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Restrictions on copredication: a situation theoretic approach

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Introduction

Main goal

An account of polysemy and copredication without assumptions motivated only by these phenomena.

Polysemy vs lexical ambiguity—simplifying assumptions

Lexical ambiguity (e.g., $bank_{finance}$ vs. $bank_{river}$)

- Non-related senses; Accidental homophony – *Bank* vs *Ufer* (German)

Polysemy: e.g., $statement_{eventuality/information/physical\ object}$

- Inter-related senses; Non-accidental homophony

Copredication

- Based on a single antecedent, applying multiple predicates with non-overlapping domains
- Polysemous nouns such as *lunch* allow for copredication
  – *lasted two hours*: domain = *Eventualities* — *was delicious*: domain = *Physical* objects (esp. food)

(1) Lunch lasted for two hours and was delicious. (Ev, Phys) Adapted from Asher and Pustejovsky 2006

Ambiguous nouns give rise to zeugma (e.g., Asher 2011):

(2) ?The party lasted all night and left base camp in the morning.

Main Claims and Contributions

From situation theory: Nouns denote situations that witness (i.e. contain) entities
Polysemous nouns denote situations that witness multiple entities, possibly of different types
Lexical entries specify connections between these entities (e.g. Theme, Contents, Patient)
Copredication is possible if such a lexically specified connection holds between different entities

Data and Observations

For nouns that are more than 2-ways polysemous, there are interesting restrictions on copredication:

(3) a. The statement in the envelope is inaccurate. (Phys, Inf)
b. ?The statement in the envelope lasted half an hour. (Phys, Ev)

(4) a. The inaccurate statement lasted half an hour. (Inf, Ev)
b. The inaccurate statement was sealed in an envelope. (Inf, Phys)

(5) a. ?The half-hour statement was sealed in an envelope. (Ev, Phys)
b. The half-hour statement was inaccurate. (Ev, Inf)

Felicitous copredication entails polysemy, but a failure of copredication does not entail that a noun is not polysemous.

Further evidence from German

(6) a. Die Stellungnahme in dem Umschlag ist sachlich.
the statement in the envelope is factual
'The statement in the envelope is factual.'
b. ?Die Stellungnahme in dem Umschlag hat eine halbe Stunde gedauert.
the statement in the envelope has a half hour lasted
'The statement in the envelope took half an hour.'

(7) a. Die sachliche Stellungnahme hat eine halbe Stunde gedauert.
the factual statement has a half hour lasted
'The factual statement took half an hour'
b. Die sachliche Stellungnahme ist in einen Umschlag gesteckt worden.
the factual statement is in a envelope put got
'The factual statement was placed in an envelope'

(8) a. ?Die halbstündige Stellungnahme ist in einen Umschlag gesteckt worden.
the half-hour statementisina envelope put got
'The half-hour statement was placed in an envelope.'
b. Die halbstündige Stellungnahme war sachlich
the half-hour statement was factual
'The half-hour statement was factual.'

Theoretical Background: Type Theory with Records (TTR) (Cooper 2022)

A compositional situation theoretic semanntics:

- **Records** are situations that witness entities of different types
- **Record types** are types of situations (cf sets of worlds/propositions)
- Common nouns express a function from records (of some type) to a record type.

Richly typed:

- Not just e, t, v etc. and type constructors for e.g., functional types

Basic types for individuals, eventualities and informational entities

- *Phys* for Physical entity (including objects and undifferentiated stuff)
- *Ev* for Eventuality (including states, processes and events)
- *Inf* for informational entity (I.e., something broader than a proposition, can encompass, e.g., the contents of a book or the contents of a statement)

TTR example: *black cat*

(9) $cat \mapsto \lambda r : [\mathrm{x} : Phys].\ [c_c : cat(r.\mathrm{x})]$

- A function from records (r) that witness a physical entity, to the record type in which the condition holds that entity is a cat. (r.x is the value of x in r)

(10) $black \mapsto \lambda r : [\mathrm{x} : Phys].\ [c_b : black(r.\mathrm{x})]$

Meet of two functions (Cooper 2011, 2022): If f_1 is a function of type $(T_1 \to T_2)$ and f_2 is a function of type $(T_3 \to T_4)$, then $f_1 \wedge f_2$ is a function f_3 of type $((T_1 \wedge T_3) \to (T_2 \wedge T_4))$

Both (9) and (10) of type *Ppty*, i.e., $([x : Phys] \to RecType)$. Via function meet:

(11) $black\ cat \mapsto \lambda r : [\mathrm{x} : Phys].\ \begin{bmatrix} c_c : cat(r.\mathrm{x}) \\ c_b : black(r.\mathrm{x}) \end{bmatrix}$

- A function from records that witness a physical entity, to the record type in which the conditions hold that that individual is a cat and is black.

Polysemy

lunch denotes a property of situations that witness some physical individual and an eventuality such that:

- the individual is food
- the eventuality is a (lunch) eating event
- the food is the Patient of the lunch eating event

(12) $lunch \mapsto \lambda r : \begin{bmatrix} \mathrm{x} : Phys \\ \mathrm{e} : Ev \end{bmatrix}.\ \begin{bmatrix} c_f : food(r.\mathrm{x}) \\ c_e : eat(r.\mathrm{e}) \\ c_p : patient(r.\mathrm{x}, r.\mathrm{e}) \end{bmatrix}$

Polysemy Hypothesis: The lexical introduction of more than one entity is a necessary condition for the lexical item to be polysemous.

Abstract nouns

Some abstract nouns are at least three-way polysemous between the following readings: **Ev**entuality, **Inf**ormational content, and **Phys**ical object.

- *claim, comment, declaration, evidence, message, report, statement, testimony*

Eventualities, informational entities and physical individuals need not cooccur:

- stating event, but no physical object (the agent just speaks)
- physical statement, but no stating event (the agent wrote something down/signed a pre-written statement)

But **all** statements have some kind of informational content:

(13) Al's statement was informative ⊨ there was a written or verbal statement (Inf ⊨ Phys ∨ Ev)

This suggests a join type: *Phys* ∨ *Ev*. Suppose that:

- the predicate *statement_ev_or_phys* has an arity (i.e., applies to entities of type) ⟨*Phys* ∨ *Ev*⟩
- the relation *contents_of* has an arity: ⟨*Inf*, *Phys* ∨ *Ev*⟩

(14) $statement \mapsto \lambda r : \begin{bmatrix} \mathrm{j} : Phys \vee Ev \\ \mathrm{p} : Inf \end{bmatrix}.\ \begin{bmatrix} c_s : statement\_ev\_or\_phys(r.\mathrm{j}) \\ c_c : contents\_of(r.\mathrm{p}, r.\mathrm{j}) \end{bmatrix}$

statement denotes a property of situations that witness some informational content and either some physical individual or an eventuality such that:

- the physical individual counts as a physical statement or the eventuality counts as a statement-making eventuality
- the informational entity is the contents of whichever manifestation of statement we have

Copredication

The copredication patterns match the lexically specified relations:

Lexically specified relations:

Noun	Ev & Inf	Phys & Inf	Ev & Phys
statement	Yes	Yes	No
evidence	Yes	Yes	No
lunch	–	–	Yes
book	–	Yes	–

Copredication patterns:

Noun	Ev & Inf	Phys & Inf	Ev & Phys
statement	Yes	Yes	No
evidence	Yes	Yes	No
lunch	–	–	Yes
book	–	Yes	–

Copredication Hypothesis: A lexically specified relation is a sufficient condition for licensing copredication over the entities related

(15) $long_{temp} \mapsto \lambda r : [\mathrm{e} : Ev].\ [\, c_l : \tau(r.\mathrm{e}) = \mathrm{long}\,]$

(16) $delicious \mapsto \lambda r : [\mathrm{x} : Phys].\ [\, c_d : \mathrm{delicious}(r.\mathrm{x})\,]$

(17) $long\ and\ delicious \mapsto \lambda r : [\mathrm{e} : Ev] \wedge [\mathrm{x} : Phys].\ [\, c_l : \tau(r.\mathrm{e}) = \mathrm{long}\,] \wedge [\, c_d : \mathrm{delicious}(r.\mathrm{x})\,]$
$\mapsto \lambda r : \begin{bmatrix} \mathrm{e} : Ev \\ \mathrm{x} : Phys \end{bmatrix}.\ \begin{bmatrix} c_l : \tau(r.\mathrm{e}) = \mathrm{long} \\ c_d : \mathrm{delicious}(r.\mathrm{x}) \end{bmatrix}$

Via *function meet*:

(18) $long\ and\ delicious\ lunch \mapsto \lambda r : \begin{bmatrix} \mathrm{x} : Phys \\ \mathrm{e} : Ev \end{bmatrix}.\ \begin{bmatrix} c_f : food(r.\mathrm{x}) \\ c_e : eat(r.\mathrm{e}) \\ c_p : patient(r.\mathrm{x}, r.\mathrm{e}) \\ c_l : \tau(r.\mathrm{e}) = \mathrm{long} \\ c_d : \mathrm{delicious}(r.\mathrm{x}) \end{bmatrix}$

A property that denotes situations that witness some food and a lunch eating eventuality. The food is delicious and the patient of the eventuality, the eventuality counts as long.

