

Explaining EARLIEST*

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0 Overview

- the semantics of degree constructions has motivated the implementation of a MAX operator, a function from a set of degrees to its maximal member (von Stechow, 1984; Rullmann, 1995, a.o.)
 - this operator is unsatisfying: it’s arbitrary (cf. MIN), and therefore not explanatory
 - there have thus been proposals to reduce MAX to a more pragmatic principle of maximal informativity (Dayal, 1996; Beck and Rullmann, 1999; Fox and Hackl, 2007; von Stechow et al., 2014)
- intriguing differences between *before* and *after* have caused some to posit an EARLIEST operator in the temporal domain (Beaver and Condoravdi, 2003; Condoravdi, 2010)
 - this operator is unsatisfying for similar reasons (cf. LATEST, see Krifka, 2010)
 - some have suggested it, too, can be redefined in terms of informativity (Krifka 2010¹; Rett 2015)
- the hypothesis that these semantic properties are better characterized as the result of a maximal informativity principle results in at least two testable predictions:
 - (1) **the cross-domain prediction**
If MAX/EARLIEST were better characterized as a pragmatic pressure to maximize informativity, we would expect the effects attributed to them to hold across (strictly ordered) domains.
 - (2) **the universality prediction**
If MAX/EARLIEST were better characterized as a pragmatic pressure to maximize informativity, we would expect the effects attributed to them to be universal.²
- recent research has addressed both predictions:
 - there is evidence from the temporal domain (Condoravdi, 2010) and across domains (Rett, 2015) that the principle of maximal informativity only applies to closed (cf. open) bounds
 - and, as I report here, there is evidence that the semantic properties of ‘before’ and ‘after’ that originally motivated EARLIEST are in fact universal
 - but these data also show there is at least one key, principled way in which EARLIEST effects differ across languages

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¹An even more general explanation: “We might also argue that EARLIEST is motivated by general cognitive principles, as “edges” are salient in perceptual experiences as in hearing and vision; it is well-known that there are neurons that are detectors of sudden changes” (Krifka, 2010, 916).

²Crnić and Fox (2017) argue that Slovenian equatives provide a counterexample to this claim.

1 Background: maximality in degree constructions

- (3) a. John drove faster than Mary did.
 b. *John drove faster than Mary didn't. (von Stechow, 1984)
- (4) How many books did John read? (Rullmann, 1995)

- we conceptualize the scale of e.g. integers as unidirectional, ranging from low (1) to high (e.g. 10)
- from this perspective, an informativity ordering on intervals – a relation between an interval and its most informative member – can be conceived as a maximality operator

- (5) Rullmann's MAX (Rullmann, 1995)
 Let D be a set of degrees ordered by the relation \leq , then
 $\text{MAX}(D) = \text{id}[d \in D \wedge \forall d' \in D[d' \leq d]]$

- a few concerns:
 - this absolute formulation doesn't generalize well to negative antonyms (as in Heim, 2007)
 - nor upward-monotonic questions (Beck and Rullmann, 1999)
- (6) How much money can a graduate student live on?
- an alternative proposal: the effects attributed to MAX are instead the result of a more general principle requiring maximal informativity (Dayal, 1996; Beck and Rullmann, 1999; Heim, 2000)
 - this reformulation has order-sensitivity built into it
 - Fox and Hackl (2007) argue that the Maximal Informativity approach is independently motivated with the additional assumption that natural language treats all intervals as dense
 - von Fintel et al. (2014) generalize a relative, order-sensitive MAX to propositions, arguing that a “uniquely maximal object is the one that creates the most informative true proposition” (p167).
 - Rett (2015) presents arguments that Maximal Informativity is domain general (termed ‘Economy of Bounds’; empirical arguments in the Appendix)

2 Before, after and EARLIEST

2.1 Some theoretical preliminaries

- in P before Q , P is the **main clause** and Q the **embedded clause** (a.k.a. the temporal clause)
- P and Q , at some level, denote eventualities that can be mapped to their temporal extension via a temporal trace homomorphism τ (Davidson, 1969; Krifka, 1989).
- we can represent the runtime of an event using a set of times, and since the domain of times is dense and strictly linear, we can represent that set as an **interval**, e.g. (7) (also see Appendix).

