt-en og les-er.
       book-DEF sit-PRS boy-DEF and read-PRS.
       'The boy is sitting and reading the book.'

   b. *Bok-a skriv-er gutt-en og les-er.
       book-DEF write-PRS boy-DEF and read-PRS.
       '(intended:) The boy is writing and reading the book.'

It is unclear whether pseudocoordinations are best to be analysed as instances of complex predicates, coordination or subordination (see e.g. the discussion in Lødrup 2002, 123f.), which is one of the reasons why pseudocoordinations have been of continuous interest for syntacticians.

While it has often been claimed that the number of verbs that can occur first in a pseudocoordination is "small" (Lødrup, 2002: 121) or that they belong to a "closed class" (Gjersøe, 2016: 353), corpus studies such as the ones conducted by Kinn (2018) show that this assumption is probably untrue.

When it comes to the semantic characterisation of pseudocoordinations, discussion of certain individual semantic properties of some or all pseudocoordinations — such as aspectual readings of pseudocoordinations with posture verbs such as sitja 'sit' (see e.g. Vannebo, 2003: 166f., Lødrup, 2002: 122 and the references cited there), or the differences between "simultaneous" and "successive" pseudocoordinations (essential to the analysis by Jørgensen, 2000) — occurs in the literature. However, discussion in terms
of a large-scale classification of (the different types of) pseudocoordination is somewhat lacking.

In this talk, steps toward such a classification shall be undertaken. It will be argued that different types of pseudocoordination can be placed on a "semantic bleaching" continuum (probably also correlating with the extent of grammaticalisation), and formalisations in terms of frame theory will be presented for the more lexically transparent (i.e. less semantically bleached) types of pseudocoordination.

First, a central claim of my analysis of pseudocoordination constructions is that all pseudocoordinations exhibit the Macro-Even Property (MEP) as laid out by Bohnemeyer & Van Valin (2017) (against ideas by Lødrup, 2014). In informal terms, the MEP entails that no two incompatible temporal modifiers can modify different parts of a complex syntactic construction, i.e. pseudocoordination sentences such as *Han satt i går og leste i dag, 'He sat yesterday and read today,' are impossible.

When it comes to the internal classification of different types of pseudocoordination consider the following sentences which exemplify different ends of the "semantic bleaching scale" (taken from Vannebo, 2003: 169, and Vagstad, 2010: 8 respectively):

(3) a. Du få-r ta og gå heim.
    you get-PRS take.INF and go.INF home
    'You can just go home.'

b. Kari og Mari ring-de og bestil-te pizza.
    Kari and Mari call-PST and order-PST pizza.
    'Kari and Mari called and ordered pizza.'

In (3a), the verb ta 'take' does not contribute any semantic content directly related to its lexical meaning, and as such it is entirely bleached semantically.

On the other end of the scale, one finds examples such as (3b), in which the first verb of the construction seems not to have lost any of its lexical meaning. Other instances of pseudocoordination, such as pseudocoordinations with posture verbs mentioned above, occupy a middle ground on this scale, where the first verb partially contributes its lexical meaning to the construction and partially grammaticalised meaning such as aspectual information.

When analysing pseudocoordinations of the type of (3b), it is important to note that the English translation of (3b) fails to convey the fact that the calling and the ordering of the pizza constitute one event. In line with the MEP, readings under which there are separate acts of calling and ordering a pizza, are excluded.

The relationship between the first verb ringja 'call' and the second verb bestilla 'order' constitutes an in-relation in the sense of Löbner (submitted: 8) defined as follows:

"h IN l
Under the given circumstances
- the agent, i in doing l, exemplifies an act h of type H;
- doing h consists in exemplifying an act l of Type L;
- the agent's doing l counts as / amounts to / means exemplifying an act of type H"

With regard to (3b), Kari and Mari ordered pizza in making a phone call.

Finally, the meaning conveyed by the construction ringja og bestilla can be represented in a simple cascade (i.e. a frame-theoretical representation of such a relationship, see Löbner, submitted for what cascades entail in detail):
Prototype vs. Prominence: Experimental studies on the decomposition of agentivity

FRANZISKA KRETZSCHMAR\textsuperscript{1,2}, TIM GRAF\textsuperscript{1,2}, MARKUS PHILIPP\textsuperscript{2} & BEATRICE PRIMUS\textsuperscript{2}

\textsuperscript{1}SFB 1252 Prominence in Language, \textsuperscript{2}Institute of German Language and Literature, University of Cologne

Agentivity is a central category in human language and cognition (e.g. Spelke & Kinzler, 2007). In both theoretical and empirical linguistics, agentivity has sparked an enduring debate about the adequate definition and empirical adequacy of the agent notion in sentence interpretation (e.g. Levin & Rappaport, 2005; Van Valin & LaPolla, 1997). On one dominant view, the agent is conceived of as a prototype category that is decomposed in different semantic role features. The prototype accumulates the highest number of agent features and is the primary candidate for subject selection (Dowty 1991). Thus, this approach assumes that feature accumulation is the key factor for argument selection across different sentence types/constructions (Dowty, 1991; Primus, 2011). Contrary to this, psycholinguistic findings suggest that agent features may be flexibly ranked depending on language, speaker or the choice of syntactic construction and its discourse
function (e.g. MacWhinney et al., 1984; Alday et al., 2015). Following this lead, we assume that agentivity effects might be better captured if agent features are ranked differently depending on the choice of the construction. Such highlighting of features meets the criteria of the notion of prominence as elaborated in Himmelmann & Primus (2015).

The present paper aims to address the question whether agent prominence and feature ranking can indeed provide a more adequate account for agentivity effects as compared with the prototype approach and feature accumulation. In a series of rating experiments, we investigated transitive argument structures in personal passives, actives, and do pseudoclefts. While the prototype approach predicts identical acceptability clines across these constructions and consistent use of feature accumulation, the prominence approach predicts variation due to feature ranking that differs between these constructions.

In order to be able to clearly identify agentive features, we focused on German verbs entailing a volitional and/or sentient agent in our studies, hence including volitional perception (e.g. watch), non-volitional perception (e.g. see), non-volitional emotion (e.g. hate) and non-volitional cognition verbs (e.g. know) (cf. Lehmann et al., 2004; Viberg, 2001; Van Valin, 1999). We constructed experimental items such that in each verb class there were six different verb lexemes, each occurring in ten lexically different sentences. All sentences were constructed to be meaningful and grammatical. In two experiments, participants were asked to judge experimental items for acceptability on a 6-point scale. Data were analyzed using cumulative linked mixed effects regression models. We found that (i) acceptability clines varied among constructions and (ii) that feature accumulation as implicated by agent prototypicality does not capture the acceptability clines for individual constructions.

In Experiment 1 (N = 69) we investigated the influence of verb class and voice. We found that personal passives show an acceptability drop for cognition verbs that is larger than in actives, while volitional and non-volitional perception verbs cluster with emotion verbs in passives but not in actives. All sentence verb classes were rated better than a control condition including verbs with neither volition nor sentience as agentive features (e.g. exhibit), resulting in the following acceptability cline in the passive: watch, see, hate > know > exhibit. This finding cannot be accounted for by agent prototypicality, which predicts that the agent with the greatest number of agentive features (provided by volitional perception verbs) is rated best in both active and passive. Feature ranking, by contrast, is compatible with these results in assuming that volition is not a prominent feature for personal passives. Moreover, our results suggest that sentience has to be decomposed since cognizers do not cluster with perceivers and emoters. Hence, agent prominence (construction-dependent feature ranking), but not agent prototypicality (construction-independent feature accumulation), accounts for the different ratings in active vs. passive voice including German sentience verbs.

In Experiment 2 (N=60), the same verbs were embedded in do pseudocleft structures (What the spectator did was watch the landing on the moon, cf. Jackendoff, 2007). Results showed a cline different from the one in active and passive voice above. Volitional perception (watch) was rated significantly better than any other class of non-volitional sentence verbs, which were in turn rated better than the control condition (exhibit), resulting in the following acceptability cline: watch > see, hate, know > exhibit. While this finding is well compatible with feature accumulation (volition + sentience for watch vs. only sentience for the remaining sentence verbs), it is inconsistent with further assumptions. First, the do pseudocleft is not only sensitive to volition, as claimed for English (Jackendoff, 2007), but also to sentience in German. Second, in comparing the results
from Experiments 1 and 2, it is also apparent that feature accumulation does not hold for all the tested constructions.

In summary, construction-sensitive feature ranking captures all our data and suggests that agent prominence is a more adequate explanans than agent prototypicality. Hence, gradient human categorization may not be based on prototypicality alone.

References

Incremental inference-based MWE processing with TUCO

TIMM LICHTE
(Heinrich Heine University Düsseldorf)

Multi-word expressions (MWEs) like kick the bucket or take a walk stand out as being idiomatic with respect to semantic composition while being restricted to a specific surface realization. In many grammar frameworks, this is dealt with in terms of syntactic ambiguity between an MWE and its literal counterpart – Tree Adjoining Grammar (TAG) being one of them (Abeillé 1995; Abeillé & Schabes 1996). Lichte & Kallmeyer (2016) have recently argued for an approach based on TAG, however, that issues the same syntactic analysis for both and draws the difference solely in the semantics. Hence, on this approach, kick the bucket is canonically generated from the TAG elementary trees of kick, the and bucket. Their semantics, on the other hand, is special in that it also
carries the meaning of the MWE, thus being systematically ambiguous. Moreover, the MWE part of the semantics is immediately linked to morphological information in order to ensure the right surface realization. An example of this semantic ambiguity approach is shown in Figure 1.

Yet, there are some desiderata for this TAG-analysis of MWEs. Firstly, the MORPH feature is somewhat redundant since the encompassed information is usually also available in the syntactic structure. Secondly, an inference-based extension (following Pulman 1993), which could help to express lexical generalizations more succinctly, seems to come with considerable disadvantages as it presupposes a two-step procedure: first the full literal meaning is composed, and then the MWE meaning is “quasi-inferred” based on the literal meaning. This two-step procedure seems inevitable because, in the TAG-implementation by Lichte & Kallmeyer (2016), “quasi-inferences” on a per-word basis would be hard to control and prone to infinite regress. In my talk, I will address the desiderata and propose an improved tree grammar model, which I will briefly present in the remainder of this abstract.

While I agree that MWEs should obtain a uniform syntactic analysis, I propose to implement this idea with TUCO (Tree Unification & Constraints), a recently developed tree grammar formalism. TUCO differs from TAG in one crucial respect: In TUCO, the derived tree is composed with only one operation, tree unification, instead of using substitution and adjunction as in TAG. Tree unification is guided by constraints, which are imposed on the derived tree. Those tree constraints are just conditional statements on linked tree and frame descriptions. An example of this sort of constrained composition is shown in Figure 2. What’s more, in TUCO, nodes in the derived tree not only carry sets of morpho-syntactic features, but, unlike in TAG, nodes can be polarized. Polarization eventually makes it possible to see what information has been contributed by elementary trees (i.e. the lexicon), and what is subsequently added by constraints. This distinction becomes substantial when trying to avoid the problem of infinite regress in
inference-based approaches: Constraints can now be grounded as to the nodes contributed by elementary trees; in other words, it can be prevented that constraints apply to nodes that are added by constraints, thereby effectively ruling out recursion. As a consequence, it is not only possible to specify the ambiguity between the literal and figurative meaning of *kicked the bucket* as succinctly as in the quasi-inference rule in Figure 3, the quasi-inference rule can also be used at any point of the derivational process, hence allowing for a cognitively more realistic use within incremental processing models.

Figure 10: TUCO derivation of the literal meaning of kick the bucket: above the brace, the first three columns show the tree unification part; the last column contains one simple constraint. The resulting tree-frame pair is shown below the brace. ① and ② are links connecting syntactic nodes and frame components. • (can unify with anything) and ! (can unify only with •) are polarization markers.

Figure 11: Quasi-inference rule for the figurative meaning of *kick the bucket* in the shape of a TUCO constraint: if the antecedent left of ⇒1 is fulfilled, wrap an l-term around the semantic part of the antecedent and the consequent in the following way: τ ∧ a ⇒1 b = τ ∧ a ⇒ (a l b) with τ being a tree description and a and b frame descriptions. <kick> marks the baseform of kicked.
A ‘Situated’ Solution to Prior’s Substitution Problem

KRISTINA LIEFKE
(Goethe University Frankfurt)

1. Introduction. DP/CP-neutral attitude verbs (e.g. remember, fear, imagine, see) exhibit the following phenomena:

1.1. DP/CP substitution behavior. In the complements of most of these verbs, CPs resist the truth-preserving substitution by a DP of the form ‘the proposition [CP]’ (see (1)) (see a.o. Prior, 1971; King, 2002; Moltmann, 2003, 2013):

(1) a. Sherlock remembers (/fears/imagines/sees) [CP that Moriarty has returned].
≠ b. Sherlock remembers (/fears/imagines/sees) [DP the proposition [CP that Moriarty has returned]].

Some of the verbs in (1) allow the substitution of their CP complement by some DP of the form ‘[DP [CP]]’. In particular, most factive verbs (incl. remember) allow the substitution of their CP complement by a DP of the form ‘the fact [CP]’ (see (2)); most negative future-oriented verbs allow the substitution of their CP complement by a DP of the form ‘the possibility [CP]’ (see (3)) (cf. Moltmann, 2003):

(2) a. Sherlock remembers [CP that Moriarty has returned].
≡ b. Sherlock remembers [DP the fact [CP that Moriarty has returned]].