- Copredication is licensed due to the Patient relation.

(19) $inaccurate \mapsto \lambda r : [\mathrm{p} : Inf].\ [\, c_d : \mathrm{inaccurate}(r.\mathrm{p})\,]$

(20) $half\text{-}hour \mapsto \lambda r : [\mathrm{e} : Ev].\ [\, c_h : \tau_{hrs}(r.\mathrm{e}) \geq 0.5\,]$

(21) $statement \mapsto \lambda r : \begin{bmatrix} \mathrm{j} : Phys \vee Ev \\ \mathrm{p} : Inf \end{bmatrix}.\ \begin{bmatrix} c_s : statement\_ev\_or\_phys(r.\mathrm{j}) \\ c_c : contents\_of(r.\mathrm{p}, r.\mathrm{j}) \end{bmatrix}$

(22) $half\text{-}hour\ statement \mapsto \lambda r : \begin{bmatrix} \mathrm{j} : Phys \vee Ev \\ \mathrm{p} : Inf \\ \mathrm{e} : Ev \end{bmatrix}.\ \begin{bmatrix} c_s : statement\_ev\_or\_phys(r.\mathrm{j}) \\ c_c : contents\_of(r.\mathrm{p}, r.\mathrm{j}) \\ c_h : \tau_{hrs}(r.\mathrm{e}) \geq 0.5 \end{bmatrix}$

(23) $inaccurate,\ half\text{-}hour\ statement \mapsto \lambda r : \begin{bmatrix} \mathrm{j} : Phys \vee Ev \\ \mathrm{p} : Inf \\ \mathrm{e} : Ev \end{bmatrix}.\ \begin{bmatrix} c_s : statement\_ev\_or\_phys(r.\mathrm{j}) \\ c_c : contents\_of(r.\mathrm{p}, r.\mathrm{j}) \\ c_h : \tau_{hrs}(r.\mathrm{e}) \geq 0.5 \\ c_d : \mathrm{inaccurate}(r.\mathrm{p}) \end{bmatrix}$

Prediction: If further information is provided in the context such that a relation between a physical object and the eventuality, then this should improve felicity:

(24) The statement, which took half an hour to read out, was sealed in an envelope. (Ev, Phys)

Informal analysis:

- 'read out' introduces an eventuality and relates a physical object to the eventuality via a Theme relation
- *statement, which took half an hour to read out* then specifies a thematic relation between the object that was read and the event of reading it out.
- This licenses the copredication

Some Comparisons (more in the full paper)

Dot types (Pustejovsky 1994, 1995; Asher and Pustejovsky 2006; Asher 2011)

- My approach has complex types, but no dot-type constructor.
- It also does not posit complex objects, but only complex situations.
  – And situations are one of the things that should be able to be complex!
- I do not posit aspects of one thing, rather different interrelated things in the same situation
  – E.g., an eating event with a food as a Patient
- Previous TTR analyses (Cooper 2007, 2011) replicate the dot type analysis
  – No dot types, but still 'aspects'

Mereology (Gotham 2014, 2017)

- E.g., *book* denotes an sum-entity that has an informational part and a physical part
- Provides detailed work on counting & individuation with polysemous nouns

Worries:

- Should polysemy motivate us to have a semilattice-structured domain over entities of all types? — What is the part structure for the sums of all objects and events (and propositions, and predicates, etc.)
- For *statement* we'd need two sums $Inf \sqcup Ev$ and $Inf \sqcup Phys$ — What, beyond stipulation, ensures that the two informational parts are identical?

Conclusions

A semantic account of polysemy that:

- Does not appeal to abstract/complex objects?
  – Yes. Only complex situations. And situations are exactly the kinds of things we anyway expect can be complex!
- Does not appeal to something not independently motivated (dot-types/aspects of one entity, mereological sums across domains)?
  – Yes. Only to independently justified types (situations, physical entities, informational entities etc.).

An account of copredication that can explain the restrictions on copredication?

- Some more work to be done on constraining the right set of relations (see also Ortega-Andrés and Vicente 2019).

AS STRONG AS AN NPI *IN LIS, LSF & NGT*

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Negative Polarity Items (NPIs) are grammatical expressions like English *any* licensed under particular syntactic and semantic conditions involving negation or other downward entailing/non-veridical environments. We show that punctual UNTIL functions as a strong NPI in three sign languages.

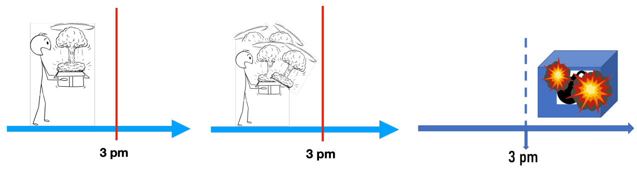
1 NPIs ACROSS MODALITIES

- Very common in spoken languages[1]
- Very hard to find in sign languages[2]; complications:

1. **Incorporated negation** in sign language where we would find NPIs in spoken language equivalents:
   - Not … yet ➞ NOT-YET
   - Not … anyone/anything ➞ NOBODY & NOTHING
2. **Minimizers**:
   - Do not necessarily morphologically incorporate negation
   - Are heavily idiomatic in their use and less prone to:
     - ➢ Cross-linguistic comparison (language specific)
     - ➢ Cross-modal comparison (calque)

2 METHODS

- **Elicitation** and recording of constructions with native signers of Italian Sign Language (LIS), French Sign Language (LSF), and Sign Language of the Netherlands (NGT.)
- **Acceptability** and **felicity judgments** (7-point Likert scale)
- Score operationalization: 1-3 = *; 4-5 = ?(?); 6-7 = ✓
- Consultants were asked to explain construction **meanings** and semantic **compatibility** with images:



3 *UNTIL* ACROSS MODALITIES

UNTIL is less idiomatic, still iconic in its distribution:


LSF


LIS


NGT

Punctual *until* behaves as an NPI with telic predicates.[3,4] **Durative until** is not an NPI.

1) a. * The box exploded **until 3pm.** (telic)
   b. The box did**n't** explode **until 3pm.**
2) a. * BOX EXPLODE **UNTIL 3PM.** (LSF, LIS, NGT)
   b. BOX EXPLODE **NEG UNTIL 3PM.**
3) a. The baby slept **until 3pm.** (atelic)
   b. The baby did**n't** sleep **until 3pm.**
4) a. BABY SLEEP **UNTIL 3PM.** (LSF, LIS, NGT)
   b. BABY **NEG** SLEEP **UNTIL 3PM.**

Greek lexically differentiates punctual *until* from durative *until*:[3,4]

5) a. * I vomva ekseraghi para mono htes. (telic= explode)
   b. I vomva **dhen** ekseraghi para mono htes.
   c. * I vomva (?***dhen**) ekseraghi ***mehri*** *htes*.
   d. (**dhen**) itan thimomenos ***mehri*** *htes*. (atelic = be angry)

4 *UNTIL* AS A STRONG NPI IN ENGLISH

➞ **Punctual until** is more restricted than NPIs like *any*.

➞ It has the distribution of a strong NPI:[3,4]

Unlicensed in conditionals (5b) and questions (6b) without negation; complex clauses with negation in matrix clause (7b):

6) a. If *any* box exploded, the doorman would have noticed it.
   b. * If the box exploded until 3pm, the doorman would've noticed it.
7) a. Has *any* box exploded?
   b. * Has the box exploded until 3pm?
8) a. The doorman didn't claim that *any* box exploded.
   b. * The doorman didn't claim that the box exploded until 3pm.

Licensed with Neg-raising predicate (8) and negative indefinite (9):

9) The doorman did**n't** think that the box exploded until 3pm.

10) **Nothing** exploded until 5pm.

5 *UNTIL* AS A STRONG NPI IN LSF, NGT & LIS

Unless otherwise specified, data are valid for the 3 languages modulo sign order.