- (7) a. Jane studied from 6:00 to 8:00pm. [6:00pm, 8:00pm]
 b. Jane studied from after 6:00 to before 8:00pm. (6:00pm, 8:00pm)

- interval bounds can be closed, as in (7-a), or open, as in (7-b). A closed bound is included in the interval; an open bound defines an interval, but is not included in it.

2.2 Anscombe’s analysis

- since Anscombe (1964), it’s been recognized that *before* and *after* are not duals, strictly speaking
 - *before* but not *after* is associated with a transitive and antisymmetric relation (Anscombe, 1964);
 - *after* but not *before* is veridical (entails the truth of its internal argument; Heinämäki, 1974);

- (8) a. Mozart died before he finished the Requiem.
 b. Mozart died after he finished the Requiem.

- *before* but not *after* licenses NPIs (Ogihara, 1995; Beaver and Condoravdi, 2003)³

- (9) a. John arrived before anyone left the party.
 b. *John arrived after anyone left the party.

- Anscombe (1964) attributes her observed asymmetries to a difference in quantificational force:

- (10) a. $\llbracket A \text{ before } B \rrbracket = 1$ iff $\exists t \in A, \forall t' \in B[t < t']$
 b. $\llbracket A \text{ after } B \rrbracket = 1$ iff $\exists t \in A, \exists t' \in B[t > t']$

- accounts for the fact that *before* is transitive and antisymmetric, but *after* is not;
- accounts for the veridicality and NPI asymmetries
- but incorrectly predicts the truth conditions for *before* sentences (Beaver and Condoravdi, 2003)
 - * e.g. that *Squares had four sides long before David made a clean sweep of all of the gold medals in the Sydney Olympics* is true in worlds in which David has never won a gold medal⁴
 - * and, impossibly, that *Cleo left exactly 5 seconds before David sang* is true for each time in the temporal extension of David’s singing

2.3 The EARLIEST analysis

2.3.1 The initial proposal

- Beaver and Condoravdi (henceforth ‘B&C’) characterize *before* and *after* as follows:

- (11) a. $\llbracket A \text{ before } B \rrbracket = 1$ iff $\exists t \in A[t \leq \text{EARLIEST}(B)]$
 b. $\llbracket A \text{ after } B \rrbracket = 1$ iff $\exists t \in A[t \geq \text{EARLIEST}(B)]$

- they characterize EARLIEST as requiring that “a set T is left-bounded if there is $t \in T$ such that for all $t' \in T, t \leq t'$. For left-bounded T , we call that t , EARLIEST(T)” (Beaver and Condoravdi, 2003, 47).
- in other words (from Krifka, 2010),⁵

- (12) $\text{EARLIEST}(T) = t[t \in T \wedge \neg \exists t'[t' \in T \wedge t' < t]$
 $\wedge \forall t''[t'' \in T \wedge \neg \exists t'''[t''' \in T \wedge t''' < t''] \rightarrow t \sqsubseteq t'']$

- importantly, “Given the assumption of left-boundedness, EARLIEST will always be defined for instantiated [embedded] clauses and will be undefined for uninstantiated [embedded] clauses” (p49).⁶

³Although there are cases in which a modified *after* can license NPIs (Linebarger, 1987).

⁴I don’t love this argument, because of the observed non-veridicality of *before*. But, crucially, B&C cite Landman (1991); Valencia et al. (1992); Ogihara (1995) for the claim that we can’t analyze the non-veridicality of *before* sentences as an underspecification. They instead analyze it as a 3-way ambiguity between veridical *before*, non-veridical *before*, and “the non-committal type of the non-veridical reading” (p47–8). I think this is an incorrect conclusion, especially in light of the cross-linguistic data.