(3) a. Sherlock fears [CP that Moriarty will return].
≡ b. Sherlock fears [DP the possibility [CP that Moriarty will return]].

1.2. The objectivization effect. The truth-conditional difference between (1a) and (1b) is often attributed to a shift in the reading of the attitude verb (see Pietroski, 2000; Moltmann, 2003; Forbes, t.a.). This shift changes the reading of the verb from a reading in which the semantic value of the complement serves as the content of the reported attitude (in (1a); see (4a)) to a reading in which the semantic value of the complement serves as the object towards which the attitude is directed (in (1b); see (4b)):

(4) a. Sherlock’s remembering has as its content (the fact) that Moriarty has returned
≠ b. Sherlock’s remembering has as its object the proposition that Moriarty has returned
Moltmann (2003) calls the above-described shift in reading the *objectivization effect*. This effect is typically not exemplified by pairs of sentences like (2) and (3). For example, the salient reading of (2b) is (4a).

2. Challenges and Objectives. Since traditional accounts analyze attitude reports as relations between individuals and propositions – and identify the values of CPs with propositions –, they capture neither the above substitution behavior (s.t. they face Prior’s *substitution problem*) nor Moltmann’s objectivization effect. Newer relational accounts solve this problem by questioning the interpretation of CPs as propositions (see Parsons, 1993; Moffett, 2003; Pryor, 2007) or by separating DP- from CP-taking occurrences of attitude verbs (see a.o. Pietroski, 2000; King, 2002; Forbes, t.a.). However, none of these accounts simultaneously solves the substitution problem and captures the objectivization effect.

This paper seeks to compensate for the above shortcoming. Specifically, it provides a uniform account of DP/CP substitution behavior and the objectivization effect that uses the particular pragmatic properties of the situation that serves as the internal argument of the attitude report (cf. Schlenker, 2003; Higginbotham, 2003). The account is inspired by Forbes’ (t.a.) account of the objectivization effect and by Moltmann’s (2003) ‘unique determination’ strategy for the solution of the substitution problem.

3. Proposal: background. On the proposed account, attitude verbs are interpreted as relations to *situation-anchored propositions*, i.e. a variant of Austinian propositions. Situation-anchored propositions are sets of situations, $\lambda j [j \leq (w_\sigma, t_\sigma) \land p(j)]$, at which the proposition $p$ is true, which approximate the information of the temporal world-part, $(w_\sigma, t_\sigma)$ (with $w_\sigma$ a world and $t_\sigma$ a point in time), that is associated with a contextually chosen situation $\sigma$ (=: $f_c(S)$) (called the *anchor* of the proposition) (see Liefke and Werning, t.a.). The situation-anchoring of propositions is motivated by the $\sigma$-relativity of the truth of $p$ (s.t. $p$ may be false at the external situation @: consider the case of *fear* and *imagine*) and is supported by the situation-semantic analysis of attitude verbs (see Barwise and Perry, 1983; Kratzer, 2002, 2006; Higginbotham, 2003).

The interpretation of *remember* is given in (5). (The interpretation of the other verbs from (1) is analogous). In this interpretation, $f$ is a contextually given choice function. This function selects a specific (possibly non-unique) member of the set of situations, $S$, in dependence on a parameter, $C$, for the event described by the attitude verb (in (5): $x$’s remembering in $i$). $f_c(S)$ is then the particular situation which the agent $x$ remembers in the external situation $i$.

$$ (5) \ [\text{remember}] = \lambda p \ \lambda x \ \lambda i \ \exists f [\text{remember}; (x)(\lambda j. j \leq (w_{f_C(S)}, t_{f_C(S)}) \land p(j))] $$

4. Proposal, part I: the DP/CP substitution behavior from (1)–(3) is then explained by the lexical/pragmatic constraints on the contextually chosen situation, $f_c(S)$: For the verb *remember*, these constraints restrict the candidate anchors of the embedded proposition to situations $j$ that are located at a part of the world $w_\sigma$, that is associated with the point of evaluation, @, of the attitude report (i.e. $j \leq w_\sigma$) and that precede the time of @ (i.e. $j < @$). As a result of this restriction, (5) is equivalent to (6):

$$ (6) \ \lambda p \ \lambda x \ \lambda i \ \exists f [\text{remember}; (x)(\lambda j. j \leq (w_{f_C(S)}, t_{f_C(S)}) \land (j \leq w_1 \land j < i) \land p(j))] $$

We assume that the DP shells *the fact* and the *possibility* have the interpretation from (7) and (8), respectively:
The compatibility of the constraint-profile of ‘the fact [CP]’ (i.e. if \( p \) is a fact, then \( p \) is true of a temporal part of \( @ \)) with the constraint-profile of remember then explains the equivalence of (stylized variants of) (2a) and (2b):

\[
\text{Sherlock remembers [DP the fact [CP that \( p \)]]} = \lambda i \exists f [\text{remember}_i (s) \lambda j. (j \leq \langle w_{\text{fC}(S)}, t_{\text{fC}(S)} \rangle \land (j \leq w_i \land j < i)) \land (p(j) \land j \leq w_i)]
\]

Analogous observations hold for the constraint-profiles of the DP ‘the possibility [CP]’ (see (8)) and the verb fear, whose compatibility explains the equivalence of (3a) and (3b). The requirement of maximal generality on the interpretation of the DP shell the proposition – which excludes the restriction to situations with particular temporal or spatial properties – explains the semantic deviance of (the content-reading of) (1b) and the resulting difference between (1a) and (1b).

5. Proposal, part II: the objectivization effect from (1) (see (4)) is explained by assuming that DPs of the form ‘[DP [CP]]’ can only be interpreted as the content of the reported attitude when the constraint-profile of the DP is compatible with the constraint-profile of the verb (e.g. in (2b), (3b)). In this case, the attitude verb (here: remember) saliently receives its interpretation from (5). When the constraint-profile of the DP is not compatible with the verb’s constraint-profile (e.g. in (1b)) – or when the attitude verb receives its alternative interpretation in compatible cases –, the DP is interpreted as the object of the attitude. To make this possible, the verb is coerced into an object-reading along the lines of Ginzburg (1995).

6. Discussion. The full paper gives a detailed semantics for DPs of the form ‘the proposition [CP]’, ‘the fact [CP]’, and ‘the possibility [CP]’ (alongside other examples), compares the proposed account to the accounts from Moltmann (2003), Forbes (t.a.), and Elliott (2016), and defends this account against objections from King (2002) and Moltmann (2013).

References.


her 80th birthday. Jerusalem: Hebrew University.

‘Most people but not Bill’: integrating sets, individuals and negation into a cognitively plausible account of noun phrase interpretation
ANDY LÜCKING & JONATHAN GINZBURG
(Goethe University Frankfurt & Université Paris-Diderot)

An important motivation for Montague’s work on quantification (Montague 1974) was to achieve uniformity with respect to predication across referential and quantificational subjects. This was attained by type raising all NPs to denote sets of sets. In this paper we argue for essentially the opposite move whereby all predication involves individuals or sets of individuals (for plurals).

Our motivation for this derives from (i) the need to attain referential transparency, a desideratum incorporating anaphoric and clarificational potential and co-verbal gesture; and (ii) from several key recent psycholinguistic results on processing generalized quantifiers (GQs). Since anaphoric expressions stand out in picking out a referent from the co-text, they are particularly suited for discovering antecedent denotations. Given that co-verbal gesture also has a kind of anaphoric relation to their affiliated speech, they provide a multimodal extension of the phoric principle. Psycholinguistic studies provide further evidence for the internal structure of quantified noun phrases in terms of their effect on processing in various contextual conditions. On our account formulated in Type Theory with Records (Cooper and Ginzburg 2015), NPs denote structured semantic objects as required by referential transparency that for extensional argument roles can either be referentially grounded (when coerced into dialogue-game-board parameters (dgb-params), see Figure 1) or existentially quantified away (when coerced into quantificational parameters (q-params), as exemplified in Figure 1); intensional readings arise via selection for the complex structured object. Our focus here is on how Boolean operations affect NPs, that is, how complex NPs are built using logical connectives like ‘but’, ‘and’ and ‘not’.
Our starting point is an argument emanating from Purver and Ginzburg (2004) and Ginzburg and Purver (2012). They show that clarificational potential provides data against higher order denotations (as postulated by GQs) in that answers to reprise fragment clarification requests always provide individuals or sets but not sets of sets. Hence, they argue in favour of a more transparent NP denotation in terms of witness sets (cf. Barwise and Cooper 1981). We refine and generalize their proposal to all NPs. On our view the denotation of an NP is given in terms of the type in Figure 1. Here the maxset introduces a set-valued plurality, which is constituted out of individuals sharing a property given as value of c1 (the arrow type distributes this property (Ppty) over the elements of the maxset); the reference set (refset) and comp(lement) set partition the maxset, with the former providing a witness for the NP and the latter ‘anti-witnesses’. θ is a contextual norm needed for capturing certain interpretations of quantifiers (van Benthem 1986), q-cond hosts the descriptive quantifier meaning (an example is given in Figure 2 below), and q-persp spells out the ‘focus’ of a quantified NP as being part of expectancy-driven GQ processing (Sanford, Dawydiak and Moxey 2007).

While in semantics in particular the compset received only a marginal and highly marked status (Nouwen 2003), we argue that it has a systematic place (besides compset anaphora) in the negation operation on NPs to explicate uses such as follows:

(1) a. Jo: Who can solve the riddle? Bo: Not Bill.
    b. Not all the boys left.
    c. This view is shared by not a few scholars
Since for the universal quantifier the inequivalence $\neg \text{all.} x (\varphi)(\psi) \not\leftrightarrow \text{all.} x (\varphi)(\neg \psi)$ holds, lexical decomposition (Sailer 2007) cannot be applied here. The same problem affects the account of Schmitt, Onea and Buch (2017). Therefore we introduce a new negation operation on nominal expressions, which is given in (2):

(2) Not Q

- all occurrences of ‘refset’ and ‘compset’ within dgb-params or q-params fields are swapped, and
- the relation symbol used in q-cond and q-persp is reversed ($\rightarrow \not\leftrightarrow$, $\geq \rightarrow <$, $\leq \rightarrow >$, $\not\leftrightarrow \rightarrow =$).

We show how this operation can enable both the right witnessing conditions for the examples above, as well as anaphora in cases such as the following, which have long been tricky for dynamic semantics (Fernando 1993):

(3) A: Go get a bike from the vélib station. B: Oh, but I don’t see any bike that works there.
   a. They are probably rented out.
   b. It is probably rented out.
   c. Where are they gone?

We similarly show how this account extends to other Boolean operations even involving singular expressions like proper names as in Figure 2. Our account is motivated by a variety of experimental evidence. This ranges from the extensive work on the refset/compset partition by Moxey, Sanford, Filik and colleagues (e.g., Moxey and Sanford 1986; Moxey et al. 2004; Filik et al. 2011), which in particular shows that compset and maxset are not constructed as a fallback interpretation option, but have the same processing status as default antecedents have. It includes crucially experimental support for our account which assigns the QNP a completely “in situ”, “internal” (in the sense of not incorporating a projected verbal argument) meaning from work by Urbach, DeLong and Kutas (2015), which indicates that, as with other meaning elements, QNPs are interpreted incrementally.


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**A Rate-Distortion Theory of Concepts**

**MANOLO MARTÍNEZ**

(Universitat de Barcelona)

Theories of concepts in psychology have traditionally been divided in two groups: *prototype and exemplar theories* on the one hand (Brooks, 1978a; Hampton, 1995; Medin & Schaffer, 1978; Rosch, 1999), where concepts are identified with typical members of the class the concept is about, or some other body of statistical knowledge about this class; and the various *theory theories* on the other hand (Carey, 1985; Murphy & Medin, 1985), according to which concepts are theories about the class they target. Choosing the correct theory of content among these two families has proven hard: each of them is better suited to explaining different aspects of our competence in the use of concepts, and does a better job at explaining different experimental results. This has lead some theorists to defend that concepts are composites of prototypes and/or exemplars, and theories (Nosofsky, Palmeri, & McKinley, 1994; Osherson & Smith, 1981), or even that there are no such things as concepts (Machery, 2009).

In this paper I present an information-theoretic account of concepts out of which these two perspectives on concepts fall out naturally, as part of the same, simple theoretical construct. The main idea is that concepts do *lossy compression* of the state of the world: they say a lot about the world that is relevant to the thinking subject, in an economic way. I propose that we see concepts as signals that attempt to solve a coding problem: given the available rate in a certain channel (say, from perception to higher cognition), how should signals (concepts, in the case that interests us) encode the world so as to minimize errors in the picture that the thinking subject forms of it?

Suppose, for example, that a subject needs to cope with a world consisting of two “noisy essence kinds”, that can be independently instantiated. In these kinds, the essence is highly predictive of the presence of the whole property cluster, but, because of the noisy part, abnormal kind instances are possible (fig. 1.) The subject “samples” from the
world; this produces a binary string, with each member of the string being 1 if the corresponding node is on, and 0 if it’s off. This signal is encoded, goes through a channel, and is then decoded at the other side. The target distortion measure consists in counting the number of differences between original and decoded message. So, for example, if the original message is 1001001110 (ten bits, corresponding to the ten properties) and the decoded message is 1101001010, the distortion would be 2—the two wrongly decoded bits are the second and the eighth.