Unlicensed in conditionals (11a) and questions (11a) without negation; complex clauses with negation in matrix clause (13):

11) a. * IF BOX$_K$ EXPLODE **UNTIL 3PM**, DOORMAN NOTICE IX$_K$
    b. IF BOX$_K$ EXPLODE **NEG UNTIL 3PM**, DOORMAN NOTICE IX$_K$
12) a. * BOX EXPLODE **UNTIL 3PM**?
    b. BOX EXPLODE **NEG UNTIL 3PM**?
13) * DOORMAN CLAIM **NEG** THAT THE BOX EXPLODED UNTIL 3PM.

Licensed with Neg-raising (14); neg. indefinite (15); headshake (16):

14) DOORMAN THINK-**NEG** BOX EXPLODE UNTIL 3PM.
15) UNTIL 3PM EXPLODE **NOTHING** (only NGT & LIS)

    neg

16) BOX EXPLODE **UNTIL 3PM.** (only NGT)

6 CONCLUSIONS

- **Punctual UNTIL** is a strong NPI in LSF, NGT & LIS.
- It's not a calque from the spoken spoken language!
- NPIs of the *any* type are hard to find in SL ➞ unattested also in LSF, NGT & LIS
- **Speculation:** (Existential) pronouns are localized in space. Spatial loci = indices
  ➞ (free) variable interpretation always available. ➞ strong bias towards deictic interpretation ➞ NPI status hard to emerge

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THE CHIN AS A DOMAIN WIDENER IN ASL

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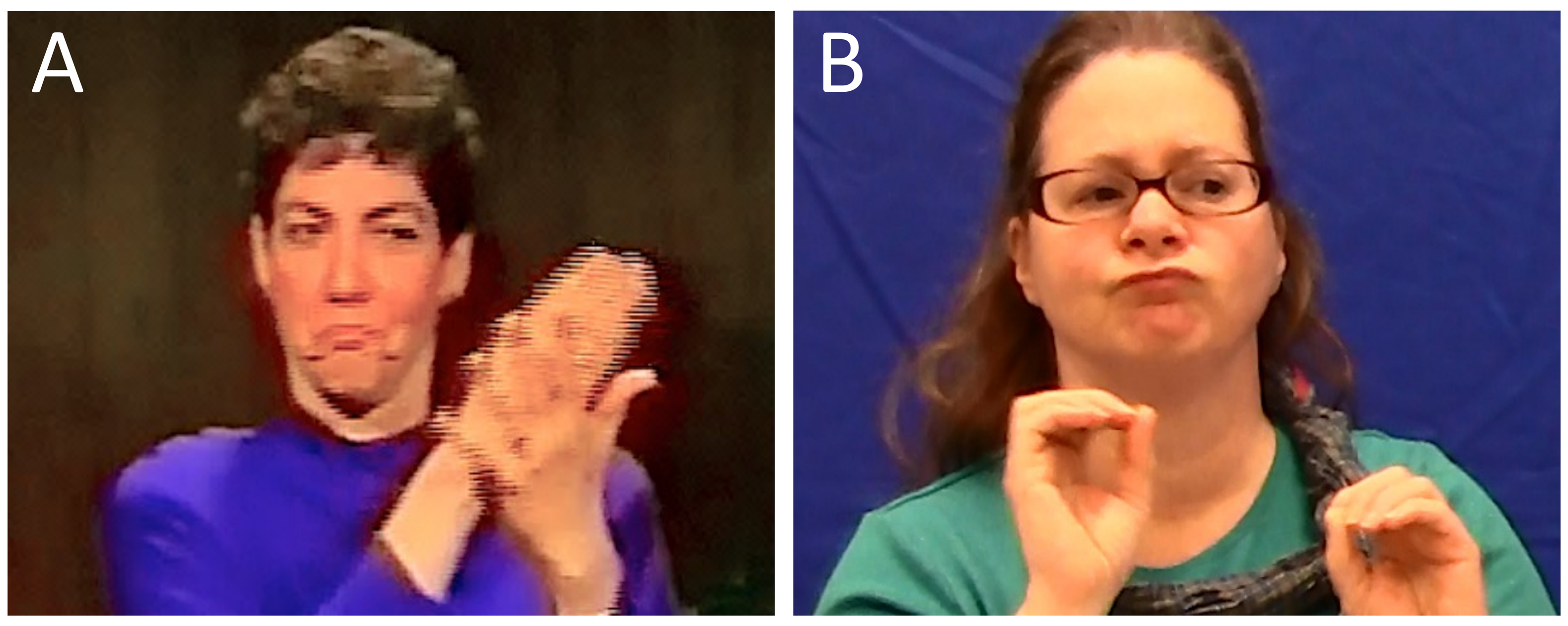
INTRODUCTION

Flat Chin (‘fc’)

- **Non-Manual Markers (NMMs)** are facial and body movements which have been grammaticalized in a given sign language.
- The NMM **‘flat chin’** is made by pulling the mentalis muscle taut (*see figs. A & B*).
- It is frequently observed in ASL, but its **linguistic meaning is understudied**.



Previous Research

- The lower face is **often analyzed as a whole or reduced to the lips**, ignoring the chin.
- Lower face NMMs are taken to be **manner adverbials**, like the mouth NMM ‘mm,’ meaning ‘contentedly’ or ‘in a normal way’. [1, 4]
- Previous work by Nikolai & Wilbur [6] has shown that while fc can indeed function as such a manner adverb, it seems to have more functions.

Methods

- **Some corpus data** pulled from the ASL instructional video series *Face of ASL* [3].
- **Primarily elicited data** from native/early signers (began acquiring ASL before age 4), using stimuli compose of English sentences paired with pictures

Our Proposal

- Flat chin is a general-purpose **domain widener** in ASL, targeting both **quantificational domains**, as well as the **scales** used by gradable predicates.

DATA & INITIAL FINDINGS

Data

(1) #RUG #IF GERMAN $\overline{\text{STRONG}}^{\text{fc}}$
‘If the rug is German, it’s *totally/completely/really* strong.’

#RUG #IF GERMAN STRONG

(2) MOTHER IF NOT COME $\overline{\text{MISS IX-1}}^{\text{fc}}$
‘If my mother doesn't come, she'll *really* miss me.’

(3) $\overline{\text{IX-3++ STUDENT IX-3++}}^{\text{fc}}$ TEACHER HOMEWORK GIVE
‘The teacher gives homework to each *and every* student.’

(4) IX-3 HEY SEE IX-3 $\overline{\text{CL:F "spots" SEE NONE}}^{\text{fc}}$
‘He doesn’t see any spots there at all.’

(5) IX-3 WATER CL: BENT-L "LAKE" $\overline{\text{FREEZE}}^{\text{fc}}$
‘The lake is frozen *solid/completely*.'

(6) IX-3 KNOW W-A-G-O-N $\overline{\text{CL:C CL:0}}^{\text{fc}}$ CL:BENT-B FINISH
‘He loaded the wagon *full*.' or 'He *completely* loaded the wagon.”

(7) FULL FREEZE NOT-YET, $\overline{\text{MAYBE IX-1 BAKE CAN}}^{\text{fc}}$
‘Is it (the pie) completely frozen yet? Maybe I could bake it, *even still*.’

Initial Findings

- Flat chin typically applies to **gradable predicates**, like STRONG in (1) or MISS in (2), where it acts as a strengthener; cf. English *very strong* and *really miss*.
- But fc also applies to **quantifiers**, like EVERY in (3) and NONE in (4), which are not traditionally thought of as gradable.
- Here, fc acts like English *absolutely every/none*, substituting a wider domain of quantification [3,5]: e.g., all registered students instead of just those present today.

