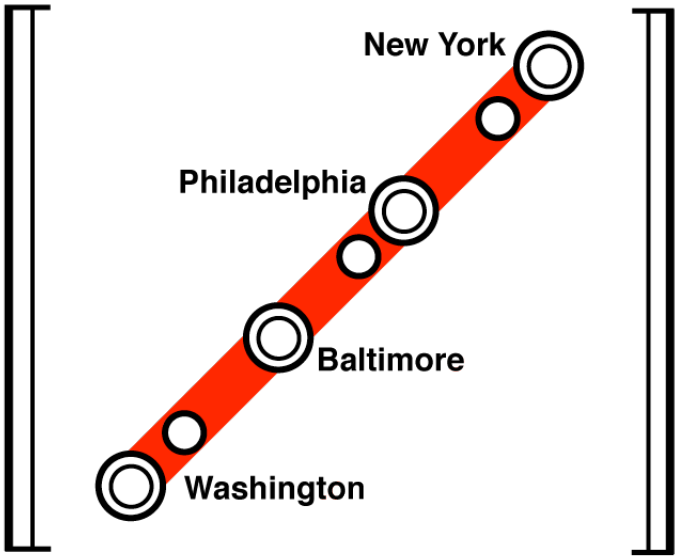
Mid-Atlantic Colloquium of Studies in Meaning

Department of Linguistics &
Institute for Research in Cognitive Science
University of Pennsylvania

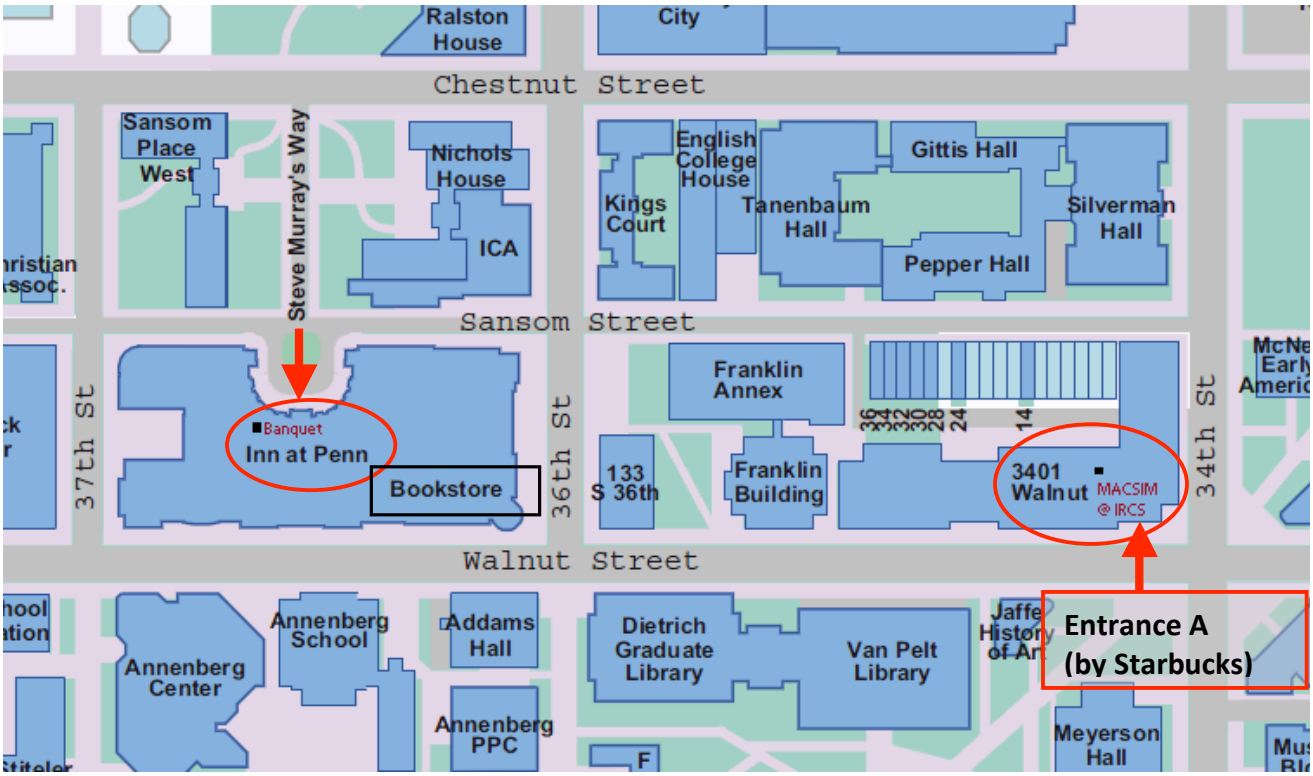
April 10, 2010



MACSIM

MACSIM @ the
Institute for Research in Cognitive Science
3401 Walnut - Suite 400A
Main number - 215-898-0357

Dinner @
the Inn at Penn
3600 Sansom Steet
(Take Entrance on Sansom!)



Acknowledgements MACSIM has been made possible by generous financial and logistical support by the Institute for Research in Cognitive Science at the University of Pennsylvania, which is gratefully acknowledged. Special thanks to Jessica Marcus, Christine Massey, and Laurel Sweeney for invaluable help in planning the event. Many thanks also to Dimka Atanassov, Jana Beck, Catherine Lai, Jon Stevens, and Yanyan Sui for their help with the workshop.

Program

9-10	*Breakfast; poster set-up*	Abstract
10-11	*Talk Session 1):*	
	Masahiro Yamada (U of Delaware)):	
	Discontinuous Reciprocal in Japanese	(p. 1)
	Grant Armstrong (Georgetown)):	
	Semantic and Pragmatic Contributions of a Non-Adicity Reducing	(p. 2)
	Reflexive Clitic in Spanish	
11-11:15	*Coffee break*	
11:15-12:15	*Invited Talk by* **Jeff Lidz (Maryland)):**	
	Interface Transparency	
12:15-12:45	*Lunch (provided on site)*	
12:45-1:45	*Poster session 1*	
1:45-2:45	*Talk Session 2*:	
	Aviad Eilam & Catherine Lai (UPenn)):	
	Sorting Out the Implications of Questions	(p. 3)
	Lilia Rissman (Hopkins)):	
	Periphrastic 'use' and the expression of goals	(p. 5)
2:45-3:45	*Poster Session 2*	
3:45-4	*Coffee Break*	
4-5	*Talk Session 3):*	
	Alexis Wellwood (U of Maryland)):	
	The uniformity of nominal and verbal comparatives	(p. 6)
	Salvador Mascarenhas (NYU)):	
	Contextual givenness vs. existential quantification	(p. 7)
6 -	*Dinner @ Inn at Penn*	

Talks will be 20 minutes + 10 minutes for discussion

Poster Session I (12:45-1:45)

Poster # helps you to find the location of the poster:

they are numbered clockwise starting from the left of the conference room

Posters will be available for viewing all day.

Poster Session II (2:45-3:45)

Poster # helps you to find the location of the poster:

they are numbered clockwise starting from the left of the conference room

Posters will be available for viewing all day.

Discontinuous Reciprocal in Japanese

Masahiro Yamada
University of Delaware (JSPS Research Fellow at Kyoto University)

It has been noted that the verbal reciprocal allows a discontinuous plural argument for its argument crosslinguistically. The discontinuous plural arguments consist of a noun phrase at a canonical argument position and an oblique or comitative noun phrase, as can be seen in the Japanese example (1).

(1) **Hiroki**-ga kinoo **Yasu-to** home-**at**-ta.
Hiroki-N_{OM} yesterday **Yasu-with** praise-$\mathbf{R_{ECIP}}$-P_{ST}
'Hiroki and Yasu praised each other yesterday.'
Literally 'Hiroki engaged in a reciprocal praising with Yasu yesterday.'

This piece of data appears to be a counter-example to the observation that the verbal reciprocal requires a plural subject. The canonical argument position is occupied by a singular noun *Hiroki*, but the sentence yields the reciprocal interpretation. I propose an account for this apparent counter-example to the verbal reciprocals.

I will first investigate the comitative phrases' different interpretations to explain the apparent counter-example to the plural requirement of the verbal reciprocal. I will classify comitative phrases into three categories in terms of the linguistic environments and their interpretations. Two out of the three types of comitative phrases appear to be part of a discontinuous plural argument, but they are different in several aspects, and only one of them is a true member of a discontinuous plural argument.

(2) Three types of comitatives
a. Type 1: Stan collided **with Kyle**.
b. Type 2: Stan built a raft **with Kyle**.
(="Stan and Kyle built a raft.")
c. Type 3: Shelly cooked **with her baby**.
(="Shelly cooked and she was with her baby, e.g. carrying her on her back.")

The comitative phrase that appears in the Japanese verbal reciprocal sentences is analyzed on par with the one that appears in sentences like (2)b. I will claim that the Japanese verbal reciprocal uses the comitative phrase that is generally available for the plural predication of the predicates other than the verbal reciprocal. This finding contrasts with the Hebrew-type verbal reciprocals, which Dimitriadis (2004) analyzes along with the sentences like (2)a, and suggests a typological variation of the phenomenon of the discontinuous reciprocal.

Reference

Dimitriadis, Alexis. 2004. Discontinuous Reciprocals. Ms. Utrecht institute of Linguistics OTS. [http://www.let.uu.nl/~alexis.dimitriadis/personal/papers/discon-long-ms04.pdf, Last Accessed. Mar.1, 2010]

Semantic and Pragmatic Contributions of a Non-Adicity Reducing Reflexive Clitic in Spanish

Grant Armstrong
Georgetown University

Spanish contains a reflexive clitic, SE, that does not reduce the adicity of the verbal predicate with which it combines. In this presentation I examine three different classes of transitive verbs that productively admit this clitic and propose a meaning for SE that captures the semantic and pragmatic contributions that it makes to these sentences. The three verb classes under investigation are shown in (1).

(1) a. **Me** tomé la cerveza. Literal Consumption
SE.1s drink.1s.PST the beer
b. María **se** ve una película diaria. Performance (internalization)
María SE.3s watch.3s.PRES a film daily
c. Los mariachis **se** cantaron todo el repertorio. Performance (creation)
The mariachis SE.3p sing.3p.PST all the repertoire

As can be seen in these examples, the effect of the reflexive clitic cannot be the same as the one in passives, reflexives and anti-causatives because the transitive verbs in each case contain both an external and internal argument and no SELF (= mismo) anaphor. Traditional and formal literature on the subject has described two primary meaning contributions of SE in these sentences. One popular intuition is that the clitic adds a special type of reflexive affective meaning related to subject effort/involvement/satisfaction/benefactivity (Bello 1981/1847, Molina Redondo 1974, Maldonado 1999) and a more recent one is that it simply marks telicity (Nishida 1994, Zagona 1996, Sanz 2000). I argue that the different predicate classes cited above show distinct behaviors with respect to these two meaning components.

For one class of verbs, which includes primarily those of literal consumption, SE is treated as a morphological marker of telicity: it is the realization of an Asp head (Travis 2000) that introduces a time *t* and a predicate CUL (Parsons 1990) and says of the event in question that it must culminate in time *t* (3a). In these verbs phrases, for a vast majority of speakers, the presence of SE is mandatory for the predicate to be interpreted as telic and there is generally no affective meaning perceived. For the other verb class, which includes nearly all of the performance verbs I have looked at thus far, telicity can be computed in the absence of SE. When SE does appear, it forces a telic interpretation but also has a notably different flavor. In these verbs, the affective meaning mentioned above (i.e. subject involvement) is clearly noted by speakers but is often difficult to articulate. The main claim is that in these cases SE is a telic identity function that adds a conventional implicature that is labeled 'subject indulgence/satisfaction', similar to claims made by Horn (2008) with respect to the meaning of the personal dative construction in vernacular English (3b).

(3) a. $[[SE]]_1 = \lambda f_{<ev, t>}.\lambda e.\ f(e) = 1 \wedge \exists t.\ \text{CUL}(e, t)$ (combines with VP, consumption verbs)

b. $[[SE]]_2 = \lambda f_{<ev, t>}.\ f$ (where f is [+telic]) (combines with AspP, performance verbs)
Adds the follow conventional implicatures:
(i) SUBJECT INDULGENCE (= the activity is an indulgence for the subject)
(ii) SUBJECT SATISFACTION (= the subject is satisfied through the completion of the event)

The paper evaluates this claim with respect to its ability to account for speaker variation, the interaction of these constructions with negation as well as the wide-spread appearance of positive adjectives and temporal compression adverbial phrases (i.e. *in one sitting*) in these sentences. It is shown that there are different patterns manifested in the different verb classes that have plausible explanations given the denotations of SE proposed in (3). A more long-term (and less developed) part of the project is to compare and contrast these constructions with other reflexive dative phenomena such as the personal dative construction of vernacular English (Christian 1991, Conroy 2007, Horn 2008) and to reflexivity in general (Reuland & Reinhart 1993, Lidz 2001).

Sorting Out the Implications of Questions

1. The Issue Despite extensive debate in the literature, there is no consensus regarding the status of the existential proposition associated with a *wh*-question (1). Part of the difficulty in determining whether this is a presupposition, implicature, or other meaning component, derives from disparate interpretations of certain presupposition diagnostics and the inapplicability of other criteria to interrogatives. In this paper we propose two novel diagnostics for the status of this proposition, (i) intervention effects and (ii) the ability to serve as an antecedent for *too*, both of which indicate that a fine-grained classification of different types of questions is needed. Accordingly, we claim that argument *wh*-questions and alternative questions indicate an epistemic bias, while adjunct *wh*-questions and clefted *wh*- and alternative questions are associated with a presupposition.