⁵For \sqsubseteq the part relation for times; see also Moens and Steedman (1988) and Fernald (1999) for their use of a similar operator to treat inchoative coercion.

⁶It is appropriately formally relativized in Condoravdi (2010).

- this definedness condition results in the veridicality asymmetry:

- (13) a. Mozart died before he finished the Requiem.
b. Mozart died after he finished the Requiem.

- if the embedded clause is not instantiated in the world of evaluation, EARLIEST “is relativized to an expanded domain of worlds, closely related to the world of evaluation” (p52).
- assuming a right-branching model of history, the precedence relation in (11-a) allows the world of evaluation for the main clause to be distinct from that of the embedded clause...
- ...while the (inverse) precedence relation for *after* in (11-b) guarantees that the embedded clause is always true in the world of evaluation.

- and the NPI asymmetry:

- “the *before*-clause creates a downward-entailing context, and hence should license NPIs. Assume that B' is a temporally more specific proposition, i.e., it holds that $\llbracket B' \rrbracket(w) \subseteq \llbracket B \rrbracket(w)$; it then follows that $\llbracket \textit{before } B \rrbracket(w) \subseteq \llbracket \textit{before } B' \rrbracket(w)$ and consequently it holds that if $[A \textit{ [before } B]]$ is true, then $[A \textit{ [before } B']]$ is true as well” (Krifka, 2010, 913).
- because *earliest* is undefined if the embedded clause is uninstantiated; thus a complete account of NPIs must incorporate Strawson entailment (von Stechow, 1999).

2.3.2 Some truth-conditional considerations

- English *before* and *after* are aktionsart-sensitive in different ways (Heinämäki, 1974), prompting some supplements to the basic EARLIEST analysis.
- English *after* treats states differently than other aktionsart classes (Beaver and Condoravdi, 2003)

- (14) a. John met Mary after she climbed to the top of the mountain. *embedded accomplishment*
b. John met Mary after she was president. *embedded state*

- via (11), (14-a) is interpreted wrt the initial point of the embedded clause.
- but (14-b) is ambiguous: speakers report that in some contexts it can be interpreted wrt the initial point of the embedded clause, but in others it must be interpreted wrt the final point.
 - * one of these readings (> final) entails the other (> initial).
 - * we nevertheless characterize it as an ambiguity: there are some contexts in which only the > final reading is available
 - * arguably, this ambiguity is the result of inchoative coercion, in which the initial point of a state is made more salient than it would otherwise be (Beaver and Condoravdi, 2003, 47-8)
 - * the EARLIEST analysis can account for this if EARLIEST is viewed as an optional inchoative coercion operator for *after* (and for states).

- English *before* treats accomplishments differently than other aktionsart classes (Heinämäki, 1974)

- (15) a. John met Mary before she was president. *embedded state*
b. John met Mary before she climbed to the top of the mountain. *embedded accomplishment*

- as expected by EARLIEST, (15-a) is interpreted wrt the initial point of the embedded clause
- but (15-b) is interpreted with respect to the final point of the embedded clause; it remains true in a context in which John and Mary met on the side of the mountain.

- the issue of how *before*+accomplishments is interpreted is more problematic (and, as it turns out, central to the investigation here)

- Beaver and Condoravdi (2003) account for these facts by assuming that accomplishments are coerced into punctual intervals that contain only the telos (p46).
- Condoravdi (2010) rejects that approach, instead revising EARLIEST as follows (p886–889):⁷

- (16) EARLIEST(T) = **glb(itop(T))**, if defined, where
- a. **glb(T)**, if defined, is that $t \in T$ such that (a) for any $t' \in T, t \leq t'$, and (b) for any $t'' \in T$ such that for any $t' \in T, t'' \in T$ such that for any $t' \in T, t'' \leq t', t'' \leq t$.
 - b. **itop(T)** = $\{t \in T \mid \exists t' \in T : \mathbf{rb}(t') = t\}$

- wrt these and other data (see Appendix), I proposed a general pragmatic version (Rett, 2015):

- (17) ECONOMY OF BOUNDS
For any intervals a, b : ' aRb ' is true iff some member of a exceeds (in a relative sense) the greatest closed bound of b .