ANALYSIS

Flat Chin as a Domain Widener

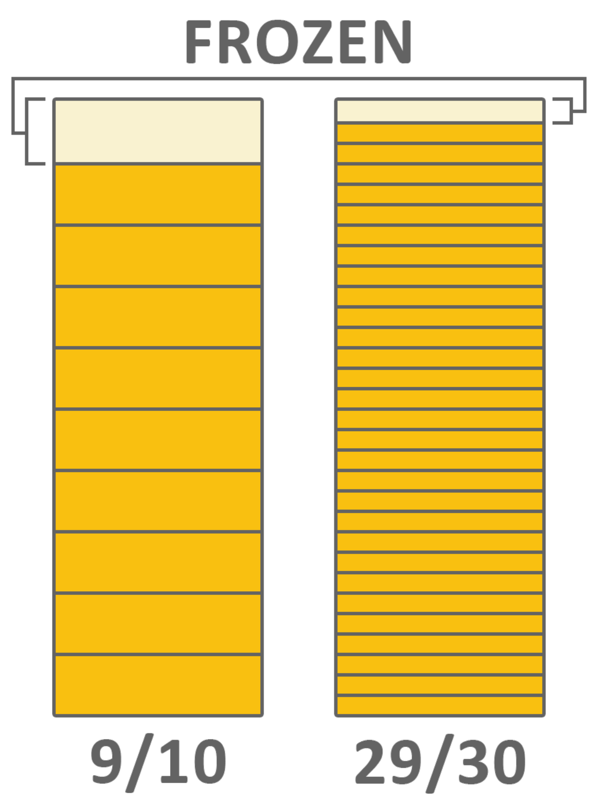
- We therefore propose that fc **replaces the salient standard domain C with a salient expanded domain C⁺**, where both C and C⁺ are provided by the context. [cf. 5]
- Syntactically, fc takes two contextual variables as arguments:
  Standard: [#RUG [STRONG C_{STR}]]   Flat Chin: [#RUG [STRONG [fc C^{+}_{STR} C_{STR}]]]
- Semantically, fc simply returns the larger domain: $\lambda C^{+}.\lambda C : C \subseteq C^{+}. C^{+}$
- This immediately explains the domain-widening effect for EVERY and NONE: fc supplies a salient expanded domain C⁺, e.g., all registered students vs. just those present.

From Widening to Strengthening

- For traditionally gradable predicates, we propose a **Gricean account**:
  - The signer **would not have used C⁺**, the alternative, expanded domain if the degree d in question was already in the standard domain C.
  - Further, d must be **above every degree in C**, not below, since it also must be above the standard threshold (which is in C).
  - Cf: “A: Is he under 40 years old? B: He’s under 45…”
- For instance, the strength of the rug in (1) must be higher than expected for any standard (non-German-strength) rug.

Closed Scales

- As noted in [5], this approach **also explains closed-scale cases** like (5):
  - Suppose that a standard scale for FREEZE has ten segments, and degrees in the highest segment count as frozen: i.e., those between 9/10 and 10/10.
  - Expanding a closed scale necessarily shrinks the size of the segments: for instance, 29/30 is equivalent to 9.67/10.
  - Therefore, the degree of frozenness required to reach the highest segment is greater as the scale expands.



FURTHER QUESTIONS

- Are there any similar general-purpose domain wideners in spoken languages? Why or why not?
- What is the difference between a domain-widening strengthener like fc, and a strengthener that maintains the same scale, such as English *very*?
- Flat chin is often found in resultative constructions like (5,6); does it contribute to verbal aspect or merely complement existing scalar aspectual properties?
- Flat chin appears on modals, as in (7), but what is the precise semantics in this case?
- Other lower face NMMs also seem to interact with domains/scales as well—is there a larger paradigm here that can be analyzed/described?

FIGURE DESCRIPTIONS

A: An instance of flat chin in our corpus, *The Face of ASL* [3]
B: An instance of flat chin in our elicited data
C: Sentence (1), where flat chin seems to strengthen the signers claims about the strength of the rug
D: The visual difference between ‘frozenness’ on a 10-segment scale and a 30-segment scale

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Expressives and argument extension

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Introduction

- Expressive adjectives (EAs) and epithets are considered to constitute a natural semantic class (Potts 2005):
  - they make no truth-conditional contribution
  - they possess functional expressive meanings
  - they combine with other phrases via CI application
- However, there is an important difference: only EAs exhibit argument extension, an apparent mismatch between syntax and semantics whereby they target a syntactic constituent other than the one they directly modify.
- Existing views (Potts 2005, Gutzmann 2019) lack a principled explanation of this contrast.
- *Main thesis:* unlike epithets, EAs are Isolated CIs, that is, expressions that carry propositional (and hence saturated) expressive meaning. Such a view accounts for the contrast, while preserving some good results of its competitors.

Argument extension

- *Assumed syntax for EAs:*

1. [$_{DP}$ [$_{D}$ the] [$_{NP}$ [$_{AP}$ damn] [$_{NP}$ [$_{N}$ dog]]]]

- *Available readings:*

2. 😠 [$_{DP}$ [$_{D}$ the] [$_{NP}$ [$_{AP}$ damn] [$_{NP}$ [$_{N}$ dog]]]]
3. 😠 [$_{S}$ [$_{DP}$ [$_{D}$ the] [$_{NP}$ [$_{AP}$ damn] [$_{NP}$ [$_{N}$ dog]]]] [$_{VP}$ [$_{V}$ ate] [$_{DP}$ [$_{D}$ the] [$_{NP}$ [$_{N}$ cake]]]]]

- *Further possible readings:*

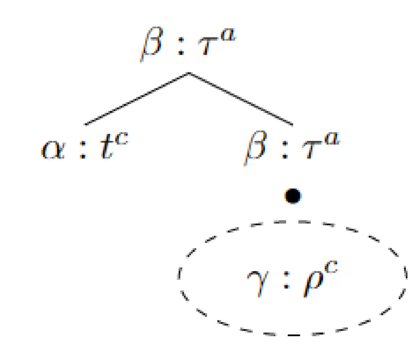
5. The dog ate the damn cake (*right-to-left argument hopping*)
   a. 😠 the dog
6. The damn dog ate the cake (*left-to-right argument hopping*)
   a. 😠 the cake

- *Epithets, by contrast, can only target the syntactic constituent they combine with:*

6. That bastard John ate the cake.
   a. 😠 John
   b. # I actually like John

Proposal

- *All EAs are Isolated CIs:* they have a propositional, saturated non-at-issue meaning, and hence do not interact with the at-issue material around them in a way that is representable in terms of functional application.
  - *Damn* ⇝ ***Damn:*** t^c
  - $[\![Damn\!: t^c]\!]^{M,g}$ = *the speaker is in a heightened emotional state at @*
- EAs combine with other constituents via the rule *Isolated CIs:*



- This view accounts for the impossibility of expressives to occur in predicative position or to combine with degree modifiers.
- It offers a principled explanation of the difference between EAs and epithets regarding argument extension:
  - EAs are semantically isolated: that paves the way for the hearer to make pragmatic inferences concerning the target of the speaker's attitude
  - epithets have functional expressive denotations: they always target their syntactic sister, so their interpretation is highly restricted
- The theory predicts a wide range of possible interpretations for EAs, but they are still highly restricted by the linguistic and non-linguistic context (placement of the EA, causality, the presence of other expressives).

data

A significant prediction: EAs can be interpreted as primarily targeting contents beyond the at-issue dimension of the utterance, something unexpected in Potts (2005) or Gutmzmann's (2019) views.

- *Implicatures*

Scenario: the speaker went to the bank to try to get a credit for his business. His business partner waited in the car.

7. A: Did we get the money?
   B: Start the damn car.
   a. 😠 +> the bank did not grant us the money/# 😠 the money

- *Presuppositions*

8. Luckily, it was not John who stole the damn money.
   a. 😠 someone stole the money
   b. # 😠 John/ # 😠 the money/ # 😠 John did not steal the money

- *Contextually available contents*

Scenario: the addressee owes money to the speaker

9. I want my damn money
   a. # 😠 the money/# 😠 I want my money
   b. 😠 the addressee has not paid his debt yet

Other proposals

- Expressivity is a syntactic feature *iEx,* whose various placements result in different readings of the EA (Gutzmann 2019).
- Two predictions:
  - Argument hopping is not allowed: apparent cases of argument hopping are understood as implicatures derived from the sentential reading of the EA.
  - An EA belonging in an embedded clause cannot affect neither the matrix clause nor its subject.

- Rejecting the predictions:
  - *Scoping out of embedded clauses*

Scenario: Peter ate a birthday cake that was meant for the speaker and then lied about it and blamed the dog.

10. Peter said that the damn dog ate my cake. I can't believe that guy.
    a. # 😠 the dog ate the cake/# 😠 the dog
    b. 😠 Peter said that the dog ate the cake/ 😠 Peter

  - *Cases of argument hopping*

Scenario: the racist CEO of the company is talking to one of his associates.

11. Luckily, that latino will not work in my damn company.
    a. # 😠 my company/ # 😠 that latino will not work in my company
    b. 😠 that latino

Scenario: the speaker had an awful childhood, and she strongly associates all those bad memories with the house she used to live in

12. Luckily, the damn fire destroyed that house.
    a. # 😠 the fire destroyed that house. # 😠 the fire
    b. 😠 that house

Conclusions

- Our view offers a simple and uniform semantics for EAs + a pragmatic explanation of their uses.
- It provides an account of argument extension without resorting to lexical ambiguity (Potts 2005) or structural ambiguity (Gutzmann 2019).
- It allows for a clear distinction between EAs and epithets.
- It explains novel data concerning conversationally implicated, presupposed and mutually manifest contents that can be the target of emotional attitudes.