Fig. 2 gives the rate distortion function for this world. The blue line is the rate-distortion curve: distortion in the x-axis, rate in the y-axis. The red line is the negative of the slope of the blue line: the higher the red line, the steeper the blue one. There is a pronounced “elbow” in the blue line—i.e., a sudden drop in its slope, as shown by the red line. A rate of 2 bits is a “sweet spot” in the function: most of what needs to be said about the world can be said in two bits.
And now, the encoding-decoding strategy that sits at the blue cross, i.e., that achieves the minimum possible distortion at the 2-bit sweet spot is as follows.

**Optimal Encoding Strategy:**

1. First divide the incoming signal in two halves, one corresponding to properties $P_1$ through $P_5$; the other corresponding to properties $P_6$ through $P_{10}$.
2. If there is a majority of 1s in the first half of the original signal set the first bit of the signal to 1. Otherwise set it to 0. Ditto for the second half of the original signal and the second bit of the signal.

**Optimal Decoding Strategy:**

If the first bit in the incoming signal is 1, set the first half of the decoded signal to 11111. Otherwise, set it to 00000. Ditto for the second bit and the second half of the decoded signal.

The intended interpretation of the model is as follows: each of the two bits in the signal correspond to a concept. The encoding strategy corresponds to our classification judgments: in the model, as in real-life examples, this strategy incorporates statistical information about the kind (in this simple model, a majority rule.) The decoding strategy tells us how the instantiation of the concept is interpreted downstream: as a prototypic instance of the kind (11111, the most common one). Finally, this encoding-decoding pair embodies a simple theory about the structure of the world: it is a world composed by two essence kinds, within each of which properties tend to be instantiated together.

The prototype aspect and theory aspect of the concept are, thus, just ways to achieve optimal compression of the state of the world for further cognitive processing downstream.


The interaction of action verbs and adverbs in the brain: an approach in frame theory

RALF NAUMANN, WIEBKE PETERSEN & KATJA BIERMANN-RUBEN
(University of Düsseldorf)

Central issue. Embodied cognition theories propose that modal brain regions involved in perception and action are likewise involved in the processing and storage of semantic memory traces. Specifically, the motor component inherent to language containing action verbs triggers a simulation of the implied movement in sensorimotor areas which is likely reflected in increased activation. In natural language, however, important cues about the precise implied action may not only come from the verb itself but from other sources. E.g., the interaction of verb type and motor simulation could be hypothesized to be more pronounced when the action verb is combined with an intensifying adverb like ‘hard’ compared to an attenuating adverb like ‘lightly’ Based on two studies in which the effects of processing actions verbs either alone or together with manner adverbs were investigated we present a theoretic account of the results in a dynamic, probabilistic frame theory.

Data. The neurophysiological interaction between action verbs and manner adverbs in German was investigated in Sieksmeyer et al. (2017). In experiment 1A subjects were presented an intensifying or attenuating adverb followed by a verb (either hand, foot or abstract). After 400ms the stimuli turned either blue or yellow and the subjects had to respond with the hand or the foot according to the color of the adverb-verb combination, but only if the verb expressed a concrete bodily action. In Experiment 1B the verb was shown first followed by the adverb. Subjects had to react with their right hand to intensifying adverbs and with their right foot to attenuating adverbs (no color change). In a second session the response effector-adverb type relationship was reversed. In Ex. 1A the authors found a main effect for (i) response effector with faster hand responses than foot responses; (ii) adverb type with faster responses following intensifying adverbs compared to attenuating adverbs; and (iii) the interaction between verb and response effector. Hand (foot) responses were significantly faster following hand (foot) verbs compared to foot (hand) verbs. In Ex. 1B significant effects were: (i) response effector with faster hand responses than foot responses and (ii) an interaction between adverb type and response effector. There were significant differences for hand responses with fast hand responses following intensifying compared with attenuating adverbs. By contrast, for foot verbs, no differences emerged.

Klepp et al. (2017) conducted two experiments with action verbs including two semantic factors. An action verb has a high degree of prototypicality if it is associated with one particular way of executing the action. Examples are ‘klatschen’ (to clap) or ‘trampeln’ (to trample). A low value indicates that there are several associated ways to perform the action (‘basteln’ (to do handicrafts) or ‘fliehen’ (to flee)). The second semantic factor, effector-specific movement, describes the amount of movement in the major executing limb that subjects associate with a given verb. Examples of high effector-specific movement verbs are ‘rubbeln’ (to rub) or ‘springen’ (to jump) while ‘buddeln’ (to dig) or ‘schleichen’ (to tiptoe) involve a low effect-specific movement. In experiment 2A the verb prime was followed by a target stimulus of a geometric shape with either pointed or rounded corners. The type of corners determined the response effector, i.e. the right hand or the right foot. In experiment 2B responses were required only after
concrete verb primes. For Ex. 2A the authors found a priming effect in the sense of faster reaction times for congruent verb-effector combinations only for verbs with high effector-specific movement and hand responses. In Ex. 2B a main effect was found for effector-specific movement and for prototypicality. Above that, high prototypicality led to even faster reaction times for foot verbs than for hand verbs (significant interaction).

**Outline of the analysis.** The results in Sieksmeyer et al. (2017) show that there is no direct modulation of verb-motor priming by adverbs in the sense that intensifying manner adverbs increase motor activation per se and thereby increase the motor contribution to the processing of the action verb. Though responses were faster following intensifying adverbs compared with attenuating ones in the sequence adverb-verb (Ex. 1A), no corresponding effect of the adverb was found for the reverse order in Ex. 1B. Hence, the influence of manner adverbs in Ex. 1A and the interaction with the effector in Ex. 1B have to be explained in a different way by taking into account that the order in which the two verbal elements were processed in the two experiments was different. Instead of priming motor activation directly action verbs prime it indirectly. In particular, adverbs like ‘lightly’ or ‘hard’ prime those verb classes for which a force attribute that specifies the intensity and/or the speed of the action is defined in the following way. The relation between an adverb and verb as modification is reflected in our frame theory by directly linking the interpretation of an adverb to an event frame. The frame of the adverb is a subframe of the frame of the event. This has two effects if the adverb precedes the verb. First, in case of an action verb this (pre-)activation elicits motor activation since motor output interacts with action-related language processing because of shared neuronal circuits. Second, since the verb frame contains the force attribute, which is the contribution of the adverb and which is directly related to the amount of motion in the action, the amount of motor activation is modulated by the value of the force attribute (high for intensifying and low for attenuating adverbs) independently of the sort of the verb, provided the attribute is defined for the verb. Semantically, the priming is due to two factors. First, for events denoted by action verbs it is not only true that they have a force attribute but in addition it is more likely that this attribute plays a role in the action. This latter point is closely related to the second factor that concerns the discourse level. Following theories of Question under Discussion (QuD), an adverb raises a set of questions, one of which is related to the rhetorical relation entity-elaboration: *What about x?* For adverbs, one answer to this question, and the most likely one, is the specification of the sort of event whose force attribute is determined by the adverb. When taken together, one gets: (i) manner adverbs prime action verbs among those verbs which have a force attribute and (ii) raise expectations about the sort of this verb (event).

If the action verb precedes the adverb, a frame of the event is already activated. This has the following effects. First, the value of the attribute determining the effector-specificity is specified. Second, motor activation is elicited. For the adverb, one has: there is no priming as described above because the sort of the event is already known. The semantic effect of the adverb is reduced to specifying the value of the force attribute. The frames of hand and foot verbs differ from each other w.r.t. an expectation of the force attribute. Specifically, we assume that hand and foot verbs differ w.r.t. which frame information gets activated when they are semantically processed. Ex. 2B suggests that foot verbs preferably introduce a prototypical representation in the sense that either attributes get a prototypical (default) value or the attribute is not represented at all and no QuDs related to entity-elaboration are raised relative to those attributes. Specifically, this holds for the force attribute (for foot verbs, Klepp et al. (2017) found a correlation
of $\rho = 0.64$ for prototypicality and effector-specificity, which is related to the force attribute. It does not get primed and no answers for this attribute are expected so that intensifying and attenuating adverbs do not have an additional impact on motor simulation. By contrast, the results of Ex.2A and 2B suggest that hand verbs specify the values of less attributes upon introduction of an event of this type. This has the effect that the QuD related to entity-elaboration is more prominent. One expected answer is that relative to the force attribute. For a hand verb with a high effector-specific movement, the probability of finding an intensifying adverb compared to an attenuating one is higher, leading to a higher motor activation as shown by the way high effector-specificity interacts with the response effector in Ex.2A.

Outline of the formal framework. In addition to a domain of individuals and events there is a separate domain of frames. Each frame is related to its root by a function root. The relation between a frame and a set of attributes is defined by a function $\theta$ which maps a frame $f$ to the set of attributes associated with it. Hence, frames are partial objects. Getting more information about an object is modelled by an update operation that is defined in terms of a move along $\downarrow_f$. $f \downarrow_f f'$ holds if $f$ and $f'$ have the same root and for all attributes in $\theta(f)$ one has that if it holds in $f$ w.r.t. to two objects $o$ and $o'$ then it holds in $f$ for these two objects too. Hence, $\downarrow_f$ is an information ordering on the domain of frames. Information states are sets of possibilities together with two probability distributions. A possibility is a pair $(c,w)$ consisting of a stack $c$ (discourse component) and a possible world $w$ (world component). A position on the stack is assigned a discourse object which is an object (individual or event) together with an associated frame that contains the information known in a discourse about that object. We assume that frames for action verbs have a FORCE attribute with values like ‘high’ and ‘low’. In addition, they have an attribute which specifies the value for effector-specificity. For a given action verb, this value is uniquely determined. Frames for adverbs are dependent frames in the sense that the central node which refers to the object denoted by the frame is not the root of the frame. ‘Dependent’ refers to the fact that these frames are part of another (independent) frame of sort ‘event’. This relation is reflected in the update operation for adverbs. For each possibility in the input information state there is a set of successor possibilities with a discourse component of the form $(\delta, f)$ where $\delta$ is a degree (corresponding to, say, ‘low’ or ‘high’) and $f$ is an event frame with the frame for $\delta$ as a subframe linked by the attribute FORCE. The successors differ w.r.t. the sort of the event frame in the frame component, e.g. ‘hit’, ‘kick’ or ‘think’ for the adverb ‘hard’. The priming effect is modelled at the level of the first probability component. A standard way of defining the probability update triggered by a domain extension operation is to uniformly distribute the probability of the input possibility over its successors. In the case of an adverb, the probability of a successor depends on properties of the associated event frame. E.g. if the effector-specificity is high, as for ‘rub’, the probability of the possibility is higher than that for an event with a low effect-specificity like ‘do handicrafts’. Expectations are modelled at the level of the second probability component which is defined on contexts and which takes conditional probabilities as basic.


The aim of this paper is to propose an essentialist model of the semantics of slurs. In particular, I will defend the view that the semantic mechanism behind slur nouns is similar to the one behind kind terms: slur concepts, from which slur terms inherit their meaning, encode mini-theories which represent an essence-like element that is causally connected to a set of negatively-valenced stereotypical features of the social group in question. Thus, slur concepts encode three central elements: 1) a causal component, which is the ‘hidden unobservable’ that gives rise to and explains the superficial, stereotypically observable features and actions of members of the social category in question, and which we call the ‘essence’ of the category, 2) a causal, law-like relationship between the essence and the surface features of the social category in question, and 3), a set of negatively-valenced stereotypical features of the social group, which members of the social group are predisposed to instantiate and which thus deliver a heuristics for the identification of individuals of the essentialized group.

It is widely accepted that the semantics of kind terms, such as ‘water’ or ‘gold’, is essentialist in nature. According to my theory, then, slur nouns can be seen as belonging to the category of kind terms and thus parallel their semantics. Soames (2008) describes the meaning of ‘water’ fixed as being whatever underlying physical characteristic is shared by all ‘water’-members and explains and gives rise to the paradigmatic features of water. Slur terms, then, work in a comparable way. For example, slurs for women are true of those people who share the ‘womanhood essence’ – whatever this essence is –, which is causally responsible and explains stereotypical negative features associated with women. Slurs for male homosexual persons are true of those people who share the ‘gayness’ essence – whatever this essence is –, which is causally responsible and explains stereotypical negative features associated with gay people. Or, to put it more general: For a given slur S of a social group G and a person P, S is true of P iff P bears the ‘essence’ of G – whatever this essence is –, which is causally responsible and explains stereotypical negative features associated with G. Slur terms, then, encode this kind of mini-theory, which correspondingly is embedded in our conceptual representations of slurs.

However, although slurs are introduced with the intention of designating natural kinds, in most cases, they actually fail to do so. In contrast to ‘water’, ‘gold’ or ‘tiger’, there obviously will be no underlying, unified causal explanation for the set of features that is supposed to be explained by the essence. More concretely, there is no such thing as a ‘gayness essence’, ‘womanhood essence’, ‘blackness essence’, ‘Chinese essence’ or what have you, which disposes members of the group in question to exhibit stereotypical properties associated with it. Thus, the semantic contents of slurring words are empty, and sentences containing slurs in extensional contexts come out meaningless or false.