2.4 Interim summary

- the EARLIEST analysis successfully accounts for:
 - the veridicality asymmetry (hence the transitivity and anti-symmetry differences);
 - the NPI asymmetry;
 - the truth conditions of *before* and *after* sentences
- although we need to supplement it with a few additional tweaks (Condoravdi, 2010), and these might make the EARLIEST approach unsatisfying (Krifka, 2010).
- cross-linguistically, its invocation of a null operator makes two predictions:
 - it's possible that not all languages display these properties (the **universality prediction**)...
 - ...but if a language displays one of them, it displays them all (a new **correlation prediction**)
- in search of a more explanatory analysis of *before* and *after* – as well as a better understanding of maximal informativity – we conducted a cross-linguistic survey to determine the extent to which the observed semantic properties of English *before* and *after* are indeed universal and universally correlated.

3 Cross-linguistic considerations

- we consulted native speakers of 17 languages (including English), from 7 different language families.
- (18)
- a. **Afroasiatic**: Hebrew
 - b. **Austronesian**: Tagalog
 - c. **Indo-European**: Dutch, English, German (*Germanic*); Greek (*Hellenic*); French, Italian, Spanish (*Romance*); Russian, Serbo-Croatian, Slovenian (*Slavic*)
 - d. **Japonic**: Japanese
 - e. **Sino-Tibetan**: Mandarin
 - f. **Turkic**: Turkish
 - g. **Uralic**: Estonian, Hungarian
- consultants were all linguists, accustomed to evaluating their linguistic intuitions, and fluent in English as well as the target native language.
 - they were given a survey over email in which they were asked to translate sentences from English and then provide judgments about whether those sentences are grammatical and how they are interpreted.

⁷“They come down to the same thing for any temporal property X for which $[\mathbf{itop}(T)]$ is a subset of $[T]$ and which contains its own **glb**. This is the case for stative predicates.... For accomplishment predicates **itop** will collect the culmination points and **glb** will pick out the earliest among them (Condoravdi, 2010, 889).

3.1 The veridicality asymmetry

- every language in the survey, without exception, demonstrated a veridicality asymmetry between *before* and *after*, with *after* clauses being necessarily veridical.

- (19) a. John elment, mielött gond volt. *Hungarian*
 John left before trouble was
 ‘John left before there was trouble.’ *doesn’t entail* There was trouble
 b. John elment, miután gond volt.
 John left after trouble was
 ‘John left after there was trouble.’ *entails* There was trouble

- some languages in the survey (Estonian, Italian, Greek, Hebrew, Russian, Slovenian, Tagalog) optionally allow irrealis marking (e.g. subjunctive or conditional mood) in *before* but not *after* clauses.
 - in these languages, *before* clauses with realis marking were veridical, while only *before* clauses with irrealis marking were non-veridical.
 - so these languages, too, demonstrate a veridicality asymmetry between ‘before’ and ‘after’ insofar as ‘before’ clauses are not necessarily veridical, while ‘after’ clauses necessarily are.

- (20) a. Janez se je odločil, da bo šel, preden so bili problemi. *Slovenian*
 John SELF is decided that will gone before are been problems
 ‘John decided to leave before there was trouble.’ *entails* There was trouble
 b. Janez se je odločil... preden bi bili problimi.
 John SELF is decided... before are-COND been problems
 ‘John decided to leave before there was trouble’ *doesn’t entail* There was trouble

3.2 The NPI asymmetry

- In every language in the survey with one exception, if NPIs were licensed under temporal relations at all, they were licensed under ‘before’ but not under ‘after’.