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Back to restitutive readings again

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Key question: How does a non-repetitive adverb give rise to restitutive readings?

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Restitutive readings using AGAIN

- "Restitutive" sentences convey a state being restored; often using an adverb that modifies eventualities (events or states): **AGAIN** ⟨⟨st⟩⟨st⟩⟩
- True for English, Dutch (Zwarts 2019), & Hindi-Urdu

(1) ***English:*** Anu closed the lid, and then popped it open **again**.

(2) ***Hindi-Urdu:***
anu-ne darwaazaa **phir-se** khol diyaa
Anu-ERG door AGAIN open GIVE.PFV
'Anu opened the door again.' (& the door was open before)

Restitutive readings using BACK

- You can also convey a state being restored without **AGAIN**, by instead using a different adverb of the same semantic type: **BACK** ⟨⟨st⟩⟨st⟩⟩
- Also true for English, Dutch (Zwarts 2019), & Hindi-Urdu

(1′) ***English:*** Anu closed the lid, and then popped it **back** open.

(2′) ***Hindi-Urdu:***
anu-ne darwaazaa **vaapas** khol diyaa
Anu-ERG door BACK open GIVE.PFV
Lit. 'Anu opened the door back.' (& the door was open before)

Parts of presupposition of BACK

<u>Property 0</u>: There exists an event e' that precedes asserted event e such that the THEME holds the same scalar value at the end of e as it held at the start of e′; the function TRACE retrieves that value: TRACE(e′)(0) = TRACE(e)(1)

<u>Property 1</u>: THEME must be same (or contextually equivalent) for e, e′

<u>Property 2</u>: SCALE/domain of scalar change must be same for e, e′

<u>Property 3</u>: Other properties of e, e′ must be allowed to vary

Proposed lexical entry

$$[[\textbf{BACK}]]_{\langle\langle st\rangle\langle st\rangle\rangle} = \lambda e_s.\ \exists e_s'\ [e' \prec e \wedge \text{TRACE}(e')(0) = \text{TRACE}(e)(1) \wedge \text{THEME}(e') = \text{THEME}(e) \wedge \text{SCALE}(e') = \text{SCALE}(e)].\ P(e)$$

The standard account: AGAIN-restitutives

- The standard account (e.g. Stechow 1995, 1996) says restitutives involve AGAIN ⟨⟨st⟩⟨st⟩⟩ modifying only a result state ⟨st⟩
- Normally AGAIN introduces a *repetitive presupposition:*
  *"There exists a prior event that is **<u>the same as the asserted event</u>**"*
- Restitutive readings are the subset of uses of AGAIN where what's being modified is the result-denoting subevent, i.e. ***<u>this state held before</u>***

The puzzle: BACK-restitutives

- The standard account didn't include restitutive readings of lexical items other than AGAIN (until Patel-Grosz & Beck 2014, 2019; Zwarts 2019)
- Normally **BACK** introduces <u>**not**</u> a *repetitive* but a *counterdirectional presupposition* (e.g. Fabricius-Hansen 2001, Patel-Grosz & Beck 2019):
  *"There exists a prior event that is **<u>the reverse of the asserted event</u>**"*
- Restitutive readings can arise even when there is no AGAIN to convey the repetition of the result-denoting subevent

	Response 'doing in return'	Repetitive 'happening once more'	Restitutive 'restoring location/value'	
English	*back*	*again* (**back*)	*back*† OR *again*	***Type I***
Hindi-Urdu	*vaapas*	*phir-se* (*%vaapas*)	*vaapas*†† OR *phir-se*	
Dutch	*terug*	*terug*	*terug*	***Type II***
Kutchi Gujarati	*pacho*	*pacho*	*pacho*	

- Dutch & Kutchi Gujarati exhibit radical merger of **BACK** & **AGAIN**: a single lexical item conveys both repetition and response, and appears in restitutives
- English & Hindi-Urdu have distinct lexical items for repetition and response
  - but Hindi-Urdu speakers allow radical merger in a subset of cases
  - in both Eng and H-U the item that does response has some restrictions:

† *back*-restitutives are restricted to cases with an overt result (esp. PP-result)
†† *vaapas*-restitutives generally must be eventive: 'to {become/*be} vaapas happy'

Getting to a semantics for BACK-restitutives

- There are other readings of **BACK** as well; restitutive readings are a subset of cases where the event being modified involves scalar change:
  - **RESTITUTIVE** readings, which arise when **BACK** modifies **change-of-state (COS)** events → *have a* THEME *undergoing scalar change (any scale)*
  - **REVERSED PATH** readings, which arise when **BACK** modifies **directed motion (DM)** events → *have a* THEME *undergoing scalar change (spatial domain)*
- I propose a revised *counterdirectional presupposition* enabling us to replace a fuzzy notion of "<u>**reverse**</u>" with a simpler statement in terms of identity:
  - *"There exists a prior event such that **<u>the start point of the prior event is the same as the end point of the asserted event</u>**"* (let's call this "<u>**Property 0**</u>")
- This applies to all the uses of BACK – but these two core use-cases (**DM** and **COS**) share some additional properties, which complete the lexical entry

<u>Prop 1</u>: THEME must be the same across the 2 events

(3) ***Hindi-Urdu*** **(DM event):**
sonam dillii-se aagraa gayii, phir (#tara) dillii **vaapas** aayii
Sonam Delhi-FROM Agra GO.PFV, then (#Tara) Delhi **back** come.PFV
'Sonam went from Delhi to Agra, then {she/#Tara} came back to Delhi.'

- ALL '#' sentences are rescue-able by accommodating a presupposition that is unlicensed in the given minimal context. This is irrelevant.

(4) ***English*** **(COS event):** Brad dyed his eyebrows purple. Then he dyed {them/#his roots} **back** blonde.

- Contextually equivalent or closely-related THEMES are treated as "the same" as in (5); truly unrelated THEMES are not permitted, as seen in (6).

(5) ***Dutch*** **(DM event):** Bob emigreerde in de jaren 50. Zijn familie keerde onlangs **terug** naar Holland. 'Bob emigrated in the fifties. His family came **back** to Holland recently.'

(6) ***English*** **(DM event):** My friend Bob emigrated in the fifties. {His family/#Actress Famke Jansen} came **back** to Holland recently.

<u>Prop 2</u>: SCALE must be the same across the 2 events

(7) ***Hindi-Urdu*** **(COS event):**
saaf kamraa gandaa ho gayaa,
clean room dirty be go.PFV,
ali kamraa **vaapas** saaf kar rahaa hai
Ali room BACK clean do PROG be.PRES
Lit. 'The clean room got dirty, Ali is {cleaning/#warming} it back.'

- In (7), prior event has SCALE = CLEANNESS, thus in asserted event the SCALE must be = CLEANNESS, can't be TEMPERATURE
- DM events all use SCALE = LOCATION, thus satisfy this rule
- English version of in (8) similarly does not permit SCALE to vary, but English happens to require that *back* come with overt result; speakers prefer P (e.g. *up*) or full PP (e.g. *to its original level*)

(8) ***English*** **(COS event):** The clean room got dirty, Ali is {cleaning/#warming} it **back** up.

<u>Prop 3</u>: Other info must be allowed to vary

(9) ***Hindi-Urdu*** **(2 DM events varying in Manner):**
anu saikil calaake skuul gayii, phir bhaagke (ghar) **vaapas** aayii
Anu cycle ride.BY school go.PFV, then run.BY (home) BACK come.PFV

(10) ***English*** **(DM, vary Manner):** Anu cycled to school, then ran **back** (home).

(11) ***Dutch*** **(DM, vary Manner):** Ada fietste naar school. Ze liep **terug**.
'Ada cycled to school. She walked back.'

(12) ***Eng*** **(COS, vary Manner):** The door slammed shut, then swung **back** open.

- **BACK** also has RESPONSE 'in return' readings which don't involve scalar change, therefore the restrictions on SCALE/THEME don't have anything to apply to; effectively works as if only <u>**Property 0**</u> and <u>**Property 3**</u> are active

(13) ***Dutch*** **(RESPONSE):** Ada gooide een bord naar Bob. Bob schopte een kussen **terug**. 'Ada threw a plate to Bob. Bob kicked a pillow **back**.'