2. Existing Analyses According to one view, the proposition associated with *wh*-questions is a presupposition (Katz & Postal 1964, Comorovski 1996, a.o.). Evidence for this comes, for example, from the impossibility of cancelling the presupposition by the speaker who uttered the question (2). Alternative questions (3) are also commonly thought to involve a presupposition, whereby one and only one of the alternatives is true (Karttunen 1977). However, others maintain that no such presupposition exists: Ginzburg (1991) claims that an implicature is involved in *wh*-questions, based on the fact that it is (i) amenable to suspension (4), (ii) does not always arise, so that in (5) the speaker of the House does not necessarily believe that anyone supports amending the Bill of Rights, and (iii) is calculable from the fact that the more neutral yes/no question form was not used.

3. A Novel Approach We argue that a uniform analysis of questions is misguided, given that on a number of tests, argument *wh*-questions and alternative questions give different results from adjunct *wh*-questions, clefted *wh*-questions, and clefted alternative questions. First, the former allow negative answers (6), while the latter do not (7)-(8) (cf. Brandtler 2008). Second, clefted questions cannot be suspended (9), unlike non-clefted questions (4), and third, argument *wh*-questions can be answered with a positive indefinite (10), but adjunct *wh*-questions cannot (11). Furthermore, we offer two novel diagnostics which support a non-uniform analysis: First, although adjunct *wh*-questions (12) and clefted *wh*-questions (13) provide an antecedent for the presupposition of *too*, on a par with presuppositions in declaratives (14), argument *wh*-questions do not (15). Second, the first group of questions exhibit intervention effects, becoming degraded when a focused phrase precedes the *wh*-phrase (16), or, in the case of alternative questions, losing the alternative question reading (17). Adjunct *wh*-questions (18) and clefted questions (19) do not show this effect. The latter finding is explained under an information structural approach to intervention effects (Tomioka 2007), whereby they are the result of a mismatch between the information structure of questions and the properties of interveners. This mismatch is avoided in adjunct *wh*-questions and clefted questions because their presuppositions include the potential intervener, which is thus backgrounded and does not clash with the informational articulation of the question. The results of all these tests point to the same conclusion: adjunct *wh*-questions, clefted *wh*-questions, and clefted alternative questions are associated with a presupposition, but argument *wh*-questions and alternative questions are not. We propose that the latter indicate an epistemic bias (cf. Romero & Han 2004), which unlike a presupposition, need not be shared by the discussants.

4. Ramifications This study develops recent work demonstrating that a uniform analysis of questions as presupposition triggers is inadequate (Fitzpatrick 2005). In addition, it establishes that infelicitous negative answers are true indicators of presuppositional status, contra Comorovski (1996), and it provides support for an information structural approach to intervention effects: syntactic or semantic theories cannot connect the findings reported here to their account of intervention.

(1) Who read the book? *Associated Proposition*: Someone read the book.

(2) #Although nothing is on the table, what is on the table? (Postal 1971:73)

(3) Did John drink coffee or tea? *Presupposition*: John drank either coffee or tea, but not both.

(4) What, if anything, should I buy at the store?

(5) Who is in favor of amending the Bill of Rights?

(6) Q: Who bought that book?
A: No one.

(7) Q: When did John buy that book?
A: #Never.

(8) Q: Who is it that failed the test?
A: #No one.

(9) #Who is it that failed the test, if anyone?

(10) Q: Oh gosh, who locked up the house?
A: Don't worry, someone did. I heard the keys turn as I walked below. (Ginzburg 1995:474)

(11) Q: When did John buy that book?
A: #I don't know, but he did it at some point.

(12) Q: Where on campus did John give the lecture yesterday?
A: I don't know, but he gave it at Drexel too.

(13) Q: Who is it that went to the meeting with the dean?
A: I don't know, but I did too.

(14) John quit smoking. I used to smoke too.

(15) Q: Who went to the meeting with the dean?
A: #I don't know, but I did too.

(16) *amuto nuku-lul manna-chi anh-ass-ni?
anyone who-ACC meet-CHI not.do-PAST-Q
'Who did no one meet?' (Korean; Yoon 2008:381)

(17) Q: Does only John like Mary or Susan?
A1:#Mary. [*AltQ]
A2: Yes. [√Yes/NoQ] (Beck & Kim 2006:167)

(18) (?) amuto encey sukce-lul cechulha-chi anh-ass-ni?
anyone when homework-ACC submit-CHI not.do-PAST-Q
'When did nobody submit their homework?' (Korean; Yoon 2008:381)

(19) Is it Mary or Susan who only John likes? (Beck & Kim 2006:167)

Selected References: Comorovski, I. 1996. *Interrogative Phrases and the Syntax-Semantics Interface*. Dordrecht: Kluwer. Fitzpatrick, J. 2005. The whys and how comes of presupposition and NPI licensing in questions. In J. Alderete et al. (eds.), *Proceedings of WCCFL 24*, 138–145. Somerville, MA: Cascadilla. Tomioka, S. 2007. Pragmatics of LF intervention effects: Japanese and Korean *wh*-interrogatives. *Journal of Pragmatics* 39, 1570–1590.

Periphrastic *use*: the expression of goals

English provides several means for talking about instruments:

(1) a. I generally brush my teeth with a toothbrush.
b. Chloe used a wet blanket to put out the fire.
c. This spray kills mosquitoes instantly.

Although the instrument is a familiar member of the constellation of proposed thematic roles, we lack a clear sense of what instrumenthood involves. Instruments have been analyzed in terms of undefined primitives such as CONTROL and CONTROLLER (Nilsen 1973) and BY (Jackendoff 1990), or as causal intermediaries (e.g. Talmy 1976). In this paper I explore the semantic properties of one instrument-introducing element, periphrastic *use*, arguing that *use* is best defined in terms of the goals of an agent.

Although a causal-intermediary analysis of instruments is often intuitively plausible, it will not cover the full range of events that *use* may describe. For example, a semantic decomposition within the framework of Dowty (1976) seems to capture the meaning of (1b):

(2) [[Chloe ACT wet blanket] CAUSE [BECOME [fire extinguished]]]

(2) can be paraphrased as Chloe acted on the wet blanket, which caused the fire to become extinguished. Such an approach to instrumenthood does not, however, capture the causal relations in a sentence like (3a):

(3) a. Chloe used a ladder to change the lightbulb.
b. [[Chloe ACT ladder] CAUSE [BECOME [lightbulb changed]]]

Under a counterfactual analysis of causation (c.f. Lewis 1973), (3b) is inappropriate: it is not the case that if Chloe had not acted on the ladder, the lightbulb would not have been changed. Rather, Chloe chose to include the ladder in the event because it was helpful to her in some way.

I adopt the alternative approach that *use* provides information about the goals of an agent with respect to an event. *Use* indicates the presence of a subevent in which the agent acts on the object of *use* (the instrument). The outcome of the event is more consistent with the agent's goals when the agent acts on the instrument than when the agent does not. This meaning is formalized in (4). v is the type of events, $O(e)(w) \equiv$ e occurs in w, $e' \subset_w e \equiv e'$ is a subevent of e in w, f(w) is a circumstantial modal base and g(w) an agent-oriented teleological ordering source (c.f. Kratzer 1991 for a definition of partial order).

(4) $\|\text{use}\|^c = \lambda x \in D_e.\ \lambda P_{<v<st>>}.\ \lambda e \in D_v.\ \lambda w \in D_s.$
$P(e)(w) \wedge \exists e'\colon e' \subset e \wedge Ag(e') = Ag(e) \wedge Pat(e', x) \wedge$
$\forall w'\colon (w' \in f(w) \wedge O(e)(w') \wedge O(e')(w') \wedge e' \subset_w, e) \rightarrow$
$(\exists w''\colon (w'' \in f(w) \wedge e' \subset_w, e \wedge O(e)(w'') \wedge \neg O(e')(w'') \wedge\ w' <_{g(w)} w''))$

Applying this denotation to (3a), e is a changing event and there is a subevent e′ where the agent of e = the agent of e′ and the ladder is the patient of e′. For all worlds w′ in which the changing event and subevent occur, there exists some world w″ in which the changing event but not the subevent occur and w′ is more consistent with the agent's goals than w″.

With its use of a teleological ordering source, my analysis establishes a relationship between periphrastic *use* and structurally similar purpose clauses (c.f. anankastic conditionals):

(5) You must take the A train (in order) to go to Harlem.

Nissenbaum (2005) analyzes the *(in order) to* adjunct as indicating that in all worlds compatible with the goals relevant to some event, PRO goes to Harlem in those worlds. This proposal supports the analysis of *use*-instruments as indicating some fulfillment of an agent's goals.

The uniformity of nominal and verbal comparatives

Alexis Wellwood
University of Maryland

Theories of adjectival comparatives posit a measure function that relates individuals and degrees in an order-preserving way. If a measure function μ is order-preserving, and if *Mary is more intelligent than John*, then μ maps *Mary* to a higher degree on the scale associated with intelligence than it does *John*. The dimension of a given scale is idiosyncratic to the adjective—e.g., *tall* refers to degrees on a scale of height, *beautiful* to degrees on a scale of beauty. How uniform are comparatives across domains? What determines measure functions in nominal and verbal comparatives?

Hackl (2001) argues that the determiner *more* selects arguments which may be non-trivially, orderly mapped to degrees on a scale of increasing cardinality—singular count NPs are ruled out since individuals in these extensions would all be mapped to the (trivial) degree of one. We generalize Hackl's plurality requirement to include mass NPs, and discuss how, in general, lexical properties determine the scale: count NPs are compared by cardinality, mass NPs along some (usually non-cardinal) dimension. If *more girls than boys like chocolate*, the number of relevant girls/boys determines the truth value of the sentence. If *more wine than beer spilt on the floor*, the volume of wine spilt is greater than the volume of beer spilt. As Bale and Barner (2009) showed, however, grammatical context can override lexical factors: e.g., plural *-s* (i.e., count syntax) on mass NPs triggers obligatorily comparison in terms of cardinality, e.g. *John has more waters than Mary.*

We consider two parallels between the nominal and verbal domains: the count/mass distinction to the telic/atelic distinction (telic event descriptions are countable, whereas atelic event descriptions are usually not), and singular/plural morphology to grammatical aspect—perfective quantifies over a single event, and imperfective-habitual over a plurality of events (Ferreira 2005). If *Mary kicked the statue more than John did*, with a telic predicate, the number of kickings by Mary is compared to the number of kickings by John. In contrast, if *Mary ran more than John did*, with an atelic predicate, the relevant scale is underdetermined—either the number of events, or the temporal duration/spatial path of the event(s) is compared. We investigate whether adverbial *more* is constrained in the same ways as the determiner *more*: does it combine with perfective telic ('singular count') VPs? Is the scale for comparison determined by an interaction of lexical properties (atelic v. telic) and grammatical 'number' (perfective v. imperfective)?

We present novel data from English, Spanish, Bulgarian and Hindi, showing that similar restrictions on *more* appear to be in effect across the adjectival, nominal, and verbal domains. Our data and discussion suggest the desirability of a common semantics for *more* across these occurrences.

Bale, A. & Barner, D. (2009).The interpretation of functional heads: Using comparatives to explore the mass/count distinction. *Journal of Semantics*, 1-36.

Ferreira, M. (2005). *Event Quantication and Plurality*. PhD thesis, MIT. Boston MA.

Hackl, M. (2001). Comparative quantiers and plural predication. In Megerdoomian, K. and Bar-el, L. A., editors, *Proceedings of WCCFL XX*, Somerville, MA.: Cascadilla.

Context-givenness vs. existential quantification

Salvador Mascarenhas
New York University

This paper argues that there are strong parallelisms between indefinite noun phrases and two seemingly unrelated constructions, namely domain restriction of universals and *de re* readings of names in attitude reports, and proposes that exploring those parallelisms helps provide better analyses for these phenomena, as well as shed light on certain formal mechanisms that have been used to account for them.

Two very important properties of indefinite noun phrases, object of considerable attention especially in the nineties, are (1) indefinites' ability to take wide scope out of islands, a property some authors associate with contextual dependence (Kratzer, 1998, 2003; Schwarz, 2001), and (2) their ability to be dependent on a universal quantifier, as illustrated below.

(1) a. John is wondering whether *a certain man* will come to the party tonight.
b. Every one of my students is excellent at *a sub-field of linguistics*.

These and other properties of indefinites have been used by authors as reasons to propose several different mechanisms. Some argue that (at least some) wide scoping indefinites are contextually determined free choice functional variables (Kratzer 1998; Schwarz 2001), while others claim that they always carry existential force (Matthewson, 1998); some claim that co-variation is best captured by Skolemization (Kratzer, Schwarz) while others use standard existential closure under the scope of a universal quantifier (Reinhart, 1997). While these different mechanisms aren't incompatible with each other, one is naturally suspicious about whether they are all necessary. I propose that considering other phenomena that share some of these properties with indefinites can help understand what the roles of these formal tools are in grammar. Two such phenomena are domain restriction and *de re* readings of names in attitude reports.