- (21) a. Sue azva lifney Se-miSehu nakaf etsba laazor la. *Hebrew*
 Sue left before that-someone lift finger to-help her
 ‘Sue left before anyone could lift a finger to help her.’
 b. *Sue azva axarey Se-miSehu nakaf etsba laazor la.
 Sue left after that-someone lift finger to-help her
 ‘Sue left before anyone could lift a finger to help her.’

- some caveats:
 - in Greek and Spanish, NPIs are licensed under neither ‘before’ nor ‘after’.
 - there must be some morphosemantic wiggle room in this claim:
 - as del Prete (2008) shows, different morphosemantic strategies for ‘before’ and ‘after’ comparisons yield different expectations for NPI-licensing.
 - (he argues that, in Italian, *dopo* ‘after’ is a temporal preposition like its English counterpart, but *prima* ‘before’ is really a temporal comparative, similar in many ways to Italian degree comparatives, which license NPIs for independent reasons.)
 - we discovered related but different considerations are relevant for Serbo-Croatian, which has two different strategies for ‘after’ (*poslije* and *nakon*), one of which (*nakon*) does license NPIs.

3.3 Differences in stativity embedding

- there appears to be an additional, novel asymmetry between *before* and *after*: the languages in our survey were divided with respect to whether their counterparts of *before* and *after* can embed stative predicates... in a principled way.
 - **Type 1, stative-embedding:** *before* and *after* both embed statives (English, Estonian, French, German, Hebrew, Mandarin, Slovenian, Spanish, Turkish)
 - **Type 2, stative-asymmetrical:** *before* embeds statives, but *after* doesn't (Dutch, Hungarian, Italian, Serbo-Croatian⁸, Tagalog)
 - **Type 3, stative-non-embedding:** neither embeds statives (Greek, Japanese⁹, Russian)
- example, Type 1 (in addition to English):

- (22) a. Sue tegutses enne kui Peter oli abielus. *Estonian*
 Sue acted before than Peter was married
 'Sue took action before Peter was married.'
 b. Sue tegutses peale seda kui Peter oli abielus.
 Sue acted after that than Peter was married
 'Sue took action after Peter was married.'

- both sentences reported to be (equally) acceptable
- both sentences reported to be interpretable

- example, Type 3:

- (23) a.???Anja vstretila Dinu do togo, kak ona byla svobodna. *Russian*
 Anna met Dina until then how she was free
 Intended: 'Anna met Dina before she was single.'
 b.???Anja vstretila Dinu posle togo, kak ona byla svobodna.
 Anna met Dina after then how she was free
 Intended: 'Anna met Dina after she was single.'

- both sentences reported to be (equally) unacceptable, no truth conditions given
- each sentence would be acceptable with an inchoative predicate in place of the stative one

- examples, Type 2:

- (24) a. Ik heb Marjan ontmoet voordat ze vrijgezel was. *Dutch*
 I have Mary met before she single was
 'I met Mary before she was single.'
 b. ?Ik heb Marjan ontmoet nadat ze vrijgezel was.
 I have Mary met after she single was
 Intended: 'I met Mary after she was single.'

- (25) a. Mary azelőtt találkozott Johnnal, hogy egyetemista volt. *Hungarian*
 Mary before met John.with that university.student was
 'Mary met John before he was a university student.'

⁸Recall that Serbo-Croatian has two words for 'after'. *Poslije*, which is the clear morphological counterpart to *prije* ('before') cannot embed statives, but the morphologically unrelated word *nakon* can.

⁹The claim that *before* clauses in Japanese can't embed stative predicates originates from Ogihara (1995), who was interested in replicating Anscombe's 1964 data for Japanese. This fact was confirmed by our consultant, along with the observation that *after* in Japanese also cannot embed statives. Although there is an interesting twist: both *before* and *after* can embed statives in Japanese (that is Japanese becomes a Type 1 language) if the matrix predicate is stative as well.

b. ??Mary azut'an találkozott Johnnal, hogy egyetemista volt.
 Mary after met John.with that university.student was
 Intended: 'Mary met John after he was a university student.'