(14) ***English*** **(RESPONSE):** I'll call you **back**. (*communicative event, no* THEME)

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PRE-DP *only* IS ALWAYS A PROPOSITIONAL OPERATOR AT LF: A NEW ARGUMENT FROM ELLIPSIS

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ZAS

Leibniz Dream

erc SPAGAD Speech Acts in Grammar and Discourse

The challenge

- As traditionally defined, *only* encodes a **propositional** operator.

(1) $[\![\text{only}]\!]^C = \lambda p_{\langle s,t\rangle} . \lambda w : p(w) . \forall p' \in C\, [\, p'(w) \to p \subseteq p' \,]$

- Yet, *only* can appear at different syntactic positions, including **pre-DP**.

(2) a. Jill **only** brought wine. (pre-*v*P)
b. Jill brought **only** wine. (pre-DP)

- **Question:** how can the meaning of *only* be reconciled with DP attachment?

Two theories of pre-DP *only*

- **The Quantifier Approach**

Only has flexibility in its type, type-shifts to compose with a quantifier.

(3) $[\![\text{only}_Q]\!]^C = \lambda Q_{\langle est,st\rangle} . \lambda f_{\langle e,st\rangle} . [\![\text{only}]\!]^C(Q(f))$

(4) $[_{TP}$ Jill$_1$ $[_{vP}$ **[only wine$_{Foc}$]$_2$** $[_{vP}$ t_1 brought t_2]]]

(Rooth 1985, see also Wagner 2006)

- **The Proposition Approach**

Pre-DP *only* is inert, = concord with a covert propositional ONLY.

(5) $[_{TP}$ Jill$_1$ [**ONLY** $[_{vP}$ t_1 brought **wine$_{Foc}$**]]]

(Quek & Hirsch 2017, Hirsch 2017, 2022, cf. Bayer 1996, Lee 2004, Horvath 2007, Barbiers 2014, Hole 2015, Branan & Erlewine 2020, Sun 2021, i.a.)

- **Goal:** argument for the P-approach involving ellipsis, based on Benbaji (2021).

Data: a scope freezing effect

- *Only* can scope **above or below** the modal in (6) (Taglicht 1984), but must take **narrow** scope in (7) (extending to English data for Hebrew due to Benbaji).

(6) Jill **may** bring **only** wine.
a. She is allowed to not bring anything else. ($\diamond >$ *only*)
b. She is not allowed to bring anything else. (*only* $> \diamond$)

(7) Jill may bring only wine. Bill may Δ, too. ($\diamond >$ *only*, **only* $> \diamond$)

- **Form of argument:** scope freezing with ellipsis in (7) follows from **independent constraints** in the P-approach — but not the Q-approach.

An independent constraint

- Beaver & Clark (2008) observed an independent restriction on *only* in ellipsis data, (8), which can be substantiated when *only* is pre-*v*P, (9).

(8) **B&C's constraint (cf. pp. 177)**
Only cannot be separated from Foc by a node targeted for ellipsis.

(9) I only know he brought RED wine. What about you?
a. *I only know he did Δ, too. (Δ = brought red$_{Foc}$ wine)
b. I do Δ, too. (Δ = only know he brought red$_{Foc}$ wine)

- As Benbaji notes: (8) also affects pre-DP *only*, but only in the P-approach.

The P-approach predicts freezing

- Scope with pre-DP *only* depends on where ONLY attaches on the clausal spine.

(10) Jill may bring only wine.
a. $[_{TP}$ Jill$_1$ $[_{T'}$ **may** $[_{vP}$ **ONLY** $[_{vP}$ t_1 bring wine$_{Foc}$]]]] ($\diamond >$ *only*)
b. $[_{TP}$ Jill$_1$ $[_{T'}$ **ONLY** $[_{T'}$ **may** $[_{vP}$ t_1 bring wine$_{Foc}$]]]] (*only* $> \diamond$)

- Taking B&C's constraint to apply to covert ONLY, ellipsis will fix scope.

(11) **B&C's constraint (P-approach version)**
ONLY cannot be separated from Foc by a node targeted for ellipsis.

(12) Jill may bring only wine. Bill may Δ, too.
a. $[_{TP}$ Bill$_1$ $[_{T'}$ may ~~$[_{vP}$ ONLY $[_{vP}$ t_1 bring wine$_{Foc}$]]~~]] (respects (11))
b. *$[_{TP}$ Bill$_1$ $[_{T'}$ ONLY $[_{T'}$ may ~~$[_{vP}$ t_1 bring wine$_{Foc}$]~~]]] (violates (11))

- If ONLY is **high**, it is outside the ellipsis, while Foc is inside, **violating** (11).

The Q-approach over-generates

- *Only*+DP form a complex quantifier, and QR together, (13). Because *only* is not separated from Foc, B&C's constraint is **respected** in both LFs. In addition, **no other constraint** generally prohibits a quantifier from taking wide scope out of an ellipsis site, (14) (e.g. Sag 1976, Fox 2000).

(13) a. $[_{TP}$ Bill$_1$ $[_{T'}$ may $[_{vP}$ [only wine$_{Foc}$]$_2$ ~~$[_{vP}$ t_1 bring t_2]~~]]] ($\diamond >$ *only*)
b. $[_{TP}$ Bill$_1$ $[_{T'}$ [only wine$_{Foc}$]$_2$ $[_{T'}$ may ~~$[_{vP}$ t_1 bring t_2]~~]]] (*only* $> \diamond$)

(14) a. The duke **may** marry **most** commoners. The prince may, too. (*most*$>\diamond$)
b. **A** boy is standing on **every** building. A girl is, too. ($\forall > \exists$)

- The unattested reading is generated via (13-b) (without stipulations).

Prediction: the size of ellipsis

- A **larger ellipsis** that includes the modal should **allow** *only* to take wide scope, since then ONLY can be high and still elided with Foc.

(15) a. *[... [ONLY [MODAL ~~[... DP$_{Foc}$ ...]~~]]]
b. ✓[... ~~[ONLY [MODAL [... DP$_{Foc}$ ...]]]~~]

- The prediction is verified e.g. in bi-clausal data. In (16) (cf. Hirsch 2017), the context biases wide scope, and high vs. low ellipsis contrast in felicity, (17).

(16) To get tenure, Anna has to write only two papers.
⇝ 'Anna does not have to write more than two papers.' (*only* $> \Box$)

(17) a. #... Ben has to Δ, also. They're so lucky.
b. ... Ben does Δ, also. They're so lucky.

(18) $[_{TP}$ Ben$_1$ $[_{T'}$ does $[_{vP}$ ~~ONLY $[_{vP}$ have to $[_{vP}$ t_1 write two$_{Foc}$ papers]]]~~]]

A more general constraint?

- Negative indefinites have been proposed to reflect concord with a covert sentential **negation** (Penka 2011). Like ONLY, NEG can take wide scope with high, but not low ellipsis (van Craenenbroeck & Temmerman 2017).

(19) Bill can offer no help.
⇝ 'It is not possible for Bill to offer any help.' (*not* $> \diamond$)

(20) Who can offer no help?
a. #Bill can! (**not* $> \diamond$) b. Bill! (*not* $> \diamond$)

(21) *$[_{TP}$ Bill$_1$ [NEG$_{[iNEG]}$ can ~~$[_{vP}$ t_1 offer $\exists_{[uNEG]}$ help]~~]]

- **Possibility:** there might be a broader constraint where an operator and concord item cannot be separated by ellipsis, (22). B&C's constraint could be subsumed, given the concord syntax for *only* in (23) (for (7), elaborated from (12)).

(22) **Potential constraint (general)**
OP$_{[iOP]}$ and X$_{[uOP]}$ cannot be separated by ellipsis.

(23) *$[_{TP}$ Bill$_1$ $[_{T'}$ ONLY$_{[iONLY]}$ $[_{T'}$ may ~~$[_{vP}$ t_1 bring [F$_{[uONLY]}$ wine$_{Foc}$]]~~]]]

- Future: is a general constraint viable with concord cross-linguistically?

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Framing events in the logic of verbal modification

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Introduction

Jointly accommodating one principle (**Role Exhaustion**) and three facts (NON-EQUIVALENCE, NUMEROSITY, SCOPE) supports two sets of claims:

1. Verbs introduce their own ∃-closure, and adjuncts/theta-marked phrases take Vs as semantic arguments [1]
2. Clauses have two layers of event representation: 'framing' events E and 'framed' events e [2]

This overcomes challenges for existing accounts, and has interesting extensions to temporal modifiers and negative perceptual reports.