Szabolcsi (2010) argues that it is possible and desirable to unify our accounts of domain restriction and of indefinites, based on examples like (2) (from Stanley and Szabó, 2000). This sentence has a reading where the set of apples universally quantified over is the same for each child, which happens to be nonsensical, and it has a sensible reading where the sets of apples vary with children (e.g., each child had its own basket full of apples).

(2) Every child devoured every apple.
a. #Every child devoured every apple in the set A of apples.
b. Every child devoured every apple in the subset a of the set A of apples that is (somehow) assigned to that child.

Szabolcsi observes that reading a. is parallel to wide scope readings of indefinites (no co-variation, possible contextual dependence) and b. to Skolemized readings of indefinites, and she proposes that an analysis in the spirit of Kratzer (1998) can account for this.

Similarly, I argue that *de re* readings of names in attitude reports have certain characteristics in common with indefinites and domain restriction. The following is particularly striking, and to the best of my knowledge novel. Assume a scenario much like Quine's classical Ortcutt story (Ralph is acquainted with Ortcutt in two different ways, without knowing that the "two" men he saw are one and the same, and he is convinced that one of them is a spy while the other is a model citizen), but where we have a second individual, Ralph', who has beliefs that are the exact inverse of Ralph's concerning who is a spy and who is a model citizen. If Ralph and Ralph' are my only students, then sentence (3) has a true reading.

(3) Every one of my students thinks Ortcutt is a spy.

According to Kaplan (1968), the embedded clause contains a variable ranging over descriptions of Ortcutt, but since (3) can be true in the scenario just given, it must be possible for this description of Ortcutt to depend on the choice of student, for there isn't a unique description of Ortcutt that can make the sentence

true. The availability of co-variation can potentially be accounted for with Skolemization or with existential closure of the description variable under the scope of the universal, much like the case of indefinites. I will provide arguments that will show only the latter analysis to be correct and I will present other aspects of the parallelism with indefinites.

Finally, building on the division of labor between two kinds of indefinites explored by Schwarz (2001) and Solomon (this conference), I will provide an analysis of *de re* readings of names in attitude reports and of (the relevant aspects of) domain restriction that takes into account these parallelisms and attempts to shed light on the roles and consequences of the formal mechanisms mentioned above.

References

Kaplan, David (1968). Quantifying in. *Synthese*, 19:178–214.

Kratzer, Angelika (1998). Scope or pseudoscope? are there widescope indefinites? In S. Rothstein, editor, *Events in Grammar*. Dordrecht: Kluwer.

Kratzer, Angelika (2003). Choice functions in context. Unpublished manuscript, available at `semanticsarchive.net`.

Matthewson, Lisa (1998). On the interpretation of wide-scope indefinites. *Natural Language Semantics*, 7:79–134.

Reinhart, Tanya (1997). Quantifier scope: How labor is divided between QR and choice functions. *Linguistics and Philosophy*, 20:335–397.

Schwarz, Bernhard (2001). Two kinds of long-distance indefinites. In *Proceedings of the Thirteenth Amsterdam Colloquium*.

Stanley, Jason and Zoltan Szabó (2000). On quantifier domain restriction. *Mind and Language*, 15:219–261.

Szabolcsi, Anna (2010). *Quantification*. Cambridge: Cambridge University Press.

Epithets: Implicature and Information

Charley Beller, Johns Hopkins University

Definite descriptions, like *the pig* behave differently in prosodically prominent (2) and non-prominent (1) environments. (I hate Jack but . . .)

(1) Mary KISSED the pig.

(2) Mary kissed the PIG.

In (2) the definite description picks out a uniquely salient pig. In the unaccented environment (1) the definite description *the pig* is an epithet. It behaves like a pronoun in referring to some antecedent, in this case *Jack*, while providing some additional expressive content.

Potts (2003) proposes that epithets are part of a class of meanings called Conventional Implicatures (CIs). CI are lexical speaker-oriented commitments that are independent from the central at-issue meaning of a sentence. The CI characterization captures the intuition that a sentence like (1) can be faithfully paraphrased by the pair of propositions: (a) *Mary kissed Jack* and (b) *Jack is a pig*.

The current analysis adopts the indexed determiner in (3) from Elbourne's NP-deletion account of donkey anaphora (Elbourne 2005). This allows for a unified treatment of the determiner across standard and epithetic definite descriptions (contra Potts).

(3) $[\![\textbf{the}]\!] = \lambda f_{\langle e,t\rangle}.\ \lambda g : g \in D_{\langle e,t\rangle}\ \&\ \exists!x(f(x)=1\ \&\ g(x)=1).\ \iota x(f(x)=1\ \&\ g(x)=1)$

On this approach the NP of a standard definite description saturates the second argument of the determiner. But in epithets the CI NP, placing no restrictions on the identity of the referent, is not an argument of the determiner. Instead the determiner is saturated by the element in (4). The referent provided by the fully composed determiner then composes with the CI NP.

(4) $[\![\textsc{deaccent}]\!] = \lambda x[x = x]$

DEACCENT is simply a name for the element in (4), but it is an intuitive one. While standard and epithetic definite descriptions are not distinguished in their segment level phonology, they do differ in their ability to bear utterance level prominence. Previous accounts of have attributed the lack of prominence on epithets to some notion of givenness (Umbach 2002). But in (1) there are no independent criteria by which it is given that the speaker believes Jack to be a pig. This requires revising the concept of linguistic givenness, otherwise it is reduced meaning 'unaccented'.

Given the independence displayed by CI elements in the semantics it is reasonable to suppose that independence extends to other components of the grammar. Sentence prosody in English is a way to encode the Information Structure of an utterance (Vallduví 1993). A working hypothesis is that Information Structural accent placement algorithms will be insensitive to CI elements.

Elbourne, P. 2005. *Situations and individuals*. Cambridge, MA: MIT Press.

Potts, C. 2003. The logic of conventional implicatures. Doctoral Dissertation, University of California, Santa Cruz.

Umbach, C. 2002. (De)accenting definite descriptions. *Theoretical Linguistics* 27:251280.

Vallduví, Enric. 1993. The informational component. Doctoral Dissertation, University of Pennsylvania, Philadelphia, PA.

Continuation semantics for expressives and epithets

Timothy Leffel / NYU / tim.leffel@nyu.edu

Potts' (2005, 2007) theory of expressive content holds that expressive and descriptive elements generate entailments which are logically independent of one another, and hence contribute to different *dimensions* of meaning. However, Potts' multi-dimensional logic $\mathcal{L}_{\text{CI}}$ is not compositional and does not capture certain empirical facts about apparent interactions between different dimensions of meaning. For example, his system cannot predict *the bastard Schmidt is not a bastard* to be a contradiction (Geurts 2007). In this presentation, I use Kubota & Uegaki's (2009) framework for multi-dimensional meaning to give a compositional semantics for expressive adjectives (EA) and epithets. The analysis accounts for Geurts' observation and others.

Configurational approaches to expressive content (e.g. Schlenker 2007) are generally not multi-dimensional, while *contextual* approaches (e.g. Potts 2007) are generally not compositional. I follow Potts in assuming multi-dimensionality, but make crucial use of a configurational framework (KU09). KU09 is based on the formal system in e.g. Barker & Shan (2008), which was originally designed for scope manipulation. I show that well-motivated scope displacement mechanisms can be used to derive non-speaker-oriented interpretations of expressives (cf. Harris & Potts 2010). In short, orientation depends on the point in the derivation at which the expressive element is evaluated. This approach is thus configurational, but maintains multi-dimensionality and compositionality.

The flexibility of KU09's system allows us to encode the scope displacement properties of expressives and epithets directly into their lexical entries. Scoping EAs over the NPs in which they occur automatically predicts that EAs are not restrictive, as Potts (2005) notes.

The continuation-based approach also gives a unified account of expressive and descriptive uses of single lexical items; e.g., the entailments generated by epithetical *bastard* and predicative *bastard* are identical, but happen to lie on different semantic dimensions. This accounts for Geurts' observation above.

Because epithets are typically evaluated at the root node, it is straightforward to derive the intended reading of so-called *pseudo de re* reports (Kaplan 1989), such as *John said the bastard who stole his car is honest.* Potts (2005) claims that the correct interpretation of these sentences cannot be captured in a configurational approach without *ad hoc* stipulations.

References: **Barker, C. & C-c Shan.** 2008. Donkey anaphora is in-scope binding. *S&P* 1(1). **Geurts, B.** 2007. Really fucking brilliant. *Theoretical Linguistics* 33(2). **Harris, J. & C. Potts.** 2010. Perspective-shifting with expressives and appositives. To appear in *L&P*. **Kaplan, D.** 1989. Demonstratives. In *Themes from Kaplan.* OUP. **Kubota, Y. & W. Uegaki.** 2009. Continuation-based semantics for conventional implicatures: the case of Japanese benefactives. *SALT 19*, OSU. **Potts, C.** 2005. *The Logic of Conventional Implicatures.* OUP. **Potts, C.** 2007. The expressive dimension. *Theoretical Linguistics* 33(2). **Schlenker, P.** 2007. Expressive presuppositions. *Theoretical Linguistics* 33(2).

Evidence for a Domain-General Cognitive Mechanism in the Construction of Basic Linguistic Meaning

Doug Bemis (New York University) & Liina Pylkkänen (New York University)
doug.bemis@nyu.edu

Fundamentally, language is a vehicle for conveying and constructing complex meanings out of simple pieces. Consequently, characterizing the core mechanisms responsible for this combinatorial process should be a central goal in the cognitive neuroscience of language. However, to date, there has been little research directed at the heart of this problem with past work focused mostly on phenomena such as complex syntactic constructions [1], semantically unexpected expressions [2], and semantic mismatches [3]. Therefore, in the present research, we introduce a novel paradigm investigating the processing evoked by a straightforward, minimal combinatorial context – a simple adjective-noun phrase. We used magnetoencephalography to track brain activity during the comprehension of a noun, both in the presence and absence of a combinable adjective. Previous research suggests that the ventro-medial prefrontal cortex (vmPFC) is involved in semantic composition [3] while the left anterior temporal lobe (LATL) plays a central role in syntactic structure building [4]. If these regions subserve basic linguistic combinatorial processing, we expect to see an increase in their activity during the combinatorial condition.

Exp. 1: 20 subjects were asked to judge whether a colored shaped matched a preceding verbal description. We used a 2x2 design with Task (Composition, List) and Number of words (One, Two) as factors. Subjects had to determine either if the following shape matched the entire description (Composition) or any part of it (List). Processing of the noun showed significantly more activity in the LATL from 200-300ms and the vmPFC from 300-500ms for the Two-word Composition condition (‘red boat’) compared to the other conditions ('xhl boat', 'cup boat'). This suggests that the vmPFC and LATL subserve operations active during basic linguistic combination. Furthermore, the temporal ordering of the effects conforms to a broad class of models positing initial syntactic operations prior to semantic composition [5].

Exp. 2: The extent to which language processing relies upon domain-general mechanisms has recently been speculation upon [6], though little direct empirical data has yet been uncovered. Recent research has focused on parallels between syntactic and musical parsing, though primarily within incongruous situations [7]. By substituting analogous non-linguistic stimuli for our previous verbal descriptions, we were able to approach this problem more directly. Our task still required conceptual integration of both shape and color from the phrasal replacements and extraction of shape alone from the control condition. Therefore, if increased activity observed during linguistic combination reflects domain-general operations, we expect to see similar increases for this comparison. 19 subjects were shown either a colored shape and asked to determine if the following picture was of the same shape and color or a silhouette on a colored background and asked to judge if the following picture was of the same shape, with color being irrelevant. We found significantly more vmPFC activity during the processing of Colored shapes as compared to Silhouettes, but no LATL effects. This suggests that syntactic processes are comparatively language-specific, while semantic operations reflect a more domain-general conceptual combination mechanism.

References:

[1] Stromswold, Caplan, Alpert, & Rauch (1996) Brain and Language, 52, 452-473.
[2] Kutas & Hillyard (1980) Science, 207, 203-205.
[3] Pylkkänen & McElree (2007) Journal of Cognitive Neuroscience, 19, 1905-1921.
[4] Humphries, Love, Swinney, & Hickok (2005) Human Brain Mapping, 26, 128-138.
[5] Friederici (2002) TRENDS in Cognitive Science, 6, 78-84.
[6] Marcus & Rabagliati (2006) Nature Neuroscience, 9, 1226-1229.
[7] Patel (2003) Nature Neuroscience, 6, 674-681.

Teasing apart structure-building and semantic composition during reading with MEG

Jonathan Brennan & Liina Pylkkänen (New York University)

Introduction Linguistic compositionality forces a tight relationship between structure-building computations and semantic composition, making it extremely difficult to tease apart these two fundamental operations during sentence comprehension. While previous work has attempted to distinguish these processes by varying the attention of participants (Dapretto & Bookheimer, 1999), or by examining the response to syntactic vs. semantic violations (e.g. Neville, Nicol, Barss, Forster, & Garrett, 1991), we sought to investigate these computations during normal comprehension, while subjects read a story. We hypothesized that syntactic and semantic structures may be incrementally built at different rates during comprehension (cf. Stabler, 1991). Assuming that semantic rules apply only once sufficient structural information is available, there is a dissociation in number of syntactic and semantic operations that are engaged word-by-word. Although not a necessary property of the human parser, this plausible dissociation provides a novel and intriguing approach to distinguishing these computations in the brain.