- the 'before' sentences were reported to be grammatical and interpretable;
- the 'after' sentences were described as 'degraded' or 'confusing' without an inchoative predicate (or an adverb like *already* or *still*)

- a (new!) typological asymmetry: no Type 4

3.4 Truth-conditional differences

- a reminder of the aktionsart-sensitivity of English *before* and *after*:
 - *after* is aktionsart-sensitive because it is ambiguous between a > initial and > final reading when its embedded clause is a stative
 - *before* is aktionsart-sensitive because it interprets embedded accomplishments differently (< final) than other eventualities (< initial)
- we have preliminary evidence that the same inchoative coercion available to 'after'+stative constructions like (14-b) are available across languages
- however, languages differ in how they interpret 'before'+accomplishment sentences like (15-b).
- surprisingly, there appears to be a correlation between the ability of a language to embed statives under 'before' and 'after' and how they interpret 'before'+accomplishment sentences.

(26) stativity correlation

Type 1 languages interpret 'before'+accomplishment sentences with respect to the *final* point of the embedded event, but Type 2 languages interpret them with respect to the *initial* point.¹⁰

<i>embedded eventuality</i>	TYPE 1 LANGUAGES	TYPE 2 LANGUAGES
accomplishment	< final	< initial
other	< initial	< initial

Table 1: Truth-conditions for 'before' sentences across languages

- examples, Type 1 languages:

- (27) a. Ig'ati lifnej Se hajita b-a-bajit. *Hebrew (Type 1)*
 arrived.1 before that were.2 in-the-house
 'I arrived before you were home.' < initial
- b. Miri pagSa et Joni lifnej Se he'epila le-pisgat ha-har.
 M met ACC J. before that 3.ascended to-peak the-mtn
 'Mary met John before he climbed to the top of the mountain.' < final
- (28) a. Marija je spoznala Janeza preden je bila samska. *Slovenian (Type 1)*
 M AUX met J before AUX was single
 'Mary met John before he was single.' < initial
- b. Marija je spoznala Janeza preden je prebrala to knjigo.
 M AUX met J before AUX read the book
 'Mary met John before he finished the book.' < final

¹⁰We tentatively report that Type 3 languages pattern like Type 1 languages in this respect, but our data are not robust enough to support a strong conclusion.

- examples, Type 2 languages:

- (29) a. Um-alis si-Mary bago t<um>ira si-John sa-Maynila. *Tagalog (Type 2)*
 PFV.AV-leave SUBJ-Mary before PFV.AV-live SUBJ-John OBL-Manila
 ‘Mary left before John lived in Manila.’ < initial
- b. Nakilala ni-Mary si-John bago siya um-akyat sa-bundok.
 PFV.TV-meet GEN-Mary SUBJ-John before SUBJ.3SG PFV.AV-climb OBL-mountain
 ‘Mary met John before he climbed to the top of the mountain.’ < initial
- (30) a. Ik heb Marjan ontmoet voordat ze vrijgezel was. *Dutch (Type 2)*
 I have Mary met before she single was
 ‘I met Mary before she was single.’ < initial
- b. Marjan ontmoette Jan voor hij naar de top klom.
 Mary met John before he to the top climbed
 ‘Mary met John before he climbed to the top.’ < initial

- the difference is underscored in the following minimal pair:

- (31) *Context:* Right before John starts a climb, he puts on a very silly hat.
Test utterance: Thank goodness that... [(31-a)/(31-b)] ...Because if she had met him while he was wearing that hat, she would never have been able to take him seriously.
- a. #Mary met John before he climbed to the top of the mountain. *English*
- b. Marie ontmoette Jan voordat hij naar de top van de berg klom. *Dutch*
 Mary met John before he to the top of the mountain climbed
 ‘Mary met John before he climbed to the top of the mountain.’