The principle and the facts

Role Exhaustion (RE): each syntactic dependent specifies *all and only* the entities bearing a particular thematic role to an event [3]

No dependent can express a merely partial contribution (**exhaustive**)
No distinct dependents can express the same role (**unique**)
Applies equally to arguments, adjuncts, and cross-clausally (**semantic**)

On the face of it, examples like (1) are challenging for RE [3]

(1) Denzel ran in the hallway, in the carpark.

Facts: (2) leaves open the possibility of distinct hallway/carpark events (NUMEROSITY), while (1) doesn't (NON-EQUIVALENCE), and order matters (SCOPE): the odd (3) helps to highlight how (1) and (2) differ

(2) Denzel ran in the hallway and in the carpark.
(3) ? Denzel ran in the carpark, in the hallway.

Challenges

Different accounts have different issues with (1)/(2)

- **Classic event semantics** challenges RE, and fails NON-EQUIVALENCE
  (1)/(2) $\rightsquigarrow (\exists e)(\textbf{run}(e) \wedge \textbf{in}(e,h) \wedge \textbf{in}(e,c)\ \dots\ )$
- **Champollion** can capture NUMEROSITY, but not NON-EQUIVALENCE
  (1)/(2) $\rightsquigarrow (\exists e)(\textbf{run}(e) \wedge \textbf{in}(e,h)\ \dots\ ) \wedge (\exists e)(\textbf{run}(e) \wedge \textbf{in}(e,c)\ \dots\ )$
- **Williams** preserves RE, but threatens its generalizability
  (1) $\rightsquigarrow (\exists e)(\textbf{run}(e) \wedge (\exists l)(\textbf{loc}(e,l) \wedge \textbf{in}(l,h) \wedge \textbf{in}(l,c))\ \dots\ )$

None of these accounts predict SCOPE. The order of implicit or explicit conjunction (i.e., (1)/(3) vs (2)) simply shouldn't matter

Ingredients

I combine compositional details akin to [1] with ideas from [2] to capture the facts without compromising the principle

1. $[\![\text{ran}]\!] = \lambda f_{vt}.(\exists e)(\textbf{run}(e) \wedge f(e))$
   $[\![\text{in the hallway}]\!] = \lambda V_{\langle vt,t\rangle}\lambda f_{vt}.V(\lambda e_v.\textbf{in}(e,h) \wedge f(e))$
2. S
   THEN&THERE$_\zeta$ $\langle\langle vt,t\rangle,t\rangle,\langle\langle vt,t\rangle,t\rangle\rangle$
   FRAMING $\langle\langle vt,t\rangle,\langle\langle vt,t\rangle,t\rangle\rangle$
   vP $\langle vt,t\rangle$

E is impacted above FRAMING, e below; closure by (polymorphic) TRUE

Logical forms

Those illustrating **the basic set-up**:

$[\![$THEN&THERE$_\zeta$ FRAMING Denzel ran in the hallway.$]\!]^\sigma$
$= (\exists E : \sigma(\zeta)(E))(\exists e)(E(e) \wedge \textbf{ag}(e)(d) \wedge \textbf{run}(e) \wedge \textbf{in}(e)(h))$
$[\![$In the carpark FRAMING Denzel ran.$]\!]^\sigma$
$= (\exists E : \textbf{in}(E)(c))(\exists e)(E(e) \wedge \textbf{ag}(e)(d) \wedge \textbf{run}(e)))$

Those illustrating **the target contrast**:

$[\![$In the carpark FRAMING Denzel ran in the hallway$]\!]^\sigma$
$= (\exists E : \textbf{in}(E)(c))(\exists e)(E(e) \wedge \textbf{ag}(e)(d) \wedge \textbf{run}(e) \wedge \textbf{in}(e)(h))$
$[\![$THEN&THERE$_\zeta$ FRAMING Denzel ran in the hallway and in the carpark$]\!]^\sigma$
$= (\exists E : \sigma(\zeta)(E))((\exists e)(E(e) \wedge \textbf{ag}(e)(d) \wedge \textbf{run}(e) \wedge \textbf{in}(e)(h))$
$\wedge (\exists e)(E(e) \wedge \textbf{ag}(e)(d) \wedge \textbf{run}(e) \wedge \textbf{in}(e)(c)))$

The account

Role Exhaustion is satisfied, as nowhere does **in** relate multiple instances of a single (event) variable. And **the facts are plainly borne out**:

- NON-EQUIVALENCE: the truth of (2) is independent from that of (1); they coincide only when (roughly) the hallway is part of the carpark
- NUMEROSITY: (2) has two 'framed' event descriptions, supporting multiple distinct events, while (1) doesn't
- SCOPE: the height at which the modifier attaches determines whether framing E or framed e are modified

Temporal modification?

Parallel issues with temporal modifiers (noted by [3]; cf. [4])

(4) Last year, it rained in July.

- [5]'s layers on a dynamic semantics, identity functions with 'side effects', new composition rules and closure operations, etc.
- We can simply adopt the logic of framing events
  (4) $\rightsquigarrow (\exists E : \textbf{in}(E, \textbf{last-year}))(\exists e)(\textbf{rain}(e) \wedge \textbf{in}(e, \textbf{july}))$

Negative perceptual reports?

Require more than logical negation [1]? Maybe [6]. But...

(5) Keisha saw Denzel not run in the hallway.

Three possibilities

Assuming that embedded (and non-finite) clauses have a 'framing' layer:

'K saw those events in the hallway and none were D's running'
... $\textbf{see}(e') \wedge (\exists E : \textbf{th}(E)(e') \wedge \textbf{in}(E)(h))\neg(\exists e)(E(e) \wedge \textbf{ag}(e)(d) \wedge \textbf{run}(e))$ ...

'K saw those events and none were D's running in the hallway'
... $\textbf{see}(e') \wedge (\exists E : \textbf{th}(E)(e') \wedge \sigma(\zeta)(E))\neg(\exists e)(E(e) \wedge \textbf{ag}(e)(d) \wedge \textbf{run}(e)) \wedge \textbf{in}(e)(h))$ ...

'K saw what D did and none of it was a running in the hallway'
... $\textbf{see}(e') \wedge (\exists E : \textbf{th}(E)(e') \wedge \textbf{ag}(E)(d))\neg(\exists e)(E(e) \wedge \textbf{run}(e)) \wedge \textbf{in}(e)(h))$ ...

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Division vs. distributivity: Is *per* just like *each*?

Elizabeth Coppock (Boston University) · SALT 32 · UNAM · Mexico City · June 2022

Main question

Quantities like 10 kg and 2 hours (a.k.a. "degrees") can be added, subtracted, multiplied, and divided (formalized in quantity calculus).

Are there lexical items that conventionally express the notion of quantity division? And is *per* one of them (Coppock, 2021) or is *per* a distributivity marker like *each* (à la Panaitescu & Tovena 2019)?

Observations

Like adnominal *each*, English *per* can be licensed by a **counting quantifier** but not other determiners (cf. Safir & Stowell 1988).

(1) a. They ordered **two/several** drinks $\left\{\begin{array}{l}\text{each}\\ \text{per person}\end{array}\right\}$.

b. ??They ordered **those/most** drinks $\left\{\begin{array}{l}\text{each}\\ \text{per person}\end{array}\right\}$.

But *per* has a wider distribution.

– *Per* introduces its own 'sorting key' (Choe 1987):

(2) James Bond ate **two** olives $\left\{\begin{array}{l}\text{??each}\\ \text{per martini}\end{array}\right\}$.

⇒ Paraphrase under distributivity-marker analysis:
'For each *martini*$_{\text{key}}$, James Bond ate *two olives*$_{\text{share}}$.'
(Cf. Boolos 1981, Rothstein 1995, Panaitescu & Tovena 2019)

– Licensing by gradable predicates:

(3) The guests found it quite **expensive** $\left\{\begin{array}{l}\text{??each}\\ \text{per person}\end{array}\right\}$.

$\not\Rightarrow$??For each person, the guests found it quite expensive.

– Licensing by measure function nouns like *cost*:

(4) The guests minimized (**the**) **cost** $\left\{\begin{array}{l}\text{??each}\\ \text{per person}\end{array}\right\}$.

$\not\Rightarrow$??For each person, the guests minimized the cost.

Furthermore, unlike with *each*, the event is not always divisible into 'key'-sized chunks with *per*:

(5) James Bond drove **100** km per hour.
$\not\Rightarrow$??For each hour, James Bond drove 100 km.
(Event could last only 5 minutes.)