We recorded brain activity using magnetoencephalography (MEG) while participants read a story and then correlated, word-by-word, the number of syntactic operations and the number of semantic operations predicted by the parsing model with brain activity in order to distinguish processing associated with these two computations.

The Parsing Model We focused our study on prepositional phrases, where a standard syntactic and semantic analysis (e.g. Heim & Kratzer, 1998) using a context-free grammar could be straightforwardly applied. Developing the parser proposed by Stabler (1991), we modeled incremental parsing using a left-corner algorithm in which syntactic and semantic rules were interleaved. We then counted the number of syntactic rules (e.g. Merge) and the number of semantic rules (e.g. Function Application) that were required to parse each word.

Methods Nine participants were presented with a story (*Sleeping Beauty*) using rapid serial visual presentation during MEG recording. In a block design, participants also saw the same words presented in pseudo-randomized lists. Subjects answered comprehension (story) or recall (lists) questions periodically during the experimental blocks to assess attention. We employed a cortically constrained distributed source model to estimate brain activity in a set of anatomically defined regions distributed across the cortex. Correlations between the parser and brain activity were estimated using hierarchical regression and we adjusted for multiple comparisons across time-points and ROIs using simulation.

Results: Correlating the predictions of this parser with word-by-word single-trial data showed that the application of syntactic rules correlated with activity in the left anterior temporal lobe, and semantic composition rules with the orbitofrontal cortex and left inferior frontal gyrus consistent with recent work on semantic processing (Pylkkänen & McElree, 2007).

Conclusion We developed a model of incremental syntactic structure-building and semantic composition in which these two operations are engaged at different rates. Testing the model's predictions against single-trial brain activity revealed distinct correlations between syntax in the left temporal lobe and semantics in orbitofrontal cortex, consistent with much recent work. Our results suggest that the incremental dissociation between syntax and semantics offers a novel approach to distinguishing these two operations in the brain and provides the groundwork for using brain data to test different hypotheses about the relationship between syntactic and semantic computations.

The Semantics of Comparative Correlatives and Adverbial Comparatives in Chinese

Carlos A. Fasola
Rutgers University

I discuss, reporting on joint work with Xiao Li (Queens College, CUNY), Mandarin Chinese *yue … yue* constructions as illustrated in (1). These are the counterparts to *the more … the more* constructions in English, as illustrated in the translation of (1), which have been dubbed 'comparative correlatives' (CCs).

(1) Pingguo **yue** da **yue** tian.
apple big sweet
'The bigger an apple is, the sweeter it is.'

I review Beck's (1997) semantics for CCs and a specific proposal for Chinese CCs in Lin (2007), which I adopt in its essentials. For (1), this semantics states that the set of pairs of situations such that the degree of bigness of the apple in the first is greater than that of the apple in the second is a subset of the set of pairs of situations such that the degree of sweetness of the apple in the first is greater than that of the apple in the second.

I then discuss instances of *yue … yue* constructions such as those in (2), which correspond more closely to so-called 'adverbial comparatives', as illustrated by the English *more and more* construction in the translation of (2).

(2) John **yue** pao **yue** kuai.
J. run fast
'John ran faster and faster.'

I argue that the semantics of adverbial comparatives differ in a significant manner from those of CCs, in that the former necessarily refer to a temporal ordering relation while the latter don't. I show, nevertheless, that if we identify *time* as one of the degree parameters appealed to in the semantics of CCs, the existing CC semantics will automatically yield the correct semantics for adverbial comparatives. This is a desirable result since the two constructions are closely related in Mandarin Chinese (if not identical).

Specifically, I will propose that Adjectives do not contain a time argument but only a degree and that Verbs do not contain a degree argument but only a time. I propose a unified semantics for the morpheme *yue*, in which it can combine with any predicate of an orderable type, where this is defined as a type which allows for an order to be defined on the elements in its domain, and includes the types of degrees and times. When *yue* combines with an Adjective, it will bind its degree argument and construct the set of pairs of situations such that the degree of one is greater than that of the other, while when *yue* combines with a Verb, it will bind its time argument and yield the set of pairs of situations such that one is later than the other. Thus, the necessarily temporal ordering reading of adverbial comparatives will result.

References

Beck, Sigrid. 1997. 'On the semantics of comparative conditionals'. L&P 20: 229-71
Lin, Jo-Wang. 2007. 'On the semantics of comparative correlatives in Mandarin Chinese'. JoS 24: 169-213

The meaning of adjective-noun combinations: underspecification versus overspecification

As noted by many authors (e.g. Quine 1960, Lahav 1993, Blutner 2009), many predicates do not behave intersectively. For example, if someone is said to have *brown eyes* this means that the color of her irises is brown, while *brown bread* has to be brown throughout. Similarly, the color denoted by *red* in *red hair* is different from the color denoted by *red* in for example a *red tomato*.

The dominant view in the field of lexical semantics is that lexical representations are underspecified and may be strengthened by the context (e.g. Reyle 1993, Pustejovsky, 1995, Blutner 1998, 2004). However, there are some studies that assume an overspecified lexical representation for polysemous words. For example, Dalrymple et al. (1994) propose the Strongest Meaning Hypothesis to account for the interpretation of reciprocals, which is adapted by Winter (2001) to the Extended Strongest Meaning Hypothesis:

> "A plural predicate whose meaning is derived from one or more singular predicates is interpreted using the logically strongest truth conditions that are generated from one basic meaning and that are not contradicted by known properties of the singular predicates(s)". (Winter 2001, p. 342)

This principle is also applied by (amongst others) Zwarts (2004) in an Optimality Theory analysis of the interpretation of the preposition *around* and by Hogeweg (2009) for the interpretation of the Dutch discourse particle *wel*. In this presentation I will explore the usefulness of assuming an overspecified lexical representation in adressing the problem of the context-dependence of adjectives.

Thematic Roles and *one another* reciprocals

Chris LaTerza
University of Maryland

It has been observed since Fiengo and Lasnik (1973) and Langendoen (1978) that sentences expressing reciprocity can be associated with a variety of readings, characterized by reciprocal "strength". While some sentences (in a given context) might favor Strong Reciprocity (where every individual in the plurality denoted by the antecedent both affects and is affected by every other individual there), other sentences might favor weaker readings. Indeed, nearly all work on the semantics of reciprocals has taken it as a primary goal to address these many readings, and many different approaches to the problem have been proposed.

One might want to suggest, as Langendoen did, that reciprocals have a single one weak interpretation, since anything satisfying a stronger type of reciprocity will also satisfy the conditions imposed by a weaker type of reciprocity. Dalrymple et al. (1998) reject this hypothesis, and propose the Strongest Meaning Hypothesis, which states that reciprocals are ambiguous, and a reciprocal sentence will pick the strongest meaning possible given the lexical predicate and certain nonlinguistic information. However, I believe that this is incorrect, and that an underspecification analysis such as Langendoen's can be defended once certain plausible assumptions are made. This paper proposes that *one-another* reciprocals (OARs) have a *single weak interpretation*, brought about by how the parts of reciprocal phrases interact with certain thematic roles.

The focus of this paper will be on OARs in several Indo-Eurpoean sub-families (Germanic, Romance, Slavic, and Baltic), though the analysis can also be extended to other types of bipartite reciprocals. The thematic analysis will include two proposals: (**i**) each element of an OAR is associated with a different thematic role, and (**ii**) each element contains a silent partitive argument: ONE (of them)/OTHER (of them). These two proposals together can be shown to attribute enough descriptive power to capture acceptable reciprocal sentences, while also ruling out unacceptable ones.

Concerning (**i**), there are two empirical reasons for proposing that each element of an OAR is associated with a different thematic role. The idea is that if we can show that ONE and OTHER are two distinct NPs that do not form a constituent with one another, then that would suggest that these two elements are also thematically distinct. The Spanish (1) and Serbo-Croatian (2) sentences below will help illustrate these points.

(1) los estudiantes se seguian **uno** **tras** **otro**
DEF students CL walk one behind$_P$ other

(2a) studenti su predstavili profesorima **jedne** **druge**
students.NOM AUX introduced professors.ACC one.ACC other.DAT
Reading: The students introduced the professors to other professors

(2b) studenti su predstavili profesorima **jedni** **druge**
students.NOM AUX introduced professors.ACC one.NOM other.DAT
Reading: The students introduced the professors to other students

The first reason for accepting (**i**) is preposition placement. Although Germanic OARs do not show this property, in the Romance, Slavic, and Baltic languages, prepositions (when they appear) **must** be placed **between** the elements of an OAR, as shown in (1). If we can assume that it is the complements of prepositions that receive the role associated with that preposition (Goal in (2)), then we can attribute thematic distinctness to each element of an OAR since only one of them is the complement of the preposition in these languages, the OTHER element.

The second empirical reason that suggests that (**i**) is correct comes from the Case of each element of the OARs in (2). In Slavic, the Case of each element in an OAR **must differ** from the other element. This fact alone is a reasonable argument that each of these elements is in fact a separate NP, and hence, each bears a separate thematic role. **Furthermore**, (2) also shows how *the Case on the ONE element of the reciprocal is dependent on the Case of its antecedent*. This in interesting in the Case of ditransitives like (2), where there are two potential antecedents. In (2a), *jedne* ("one") is marked as accusative, and as such the reading is one where the reciprocal takes the direct object as its antecedent. (2b), with *jedni* ("one") being nominative, the only possible antecedent is the subject. This empirical fact will be an important part of the analysis, as I will claim that the thematic role associated with ONE will always be dependent on the thematic role of the antecedent, while the thematic role of OTHER will be the canonical role associated with the position of the OAR: since the reciprocal is an indirect object in (2), the thematic role of *druge* ("other") in both sentences will be Goal.

Turning now to (**ii**), it is necessary for this theory to posit a covert restriction argument expressing partitivity within each NP in OARs. In brief, the claim is that the descriptive content of the OAR is roughly *one among them*$_X$*…other among them*$_X$, where X represents the plurality denoted by the antecedent. This will ensure that when considering the values assigned to ONE and OTHER, these values will be proper parts of the whole denoted by the antecedent. Using partitivity has proven helpful in constructing theories of reciprocals, as both Beck (2001) and Schein (2003) have shown. I will extend the claims of these authors by conjecturing that partitivity is present in ***both*** parts of bipartite reciprocals, expressed by the ≤ operator in the logical syntax below.

CLAIM: (3) means (3'). While this theory of thematic roles in reciprocal sentences differs in important ways from Schein's 2003 take on the reciprocals, I follow him in using a semantic representation that uses a neo-Davidsonian metalanguage combined with number-neutral plural variables of the Boolos (1984) sort. A crucial aspect of the analysis, following Schein (1993, 2003) is that distributive quantifiers, represented by the ONE part in OARs (∀Y in (3')), introduce reference to both sub-individuals and sub-events.

(3) They$_X$ hit one another

(3') ∃E{past(E) & ∃X[Agent(E, X) & hit(E)

& ∀Y: Y ≤ X [∃E':E' ≤ E {Agent(E', Y) & ← contribution of ONE

& ∃Z: Z ≤ X [OTHER(Z,Y) & Theme(E', Z)]}]]} ← contribution of OTHER

The descriptive content of the OAR in (3') says that for each individual$_y$ in the plurality denoted by the antecedent$_X$, that individual$_Y$ has its own events$_{E'}$ in which it$_Y$ is the Agent and there is/are some Z(s), other than Y, that is the Theme in E'. As mentioned earlier, the thematic roles associated with *one* and *other* depend on the position of the OAR ***and*** its antecedent. This theory is underspecified enough to handle almost all the readings associated with reciprocals, from Strong Reciprocity to the very weak type of reciprocity exhibited by the sentence in (1) (modulo the person walking at the head of the line—arguably a pragmatic exception). Furthermore, there are good reasons **not** to adopt the even weaker hypothesis: that each element of the plurality participates someway in the event (either as an Agent **or** a Theme). The weaker theory (and also the Strongest Meaning Hypothesis) would predict (4) to be acceptable so long as just one is taller than the other. However, (4) is not acceptable under such a reading, though the competing theories predict otherwise. The current theory predicts a contradiction, and this prediction is borne out.

(4) #John and Mary are taller than each other.

What does *really* really mean?: Prosody and gradience in dialogue

Catherine Lai, University of Pennsylvania,
laic@babel.ling.upenn.edu

Introduction. This paper provides a unified analysis of epistemic, actuality, intensifier and cue word *really* as exemplified in (1) (c.f. Romero and Han (2004)). I argue that, like other intensifiers, *really* has the effect of raising standards on the scale projected by its argument. When the argument of *really* is a proposition, the relevant scale is one of subjective probability. This allows us to treat gradability of beliefs within the same framework used to treat other forms of semantic gradability (Kennedy and McNally, 2005).

Background. Dialogue participants need to maintain the structures that utterances are evaluated against (Barker, 2009; Gunlogson, 2008). In particular, speakers need to be able to signal different levels of certainty with respect to the evidence at hand. Cue words like *yeah*, *okay*, *right*, and *really* are frequently used to do just this. However, the strength of belief expressed by these discourse particles appears to vary with prosody (Lai, 2009). This suggests a link between prosodic gradience and gradability of beliefs (2). However, it is not clear how this propositional gradability should be formalized. *Really* provides an important test case given its intensifier use (1-d). Moreover, Romero and Han (2004) equate epistemic *really* with VERUM focus in their analysis of Negative Polar Questions. However, (3) shows that *really* questions give rise to a different type of bias than NPQs. A more articulated notion of evidence in dialogue seems necessary to tease their uses apart.