4 Discussion and conclusions

- I began with the question of whether attempts to reduce MAX in the degree and individual domains to a general principle of maximal informativity could be extended to EARLIEST in the temporal domain
 - there’s lots of reasons to expect cross-domain parallels in this respect ...
 - ...and in the argument that such operators privilege closed bounds (Condoravdi, 2010; Rett, 2015)
- we found evidence that the empirical motivations for EARLIEST in English are in fact universal and universally correlated:
 - the NPI and veridicality asymmetries appear to be universal
 - and the antisymmetry and transitivity differences follow
- but we also uncovered a typological asymmetry between ‘before’ and ‘after’: in every language for which ‘after’ embeds statives, ‘before’ embeds statives, but not vice-versa
 - it’s unclear whether this is the result of a semantic restriction (e.g., something to do with subintervals) or a morphosyntactic one (e.g., something to do with stative aspectual markers)
 - I hope to follow up by checking stativity embedding in e.g. *when* clauses in these languages
- most significantly, languages differ in how they interpret ‘before’+accomplishment sentences
 - this might suggest a parameterization of Condoravdi’s (2010) closed-bound-sensitive EARLIEST (and the more pragmatic version in Rett 2015)
 - although a simple parameterization proposal couldn’t account for the observed **stativity correlation**: that all and only languages which can’t embed statives under ‘after’ interpret ‘before’+accomplishment sentences with respect to the initial point of the event.

Appendix: Cross-domain and relative maximality

Rett 2015 argues that relative maximality is (a) domain-general and (b) only calculated on closed bounds.

- a reminder:

- (32) a. **open:** $(a, b) = \{x : a > x > b\}$
 b. **partially closed:** $(a, b) = \{x : a > x \geq b\}$ **or** $[a, b) = \{x : a \geq x > b\}$
 c. **closed:** $[a, b] = \{x : a \geq x \geq b\}$

- the domain-general semantic generalizations:

- positive comparatives relate a degree to a maximum;
- negative comparatives relate a degree to a minimum, else a maximum

- the data:

- comparatives: relations between degree intervals

- (33) a. Lucinda is driving faster than is allowed on this highway. (Rullmann, 1995)
 b. Lucinda is driving slower than is allowed on this highway.

- (34) MASSACHUSETTS CONTEXT
 The highways speed laws impose a maximum (70mph) and a minimum (40mph) speed.

- * truth conditions, Massachusetts Context:

- the positive relation in (33-a) is true if Lucinda is driving 80mph (i.e., above the maximum)
- the negative relation in (33-b) is true if Lucinda is driving 30mph (i.e., under the minimum)

- (35) CALIFORNIA CONTEXT
 The maximum speed on the highway is 70mph (there is no minimum).

- * truth conditions, California Context:

- the positive relation in (33-a) is true if Lucinda is driving 80mph (i.e., above the maximum)
- the negative relation in (33-b) is true if she is driving 60mph (i.e., under the maximum)

- locative prepositions: relations between spatial intervals (i.e. vectors)

- (36) a. The mouse is above the hut.
 b. The mouse is under the hut.

MASSACHUSETTS CONTEXT



CALIFORNIA CONTEXT



- * truth conditions, Massachusetts Context:

- the positive locative in (36-a) is true if the mouse is on the roof (i.e., above the maximum)
- the negative locative in (36-b) is true if the mouse is below ground (i.e., under the minimum)

- * truth conditions, California Context:

- the positive locative in (36-a) is true if the mouse is on the roof (i.e., above the maximum)
- the negative locative in (36-b) is true if it is under the roof (i.e., under the maximum)

- temporal prepositions: relations between temporal intervals

(37) ATELIC EVENT

- a. Mary met John after she was single.
- b. Mary met John before she was single.

- * the positive (37-a) is true if the meeting happened before or after Mary was single (arguably due to inchoative coercion)
- * the negative (37-b) is true iff the meeting happened before the beginning of Mary's being single

(38) TELIC EVENT

- a. Mary met John after he climbed to the top of the mountain.
- b. Mary met John before he climbed to the top of the mountain.

- * the positive (38-a) is true iff the meeting happened before the end of the climbing
- * the negative (38-b) is true iff the meeting happened before the end of the climbing

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