My model straightforwardly accounts for one of the central desiderata of theories of slurs, which is to explain why they have the derogatory and degrading effects they have, both at the individual and the collective level. When the racist, bigot, xenophobe or homophobe applies a slur, he thereby makes the target in question – and anyone who ‘shares the same essence’ – part of the mini-theory, subjugating her to an extreme form
of causal determinism and thus depriving her and other members of the social category of human autonomy and self-determination. Members of the targeted group are not evaluated by their individual acts or in relation to their external circumstances, but by (pre-)determined membership in a group. According to the slur user, the target is just predisposed to have despicable traits, whether she currently exhibits them or not. Crucially, the attributed essence is seen as disposing their bearers to act badly, or to exhibit negative features. Thus, by carrying the relevant ‘group essence’, the target is seen by the slur user to always be predisposed to carry negatively-valenced traits – even if all available evidence indicates otherwise. Taken together, it is easy to see how the application of an essentialized slur term is derogating, demeaning and dehumanizing to the target and the entire social group she is a member of.

Consider again the analogous behavior of other kind concepts. We know from developmental psychology that young children think that kangaroos growing up with goats will nevertheless be good at hopping – they are just made to hop (Gelman, 2003; Gelman, 2004; Gelman & Wellman, 1991). So just as a kangaroo cannot lose its ‘kangaroohood’ if it is raised in a goat family, and is dispositionally ‘made’ to hop also if it doesn’t do so (cf. for an empirical overview Gelman, 2003, 2004), so are the members of the social groups in question not evaluated by their individual circumstances or self-determined acts and decisions. This is precisely what is responsible for the dehumanizing power of slurs, as the attribution of ‘essences’ that pre-determine the target’s dispositions, character traits, attitudes and behaviors creates a picture of the target according to which she lacks the full spectrum of human autonomy and self-determination that we associate with personhood.

Next, I show that my theory satisfies another core desideratum for a theory of slurs: to match and predict the linguistic behavior of slur terms in a variety of compositional contexts. My theory can straightforwardly account for the distinctive linguistic behavior of slurs that has been recognized in current theoretical discourse (Anderson & Lepore, 2013; Bolinger, 2017; Hom, 2008; Jeshion, 2013) such as so-called ‘G-extending’ uses (Jeshion, 2013), in which a slur is applied to a member of a social group not predominantly associated with the slur, or ‘NDNA’ (non-derogatory, non-appropriated) uses (Hom, 2008), in which the use of a slur seems non-derogatory. Moreover, because my model entails null-extensionality of slurs for many uses, it accounts for our intuition that many sentences containing slurs are false.

Cortical oscillatory signal correlates of action loudness and movement amount

VALENTINA NICCOLAI¹, ANNE KLEPP¹, HANNEKE VAN DIJK¹,², ALFONS SCHNITZLER¹ & KATJA BIERMANN-RUBEN¹
(¹Institute of Clinical Neuroscience and Medical Psychology, Medical Faculty, Heinrich-Heine University, Duesseldorf, Germany
²Research Institute Brainclinics, Nijmegen, Netherlands)

There is some evidence that the auditory cortex is activated during the processing of words referring to animal and object sounds as well as to other actions with acoustic features. The present study further examines whether processing words characterised by different levels of loudness such as loud (e.g., to shout) and quiet actions (e.g., to whisper) differentially activate the auditory cortex.

Twenty healthy participants were measured with MEG while semantically processing visually presented verbs. The two conditions were matched for length, word frequency, bi-/trigram frequency, and for number of facial vs. limbs/whole body actions. Verbs were followed by a short 440 Hz tone of stable sound pressure level after a time-interval of at least 600 ms to identify possible word-dependent loudness effects on the tone-related N1 amplitude. To determine brain regions of interest and loudness-related oscillatory patterns, a separate task requiring the processing of loud and quiet tones was used. The resulting temporal Brodmann areas A22, A41/42, and posterior superior temporal sulcus, which showed stronger alpha suppression following loud compared to quiet tones, were inspected in the word paradigm. Here, an analogous oscillatory pattern emerged consisting in stronger beta suppression following loud compared to quiet actions in the left hemisphere. In line with this, the tone-related N1 showed smaller amplitude after loud than quiet actions in the left but not in the right hemisphere, which hints at N1 suppression as observed after repetitive presentation of a tone. Differential auditory cortex recruitment depending on action loudness points to possible selective auditory simulation mechanisms involved in verb processing.

Additional analyses addressed high versus low movement amount as determined by means of a rating study (N=30). This served to disentangle effects of action loudness from a possible contribution of body- and object-related movement amount. While actions implying higher movement amount induced stronger beta suppression in the right V5/MT, no effect in the selected right or left auditory areas emerged. This suggests that loudness and movement amount are two independent processes, the first selectively engaging left auditory areas and the second the right motion area.
The present study focuses on the Estonian tactile perception verb *tundma* ‘to feel’ and its polysemy. Whereas tactile perception verbs have not typically been found to be highly polysemous across languages, relative to verbs of vision and hearing (e.g. Sweetser, 1990; Evans & Wilkins, 2000; Storch & Aikhenvald, 2013a), the Estonian verb exhibits a rich polysemy. Results of two different linguistic tasks will be presented. The first task deals with the nature of the polysemy of *tundma* in Estonian, and the second task focuses on the cognition meanings of *tundma* ‘to feel’ and their conceptual properties.

Sweetser (1990) argued that there is a universal pattern of certain perception domains extending to certain abstract domains (e.g. vision $\rightarrow$ cognition). However, various studies have since demonstrated that there is much variation in languages across the world. Nonetheless, the extension from perception to cognition itself does seem to be close to universal (Ibarretxe-Antunano, 2008). Evans & Wilkins (2000) showed that in Australian languages, hearing rather than vision is the source for the extension from perception to cognition. The same pattern was found in some Papuan and Austronesian languages by Storch & Aikhenvald (2013b). Viberg (2005, 2015) has shown that in Swedish, the tactile perception verb *känna* ‘to feel’ is the source for the extension for the perception to cognition.

Although much has been written on the relationship between perception and cognition, the previous work has been mostly descriptive. The present study aims to show whether the knowledge expressed by a perception verb, in this case the Estonian verb *tundma* ‘to feel’, can be shown to exhibit characteristics conceptually motivated by the physical act of perception itself.

The first experiment conducted was a sorting task with 25 senses of *tundma* ‘to feel’. 66 participants sorted 25 sentences (one sentence per sense) into groups according to the meaning of *tundma* in the sentence. It is generally presumed that sorting stimuli into groups reflects the conceptual distinctions made in the mind of the language users (e.g. Gibbs, Jr & Matlock, 2001; Sandra & Rice, 1995). Thus, a sorting task gives insights to how the polysemy structure of a verb is represented in the language user’s mind. The results show that the senses related to cognition formed a group that was distinct from the other senses. This suggests that these meanings form a conceptually coherent group within the structure of the polysemy.

The second task focused the type of knowledge that is expressed with *tundma* ‘to feel’. In addition to *tundma* ‘to feel’, knowledge can be expressed with a number of more abstract Estonian verbs like *teadma* ‘to know’ or *aru saama* ‘understand’. Examples 1 and 2 showcase two different sentences that would both be translated to English as “Kai knows Estonian plants”.

(1) Kai tunneb Eesti taimi.
Kai feel.3SG Estonia.GEN plant.PL.PART
Kai knows Estonian plants
Kai knows Estonian plants.

In Estonian, the first sentence expresses a deeper, more thorough knowledge of the plants than the second sentence. This is a tendency with the other cognition meanings of tundma ‘to feel’ as well. The second task aimed to find out whether the tundma-knowledge is perceived as being more “bodily” due to the polysemy of the verb, i.e. whether the tundma-knowledge is motivated by the physical perception. To this end, 70 participants completed a modified version of a Conceptual Feature Rating task (Troche, Crutch, & Reilly, 2014, 2017). Participants rated sentences on the cognitive dimensions of sensation, emotion, social interaction, time, mental activity, and action. Six cognition-related senses of tundma ‘to feel’ were each represented by 6 sentences. All of the sentences were paired with an equal abstract-verb sentence (e.g. 1 and 2 above). All participants thus rated 72 sentences altogether, the presentation order of the sentences was randomised. A significant difference was expected between the feel-sentences and the know-sentences within one dimension. For example, it was hypothesized that the feel-knowledge would be rated higher on the dimension of emotion than the know-knowledge.

Preliminary results show no significant difference between the two types of knowledge-sentences. There are a number of possible reasons for this. For example, it might be that randomising the order of sentences resulted in participants paying more attention to the broader context expressed by the sentence and a difference would have been visible in the case of a pairwise comparison of the sentences. A significant difference in the rating was only found across the senses, e.g. sentences expressing the sense “knowing someone thoroughly” were rated significantly higher on the dimension of emotion than sentences expressing the sense “knowing something thoroughly”.


The Modifier Effect with Unknown Subcategories

ELISA SCERRATI¹, JAMES A. HAMPTON²
(¹University of Modena and Reggio Emilia, Italy
²City, University of London, UK)

In everyday language, concept combination is a ubiquitous phenomenon. We are continually combining words into phrases and phrases into sentences in order to communicate our thoughts and intentions. A basic issue is how people successfully accomplish the building and understanding of larger structures of thought out of simpler components. Many answers have been put forward. For example, theories in philosophy and semantics respecting the principle of Compositionality such as Informational Atomism (Fodor & Lepore, 1996, 2002), Formal Semantics (Pelletier, 2017) or the Classical model of concepts (Osherson & Smith, 1981), assume that combinations such as feathered ravens simply refer to the intersection of the sets of things denoted by the two words. That is, feathered ravens refers to the set of things that are both feathered and ravens. A second class of theories, such as the Selective Modification model (Smith, Osherson, Rips & Keane, 1988) and the Composite Prototype model (Hampton, 1987; 1988) using frame or schema representations of concepts, posit that adding a modifier such as feathered to the head concept ravens alters the concept schema. That is, the modifier increases the weight of the relevant modified dimension (in this case Skin Covering) while decreasing the weight of the other unmodified dimensions (e.g., the Color dimension).

Such alteration of the head concept schema has been documented by a recent study on concept combination. Connolly, Fodor, Gleitman and Gleitman (2007) found that a generic property sentence normally considered true, such as ravens are black, is judged less likely to be true when the head noun is combined with a modifier. For example, statements such as feathered ravens are black (with a typical modifier), jungle ravens are black (with an atypical modifier), and young jungle ravens are black (with multiple atypical modifiers) were rated increasingly less likely to be true compared to the unmodified statement ravens are black. This reduction in perceived likelihood of generic properties for combined concepts has been termed the Modification or Modifier effect (Gagné & Spalding, 2011; Jönsson & Hampton, 2012). Interestingly, the Modifier effect also occurs for subcategories that are created not by modification but by using novel single-term concepts. For example, if told that brinns are a kind of bottle, brinns contain liquids is considered less likely than bottles contain liquids (Gagné & Spalding, 2014). Such evidence indicates that the effect is actually a consequence of subcategorisation rather than modification. Pragmatic reasoning might lead people to expect subcategories to be distinct from their superordinates, and hence to show lower likelihood of inheriting prototypical properties.
The current study aimed to explore this possibility. Experiment 1 compared truth likelihood judgments of statements about an unmodified familiar category (e.g., *ants live underground*) with an unmodified and unknown subcategory (e.g., *zaths are a kind of ant, zaths live underground*). In addition, Experiment 1 compared these two types of statements with added typical modifiers (e.g., *black ants live underground* versus *zaths are a kind of ant, black zaths live underground*). Adding a typical modifier should in this case increase the likelihood of zaths inheriting typical properties, if the effect is caused by semantic similarity. Experiment 2 further tested whether having an unknown subcategory is sufficient to fully depress likelihood ratings, or whether it is possible to depress likelihood further with an atypical or non-word modifier. If people feel unsure that *zaths live underground* because they only know that zaths are ants, they should not differentiate this sentence from a sentence such as *vaint zaths live underground*, since the same reasoning based on ignorance applies. However, a pragmatic intuition based on the distinctiveness of subcategories could produce a further reduction in likelihood. In both Experiments, participants were asked to indicate the likely truth of each sentence on a scale from 1 = very unlikely to 10 = very likely.

Data from both Experiments were analyzed using a Linear Mixed Model with subject and item as random factors. Results from Experiment 1 confirmed that novel subcategories like *zaths* are judged to have lower likelihood of possessing prototypical properties (e.g., *live underground*) than their categories (e.g., *ants*), replicating Gagné and Spalding (2014). In addition, adding a typical modifier (e.g., *black zaths*) did not improve the likelihood of those nonsense subcategories inheriting prototypical properties of the category. This finding indicates that the Modifier effect is not driven by semantic similarity as schema-based models would suggest. Results from Experiment 2 showed that modification with a nonsense word (*vaint zaths*) did further reduce judged likelihood of typical properties. Taken together these results suggest a pragmatic strategy underlies the Modifier effect, rather than anything involving the semantics of the concepts.

Our results show that adding a modifier to a novel subcategory has no effect if the modifier is typical, but has a negative effect on truth judgments if the modifier is also novel. Neither of these results fits with the prediction of a schema-based account of the effect, since the typical modifier should increase similarity to the parent concept (*ants*) while the addition of a nonsense modifier cannot change the similarity of the already novel subcategory to the parent concept.

As Gagné and Spalding (2011; 2014) argue, people are applying a pragmatic heuristic to their judgments, based on a meta-belief that subcategories are expected to be distinct from their superordinate category, and hence are judged less likely to possess prototypical properties of those categories. Each time a subcategory is formed (e.g. *ants > zaths > vaint zaths*) then confidence in the inheritance of default properties is reduced. The fact that *black zaths* were no different from *zaths* suggests that this heuristic can be moderated by the typicality of the modifier itself, as originally shown by Connolly et al. (2007).