***Really* tightens the kernel.** von Fintel and Gillies (2009) argue that epistemic modals signal inference via the kernel: the 'direct information' subset of the modal base. However, it seems this notion of evidential privilege is required beyond the somewhat fuzzy direct/indirect categorization. That is, utterances are generally evaluated with respect to a generalized kernel K. This subset is induced from the conversational background based on rankings of reliability and relevance. I argue that *really* marks evaluation with respect to a smaller kernel, $K_r \subset K$. Dropping propositions from the kernel means that degree evaluations are performed over a more general domain. For example, evaluating 'This tree is tall' with respect to trees in the USA is more general than evaluation considering just trees in Philadelphia. Expanding the evaluation domain reduces the likelihood of a random object having a degree that exceeds the standard (e.g. tree height, (6)). Thus, tightening the kernel has the effect of raising standards. As in Kennedy and McNally (2005), a gradable adjective G projects a scale S_G. So, as an intensifier, *really* says that the degree of x with respect to S_G surpasses the standard with respect to K_r, as shown in (4).

***Really* and probabilities.** Following Davis et al. (2007), proposition p, uttered by X, projects X's subjective probability of p: $C_{X,K}(p)$ evaluated with respect to K. Assertion of p requires $C_{X,K}(p) > c_\tau$, the quality threshold, i.e. the minimum standard for assertability. (5) shows how (4) applies to propositions. We can take K_r as containing only evidence that surpasses a certain probability. For example, kernel tightening may have the effect of dropping indirect evidence, parallel to epistemic modals. This probability based approach helps explain how *really* seems to express increased likelihood in modal sentences (7-b). Define $C_{X,K}(\text{MIGHT}(p))$ as be the probability of drawing a p world from $\cap K$ in N attempts. Now, $\cap K \subset \cap K_r$, so to assert $\text{MIGHT}(p)$, p must be true in a signficant number of worlds in this expanded set must.

Prosodic gradience and VERUM. Pitch excursion size on *really* seems proportional to how credible p is to the speaker in terms of probabilities. Emphatic H^* accents associated with VERUM focus seem to signal credibility in the same way. However, VERUM does not seem to provide the same domain expansion capability as *really*. Instead, VERUM appears to have mulitdimensional semantics (Gutzmann and Castroviejo Miró, 2009) which foregrounds propositions as being in K (9). This interpretation of VERUM, as a prosodic marker, extends to affirmative cue words: e.g. *yeah*, *right*, *okay*. Here, VERUM prosody indicates that the speaker not only accepts p as passing the quality threshold, but that it is also highly ranked in terms of credibility and relevance for the current discussion.

Implications. This approach indicates how to a map modalized propositions to probabilities, and more generally induce rankings from such degree evaluations. Connecting probability to credibility makes the connection to prosodic gradience clearer. However, many details remain to worked out, e.g. interaction with final rises and other dialogue moves, the dimensionality of VERUM and how the evidential ranking are used in evaluating utterances.

(1) a. John really did steal the money. (epistemic)
b. John did really steal the money. (actuality)
c. A: John stole the money.
B: really? (cue word/interjection)
d. John is really rich. (intensifier)

(2) a. John really/REALLY finished on time.
b. A: John really/REALLY likes apples.
B: right/RIGHT!

(3) a. A: Are there really some vegan restaurants here?
$\rightsquigarrow$ A has some evidence for the existence of vegan restaurants, but doesn't believe it, or is at least surprised by this.
b. A: Aren't there some vegan restaurants here? (bias yes)
$\rightsquigarrow$ A has some evidence that there are vegan restaurants and believes this.
c. A: Aren't there any vegan restaurants here? (bias no)
$\rightsquigarrow$ A has evidence that there are no vegan restaurants around, contrary to belief.
d. A: Aren't there really (some/no/*any) vegan restaurants here?

(4) $[\![\text{really}]\!](\text{G})(\text{x}) = \exists d[d > std(S_G) \wedge G(d)(x)]$ w.r.t $K_r \subset K$, a 'tightened' kernel.

(5) $[\![\text{really}]\!](C_{X,K_r})(p) = \exists d[d > c_\tau \wedge C_{X,K_r}(p) = d]$ w.r.t $K_r \subset K$,
i.e. $C_{X,K_r}(p) > c_\tau$ for $K_r \subset K$.

(6) a. A: That tree is tall.
b. B: It's tall, but it isn't really tall, that Giant Sequoia in Cali was really tall.
$\rightsquigarrow$ The tree isn't tall in the widened domain, i.e. *really* scopes under negation.

(7) John is the underdog in a bike race.
a. A: John might win.
(John over takes Lance near the finish line)
b. B: John really might win.

(8) a. Gore DID win the election (VERUM focus)
$\rightsquigarrow$ It is observed Gore won according to normal standards of evidence.
b. Gore DID really win the election.
$\rightsquigarrow$ Gore won considering a higher standard of evidence than usual (i.e. discard the supreme court ruling).

(9) $[\![\text{VERUM}]\!](\text{p}) =$
a. at-issue: p,
b. CI: $p \in K$,
i.e. p is highly ranked in the CB.

(10) VERUM is manifested as a H* accent.
$|\,\text{pitch excursion}\,| \propto |\,d_G - Std(S_G)\,|$.

References

Barker, C. (2009). Clarity and the Grammar of Skepticism. *Mind & Language*, 24(3):253–273.

Davis, C., Potts, C., and Speas, M. (2007). The pragmatic values of evidential sentences. In Gibson, M. and Friedman, T., editors, *Proceedings of the 17th Conference on Semantics and Linguistic Theory*, pages 71–88. CLC Publications, Ithaca, NY.

von Fintel, K. and Gillies, A. (2009). Must... stay... strong. *Natural Language Semantics*. To appear.

Gunlogson, C. (2008). A question of commitment. *Belgian Journal of Linguistics*, 22(1):101–136.

Gutzmann, D. and Castroviejo Miró, E. (2009). The Dimensions of VERUM. In *Colloque de Syntaxe et Śmantique à Paris*.

Kennedy, C. and McNally, L. (2005). Scale structure, degree modification, and the semantics of gradable predicates. *Language*, 81(2):345–381.

Lai, C. (2009). Perceiving Surprise on Cue Words: Prosody and Semantics Interact on *Right* and *Really*. In *Proceedings of INTERSPEECH'09, Brighton, UK, September 2009*.

Romero, M. and Han, C. (2004). On negative yes/no questions. *Linguistics and Philosophy*, 27(5):609–658.

Modeling early cross-situational name learning in real time
Jon Stevens

The problem of how children learn the meanings of their first words is an old one, going back even to the time of Augustine. Now, with the tools of computational modeling available to us, we are in a better position to solve that problem. Focusing only on learning names for objects, I propose a simple real-time probabilistic learning algorithm based on the Linear Reward-Penalty (LR-P) scheme (Bush and Mosteller 1951, see Yang 2002 for an adaptation to linguistic learning) which makes use of certain filters on the hypothesis space, which I argue can be independently motivated. While many current models (see Frank, Goodman, and Tenenbaum 2009 for one example) rely on complex post-hoc calculations, I propose a model that updates probabilities for word-to-object mappings as new stimuli are perceived and constructs a lexicon from the ground up.

LR-P models with various enrichments are evaluated on hand-coded data from short videos of mother-infant interactions, taken from the CHILDES database (MacWhinney 2000). Performance improves substantially with each enrichment. The best model endows the learner with the assumption that words which bear some stress at the sentence level are more likely to refer to objects in the here-and-now than words which bear only lexical stress or no stress at all, and doubly filters the hypothesis space by 1) considering only objects that have been gestured to by the mother during an utterance as possible meanings for words in that utterance, and 2) making use of syntactic bootstrapping by considering nouns over verbs as possible names for objects. I argue that these endowments can be independently justified and thus are uncontroversial additions to the model. The satisfactory performance of such a simple and domain-general learning algorithm when given these enrichments lends support to the view that name learning is a pluralistic process.

References

Bush, Robert and Frederick Mosteller. 1951. A mathematical model for simple learning. Psychological Review 68, 313-23.
Frank, Michael, Noah Goodman, and Joshua Tenenbaum. 2009. Using speakers' referential intentions to model early cross-situational word learning. Psychological Science 20:5.
MacWhinney, Brian. 2000. The CHILDES Project: Tools for Analyzing Talk. Vol. 2: The Database (3rd ed.). Mahwah, NJ: Erlbaum.
Yang, Charles. 2002. Knowledge and Learning in Natural Language. Oxford: Oxford University Press.

The Bulgarian Reportative as a Conventional Implicature

Dimka Atanassov

In this work I propose a new way of looking at the Bulgarian reportative. The reportative in Bulgarian conveys the information that the speaker's knowledge is indirect, and therefore he does not wish to commit to it. So far Bulgarian evidentials in general, and the reportative in particular, have been assumed to involve a presupposition and perhaps a modal operator. In particular, the information that the speaker's knowledge is indirect was assumed to be a presupposition. However, this kind of analysis runs into problems, mainly because the Bulgarian reportative does not behave like a presupposition. Presuppositions can be plugged, but the Bulgarian reportative cannot be plugged. In fact, it turns out that the Bulgarian reportative fits Potts 2005 definition of Conventional Implicatures: it cannot be plugged and is always speaker oriented (even under embedding). In this work I present data collected from four native Bulgarian speakers (as well as my own intuitions), involving the reportative in both main and embedded verbs, and discuss this data with respect to the analysis of the reportative as a CI.

The two examples below (based on my own judgments) show that the reportative must be speaker oriented.

(1) *Maria mi kaza che Ivan celunal Ana. Tja go vidjala.*
Maria me tell-aorist-3sg that Ivan kiss-REP-3sg Ana. She him see-REP-3sg.
'Maria told me that Ivan apparently kissed Ana. She apparently saw him'

(2) *Maria mi kaza che Ivan celunal Ana. #Az go vidjax.*
Maria me tell-aorist-3sg that Ivan kiss-REP-3sg Ana. I him see-aorist-1sg.
'Maria told me that Ivan apparently kissed Ana. I saw him'

The examples below were presented to four native speakers under four different scenarios, each involving different knowledge state. Although some variance was present, in general a reportative marking on the matrix verb was only accepted when the speaker did not have direct knowledge of the event. The reportative was occasionally accepted even in the presence of direct knowledge when the verb was embedded, however this can be explained by the speaker choosing to relate to the indirect knowledge source rather than the direct knowledge he has.

(3) *Marina kaza na Peter che Ivan celuna Ana.*
Marina tell-aorist-3sg to Peter that Ivan kiss-aorist-3sg Ana.
'Marina told Peter that Ivan kissed Ana.'

(4) *Marina kaza na Peter che Ivan celunal Ana.*
Marina tell-aorist-3sg to Peter that Ivan kiss-REP-3sg Ana.
'Marina told Peter that Ivan apparently kissed Ana.'

(5) *Marina kazala na Peter che Ivan celuna Ana.*
Marina tell-REP-3sg to Peter that Ivan kiss-aorist-3sg Ana.
'Marina apparently told Peter that Ivan kissed Ana.'

(6) *Marina kazala na Peter che Ivan celunal Ana.*
Marina tell-REP-3sg to Peter that Ivan kiss-REP-3sg Ana.
'Marina apparently told Peter that Ivan apparently kissed Ana.'

The example below was accepted as felicitous by all four speakers, therefore suggesting that the reportative may be used even in the presence of contradictory direct knowledge.

(7) *Marina kaza che Todor imal chervena kosa, no kosata mu e cherna*
Marina tell-aorist-3sg that Todor has-REP-3sg red hair, but hair-the his is black
'Marina said that Todor apparently has red hair, but his hair is black'

References

[1] Izvorski, Romyana. 1997. "The present perfect as an epistemic modal". In A. Lawson (Ed.), *Semantics and Linguistic Theory* VII, 222-239.

[2] Matthewson, Lisa, Hotze Rullmann, and Henry Davis. 2006. "Evidentials as epistemic modals: evidence from Statimcets". Unpublished ms., University of British Columbia.

[3] Patricia Amaral, Craige Roberts and E. Allyn Smith. 2007. "Review of The Logic of Conventional Implicatures". *Linguistics and Philosophy* 30:707-749.

[4] Potts, Christopher. 2005. *"The Logic of Conventional Impliactures"*. Oxford: Oxford University Press.

[5] Sauerland, U. and M. Schenner. 2007. "Embedded Evidentials in Bulgarian", in E. Puig-Waldmuller (ed.) *Proceedings of Sinn und Bedeutung 11*, Barcelona: Universitat Pompeu-Fabra, 495-509.

Evidentiality as a Link between Speakers, Times, and Events

Todor Koev, Rutgers University

Bulgarian is a language that has a bi-partite distinction between direct and indirect (reportative or inferential) evidentiality, morphologically marked by verbal suffixes (1a, 2a). A similar pattern is found in typologically unrelated languages like Turkish and Norwegian (Izvorski 1997). The goal of my presentation is to account for the semantics of the direct and the reportative uses of the indirect evidential (abbreviated as DIR and REP, respectively).

For starters, I will discuss a few crucial empirical properties of Bulgarian evidentials, namely: (i) DIR and REP cannot occur with the same proposition in their scope (REP(p)&DIR(p) is infelicitous); (ii) REP cannot be used with two contradictory propositions (REP(p)&REP(~p) is not good); (iii) evidential markers are always speaker-oriented; (iv) the evidential import cannot be directly challenged; (v) the evidentials always take scope/project through propositional operators like negation, tense, or modals; (vi) both evidentials commit the speaker to the truth of the embedded proposition. Given these facts, I conclude that DIR and REP have some kind of projective and contradictory meanings with no modality involved.

Faller (2004) distinguishes between event-level and sentence-level evidentiality. I apply her (simple-event) account on DIR and REP, assuming that event-level evidentials express a relation between the speaker and the verbal event. After showing that this account makes the wrong predications for negated sentences, I develop a double-event account, which is grounded in the following core assumptions: (i) every sentence of Bulgarian contains two events – a verbal event *e* (introduced by the main verb) and a learning event *e'* (introduced by the evidential morpheme); (ii) *e'* expresses a relation between the speaker and the main proposition; (iii) the difference between DIR and REP is a difference between overlap/non-overlap of *e'* and reference time. The particular semantics I apply is based on Hamblin (1973) and Murray (2008), with two extra definitions specifically targeting the evidential import and the main proposition (1b, 2b).

In the literature, two types of evidential systems have been distinguished, depending on whether an indirect evidential does or does not commit the speaker to the main assertion. As fallout of the discussion, I speculate that the empirical distinction between committing and non-committing evidentials corresponds to the theoretical distinction between event-level and sentence-level evidentiality.

(1)a. Ivan pobedi-**∅**. ⇝
Ivan won-**DIR**
'Ivan won (I saw it).'

b. $$\lambda p[\underbrace{p = \lambda w[\exists e(\mathrm{win}_w(e,\mathrm{ivan}) \wedge \tau(e) \subseteq \mathrm{RT})]}_{\text{identity condition}} \wedge \underbrace{\exists e'(\mathrm{LEARN}_{v_0}(e',\mathrm{SP},p) \wedge \tau(e') \subseteq \mathrm{RT})}_{\text{evidential import}} \wedge \underbrace{p(v_0) \leq p(v_1)}_{\text{illoctionary relation}}]$$

(2)a. Ivan pobedi-**l**. ⇝ b. $\lambda p[\underbrace{p = \lambda w[\exists e(\text{win}_w(e, \text{ivan}) \wedge \tau(e) \subseteq \text{RT})]}_{\text{identity condition}}$

Ivan won-**REP**

'Ivan won (I was told so).'

$\wedge \underbrace{\exists e'(\text{LEARN}_{v_0}(e', \text{SP}, p) \wedge \tau(e') \not\subseteq \text{RT})}_{\text{evidential import}}$

$\wedge \underbrace{p(v_0) \leq p(v_1)}_{\text{illoctionary relation}}]$

The Future and Epistemic Modality in Hindi

In Hindi, adding the suffix *gaa* to a subjunctive-marked verb (main or auxiliary) yields a future reading, as in (1). One way of expressing epistemic modality, shown in (2), is to use an auxiliary verb *ho-gaa* that bears a suffix form-identical to the future-marker. Future orientation in (2) is, however, impossible.

(1) Abe kaam kar-e-gaa
Abe work do-Subj-gaa
'Abe will do work.'

(2) Abe kaam kar-taa ho-∅-gaa
Abe work do-IMPF AUX.Subj-gaa
'Abe must$_{EPIST}$ do work.'

Despite the formal similarity, some recent work (Sharma 2008 - following the established tradition of traditional grammarians) has treated the future marker and the 'epistemic auxiliary' in (2) as lexically distinct. My account goes against this view.

I present a unified analysis of *gaa* that covers both the future and epistemic readings. I argue that *gaa* in (1) is not a semantic tense on par with *present* or *past*. Instead, I treat *gaa* as a necessity modal in the Kratzerian tradition with an under-specified modal base (MB).

My account differs from Kratzer's (1991) take on MB-determination in the following regard: Rather than contextually-determined, I take *gaa*'s MB to be determined by the semantic type of its sister. I argue that *gaa* has a flexible type, which allows it to merge in one of two positions: either above TP (heading its own ModP), or above AspP (as a T head).

(3) $[\![gaa]\!] = \begin{cases} \lambda p_{\langle wt\rangle}.\ \lambda w.\ \forall(\text{w'}) \in MB(\text{w},\textsf{NOW}) \rightarrow \text{p(w')} & \text{(when sister is TP)} \\ \lambda P_{\langle i,wt\rangle}.\ \lambda w.\ \forall(\text{w'},\text{t'}) \in MB(\text{w},\textsf{NOW}) \rightarrow \text{P(w',t')} & \text{(when sister is AspP)} \end{cases}$

Epistemic readings arise when *gaa* quantifies over *worlds* in an epistemic/doxastic MB. With future readings, on the other hand, *gaa* quantifies over the *world-time pairs, (w,t)*, that constitute the *metaphysical* MB (Condoravdi 2002, Thomason 1974). Forward-shifting is not a property of the modal *per se* on my account (as it is in Condoravdi 2003 and Matthewson 2005), but rather of the metaphysical MB. Because Epistemic MBs only range over worlds, they are incompatible with the second denotation in (3), the opposite is true of metaphysical MBs.

Because Tense is present in Epistemic readings, the account can explain why the instantiation time of the modal in (4) can be back-shifted with a temporal adverbial.

(4) Raamu {pichle saal | aajkal} bahut aam khaa-taa ho-gaa
Raamu {last year | nowadays} many mango eat-IMPF AUX-gaa
'Ramu must have eaten many mangoes (habitually) last year/ Ramu must eat many mangoes nowadays.' (from Sharma 2008)

In addition, taking the observation from Anand & Nevins (2006) that auxiliary *ho* is the spell-out of tense-features, we can explain why the epistemic reading is unavailable without *ho*, as it is in (1). That is, we can explain why (1) cannot mean (2). In the absence of *Present* or *Past* features, *gaa* must head T and must therefore combine with AspP. To do so, its type must be $\langle\langle i, wt\rangle, wt\rangle$, which is incompatible with the epistemic MB.

Assessor Sensitivity and the Modality of *Even*

Carlos Balhana
Department of Linguistics, and Imaging Sciences and Information Systems (ISIS) Center
Georgetown University
✉*balhana@isis.georgetown.edu*

Traditional accounts of the focus operator EVEN propose that the existential additive and scalar meanings are the result of implicatures, and scalar implicature has been analyzed in different proposals in terms of likelihood, informativeness, or noteworthiness. Kartunnen and Peters (1979) and Herburger (2000) have suggested, however, that an implicature-based analysis is too weak, and that the existential and scalar meanings are actually part of the truth-conditional meaning of EVEN. I propose that if we are to interpret focus and likelihood (or whatever other category we choose for the scale) as a contextually-determined, ranked set of alternatives, then one might expect the phenomena to be reconcilable within a theory of graded modality such that the scalar meaning is represented by an ordering source semantics.

In the present analysis, I provide some contexts which suggest that we cannot consistently evaluate the meaning of EVEN based on objective probabilities, nor can we define notions of likelihood, informativeness or noteworthiness (Rooth 1985; Kay 1990; Herburger 2000) without accounting for faultless disagreements between conversational participants. I propose that the alternatives follow from sets of beliefs represented as doxastic worlds. I also argue that the modal operator exhibits assessor sensitivity, such that alternatives are evaluated relative to individuals in addition to worlds and times and are ranked by an antistereotypical ordering source, thus engendering the subjectivity and "goodness of fit" intuition previously attributed to a scalar implicature. I also maintain that the observed faultless disagreements are part of larger phenomena which have been similarly addressed within the recent literature on predicates of personal taste (PPTs) and epistemic modals (Egan, Hawthorne, and Weatherson 2004; Lasersohn 2005; Stephenson 2007).

Finally, I address another puzzle regarding the evaluation of EVEN under the scope of a factive predicate. Herburger (2000) observes that previous scope and NPI analyses provide conflicting predictions regarding the actuality of the existential additive in sentences like *I regret even opening that book*, when in fact either option is available; that is, the proposition is compatible with either contexts where I did something else to the book or contexts where all I did was open it. Herburger argues that the existential implicature can be neutralized after computing the factivity of regret, but if we are to adopt a truth-conditional analysis of EVEN, then we cannot rule out the actuality of the additive meaning in the same way, nor can we account for the scalar ordering of expectations, which is still readily interpreted. As a proposed solution to this problem, I argue that the modal meaning of EVEN compositionally interacts with the alternative semantics of factive predicates, allowing for the interpretation of either of the above two readings.

Egan, A., J. Hawthorne, & B. Weatherson. 2004. Epistemic modals in context. In C*ontextualism in Philosophy,* ed. by G. Preyer & G.Peter, 131-168. Oxford: OUP

Herburger, E. 2000. *What Counts: Focus and Quantification.* Cambridge, MA: MIT Press

Lasersohn, P. 2005. Context Dependence, Disagreement, and Predicates of Personal Taste. *Linguistics and Philosophy* 28(6). 643-686.

Kartunnen, L., & S. Peters. 1979. Conventional Implicature. In *Syntax and Semantics 11: Implicatures*, ed. by Oh, C.K. & D.A. Dinneen, 1-55. New York: Academic Press.

Kay, P. 1990. Even. *Linguistics and Philosophy,* 13(5). 9-111.

Rooth, M. 1985. *Association With Focus.* University of Massachusetts at Amherst dissertation.

Stephenson, T. 2007. Judge Dependence, Epistemic Modals, and Predicates of Personal Taste. *Linguistics and Philosophy* 30(4), 487-525.

***De re* anaphors**. We motivate a binding theory for pronouns in intensional contexts with distributional facts about *de re*/*de se* ±anaphoric pronouns. We present new arguments that (a) *de se* readings are grammatically encoded and (b) that grammatical processes—e.g. Conditions A and B, Fox's (2000) Economy of variable binding—are *sensitive to* the *de re* vs. *de se* distinction, *pace* Anand (2006). An Economy condition on *de re* "introduction" is proposed and defended, with consequences for Zimmermann's (1991) argument that *de re* LFs are compatible with *de se* readings.

Heim (1994) observes that a *de se* pronoun (†) can "bind" a non-*de se* (‡) anaphor. For instance, (1) is judged true if Olympia doesn't realize the person she wants to criticize is herself:

(1) Olympia wants PRO† to criticize herself‡!

The standard view has it that *de se* attitudes stem from self-ascription of a property—cf. Lewis (1979). However, if in an attitude ascription this property originates via λ-abstraction—cf. Chierchia (1989)—mixed readings as in (1) should be impossible since *herself* must be locally bound:

(2) Olympia$_i$ wants λ_j PRO$_j$ to criticize herself$_{*i/j}$.

Heim proposes that an anaphor may be long-distance bound just in case its "normal" antecedent is *de se*. Using new data from nearly-free control—cf. Jackendoff & Culicover (2003)—we argue that long-distance binding cannot be the mechanism underlying mixed readings:

(3) Olympia$_i$ talked to Susan$_j$ about PRO$^{\dagger}_{i+j}$ criticizing each other$^{\ddagger}_{i+j}$!

(4) *Olympia$_i$ talked to Ben$_j$ about PRO$^{\dagger}_{i}$ criticizing himself$^{\ddagger}_{j}$!

Since reciprocal anaphors don't tolerate split antecedents, Heim's account predicts (3) to be ungrammatical with a *de re* anaphor. Absent stipulation, Heim's account also doesn't explain the contrast between (1) and (4). We conclude that a *de se* pronoun can bind a *de re* anaphor.

Sharvit (2009) argues that a *de re* pronoun cannot bind a *de se* reflexive and that if a *de re* pronoun binds a *de re* reflexive, the two must be construed relative to the same acquaintance relation:

(5) *Olympia$_i$ thinks she$^{\ddagger}_{i}$ burgled herself$^{\dagger}_{i}$.

(6) Olympia$_i$ thinks she$^{\ddagger_1}_{i}$ burgled herself$^{\ddagger_{1/?2}}_{i}$.

We argue that Sharvit is correct about (5) but mistaken about (6). In order: while an utterance of *Olympia thinks she burgled herself* seems *compatible* with a scenario in which Olympia sees the burgl-ee in the first-person way and and burglar in the third-person way, embedding in decreasing contexts—cf. Percus & Sauerland (2003)—reveals that this cannot be due to a *de re–de se reading* of (5), *per se*:

> Susan sees herself on TV without recognizing it's her. The woman on TV is defending "the junior senator from Maine"—i.e. herself. Susan thinks "How generous of her to stick up for her colleague." Mary sees herself defending Olympia without recognizing she's on TV. Mary, a suggestible amnesiac who's under the impression she's Olympia, thinks, "How generous of her to stick up for me."

(7) #Mary and Susan are both confused, but only MARY thinks she's defending herself.

(8) #Mary thinks she's defending herself, but Susan doesn't.

Context requires that only Mary has a *de se* belief about being defended by someone (who we take to be) identical to her. So if a *de re–de se* reading were available for *Mary thinks she's defending herself*, both (7) and (8) would be felicitous, contrary to fact.[1] As for (6), an utterance of e.g. *Olympia thinks she killed herself* is judged true if Olympia thinks x killed y, without taking them to be identical either to herself (though they are), or each other. Focal stress on both pronouns helps bring the reading out.