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Processing correlates of action verb specificity

MARGIT SCHEIBEL
(Heinrich-Heine-Universität Düsseldorf)

Action verbs differ in whether their lexical meaning specifies how the action is carried out or leaves it unspecified. For example, the lexical meaning of the German verb *verzieren* (to ornament) denotes fairly unspecifically a process of decorating sth. with ornaments. The ornamenting process comes about an action of the agent, but the verb entails no precise information how the agent performs the action. In comparison, the German verb *besticken* (to embroider), denoting likewise a process of ornamenting sth., entails information how the agent creates the ornaments: he/she does decorative needlework.

Previous research on verb processing has given little attention to effects of semantic specificity. Findings from related research make two hypotheses conceivable on how semantic specificity could influence on-line verb processing. HYPOTHESIS 1: Semantic specificity is an instance of semantic complexity and should slow down verb processing (similar to effects reported in Gennari & Poeppel, 2003, where semantic complexity was manipulated in terms of event structure complexity). HYPOTHESIS 2: Semantic specificity allows one to represent the verb concept in multiple codes, including an image codes and/or stored action simulation in addition to the verbal code. Multiple-codings of a concept should facilitate meaning comprehension and speed up verb processing (cf. findings in Palazova et al., 2013; Marino et al., 2012).

The reasoning of the first hypothesis is that “more complex meanings (more entailed properties)” take longer to be processed because more semantic structure needs to be encoded, accessed and activated (Gennari & Poeppel, 2003:B29). Evidence for such a correlation between the complexity of the semantic structures and processing times is
provided by the study of Gennari & Poeppel (2003). They contrasted event verbs like build with stative verbs like love. According to Levin & Rappaport (2005), event verbs have a more complex semantic structure than stative verbs. They include a higher number of semantic components, e.g. CAUSE and CHANGE, and more sub-events. The findings of Gennari & Poeppel (2003) demonstrated that more time is required to process the complex semantic structure of event verbs (vs. simple structures of stative verbs) for both infinitives and finite verb forms. If the relevant point in semantic complexity is indeed that the semantic structure has “more entailed properties” (of any kind.), an increased number of method details should also elicit complexity effects, i.e. longer processing times, compared to structures with less method details.

The second hypothesis is mainly motivated by cognitive theories on language comprehension like the dual coding theory and embodied cognition theories. However, also some discussions in the theoretical semantic literature touched on an idea implicit in the cognitive approaches. For example Rapp (1997) argued – although in a different context – that action-specific verbs make the activity more prominent than action-unspecific verbs due to the increased information about the agent-specific manners of action. Higher prominence typically correlates with faster processing times, for example demonstrated by Levelt et al. (1978) who found faster processing times for verbs with a salient movement component compared to verbs with a less salient activity.

The dual coding theory argues that concrete concepts are represented by a verbal code and a non-verbal code, a mental image of the concept, whereas abstract concepts have only the verbal code (Paivio, 1986). The findings of Palazova et al. (2013) demonstrated that an additional image code can facilitate verb processing (faster RTs for concrete verbs than for abstract verbs). The imagery of concrete concepts makes two processing routes simultaneously available from a certain point in time during verb processing (semantic processing plus image-based processing). We expect that semantic specificity affects the concreteness of verb concepts and, thereby, the availability of an image code: specific verbs should allow for a precise mental image of the action, whereas unspecific verbs allow only for a vague image, if any.

Embodied cognition theories postulate that linguistic expressions have multimodal mental representations, potentially including representations in the perceptual, motor and emotional domain (e.g., Barsalou, 2008). For action-related concepts, one relevant modality is the sensorimotor domain. The involvement of sensorimotor areas in early stages of lexico-semantic processing of action verbs has been demonstrated by several studies (e.g., Kemmerer et al., 2008). Interestingly, the findings of van Dam et al. (2010) demonstrated that the neural responses in the motor area are stronger for specific than for unspecific action verbs. If a stronger activation in the motor system due to a more precise action simulation indeed facilitates verb comprehension, specific verbs should be processed faster than unspecific verbs due to their sensorimotor specificity.

We tested the two hypotheses on semantic specificity effects in two behavioral experiments. We investigated processing times of specific and unspecific German action verbs in isolated presentation (Exp. 1) and in contextual embedding (Exp. 2).

Experiment 1 (n subj=27, n items=48) investigated single-word processing times of specific and unspecific German action verbs, e.g., besticken (to embroider) vs. verzieren (to ornament), in a visual lexical decision task. Verb pairs were selected such that the specific verb semantically entails the action described by the corresponding unspecific verb. Only the specific verb specifies a concrete method by which the action is carried
out. Verb conditions did not differ significantly in other confounding variables (e.g., word length, lemma frequency, familiarity).

The results of experiment 1 revealed significantly longer response latencies for specific verbs (17 ms longer than for unspecific verbs, main effect in a likelihood ratio test of LME-models). The findings demonstrated first of all that verb specificity has indeed processing correlates. Furthermore, the findings indicated that processing correlates of semantic specificity resemble processing correlates of semantic complexity as found for event verbs. Thus, we argue in the same line. The longer processing times for specific verbs reflect that the encoding and activation of the semantic structure were costlier for specific verbs. Their semantic structure is more complex due to the increased method information compared to unspecific action verbs with almost no method information in the semantic structure.

In Experiment 2 (n subj=40, n items=24), short contexts with specific vs. unspecific German action verbs were presented for self-paced reading (word-by-word in a stationary window), see example (1). The short contexts were identical for both verb conditions except for the critical action verb in the first sentence. The agent of the action was always named initially by a proper name and continued as agent.

(1)  *Jasper* bestickt | verziert das Sofakissen. Er hat dafür ein edles Design entworfen. (*Jasper* is embroidering | ornamenting the scatter cushion. *He has created a fancy design for it.*)

The results of experiment 2 revealed that processing correlates of verb specificity go into reverse when verbs were embedded in sentences. We found a trend for shorter processing times for specific verbs compared to unspecific verbs (slightly shorter for low frequent verbs, about 30 ms shorter for high frequent verbs, p=.08). The results suggested that additional non-verbal codes are part of the mental representation of specific verbs, in line with embodied approaches. Additional codes can facilitate verb comprehension, at least when the verbs are processed in their sentential position.

We will discuss the different findings in the two experiments as a reflection of the contextual influence on verb processing. In experiment 2, the specific verbs were encountered after reading a nominal phrase very likely denoting the agent of the action. Knowledge about the agent at the time when specific verbs were processed enables the reader to apply the agent-specific method information immediately to the agent representation. Thereby, agent and action representation become densely connected; this might immediately enhance the imagery and simulation of the action and boost the activation of the non-verbal codes. In contrast, in experiment 1, the activation of mental images and sensorimotor codes were neither boosted nor especially required by the task. The verbs were presented as neutral infinitives and no information about event participants was available. As a result, the image and sensorimotor codes of specific verbs might be, if at all, weakly activated during verb processing. Thus, verb comprehension was presumably mainly based on the verbal code of the verbs.

In sum, the findings of our two experiments provided evidence that verb specificity has processing correlates in on-line comprehension. The results suggested that semantic specificity of action verbs as such is a type of semantic complexity correlating with longer processing times, but as soon as image and/or sensorimotor codes of specific verbs become salient, verb processing seems to benefit from semantic specificity.
KATRIN SCHULZ  
(ILLC, University of Amsterdam)

This project combines recent research in linguistics, logic and psychology on the topic of counterfactual reasoning. Here, we are particularly interested in backtracking. Backtracking counterfactuals ask us to reason backward in time, as in (1).

(1) If the pavement had been wet, it would have rained last night.

The prominent approaches towards the meaning of counterfactuals are all based on the idea that in order to evaluate a counterfactual, we have to change the course of history just slightly before the antecedent became false, make the antecedent true and then run the natural course of events and check whether the consequent becomes true as well [Lewis 1979, Pearl 2013]. Such approaches predict (1) to be false. But various philosophers and linguists observe that sometimes backtracking seem intuitively acceptable [Arregui 2005, Lewis 1979]. The goal of this paper is to account for backtracking, but also explain the intuition driving the standard approach.

**Backtracking**. Recently, a number of interesting empirical studies on backtracking were published. Sloman & Lagnado (2005) confirm that people rarely backtrack. However, Rips & Edwards (2013) observe in very similar settings a frequent occurrence of backtracking. Trying to account for these different findings Gerstenberg et al. (2013) observe that the studies (Sloman & Lagnado, 2005) and (Rips & Edwards 2013) present their questions to the participants in a different order. Both studies use a scenario (Figure 1) with 4 propositional variables A, B, C and D, where the truth of A causes B and C to be true and that, in turn, causes D to be true (see the equations in Figure 1). The participants were told that A, B, C and D are all true and then were asked to consider what would have been the case, if B hadn't been true. The study (Sloman & Lagnado, 2005)
asks the participants first whether D would hold, if B was false, and then turns to A. The study (Rips & Edwards 2013), on the other hand, asks about the consequences on A, C and D at the same time, but the order of the questions on the screen invites the participants to first consider A before they turn to C and D. In this case backtracking occurs frequently. Gerstenberg et al. (2013) empirically confirm this dependency of backtracking on the order of questions.

The picture emerging from these results is that given the right setting of the context, backtracking is possible. The crucial contextual parameter on which backtracking depends seems to be what the interpreter is paying attention to, and that changes dynamically in discourse. Backtracking is only available, if the attention is explicitly drawn to the causal past of the antecedent.

The Proposal. We propose that the interpretation of counterfactuals doesn't involve a change in the course of history, whether by intervention (Pearl 2013), miracle (Lewis 1979) or other means. Instead, a counterfactual is always interpreted with respect to a submodel of the full set of causal laws. This submodel normally doesn't contain the causal history of the antecedent. Therefore, normally backtracking doesn't occur. Thus, the forward-looking orientation of counterfactuals is not due to cutting off the causal history of the antecedent, but due to a tendency to ignore it. This perspective allows us to account for backtracking, in case the attention is explicitly drawn to the causal history of the antecedent. Furthermore, by allowing the relevant submodel to grow in a counterfactual discourse (similar to von Fintel, 2001), we can capture the dynamic effects reported above.

This approach can be spelled out using a dynamic version of the causal network approach (Pearl, 2013). It correctly predicts the observations of Sloman & Lagnado (2005), Rips & Edwards (2013) and Gerstenberg et al. (2013) concerning Figure 1: if the interpreter first evaluates whether A would be the case, then C, then D, backtracking occurs and A is predicted to be false. However, if the interpreter considers first whether D would be the case, then considers C, and finally turns her attention to A, backtracking does not occur.

Testing. At the moment we are running an empirical study testing the proposal, using a setting that involves indirect backtracking (Figure 2). In this example A causes B and B prevents A from causing C as well. The truth/acceptability of the counterfactual (2) in Figure 2 changes depending on whether the interpreter backtracks from ¬B to ¬A or holds the truth of A fixed. We predict that even though interpreting (2) involves A, this doesn't draw attention to A as the cause of B. Therefore, no backtracking occurs and (2) should be judged true. This prediction was confirmed (66% of the participants judged (2) true). Furthermore, we predict an order effect: if asked first about the truth of (2) and
then about (3), backtracking should be out and (3) judged false. But asking first about (3) should make backtracking possible. The order, however, did turn out to have a significant effect on the possibility of backtracking. In our setting backtracking occurred much less frequent than observed in Rips & Edwards (2013).


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**Stochastic Frames: Motivations, applications, and challenges**

**ANNAKA SCHUSTER, CORINA STRÖSSNER, PETER SUTTON & HENK ZEEVAT**

(Heinrich Heine University Düsseldorf)

For several years now, frames in the style of Barsalou (1992) have been widely used in many branches of cognitive science. Frames are recursive attribute value structures, i.e. they represent properties as a combination of a function, e.g. means of locomotion, and an appropriate value, e.g. legs. Constraints can be used to express the fact that values of different attributes are related, e.g. wings as means of locomotion support flying as mode of locomotion. While applying frames, the authors independently developed a combination of frames and probabilistic modelling for their specific research purposes. The talk explores the general notion of stochastic frames and discusses three applications of stochastic frames: modification, prototype theory and lexical disambiguation.

**Defining stochastic frames**

The functionality of attributes makes it possible to make their range a probability distribution over values rather than a particular value, yielding a form of stochastic frame. Leg length, for example, yields a bell-shaped probability distribution on length, which particular figures depend on whose legs one talks about, e.g. cats’ or persons’. Within this framework, it is possible to express, refine and extend Barsalou’s initial idea of constraints (relations between the values of different attributes) as probabilistic constraints, e.g., informational links between values represented using conditional probabilities. For example, updating the value for a profession attribute with basketball player, may propagate information throughout the person’s frame leading to updates of other values (plausibly, an increased estimation of height, for instance). More generally, by switching to joint probability distributions over different nodes one gets a grasp on the full picture of relational constraints between the values of different nodes.