This is a surprising set of facts. It's been assumed since Zimmermann (1991) that the felicity of e.g. *everyone$_i$ thinks he$_i$ won re-election* in cases where some individuals have a *de se* belief but some only a *de re* belief entails that *de re* LFs are compatible with *de se* readings.[2] But if $[x^{\ddagger_1}_i[\dots x^{\ddagger_2}_i\text{-self}]]$ is licit, what could rule out $x^{\ddagger_2}_i$*-self* being construed *de se*—thereby contradicting $*[x^{\ddagger}_i[\dots x^{\dagger}_i\text{-self}]]$?

We assume the following (fairly standard) centered-worlds semantics for attitudes ($\mathcal{A}$):

- Following Percus & Sauerland (2003), G is a variable over *concept generators* of type $\langle e, \langle \sigma, e\rangle\rangle$, with '$\sigma$' the type of centered worlds. For any G, attitude relation $\mathcal{A}$, x_e, w_s, and any $\kappa'_\sigma = \langle w', x'\rangle \in \mathcal{A}^w_x$,[3] $[\![\mathsf{G}\ y_i]\!]^{g,\kappa'} := \iota y : R(x')(w')(y)$, with R an acquaintance relation constrained such that $\iota y : R(x)(w)(y) = g_{@}(i)$. This implements Kaplan's (1968) framework for *de re* attitudes.
- $\mathcal{A}(p)(x)(w) = 1 \Leftrightarrow \exists \mathsf{G} \forall \langle w', x'\rangle \in \mathcal{A}^w_x : p(\mathsf{G})(x')(w') = 1$. (cf. Anand 2006)

1 Crucially, parallel configurations with possessive pronouns are licit in belief ascriptions: $[x^{\ddagger}_i[\dots x^{\dagger}_i$'s NP$]]$, cf. Anand 2006.

2 See (11) below for one example of how a *de re* LF can yield a *de se* reading.

3 $\langle x', w'\rangle \in$ e.g. $\text{Dox}^w_x \Leftrightarrow x'$ is someone x thinks she might be in w, and w' is a world compatible with what x believes in w.

- Bare (i.e. G-less) pronouns get bound by a syntactic λ operator—c.f. (2). So they're *de se*.

Additionally, we assume *de re* pronominal DPs are *derived* from "bare" (i.e. *de se*) pronominal DPs via a structure-building operation: i.e. $[_{\text{DP}}\, x_i] \rightsquigarrow [_{\text{DP}}\, \mathsf{G}\ x_i]$. Fox (2000) argues that LF transformations should have semantic import. And plainly, if for any G, x_i, assignment g, world w, attitude relation $\mathcal{A}$, and doxastic state Dox_x^w, $\forall \kappa' \in \text{Dox}_x^w \,.\, \mathsf{G}([\![x_i]\!]^g)(\kappa') = g(i)$, the *de re* transform will be for naught. We propose that all G-introductions meet the following criterion: $\exists \kappa' \in \text{Dox}_x^w \,.\, \mathsf{G}([\![x_i]\!]^g)(\kappa') \neq g(i)$. Informally, Gs should *do something* in the information state of the belief ascribee. Given an LF $[[\mathsf{G}_1\ x_i]\,[\ldots[\mathsf{G}_2\ x_i\text{-self}]]$, this entails that neither pronoun can be interepreted *de se*. If the LF $[[\mathsf{G}\ x_i][\ldots x_i\text{-self}]]$ can be ruled out (see below), we derive $^*[x_i^{\ddagger}[\ldots x_i^{\dagger}\text{-self}]]$.

Of course, this proposal entails that *de re* pronouns of *all* sorts may never be construed *de se*. Isn't this inconsistent with Zimmermann's data? Evidence it's not comes from the following:

> Olympia, Susan, and Mary are watching TV. As it happens, some talking head is on the air criticizing Olympia, Susan, and Mary. Olympia and Mary, somewhat confused, realize only that the talking head is criticizing some politician. Each thinks, "I want to defend those poor souls." Susan, on the other hand, realizes what's going on and thinks, "I want to defend myself."

(9) Olympia wants to defend herself, and {✓Mary, ✓Susan} does too.

(10) ✓Each of those senators wants to defend herself.

Since $^*[x_i^{\ddagger}[\ldots x_i^{\dagger}\text{-self}]]$, we concluded *de re* anaphors couldn't be interpreted *de se*. Yet the reflexive is licensed in a mixed scenario (exactly as in Zimmermann's case)! Actually, the proposed Economy condition predicts this since only a "do-nothing" G can make *Susan wants to defend herself* true and thus yield true readings of (9) and (10) (parallel reasoning rescues Zimmermann's example):

(11) $\lambda \mathsf{G}[\forall \kappa' = \langle w', x' \rangle \in \text{Boul}_{\mathbf{s}}^{w_@} : \mathbf{defend}(\mathsf{G}(x')(\kappa'))(x')(w')](\lambda y_e \lambda \kappa_\sigma . y)$
$\rightsquigarrow_\beta \forall \kappa' = \langle w', x' \rangle \in \text{Boul}_{\mathbf{s}}^{w_@} : \mathbf{defend}(x')(x')(w')$ [**True in our scenario**]

Ruling $[[\mathsf{G}\ x_i]_j\,[\ldots x_i\text{-self}]]$ out—while ruling $[x_i\,[\ldots[\mathsf{G}\ x_i\text{-self}]_j]$ in—remains. We propose an account which (a) leaves "bare" objects in situ but (b) forces *de re* objects to raise at LF—à la object shift or focus movement. Taken together with the assumption that Binding Theory cares only about *extensional* covaluation, this derives the asymmetry:

(i) ✗$[[\mathsf{G}\ \text{she}_i]_j\,[\lambda_j\,[_{\text{VP}}\ t_j\ [\text{defends herself}_i]]]]$ (ii) ✓$[\text{she}_i\,[\lambda_i\,[\mathsf{G}\ \text{herself}_i]_j[\lambda_j\,[_{\text{VP}}\ t_i\ [\text{defends}\ t_j]]]]]$

In (i) *herself*$_i$ must, given Condition A, be bound by the trace t_j of $[\mathsf{G}\ \text{she}_i]_j$. Since (given Economy of G introduction) $g(i) \neq g(j)$ this move is illicit. In (ii), by contrast, she$_i$ binds $[\mathsf{G}\ \text{herself}_i]_j$. Since (by Percus & Sauerland's 2003 rules for G) $[\![\mathsf{G}\ \text{herself}_i]\!]^{g,\kappa_@} = g(i)$, this move is licit.

We thus maintain, *pace* Anand (2006), that Binding Theory "sees" *de re* vs. *de se*—a conclusion I think the asymmetry between (1) and (7)–(8) impels. Some more evidence this is on the right track:

(12) Olympia said she voted for her bill, and Susan did too.

(12) lacks a STRICT–SLOPPY reading, a fact known as Dahl's (1973) puzzle. Fox (2000) proposes an account based on locality of variable binding: the missing reading requires long-distance binding of *her* by *Olympia*; however, this is ruled out since local binding yields a truth-conditionally equivalent result. If this mechanism is sensitive to the truth-conditional difference between *de re* vs. *de se* readings, we should observe obviations of Dahl's effect if a *de re* pronoun intervenes between a *de se* pronoun x_i and the *de se* abstraction operator λ_i. In fact, this is precisely what obtains:

> One day Olympia and Susan return home to find that both of their computers have been stolen. They discover that a plant has been knocked over in the living room and surmise that whoever the thief was, (s)he must have been the one who knocked over that plant. In reality, Olympia knocked the plant over the previous evening in a drunken stupor, an incident she has completely forgotten.

(13) Well this is funny. Olympia thinks SHE stole her computer, and SUSAN does too.

Finally, we note that obviations of Condition B effects can occur if the binding pronoun is *de re*:

(14) Well this is funny. Olympia thinks SHE($_i$'s the one who t_i) robbed her.

Though (14) should induce a Condition B violation—see Sharvit (2009) on Condition B effects for *de re* pronouns—the construction is only slightly deviant, and the parenthetically given form is impeccable.

Anand, P. 2006. De De Se. **Chierchia, G.** 1989. Anaphora and attitudes *de se*. **Dahl, O.** 1973. On so-called 'sloppy identity'. *Synthese* 26. **Fox, D.** 2000. *Economy and Semantic Interpretation*. **Heim, I.** 1994. Puzzling reflexive pronouns in *de se* reports. **Jackendoff, R. & P.W. Culicover.** 2003. The Semantic Basis of Control in English. *Language* 79. **Kaplan, D.** 1968. Quantifying in. *Synthese* 19. **Lewis, D.** 1979. Attitudes *De Dicto* and *De Se*. *Phil Review* 88. **Percus, O. & U. Sauerland.** 2003. On the LFs of Attitude Reports. *Proceedings of SuB 7*. **Sharvit, Y.** 2009. Covaluation and Unexpected BT Effects. **Zimmermann, T.E.** 1991. Kontextabhängigkeit.

Background: Attitude verbs, (*believe, hope, know, etc*.) are sub-sentential forms expressing modal meanings. Since Hintikka, these verbs are analyzed as quantification over possible worlds. Modal concord (MC) is the phenomenon that sentences with multiple modal expressions are interpreted as if there were only one modal operator in them. Modal concord may be established between an attitude verb and a modal expression in its complement:

(1) The general demands that the troops must leave. (From Zeijlstra 2008)

Question: What aspects of the meaning of "hope" can modal concord reveal? How does the concord reading arise?

Data: The interaction between the verb "hope" and modal expressions in Mandarin shows the following patterns:

A. When there are more than one modal in the scope of "hope", the one closer to the verb does not function as a modal operator. Compare the root sentence (1a) with the complement *of hope* in (1b):

(2) a. *Lisi jintian **neng** xie de wan wenzhang.*
Lisi today may write de finish paper
'It is compatible with my belief that Lisi is able to finish the paper today.'

b. *Zhangsan xiwang Lisi jintian **neng** xie de wan wenzhang.*
Zhangsan hope Lisi today may write de finish paper
'Zhangsan hopes that Lisi is able to finish the paper today.'

'Zhangsan hopes it is compatible with his belief that Lisi will be able to finish the paper today.'

#'Zhangsan hopes that Lisi will be able to be able to finish the paper today.'

In (2a) the modal base of the auxiliary *neng* is the belief of the speaker in the time of speaking, and the potential complement structure "*xie de wan*" expresses a modal relative to the circumstances of *Lisi*. However, in (2b), *neng* cannot be interpreted relative to either a doxastic or a circumstantial modal base.

B. In (2a) *neng* can be replaced by a necessity modal *yiding*, while the same operation for (2b) will cause ungrammaticality.

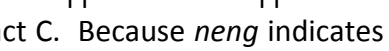
C. "*x xiwang neng p*" presupposes that the matrix subject has a weak belief on the possibility of p, while "*x xiwang p*" is neutral in terms of x's belief on the possibility of p. Consider this scenario: Zhangsan believes that his performance in class is excellent, and thus believes that it is probable that he will get an A. Given this context, statement (3a) is acceptable, but (3b) is marginal.

(3) a. Zhangsan xiwang Li jiaoshou gei ta A.
Zhangsan hope Li professor give him A
'Zhangsan hopes Professor Li will give him an A.'

b. # Zhangsan xiwang Li jiaoshou neng gei ta A.

Explanation: Hacquard (to appear) proposes that modals are relative to events rather than worlds. The types of events to which a modal can be relativized are: speech event (e_0), attitude event (e_2) and VP event (e_1). I argue that pattern A holds because "hope" does not allow a modal in its scope to be relativized to the attitude event. At the same time, *neng* cannot share its event with another operator; and since the potential complement is relativized by e_1, *neng* is stranded.

(4) [$_{CP1}$ λe_0 T Asp$_2$ Att **e_2** [$_{CP2}$ [$_{TP}$ ***neng*** T Asp$_1$ [$_{VP}$ V **e_1** de C]]]]



Pattern B is related to fact C. Because *neng* indicates that according to the beliefs of matrix subject the the complement proposition is unlikely to be true, a necessity modal will not be appropriate.

References: **Anand**, Pranav and **Hacquard**, Valentine (2009): Epistemics with Attitude, in *Proceedings of SALT 18.* **Geurts**, B. and J. **Huitink** (2006): 'Modal Concord', in *Proceedings of the ESSLLI 2006 Workshop 'Concord Phenomena at the Syntax Semantics Interface'*. **Hacquard**, Vlentine, to appear 'On the Event-Relativity of Modal Auxiliaries', *Natural Language Semantics* **Zeijlstra**, Hedde (2008): 'Modal Concord is Syntactic Agreement', in: M. Gibson and T. Friedman (eds.): *Proceedings of SALT XVII*. Ithaca: CLS Publications.

Epistemic Containment and the distribution of quantifiers

Michaël Gagnon & Alexis Wellwood
University of Maryland

Can quantifiers 'bind their trace across an epistemic modal' (the Epistemic Containment Principle [ECP] of [1])? Since [2], [3] it is often assumed that quantificational expressions undergoing the Quantifier Rule (QR) are scopally rather free in their clause. More recent work offers a different perspective ([4], [5], [6], [7]). We consider the unusual pattern of behavior of quantificational NPs (QNPs) and epistemic modals (EMs), adding to the literature that suggests the syntax imposes strict constraints on the relative scope of quantifiers.

Consider a scenario in which we are certain that some of the relevant students have left for the semester, and certain that some have not, but for any given student we do not know which have left. [1] reports that the sentence *every student may have left* can only mean that *it's possible that all the students have left*, which is false in our scenario. The ECP as a constraint on LF representations is meant to capture this data, yet the account faces empirical challenges, since QNPs headed by *each* do not respect it: *each student may have left* can mean that for each student x, it is possible that x left, which is true in our scenario.

[6] provide a number of tests that reveal the differential ability of the distributive universal quantifiers *each* and *every* to take scope w.r.t. other quantificational expressions in a given structure. Applying these tests, we demonstrate to what extent quantifiers subject to the putative ECP pattern with *every*. We identify a structural location in the syntactic hierarchy for EMs and suggest that EMs can bind QNPs of the *every* but not the *each* variety. In this, we extend the discussion of [8] and [9] on quantificational modals binding individual variables to a new class – that of *set variables* (e.g. [5]). *each*, unlike *every*, bears a strong [+Distributive] feature which must be checked at a position higher than the EM.

Thus, we adopt a classification of QNPs, where scope possibilities are determined by the interaction of the feature make-up of the quantifier classes with an articulated clausal topology. *Every* takes scope by being bound by a higher operator, while *each* takes scope by movement. Since *each* may bind its trace above EMs, this casts doubt on the existence of the ECP as a constraint on QR.

[1] von Fintel & Iatridou (2003). Epistemic containment. *Linguistic Inquiry, 34,* 173-198. **[2]** May (1977). *The grammar of quantication*. Ph.D. dissertation, MIT. **[3]** May (1985). *Logical form: Its structure and derivation*. Cambridge, MA: MIT Press. **[4]** Hornstein (1995). *Logical Form: from GB to Minimalism*. Cambridge, MA: Blackwell. **[5]** Szabolcsi (1997). Strategies for scope taking. In *Ways of scope taking*, Szabolcsi (Ed.), 109-154. Boston: Kluwer. **[6]** Beghelli & Stowell (1997). Distributivity and negation: the syntax of *each* and *every*. In *Ways of scope taking*, Szabolcsi (Ed.), 71-107. Kluwer. **[7]** Bruening (2001). QR obeys superiority: frozen scope and ACD. *Linguistic Inquiry, 32,* 233-273. **[8]** Lewis. (1975). Adverbs of quantication. In *Formal semantics of natural language*, Keenan (Ed.). Cambridge U P. **[9]** Heim (1982). *The semantics of denite and indenite Noun Phrases*. Ph.D. dissertation, UMass.

Chinese 'dou' and Cumulative Quantification

Yanyan Sui & Lucas Champollion University of Pennsylvania {yanyans, champoll}@ling.upenn.edu

Summary: We explore configurations in which *dou* in Chinese is compatible with cumulative readings involving numeral quantifiers. Such readings pose *prima facie* problems for a view that uniformly translates *dou* as Link's (1983) * operator similar to English *each*.

Data: The Chinese particle *dou* has often been claimed to be a distributivity marker (Lin 1998 and references therein). For example, while (1) has only the cumulative reading (3a), (2) only has the distributive reading (3b). Here, $X \in *P$ iff X is the sum of one or more elements of P (Link, 1987), and $\langle X,Y\rangle \in **R$ iff $\langle X,Y\rangle$ is the sum of one or more pairs in R (Sternefeld, 1998).

(1) san-ge haizi chi-le shi-ge pingguo
three- CL kid eat-ASP ten- CL apple

(2) san-ge haizi ***dou*** chi-le shi-ge pingguo
three- CL kid DOU eat- ASP ten- CL apple

(3a) $\exists X$ [3-kids(X) $\wedge \exists Y$[10-apples(Y) $\wedge \langle X,Y\rangle \in **$ate]] '3 kids between them ate 10 apples.'

(3b) $\exists X$ [3-kids(X) $\wedge X \in *[\lambda x\ \exists Y$[10-apples(Y) $\wedge$ ate(x,Y)]]] '3 kids each ate 10 apples.'

But in the causative *ba*-construction, in which both subject and object come before the verb, only a cumulative reading, but not a distributive reading, is available when *dou* is absent (4a) and also when it is present before the verb (4b). When *dou* occurs between the two quantifiers (4c), only a distributive reading is available. The compatibility of *dou* with cumulative readings is unexpected if *dou* is a one-place distributivity marker.

(4a)san-ge haizi ba shi-ge pingguo chi-le
three-CL kid BA ten-CL apple eat-ASP
'Three kids between them ate 10 apples.'

(4b)san-ge haizi ba shi-ge pingguo ***dou*** chi-le
three-CL kid BA ten-CL apple DOU eat-ASP
'Three kids between them ate 10 apples.'

(4c)san-ge haizi ***dou*** ba shi-ge pingguo chi-le
three-CL kid DOU BA ten-CL apple eat-ASP 'Three kids each ate 10 apples.'

Analysis: Our analysis uses a Neo-Davidsonian framework, in which verbs, VPs, and IPs denote predicates over events. We view *dou* as a theta role modifier. A theta role modified by *dou* causes its bearer to take distributive scope over the event predicate it c-commands, including any quantifiers it may contain. To allow *ba* to introduce an external argument higher up, *dou* places the event and the theta role bearer into a cumulative relation and leaves the sum event accessible:

(5) $[\![\text{dou}]\!] = \lambda\theta_{<ve>}.\ \lambda P_{<et>}.\ \lambda V_{<vt>}.\ \lambda E.\exists X.\ P(X) \wedge \langle E,X\rangle \in **\lambda e\lambda x.[\text{ATOM}(x) \wedge \theta(e)=x \wedge V(e)]$

Finally, we present some facts that are surprising on our analysis as well as others. First, for some speakers, *ba* can be left out from (4b) in informal speech, and by removing it, a distributive reading becomes available in addition to the cumulative reading. Second, the passive-like *bei* construction allows (in fact, forces) quantifiers to escape the scope of *dou* (6).

(6) shi-ge pingguo dou bei san-ge haizi chi-le
ten-CL apple DOU BEI three-CL kid eat-ASP 'Three kids between them ate 10 apples.'

References: Lin, J.-W. 1998. Distributivity in Chinese and its implication. NLS 6: 201-243. Link, G. 1998. *Algebraic Semantics in Language and Philosophy*. Stanford: CSLI. Sternefeld, W. 1998. Reciprocity and cumulative predication. NLS 6:303-337.

Quantifiers, alternatives, and 'certain' indefinites

Mike Solomon, *NYU*

Schlenker (2006) provides an empirical argument for the necessity of functional quantification in the analysis of indefinite noun phrases. The sentence (1a) has (1b) among its interpretations, but (1b) cannot be expressed using only first-order quantification over individuals.

(1) a. If every student makes progress in a certain area, nobody will flunk the exam.
b. There is an assignment of areas to students such that if each student makes progress in the area assigned to him or her, nobody will flunk the exam.

On the other hand, this reading is easily expressed with quantification over Skolemized choice functions ("general Skolem functions" in Schlenker's terminology). Schlenker assigns (1a) on reading (1b) the logical form (2):

(2) $\exists F_{\langle 1 \rangle}$ if $[\forall x : \text{student } x]$ x makes progress in $F(x, \lambda y[\text{area } y])$, nobody will flunk the exam.

where $F_{\langle 1 \rangle}$ ranges over Skolemized choice functions of one individual argument.

It is well-known, however, that analyses of indefinites as functional variables which may undergo top-level existential closure are bound to overgenerate when an indefinite occurs in the scope of a non-upward-entailing operator (see Schwarz 2001). Such an analysis would assign a logical form like (3b) to the sentence (3a), incorrectly predicting (3c) as a possible interpretation of (3a), which lacks this reading.

(3) a. If no student makes progress in a certain area, everybody will flunk the exam.
b. $\exists F_{\langle 1 \rangle}$ if $[\text{no } x : \text{student } x]$ x makes progress in $F(x, \lambda y[\text{area } y])$, everybody will flunk the exam.
c. There is an assignment of areas to students such that if no student makes progress in the area assigned to him or her, everybody will flunk the exam.

Notice that this interpretation cannot be blocked by an appeal to quantification over a restricted domain of "natural" functions, as in a given context the same functions validate both (3b) and (2).

I argue that functional analyses of wide-scope indefinites overgenerate because they build into the semantics of indefinites universal quantification which is properly introduced by a distributive quantifier like *every*. Skolemized choice functions are tools to encode dependencies, as between areas and students in (1a), while I argue instead that these dependencies follow automatically from the semantics of the quantifiers that support such readings. The difference between (1a) and (3a) comes down to a difference between their antecedents (with *certain* stripped):

(4) a. Every student makes progress in an area.
b. No student makes makes progress in an area.

Whereas (4a) can be made true in a number of different ways, corresponding to different assignments of areas to students, (4b) can be made true in *only one way*. Each proposition in the alternative set of (4a), in the sense of alternative semantics (Kratzer & Shimoyama 2002), or each proof of (4a), on the formulae-as-types interpretation of intuitionistic type theory (Fernando 2009), encodes an assignment of areas to students. Propagating these alternatives up in the right way (in part the contribution of *certain*) yields the desired interpretation for (1a), without predicting the illicit reading for (3a), since (4b) never encodes a dependency in the first place. I give a preliminary implementation of these ideas in the framework of alternative semantics.

Fernando, T. 2009. Situations as indices and as denotations. *Linguistics & Philosophy* 32. **Kratzer, A. & J. Shimoyama.** 2002. Indeterminate pronouns: The view from Japanese. *Proceedings of the Third Tokyo Conference on Psycholinguistics.* **Schlenker, P.** 2006. Scopal independence: a note on branching and wide scope readings of indefinites and disjunctions. *Journal of Semantics* 23. **Schwarz, B.** 2001. Two kinds of long distance indefinites.

Uncertain numerals

Erin Zaroukian, Johns Hopkins University

We often use words like *maybe* to mark uncertainty in our utterances. When we mark our uncertainty on numerals, however, strange things happen. Below we will see these somewhat unexpected effects of marking uncertainty on a numeral, as well as a for explanation for them using possible world semantics. This analysis will ultimately apply to all uncertain scalars, not just numerals, and it will inform our view on other scalar modifiers like *approximately*.

You can use words like *maybe* to mark your uncertainty with respect to an item as in (1a), and as a result your interlocutor might entertain alternatives to this uncertain item, as sketched in (1b). When the uncertain item is a numeral, there is a strong tendency for the set of alternatives to resemble approximation, as in (2).

(1) a. A: Who won the race?
B: Maybe John.
b. {John, Ann, Pete}

(2) a. A: How many people competed?
B: Maybe twenty.
b. {18, 19, 20, 21, 22}

However, this does not occur for all uncertain numerals (e.g. *Which bus? Maybe the 20*). Furthermore, when this approximation effect occurs, the range of alternatives depends on the numeral (e.g. if you replace *twenty* in (2) with *twenty-seven*, the range tends to be smaller).

These phenomena can be given a formal explanation using Krifka (2009)'s conception of numerals, along with a possible world semantics as described in Kratzer (1991). To begin, we can consider alternatives to be possible worlds (i.e. worlds consistent with the epistemic modal base), and these worlds will be ordered in terms of their plausibility by an ordering source. Following Krifka we can assume that numerals represent a range which can be characterized as the values which fall within one standard deviation of the expressed numeral on a normal distribution over the number line. For example, if we have a context where the standard deviation for *twenty* would be 2, then *twenty* can represent values in the range [18-22]. We can then phrase this in terms of propositions using p_σ, which says that the value represented by *twenty* falls within one standard deviation (σ) of 20, and a family of functions p_x, which says that the value represented by *twenty* falls within $\sigma - x$ of 20 for $0 < x < \sigma$. Now, if p_σ is in modal base and p_x is in the ordering source, we have an explanation for the approximation that arises: only worlds where values close to 20 are true will be accessible, so only these values will be plausible alternatives. We also have an explanation for why approximation does not always occur with uncertain numerals: it only happens with *scalar* numerals, like in (2), not with numerals acting in a non-scalar labeling capacity such that they do not represent normal distributions. And finally if we consider Krifka's pragmatic preference for simple expressions, we have an explanation for why the range of alternatives depends on the numeral: this preference leads more complex numerals like *twenty-seven* to represent smaller ranges (i.e. induce smaller σs) than simpler numerals like *twenty*, and since *twenty-seven* has a smaller σ, its p_σ allows a smaller range of possible worlds, leading to its narrower interpretation as an uncertain numeral.

It turns out that this analysis for the approximative effect of uncertain numeral extends naturally to other scalars, which seem to display the same effect (e.g. colors), suggesting that all scalars behave alike in representing a range characterized by a normal distribution. This analysis can also inform the way we think of other means of approximation. For example, *approximately* gives rise to a similar though not identical meaning (e.g. it shows the same range effects but does not incorporate external information in the same way), and it turns out that this too can be captured by associating scalars with normal distributions.

References: Kratzer, A. (1991). Modality. In A. von Stechow and D. Wunderlich (Eds.), *Handbuch Semantik*, Berlin: Walter de Gruyter. pp. 639–650. • Krifka, M. (2009). *Approximate Interpretations of Number Words: A Case for Strategic Communication*, CSLI Publications. pp. 109–132.