**Applications**

We argue for the benefits of applying stochastic frames in three areas:
a) Adjectival modification
Frame theory can explain how modifiers act on a particular value. Stochastic frame theory can furthermore represent the intrinsic blurriness associated with vague, gradable adjectives (a property shared with other probabilistic approaches e.g., Lassiter 2011, Egré 2017), and, due to constraints, can shift the probability distribution of other values as well. For example, a predication of bald can increase the probability of being male. Note that previous models like the selective modification model by Smith et al. (1988) don’t represent such constraints. Stochastic frames can also provide structured representations of comparison classes yielding a compositional analysis for complex APs such as tall for a basketball player derived from a composition of [tall] with a basketball player frame.

b) Prototype theory
The prototype theory of concepts, e.g. Rosch & Mervis (1975), explains the empirically confirmed typicality gradient of common-sense categories with the proximity of category members to a category’s so-called prototype. Different specifications of prototypes have been discussed. With stochastic prototype frames we propose a quantification of the prototype in terms of attribute values’ probabilities to be found in categories. We will show how a comparison of the probability distributions of values, both of the category as a whole and of its category members, provides us with a measure of typicality based on subjective probabilities.

c) Lexical disambiguation
Stochastic frames can also represent constraints between thematic roles thus giving us a handle on lexical disambiguation (cf. Zeevat et al. 2017). For example, that, for the verb break, an instrument PP (e.g., with a hammer) necessitates the provision of an agent (e.g., Sam) and blocks the provision of an inanimate causer. This, we argue, can explain the contrast between, With a hammer, Sam broke the window, and #With a hammer, a stone broke the window. We can thus illustrate ambiguous verbal concepts by using probabilities to represent distributions over thematic role signatures.

In each application, we argue that combining probability theory with frames yields the ability to represent tendentious belief, constraints between values and plausibility reasoning with them. We also argue that the stochastic enrichment of frames is warranted by the need to represent gradability, informational update, contingency and underspecification that applications (a)-(c) require. The specific required structure varies considerably with the specific application, however. This raises the question what, if any, is the correct notion of stochastic frame that would fit to all of our and other possible applications.

General problems of stochastic frames
Finally, we consider the challenges that arise for stochastic frames. First, we consider whether they can be sufficiently constrained, given that there are potentially infinitely many stochastic frames around any given classical frame. The second foundational
question that is addressed is the question of the origin of the stochastic information associated with a stochastic frame and the closely related problem how different subjects can share sufficiently similar stochastic frames – which seems to be a prerequisite for successful communication. Various roads are sketched that may lead to a solution.


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**Is the modifier effect explained by rational reasoning?**

**CORINA STRÖßNER & GERHARD SCHURZ**

(Heinrich Heine University Düsseldorf)

The perceived likelihood of a prototypical property in a noun category is diminished if the noun is modified. This modifier effect has been first demonstrated by Connolly et al. (2007). Table 1 gives an overview of their findings. The effect was replicated in many other studies (Gagné and Spalding 2011, 2014; Hampton et al. 2011; Jönsson and Hampton 2012) but is still not fully understood. In an experimental study we investigated whether the modifier effect is explainable by a rational reasoning model.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Example</th>
<th>Mean rating [0.95 CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No modifier</td>
<td>Ravens are black.</td>
</tr>
<tr>
<td>B</td>
<td>Typical modifier</td>
<td>Feathered ravens are black.</td>
</tr>
<tr>
<td>C</td>
<td>Atypical modifier</td>
<td>Jungle ravens are black.</td>
</tr>
<tr>
<td>D</td>
<td>Two atypical modifiers</td>
<td>Young jungle ravens are black.</td>
</tr>
</tbody>
</table>

*Table 3 Study from Connolly et al. (2007): Each of 40 participants rated one of the four conditions for one item on a scale from 1 (very unlikely) to 10 (very likely).*

If people handle modifications rationally, the change in likelihood after the addition of a modifier should be predictable from two variables:

1. The rated relevance of the modifier: Modifiers that are rated as positively or negatively relevant should obviously change the rated likelihood in the respective direction.

2. The rated likelihood of the modifier: For a category C, a modifier M and a typical property T it holds: $P(-T) \leq P(-T)/P(M)$. A very likely modifier M barely increase the probability of $-T$. Thus, it does not decrease the probability of T very much.
We carried out four experiments to test this rational model.
   a. Subjects rated the likelihood of (A) unmodified sentences, (B) typically modified sentences, (C) atypically modified sentences, and (D) sentences with a second atypical modifier on a scale from 0 to 10.
   b. Subjects rated the likelihood of the typical property for the same modifiers and noun categories as in experiment a and on the same scale.
   c. Subjects rated the likelihood of the modifiers for the head nouns on a five-point Likert scale from -2 (very unlikely) to +2 (very likely).
   d. Subjects rated whether the modifiers have a positive or negative relevance for their belief that the prototypical properties holds. We used a five-point Likert scale from -2 (much less believed) to +2 (much more believed) with a neutral 0 (irrelevant).

The study was constructed such that the overall 196 subjects first participated either in experiment a (89) or in experiment b (107), proceeded to experiment c and finally participated in experiment d.

The graphics in figure 1 give an overview of the rating for the 12 items in the respective conditions. We found considerable modifier effects in experiment a and b, but the modifiers were barely rated as relevant in experiment d. This tells us that the subjects’ auto-epistemic judgements were in contradiction to their own answers. There was a notable exception for item 5 - “Hamsters live in cages” (A) and “Pet hamsters live in cages” (B) - where the modified statement was judged to be much more likely. This was also the only modifier which was clearly judged as relevant. We finally looked for correlations between the modifier effect (calculated as B-A, C-A, and D-C) and the likelihood and relevance rating of the modifier. The correlations between the mean modifier effect and mean modifier likelihood was $r = 0.47$ ($p = 0.004$) and between mean modifier effect and mean modifier likelihood it was even $r = 0.74$ ($p < 0.001$). But this high correlations at the level of the mean ratings did not correspond to high correlations between the modifications when measured within the subjects. For example, the mean $r$ value was only $0.17 \ [0.15,0.20]$ between modifier effect and modifier likelihood and $0.27 \ [0.24,0.30]$ between modifier effect and modifier relevance. We argue that the decreased likelihood ratings stem from subconscious pragmatic effects with a high degree of individual variability. Averaging over individual variations amplifies the effect of those components on which subjects agree, like known relevance, leading to a wisdom of the crowd effect.
Figure 16: Results of our experiment


Abstracts

Tall – tall and not tall – neither tall nor not tall

PETER R. SUTTON
(Heinrich Heine University, Düsseldorf)

Introduction
Vague, relative gradable, adjectives such as tall, and fast admit of borderline cases and studies have found that, in these borderline regions, speakers tend to utter BORDERLINE CONTRADICTIONS (BCs) such as this one is tall and not tall or this one is neither tall nor not tall (Ripley, 2011; Alxatib and Pelletier, 2011; Serchuk et al., 2011; Egré et al., 2013). Given the evidence of the naturalness of such assertions, theories of vagueness ought not to require that all speakers who utter BCs are irrational. Indeed, such utterances are often, pre-theoretically, clear and informative as opposed to absurd. Nonetheless, even in borderline cases, one can still understand BCs in another sense, as actual contradictions. The challenge, then, is to satisfy our intuitions that, in borderline cases, statements of the form φ and not-φ and neither φ nor not-φ can be perfectly felicitous in some sense, but contradictory in another. The probabilistic frame-based analysis presented in this paper takes on this challenge.

Background
Classical logic-based theories of vagueness can easily capture the absurdity of contradictions, but struggle to model non-absurd uses of BCs. Some non-classical theories such as intensional fuzzy logic (Alxatib et al. 2013), can capture the non-absurd uses (borderline contradictions can be completely true), but then struggle to capture the absurd uses. Supervaluationism (which has truth value gaps) and subvaluationism (which has truth value gluts) can both model the classical interpretation since classical theorems are true on all super- or sub-valuations. When a proposition φ is neither true on all precisifications, nor false on all precisifications, due to truth value gaps, supervaluationism can also make sense of statements like φ is neither true nor false, but subvaluationism cannot. However, in the same situation, due to truth value gluts, subvaluationism can make sense of statements like φ is both true and false, but supervaluationism cannot. Indeed, no current theory can entirely satisfy our intuitions that all BCs with relative gradable adjectives can be both in some sense felicitous and in some other sense absurd.

Analysis with probabilistic frames
Frames are recursive attribute-value structures (the value-space of an attribute can be the range for a further attribute) (amo, Petersen 2015; Löbner 2014). Probabilistic frames lift value spaces to probability distributions over possible values.

Probabilistic frames offer two means of combining information from connectives (and, or) and negation. For tall, for instance, one means of combination, which yields the classical, absurd reading, combines inconsistent assignments for the TALL attribute. The second mode of combination, which yields the non-absurd reading, combines information about the value for the HEIGHT attribute. For example, if expected heights of individuals are represented as probability distributions over heights, then tall and not tall can also be interpreted as an instruction to combine the distributions over heights for tall and for not tall which results in a mean value centred around those heights considered to be borderline for tall.
A schematic partial probabilistic frame is given in Figure 1. It has a central node (double ringed), and somewhere in the frame, a height attribute the value of which is a probability density function over heights. The interpretation of tall requires a frame, like the one in Figure 2, with a path \( \langle \text{HEIGHT}, V \rangle \) where \( V \) is probability density function over heights. [[tall]] then modifies this function (by shifting the mean upwards and decreasing the standard deviation), and also adds a TALL attribute, a function from an individual and a height to a Boolean value (the possibility of including Boolean values in frames is raised in Löbner 2017). This is shown in Figure 2 (grey). (The Boolean value may also be sensitive to an uncertain threshold defined in terms of the cumulative probability for the height distribution, not represented here). In contrast, not tall (Figure 2 (black)) shifts expectations for heights downwards.

**Figure 1: Partial frame for a common noun concept: something with a height**

**Figure 2: Modification of the frame in Figure 1 with tall (grey), not tall (black) and tall and not tall (on the non-absurd reading, dashed)**

Utterances such as tall and not tall or neither tall nor not tall can then be interpreted in one of two ways. (i) As an actual contradiction where the value for TALL is an inconsistent Boolean assignment. This gives the absurd reading. Or (ii) As an instruction to combine the distributions for heights, yielding a height expectation centred around val-
ues which are borderline for *tall* and borderline for *not tall* (Figure 2 (dashed)). Something which can be evaluated as true if the individual is close to the borderline. This gives the non-absurd reading.

**Sketching an extension to absolute gradable adjectives**

In contrast to the open scales of relative gradable adjectives such as *tall*, absolute gradable adjectives (e.g. *full*, *dirty*, and *pure*) reflect a scale structure that is either upper closed (*pure*), lower closed (*dirty*) or fully closed (*full*) (Kennedy & McNally 1999). Furthermore, BCs are degraded for absolute gradable adjectives:

1. ??Neither full nor not full/dirty nor not dirty/pure nor not pure.
2. ??Both full and not full/dirty and not dirty/pure and not pure.

This data is captured by applying the above model wherein frame nodes record probability distributions over degrees of, e.g., purity, cleanliness etc. As an example, *pure* will be a constant function from any distribution over degrees of purity to a distribution that assigns the absolute degree of purity a probability of 1. If the graph for *not pure* assigns the same point a probability of 0, then I will show how the same means of combining *tall and not tall* above can yield the right results for, e.g., *pure and not pure*. However, this leaves a complication in delivering a uniform interpretation of negation for relative and absolute gradable adjectives insofar as it must be sensitive to whether the input distribution is over a single discrete point on a scale or over the whole scale.

**Summary**

Probabilistic frames give us the means to see BCs from two perspectives, either as a contradictory combination of statements with incompatible Boolean values, or as an update on expectations for, e.g., heights such that the referred to individual is predicates to be a borderline case. This approach, I argue, has advantages over purely logical approaches such as fuzzy logic, subvaluationism and supervaluationism, and it can be extended to cover absolute adjectives and explain why they resist BCs.

**References**


Inheritance Inference from an Ecological Perspective

PAUL D. THORN & GERHARD SCHURZ
(Heinrich Heine University Düsseldorf)

In this talk, we present results from a simulation-based study of inheritance inference. The study investigates the predictive efficiency of prototype frames when they are used as the basis for default inheritance (with attention given to both the quantity and reliability of inheritance inferences in the case when prototype frames are used to specify acceptable classes). More generally, the study investigates whether (and how) the performance of default inheritance varies, depending on the criteria that are used in selecting the classes that serve as the basis for inheritance inference.

In executing an inheritance inference, one reasons from a premise stating that a given property is ‘typical’ among a class of individuals, and concludes that the property is typical among a subclass of the class:

Property \( \varphi \) is typical among the members of class \( C \).

\( SC \) is a subclass of \( C \).

\[ \varphi \text{ is typical among } SC. \]

Within our study, the reliability of an inference type is identified with the inference type’s tendency to deliver true conclusions, given true premises. In order to make such reliability claims in the case of inheritance inference, we settle on a straightforward semantics for typicality claims: We say that a property is “typical” of a class (or subclass) if and only if the relative frequency of the property among the class (or subclass) meets or exceeds a given bound \( r \). As seen in Figure 1, we considered different values for \( r \) in our study.

One approach to inheritance inference (typical in the field of non-monotonic reasoning) proceeds by treating any atomic property as determining an acceptable class. A second approach (which had previously not been considered in the context of inheritance inference) identifies acceptable classes with the cells of a partition (of size \( k \)) of the domain that satisfies the condition of maximizing the similarity of objects that are assigned to the same class, using \( k \)-means clustering. This method (\( k \)-means clustering) associates each class with a tuple consisting of the mean property values of its members (a so-called “centroid”), which serves as a prototype for the class. Such classes correspond to a range of prototype frames that partition a domain into convex regions of an \( n \)-dimensional quality space, thereby corresponding to concepts in a conceptual space, in the sense of Gärdenfors (2004). As seen in Figure 2, we considered different values for \( k \) in our study.

A further goal of the study is to address whether inheritance inference is reliable in the case of ‘exceptional subclasses’. In cases where the following propositions are true of \( SC, C, \) and \( \psi \), we say that \( SC \) is an exceptional subclass of \( C \), with respect to (the property) \( \psi \):

Property \( \varphi \) is typical among the members of class \( C \).

\( SC \) is a subclass of \( C \).

\( \varphi \text{ is typical among } SC. \)

\[ \psi \text{ is exceptional among } SC. \]
ψ is typical among C.
SC is a subclass of C.
ψ is not typical among SC.

Figures 1 and 2 illustrate some results of our simulations. Each bar represents mean values for 10,000 randomly generated environments. For both figures, error rates are the relative frequency of cases not satisfying the ‘conclusion condition’ for an inheritance inference among the cases that satisfy the ‘premise conditions’.

Figure 1: Error Rate as a Function of Typicality Bound r (with $k = 8$)

Figure 2: Error Rate as a Function of Number of Cluster Classes $k$ (with $r = 0.9$)
As illustrated by Figures 1 and 2, our study shows that default inference based upon (a particular type of) prototype-based classes is far more reliable than inheritance inference based on atomic properties. The two approaches also produce different results in the case of exceptional subclasses (i.e., subclasses that fail to inherit a property that is typical of their superclass): In the case of exceptional subclasses, inheritance inference based upon atomic properties is horrendously unreliable. Conversely, inheritance inference based upon prototype-based classes generally suffers only a small decrease in reliability, in the case of exceptional subclasses. The results of the study address a long-running debate in the field of non-monotonic reasoning, concerning whether inheritance inference is reasonable in the case of exceptional subclasses: The matter depends upon the criteria used in selecting acceptable classes!

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**Feelings of Understanding and Dependability:**
Metacognitive Beliefs about Concepts

SAPPHIRA R. THORNE¹, JAMES QUILTY-DUNN², JOULIA SMORTCHKOVA², NICHOLAS SHEA², & JAMES A. HAMPTON¹

¹City, University of London, UK, ²Institute of Philosophy, University of London, UK, ³University of Oxford, UK

Concepts are tools for thinking. Like tools, concepts may be selected that are more or less suitable for purpose (e.g., learning, reasoning, and categorization), and people may possess metacognitive beliefs about this suitability of their concepts. In four studies, we aimed to investigate whether people can make a metacognitive assessment of the suitability of different concepts, and if the use of a concept is accompanied, either implicitly or explicitly, by some kind of assessment of confidence in the concept.

In these studies, we distinguish between two ways that a concept might be more or less suitable (Shea, in press). First, there is the individual’s own grasp of the concept. Concept-users might make an assessment of how much knowledge they have for a given concept, or a ‘feeling of understanding’ (FoU) of a concept. A second construct of assessment is inherent in the category itself. Some categories are more informative than others, allow for levels of expertise, and support many inductions. Variability on this construct may encourage a feeling in the concept-user of reliability and legitimacy surrounding the concept, or a ‘feeling of dependability’ (FoD) of the concept. Concept users might register these two broad kinds of concept suitability separately.

To begin studying this new area, we wanted first to see whether people do indeed make reliable metacognitive assessments of their concepts, and to explore how these metacognitive beliefs may be structured. In Studies 1 and 2 we explored the structure of the metacognitive assessments that people may make about their concepts, drawing inspiration from the method used by Haslam, Rothschild, and Ernst (2000) to study how essentialist beliefs are structured. We hypothesized that FoU and FoD would emerge as reliable metacognitive beliefs that people hold about concepts.

In our first study participants (N = 399) rated 40 category items from each of four different category domains (‘people’, ‘recreational activities’, ‘health conditions’, and ‘plants and animals’) on one of eight dimensions, selected to operationalise the elements associated with the metacognitive constructs of FoU and FoD. A Principal Components Analysis (PCA), with a varimax rotation, largely confirmed our predictions, revealing

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the existence of two underlying components representing the two distinct but related metacognitive constructs we predicted. Whilst the structure of FoU was consistent across domains, the structure of FoD was less clear across the four domains. In social domains (i.e., ‘people’ and ‘recreational activities’), there emerged a clear two factor solution which did not emerge in more biological domains (i.e., ‘health conditions’ and ‘plants and animals’). These results provide some evidence that FoD is less about an individual concept-user, but exists inherently in the concept itself. For Study 1 we selected categories that seemed likely to vary in dependability (e.g., Irritable Bowel syndrome vs. Sneezing) or understanding (e.g., Headache vs. Glaucoma) As such, we decided to explore whether the factorial structure in Study 1 would be replicated amongst familiar and high-frequency concepts. Accordingly, Study 2 (N = 404) was conducted using categories used in previous work on concepts (Hampton & Gardiner, 1983). We drew concepts from four different category domains (‘sports’, ‘fruits and vegetables’, ‘clothing’ and ‘furniture’). Again, the structure of FoU was consistent across domains but FoD exhibited a much less clear pattern, with substantial differences in structure across domains. The factorial structure of social (i.e., ‘sports’) and biological categories (i.e., ‘fruits and vegetables’) replicated that of Study 1, supporting our conclusion that FoD arises from the category domain and is structured distinctly depending on the nature of the concept.

In the final two studies we explore how these metacognitive constructs are used in inductive reasoning when using singular (Study 3) and multiple categories (Study 4). As FoD picks up on the abilities of the concept to support induction, it should be related to people’s inductive judgements. In these two studies we extended our understanding of these metacognitive constructs about concepts and tested the hypothesis that the degree of FoD of a category influences the extent to which one category will be used over another in property inference. Study 3 (N = 123) demonstrated that when presented with a proposition that three members of a category were found to have a particular characteristic, people are more likely to predict that another category member has the same characteristic when the concept is rated as high in FoD (b = 1.14, p = .03). Category domain was also found to significantly predict inductive judgements (b = 10.63, p <.001), providing further evidence for FoD’s position as inherent in the category itself. Study 4 (N = 121) demonstrated that when concepts high and low in FoD are pitted against each other, high FoD categories (M = 66%) are selected and used as the basis of inference more often than low FoD categories (t (51) = 7.85, p <.001). Participants also indicated a higher level of confidence when they chose the category higher in FoD (t (50) = 3.60, p = .001). We conclude that both FoU and FoD are meaningful metacognitive constructs that apply to the use of concepts. These results have implications for the ways in which concepts are used, understood, and communicated in different domains. The role of FoU and FoD as metacognitive constructs about concepts will be discussed.

The idea that phonetic detail is part of lexical representation is controversial, even as evidence in favor of this view accumulates (Ben Hedia & Plag, 2017; Ernestus & Baayen, 2007). Some would place phonetics outside of grammar (Hale & Reiss, 2000), whereas other argue that it is integrated in, but separate from phonology (Flemming, 2001, 2013). We present evidence form the phonetic properties of Hungarian transparent vowels, which shows that phonetic detail is part of phonological knowledge. We will model our result in a frame enriched which a probabilistic type signature. This type signature allows speakers to extend phonetic information in their phonological representations to novel instances.

Hungarian has backness harmony, which means that the backness of the final vowel of the stem determines the backness of suffix vowels. The front non-low vowels [i:, i, e:], however, are often accompanied by front voweled suffixes, but in some, lexically determined cases, by back suffixes. These vowels are called transparent vowels (Törkenczy, 2016; Törkenczy, 2011).

Benus & Gafos (2007) found that transparent vowels in unsuffixed words are more front when they are followed by front suffixes in other word forms in the paradigm, than in unsuffixed words that are followed by back suffixes in other word forms in the paradigm. Their findings are based on articulatory data gained from three speakers. These findings contrast with the ones reported in Blaho & Szeredi (2013). They measured the acoustics of transparent vowels and found no differences between the backness of vowels that are followed by suffixes with front vowels or back vowels in other words in the paradigm. They used a particular set of transparent vowels, namely vacillating vowels, which are vowels that are variously followed by front or back vowels.

We measured the acoustic properties of transparent vowels in monosyllabic words. 21 Hungarians were asked to silently read a sentence in which an inflected, existing monosyllabic word or a phonotactically legal nonsense word occurred. In the next sentence this word or nonsense word occurred uninflected and they were asked to pronounce this uninflected variant. We then measured the formants of the transparent vowel. We calculated the F2 - F1 and used it as a predictor, because it is a measure of backness of a vowel (Reetz & Jongman, 2011). The smaller the F2-F1 the more back a vowel. We calculated a mixed effects model for each vowel. The models showed that there is a significant difference in the F2 - F1 for the transparent vowel [i], but and a marginally significant effect for type of item (word versus nonsense word). The effects show that [i] is lower when followed by back vowels elsewhere in the paradigm. This result is illustrated in figure 1. The effects for the other vowels are not significant, but they show that for [i:] is numerically more back for back vowels than [e:] is. The direction of our effects is similar as reported in (Benus & Gafos, 2007). The fact that we found only a significant effect for short [i] is not surprising, since it is different phonetically different in that it shows a greater amount of variation than long [i:] and long [e:] (Mády & Reichel, 2007).
Figure 1: Hungarian transparent [i] in unsuffixed monosyllabic items.

We interpret this as a paradigmatic coarticulation effect. The articulation of a transparent vowel in a monosyllabic words is affected by the backness of the vowel in its affixed variants. This effect makes sense when it is assumed that words that form a paradigm are stored together in one representational unit the mental lexicon and that complex words are stored as wholes (perhaps in addition to storage of stem and affixes.)

This paradigm is stored as a frame (Löbner, 2014; Petersen & Gamerschlag, 2014; van de Vijver & Baer-Henney, 2018; Sutton & Taylor, 2017) as illustrated in figure 2. The value of the attribute of the transparent vowel of the unsuffixed word are constrained by a type signature that is determined by the range of formant values of the suffixed words in the paradigm. This distribution is used by the user to make predictions about novel items (Sutton & Taylor, 2017).

Phonetic detail is represented in this frame as a type signature. It needs to be represented for the following reason: In a complex word the suffix affects the articulation of a transparent vowel in the stem and this, in turn, affects the articulation of the transparent vowel in an unsuffixed word. As the fronting of transparent vowels is not phonemic Benus & Gafos (2007); Törkenczy (2016); Törkenczy (2011), but is nevertheless systematically present in our acoustic data, speakers know how to systematically differentiate between the the two types of transparent vowels. The acoustic targets of the vowels are a range of formant values, and, for each articulation the speakers have to sample from this range.
We have shown that phonetic detail is a systematic feature of the articulation of transparent vowels in Hungarian and have proposed a representation. By doing this we contribute to our understanding of cognitive representations in the interaction between morphology, phonology and phonetics.

References
Back in the early 70s, some psychologists started discussing focal colors (Heider, 1971; Heider, 1972; Rosch, 1975). They analyzed prototypes of real-world concepts by utilizing both images and words (Labov, 1973; Rosch, 1973). One experiment in Rosch and Mervis’ typology study (1975) asked the subjects to identify the most typical kind of birds in the category of BIRD; another test in the same paper asked the subjects to choose pictures that would fit a specific class the most. In recent years, linguists have been trying to combine language with different modalities – such as images, gesture, videos, and music (see O’halloran, 2011) – to explore human communication. However, studies of multimodality focus mainly on situations where distinct modes occur simultaneously or with some minor delay (e.g. Müller et al., 2009).

The current research centers on using different modalities to semantically frame (Fillmore, 2006) two elusively defined concepts of smell. Based on the design of Rosch and Mervis’ 1975 experiments, this study aims to uncover possible prototypes of olfactory word meanings. Two Mandarin words, xiangwei 香味 (fragrance) and chouwei 臭味 (stink), are selected because of their lack of real-world referents. These words’ ambiguity in nature is a great example to test the power of multimodal tools. Also, unlike the aforementioned previous studies of multimodality, which focused on simultaneous data, this study analyzed word senses of the two olfactory words under two modalities, utterance and drawing, non-simultaneously. We hope to know if, in different modalities, participants’ elicited responses would differ when they describe the same word concepts, and determine if this method can serve as an alternative for the inquiry of word meanings.

The experiment consists of two tasks. Two groups of participants are assigned to the concept either chouwei 臭味 (stink) or xiangwei 香味 (fragrance). In the first part, the Association Task, subjects are asked to write down ten keywords regarding one of the two concepts. Then, during the Drawing Task, they are instructed to draw their first impression prompted by that olfactory word. In this part, different components of each drawing and their functions are analyzed as Table 1.

Two groups of native speakers of Taiwan Mandarin participated in the current experiment. For both xiangwei 香味 (fragrance) and chouwei 臭味 (stink), participants consisted of 6 females and 5 males for each of them. The subjects in xiangwei 香味 (fragrance) had an average age of 23.45 and a standard deviation of 2.23. Their counterparts in chouwei 臭味 (stink) had an average age of 24.363 years old and a standard deviation of 3.023.

There are some minor differences between the verbal and drawing tasks. The results of this study show that speakers’ prototypes of smell come from their everyday experiences. According to the Association Task, the concept of xiangwei 香味 (fragrance) is often connected with Aromatic Products (e.g. 香水 Perfume), Plants (e.g. 花 Flower), and Eating Culture (e.g. 臭豆腐 Stinky Tofu). These similar patterns can also be found in the second task, the Drawing Task. Yet, there are still some differences. Aromatic
Products are most frequently used to verbally describe *xiangwei* 香味 (fragrance), while the most commonly shown objects in their drawings are Food. On the other hand, the result of *chouwei* 臭味 (Stink) in both tasks suggests a tight connection with Body Waste. Still, they are not entirely the same like the last olfactory concept. In the verbal task, 屎 Feces, 尿 Urine, and 汗 Sweat appears most often. And in their drawings, only 屎 Feces can be found.

One very intriguing result is the case of 臭豆腐 Stinky Tofu, an iconic food in Taiwanese culture. 臭豆腐 Stinky Tofu, appears in both *xiangwei* 香味 (fragrance) and *chouwei* 臭味 (stink) in the Association Task. That is, this traditional Taiwanese food is regarded as good and bad smell at the same time. One possible explanation of this is the factor that this local cuisine is both prestigious and prevalent. Therefore, Taiwanese are very familiar with this cuisine’s smelliness yet also very proud of it. This neutralizes the food’s badness judgment even though it contains a very strong judgment element, 臭 Stinky, in its character. However, the frequency of the usages and experiences has allowed the possibility of positive interpretation.

For the drawings from the Drawing Task, they have been analyzed and categorized as Main Character or Supportive Character according to subject’s description (see Table 1). The frequency of different characters is then used to determine the core ideas of the two olfactory concepts. For instance, while the food is served on a plate, it will be considered as good in smell.

Here is an example drawing from one of the subjects in *xiangwei* 香味 (fragrance):
OBJECT

<table>
<thead>
<tr>
<th>Main Character</th>
<th>STEAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supportive Character</td>
<td>STEAM, PLATE, VEG(ETABLE), SOUP</td>
</tr>
</tbody>
</table>

FEATURE

1. STEAK * lined [grilled]
2. STEAM * number of lines (3, 5) [hot, good smell]
3. PLATE * holder, below STEAK [served -> restaurant]
4. VEG * small, beside STEAK [additional]
5. SOUP * small [additional]

STATUS

<table>
<thead>
<tr>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. grilled</td>
</tr>
<tr>
<td>2. hot, good smell</td>
</tr>
<tr>
<td>3. served</td>
</tr>
<tr>
<td>4. main</td>
</tr>
</tbody>
</table>

Description: When considered good in smell, STEAK should be grilled and hot, as well as served as the main dish.

Table 1. The Analysis of Illustration 1


Interpreting Dependent NPs

HENK ZEEVAT
(Heinrich Heine University Düsseldorf)

In the Stat’ime’ets quantifier system no generalised quantifier can take scope over another and Stat’ime’ets therefore only has cumulative readings for QNP V QNP sentences (cf. Davis, Matthewson).

Each boy drank 5 beers
in Stat’im’c’ets can only mean that while all boys participated in the drinking, the total beer consumed was not more than 5 beers. ”Each” merely means that the predication applies to all boys as individuals, ”5” merely that the cardinality of the NP denotation is 5. Frame semantics predicts the cumulative reading merely by the idea of projection through thematic roles: the beers are the projection of the set of events denoted by the verb through the theme role, the boys its projection through the agent role.

The Stat’im’c’ets data gives an argument for frames (or interpreted dependency trees, or certain kinds of event semantics) as the basis for NL semantics rather than (extensions of) first order logic, since in the latter formalism quantifiers are predicted to have scope over each other by default and cumulative readings have to be painfully reconstructed. The Stat’im’c’ets data seem to show that rather than scope taking readings, cumulative readings are the typologically unmarked case for QNP V QNP sentences and in the absence of marking (floating quantifiers and corresponding determiners like both, each and every) the cumulative interpretation also seems the default in English.

Stat’im’c’ets has however a formally distinct category of dependent NPs which together with possessive NPs allow for readings dependent on quantifiers (cf. Matthewson). These readings need to be accounted for, just like the possibility of the Stat’im’c’ets system leading to a system like English in which all NPs can be dependent.

The talk will present a semantics for dependent NPs using a new attribute domina which links a dependent NP to its dominant NP (or other operator). Dependent NPs will have denotations that are functions from some domain to their ordinary denotations, with the domain determined by the denotation of the dominant NP. The domina attribute can only link NPs that are reachable by functions $f_1$ and $f_2$ from a superordinate verb node, denoting a set of events. In the simplest case, $f_1$ and $f_2$ are theta roles of the verb. The dependent NP will denote a function $F$, from a domain $D$ to its possible normal denotations, with $D$ determined by the denotation of the dominant NP. In again the simplest case -when the dominant NP is not itself dependent on another NP, $D$ is just the denotation of the dominant NP. It must now be the case, that $F(x)$ is the projection under $f_2$ of the verb extension restricted to those events $e$ in which $f_1(e) = x$.

Continuing our earlier example and assuming a domina link from ”five beers” to ”each boy”, “five beers” denotes a function $F$ from the boys to sets of five beers, such that if $x$ is a boy, $F(x)$ are the five beers that $x$ drank. If one can find the set of beer drinking events, the set of boys and $F$ as indicated, the sentence is true.

If the dominant NP itself denotes a function $G$, the domain $D$ of the dependent NP is $\{ < x,y > : x \in domain(G), y \in G(x) \}$.

Dependent NP interpretations would naturally arise out of special cumulative interpretations of sentences with possessive NPs like:

The boys like their aunts.

In such interpretations, minimally, one needs a function from the boys to some of the aunts, such that its range covers the aunts. If aunthood matters, as it is bound to be, the function that maps each boy to his own aunts is a prominent one, so prominent that it can lead to reanalysis in which their aunts is a dependent NP. If special dependent NPs derive from possessives, this would be the source of the typological possibility to have quantifiers in the scope of other quantifiers.
The new treatment has considerable advantages over FOL based approaches to quantifiers over quantifiers, next to its typological credentials. The treatment of the Barry Schein mixed cases (cf. Schein) is particularly easy. (In: Each basketball player learnt two new tricks from these videos, just add a domina arrow from the two new tricks to the basketball players. (forced by ”each”)

1. The dependent pronoun problem is trivialised. In All my colleagues fight with their wives. But they do not beat them just interpret “they” and “them” as their antecedents, inferring the domina arrow from the types.

2. The quantifier scope ambiguities are much reduced. Only plural NP (counting each and every NPs as plural) give rise to different readings when they dominate or not. Cumulative readings for a singular NP is just the readings in which they have wide scope. Island constraints are predicted by the constraint on dependency that both dominant and dependent NP are at the end of a path starting in the same verbal node. Most importantly: one gets a grasp on disambiguation: marking and absurdity drive one from the default cumulative readings to inserting dependencies.

3. The treatment overcomes the disharmony established by Zwicky between semantic and syntactic heads by abolishing generalised quantifiers in favour of functional denotations for dependent NPs. It allows a semantics for dependency grammar in which the syntactic head is always also the semantic head.

4. Viola Schmitt’s account of conjunction in which all conjunctions can give rise to cumulative readings can be incorporated. In fact it adds to the account by predicting that in: John and Bill both kissed Sue and Maria ”Sue and Maria” is dependent on ”John and Bill” denoting a constant function, which gives the reading in which both boys kissed both girls.

5. Dependency on negation should give a handle on NPIs. But that is work for the future.

It seems not possible to define dependent NPs in an extension of first order logic. The restriction that the dominant and dependent NP are both functionally linked to a superordinate verb node is essential and that notion makes sense only in frame semantics (or closely related styles of semantics).

References
The difference between terminativity and telicity and its reflection in the morphosyntax of Russian

YULIA ZINOVA & RAINER OSSWALD
(Heinrich Heine University, Düsseldorf)

A common criterion for distinguishing atelic and telic phrases in English is their compatibility with time measure phrases (MPs) preceded by *for* versus *in*. In Russian, by contrast, *for*-phrases are expressed by an accusative NP while *in*-phrases corresponds to a PP headed by the preposition *za-* (whose basic spatial meaning is ‘behind, beyond’):

(1)  
a. Anna čitalaPPF des’at’ minut.  
Anna read.PST.SG.F ten.ACC minute.PL.GEN  
‘Anna read for ten minutes.’

b. Anna dočitalaPPF knigu za des’at’ minut.  
Anna do.read.PST.SG.F book.SG.ACC za ten.ACC minute.PL.GEN  
‘Anna read/finished reading the book in ten minutes.’

The examples in (1) illustrate the well-known correlation of telicity, perfectivity and prefixation in Russian and other Slavic languages. There is an ongoing debate as to which extent this correlation is governed by strict rules. Borer (2005), among others, assumes that Slavic prefixes encode telicity on the verb; Filip (2003), on the other hand, points out that while all perfective verbs may be regarded as semantically telic, prefixes should not be viewed as perfectivity or telicity markers.

If one assumes that perfective verbs are telic then the test of telicity by means of time adverbials does not work for Russian. It is neither obligatory for a telic verbal description to be compatible with a *za*-headed temporal PP nor does the compatibility indicate that the predicate denotes single completed events. The prefix *po*- with its ‘somewhat/for some time’ interpretation is a case in point of the former fact. For instance, the verb *počitat’*PPF (*to read for some time*) is perfective and denotes bounded reading events, but it is only compatible with accusative temporal adverbials:

(2)  
a. On počitalPPF knigu pjad’ minut.  
he po.read.PST.SG.M book.SG.ACC five.ACC minute.PL.GEN  
‘He read the book for 5 minutes.’

b. *On počitalPPF knigu za pjad’ minut.  
he po.read.PST.SG.M book.SG.ACC za five.ACC minute.PL.GEN

Corre (2015), following Padučeva & Pentus (2008) and Mehlig (2008), therefore argues for an extended notion of telicity which includes cases of *terminativity* as encoded by delimitative *po-*. The goal of the present paper is to model the semantic difference between terminative and telic predicates and to relate it to their morphosyntactic encoding in Russian. To this end, we take a closer look at verbs of motion since they provide a useful window
into the relation between scalar structure, terminativity and telicity. Russian verbs of motion comprise a limited set of basic imperfective verbs which exist in two forms: *determinate* (directed, unidirectional) and *indeterminate* (multi-directional, non-directed). Like Kagan (2016), we assume that determinate motion verbs lexicalize a *path scale*, in contrast to indeterminate verbs. When prefixed with *po*, indeterminate verbs but not determinate verbs can take an accusative time MP. Prefixation with *pro* gives rise to verbs which behave like *po*-prefixed verbs with respect to accusative time MPs, but which can also combine with *za*-headed time MPs (cf. Table 1).

The different effects of the two prefixes can be explained by assuming that *pro*, in contrast to *po*, imposes a closed scalar structure as the dimension of measurement on the selected scale, which may be time or path depending on the type of the motion verb. The information contributed by the prefix *po*- is just the presence of the initial and final stages of the event, whereas in case of *pro*, these stages are in addition bound to the minimum and the maximum degrees of the scale (or scale segment). In traditional terms, *pro*-prefixed verbs are telic event predicates while *po*-prefixed verbs are not. In order to distinguish the latter from atelic predicates, we call them *terminative*, following the terminology mentioned above. This leads to a three-way distinction: atelic/terminative/telic. While the attachment of *za*-headed MPs requires a telic event predicate, the attachment of accusative MPs depends on the scale selected for delimiting the event: accusative MPs are only possible if the event is measured along the time scale and not along any other (e.g. path) scale.

Following Zinova (2017), we model the semantic elements and constraints just described by employing a frame-based decompositional system with types and relations in line with Kallmeyer & Osswald (2013). In this model, *pro*- imposes a closed scalar structure as the measure dimension (the value of the event attribute MDIM) on a scale component provided by the verb frame. Moreover, *pro*- binds the minimum and maximum of the closed scale introduced by MDIM to degrees on the selected scale that are required to hold at the initial stage (INIT) and the final stage (FIN) of the event, respectively. The prefix *po*-, by contrast, simply characterizes the event as bounded by introducing the attributes INIT and FIN into the frame representation.

In the talk, we will also briefly address the question as to which extent the distinction between terminativity and telicity shows up in other languages.

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Table 1: Relation between scale type, telicity, and MP type in the case of motion verbs
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BUILDING 25.22, FLOOR U1 (BASEMENT)
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<td>Wilhelm Geuder: The inside and outside of event concepts: “Mental” adverbs and “agentive” adverbs</td>
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<td>Corina Strößner &amp; Gerhard Schurz: Is the modifier effect explained by rational reasoning?</td>
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<td>Jonathan Ginzburg et al.: Interaction, Appraisal, and Non-Verbal Social Signal Meaning</td>
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<td>Timm Lichte: Incremental, inference-based MWE processing with TUCO</td>
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<td>Annika Schuster et al.: Stochastic Frames: motivations, applications, and challenges</td>
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<td>Tobias Kalenscher et al.: Rat ultrasonic vocalizations as social reinforcers – implications for a multilevel model of the cognitive</td>
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<td>KIELL JOHAN SÆBØ: “By”: A VINDICATION OF THE ANSCOMBE THESIS</td>
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<td>Peter Sutton: Tall, tall and not tall, neither tall nor not tall</td>
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<td>Franziska Kretzschmar et al.</td>
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<td>Automatic clustering and the lexical semantics of cooking adjectives</td>
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<td><strong>Friederike Moltmann:</strong> Attitude Reports with Attitudinal Objects</td>
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