Quotient function analysis

Quantity calculus (Raposo, 2019):

- Finite set of basic dimensions $\mathscr{B}$, such as T (time), L (distance)
- Full set of dimensions $\mathscr{D}$ which forms a group under multiplication ($\cdot$) with identity element $\mathbf{1}_{\mathscr{D}}$. Includes e.g. $\mathsf{L}\cdot\mathsf{T}^{-1}$ (distance over time).
- A quantity has a dimension; for any quantity $\mathsf{Q} \in \mathscr{Q}$:

$$\mathsf{dim}(\mathsf{Q}) \in \mathscr{D}$$

  - 'Dimensionless quantities' (ratios of two quantities of the same dimension, cardinalities, scalars) have dimension $\mathbf{1}_{\mathscr{D}}$.
- Within each dimension D, the set of quantities of that dimension $\mathscr{Q}_D$ forms a vector space, with multiplication and addition.
- Any two quantities can be multiplied together ($\times$), and non-zero quantities q have multiplicative inverses q^{-1}.
Notation: $d \times q^{-1}$ can be written $\frac{d}{q}$.

Lexicon.

Unit nouns (a.k.a. "measure nouns") are type d:

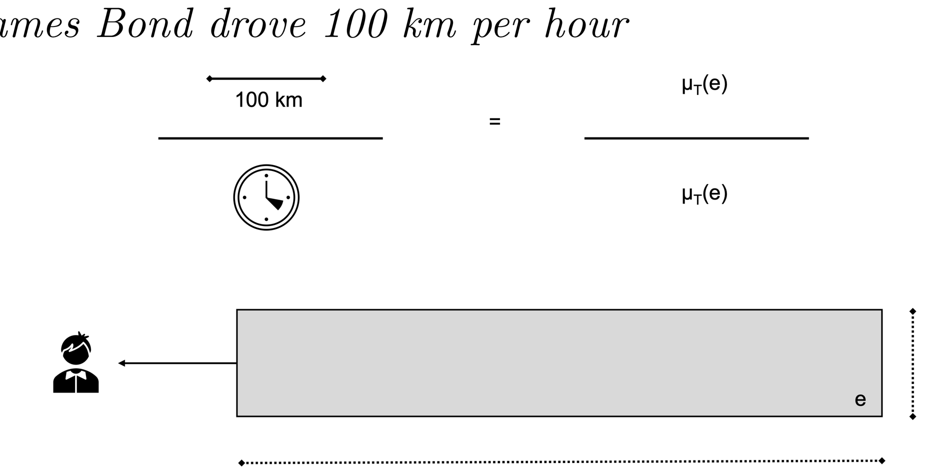
kilometer(s) $\rightsquigarrow$ km (type d)
hour(s) $\rightsquigarrow$ hour (type d)

Quotient function analysis of *per* (Coppock, 2021):

per$_0$ $\rightsquigarrow \lambda d \lambda q\,.\,\frac{q}{d}$ (type $\langle d,\langle d,d\rangle\rangle$)

- $\frac{100\times\mathsf{km}}{\mathsf{hour}}$
  - $100 \times \mathsf{km}$ — *100 kilometers*
  - $\lambda q\,.\,\frac{q}{\mathsf{hour}}$
    - $\lambda d\lambda q\,.\,\frac{q}{d}$ — *per*$_0$
    - hour — *hour*

James Bond drove 100 km per hour



Cardinality dimensions

Let us assume that for every predicate denotation $P \in D_{\langle e,t\rangle}$, there is a cardinality dimension $\#S$, and that the model determines some one-to-one mapping m such that if α is of type $\langle e,t\rangle$ then:

$$[\![\#\alpha]\!] = m([\![\alpha]\!])$$

and the output is a basic dimension: $m([\![\alpha]\!]) \in \mathscr{B}$.

As each dimension D is associated with its own unit quantity $\mathsf{unit}(D)$, we will have unit quantities for each flavor of cardinality.

$\mathsf{unit}(\#\mathsf{martini})$: the quantity '1 martini'

Sortal nouns have two denotations, e.g.:
martini $\rightsquigarrow \lambda x\,.\,\mathsf{martini}(x)$ (type $\langle e,t\rangle$)
martini $\rightsquigarrow \mathsf{unit}(\#\mathsf{martini})$ (type d)

Quotient operator analysis

(6) It's estimated that 150 species per day go extinct.
150 species per day is a high rate.
#Therefore, a high rate is among those going extinct.

Quotient operator analysis of *per*:

per$_1$ $\rightsquigarrow \lambda d_d \lambda q_d\,.\,\lambda G_{\langle d,vt\rangle}\,.\,\lambda e\,.\,\frac{\mathsf{max}(\lambda d\,.\,G(d)(e))}{\mu_{\mathsf{dim(day)}}(e)} = \frac{q}{d}$

Takes scope over a verb phrase via QR:

- vt: $\lambda e\,.\,\frac{\mathsf{max}(\lambda d\,.\,\mathsf{ge}(e) \wedge \exists x[\mathsf{th}(e) = x \wedge {}^*\mathsf{sp}(x) \wedge \mu_D(x) = d)]}{\mu_{\mathsf{dim(day)}}(e)} = \frac{150}{\mathsf{day}}$
  - $\langle\langle d,vt\rangle,vt\rangle$: $\lambda G_{\langle d,vt\rangle}\,.\,\lambda e\,.\,\frac{\mathsf{max}(\lambda d\,.\,G(d)(e))}{\mu_{\mathsf{dim(day)}}(e)} = \frac{150}{\mathsf{day}}$
    - d: 150
    - $\langle d,\langle\langle d,vt\rangle,vt\rangle\rangle$: $\lambda q_d\,.\,\lambda G_{\langle d,vt\rangle}\,.\,\lambda e\,.\,\frac{\mathsf{max}(\lambda d\,.\,G(d)(e))}{\mu_{\mathsf{dim(day)}}(e)} = \frac{q}{\mathsf{day}}$
      - *per*$_1$
      - *day*
  - $\langle d,vt\rangle$: $\lambda d\lambda e\,.\,\mathsf{ge}(e) \wedge \exists x[\mathsf{th}(e) = x \wedge {}^*\mathsf{sp}(x) \wedge \mu_D(x) = d]$
    - λd d-many species go extinct

'The ratio of how many things go extinct in e to the measure of e in time (the dimension of the quantity day) is equal to 150 divided by one day.'

James Bond ate two olives per martini

- vt: $\lambda e\,.\,\frac{\mathsf{max}(\lambda d\,.\,\mathsf{eat}(e) \wedge \exists x[\mathsf{th}(e) = x \wedge {}^*\mathsf{olive}(x) \wedge \mu_D(x) = d)]}{\mu_{\#\mathsf{martini}}(e)} = \frac{2}{\mathsf{unit}(\#\mathsf{martini})}$
  - $\langle\langle d,vt\rangle,vt\rangle$: $\lambda G_{\langle d,vt\rangle}\,.\,\lambda e\,.\,\frac{\mathsf{max}(\lambda d\,.\,G(d)(e))}{\mu_{\#\mathsf{martini}}(e)} = \frac{2}{\mathsf{unit}(\#\mathsf{martini})}$
    - d: 2
    - $\langle d,\langle\langle d,vt\rangle,vt\rangle\rangle$: $\lambda q_d\,.\,\lambda G_{\langle d,vt\rangle}\,.\,\lambda e\,.\,\frac{\mathsf{max}(\lambda d\,.\,G(d)(e))}{\mu_{\#\mathsf{martini}}(e)} = \frac{q}{\mathsf{unit}(\#\mathsf{martini})}$
      - *per*$_1$
      - *martini*
  - $\langle d,vt\rangle$: $\lambda d\lambda e\,.\,\mathsf{eat}(e) \wedge \exists x[\mathsf{th}(e) = x \wedge {}^*\mathsf{olive}(x) \wedge \mu_D(x) = d]$
    - λd eat d-many olives

'The ratio of how many olives are eaten in e to the measure of e along the number-of-martinis dimension is equal to 2 divided by one martini.'

Quotient of measure functions

cost per ton: Start with quotient function analysis and lift both arguments to measure functions and give them something to apply to. Shift *ton* to a measure function before applying *per* to it.

- $\langle e,d\rangle$: $\lambda x\,.\,\frac{\mathsf{cost}(x)}{\left(\frac{\mathsf{weight}(x)}{\mathsf{ton}}\right)}$
  - $\langle e,d\rangle$: $\lambda x\,.\,\mathsf{cost}(x)$ — *cost*
  - $\langle ed,ed\rangle$: $\lambda f\lambda x\,.\,\frac{f(x)}{\left(\frac{\mathsf{weight}(x)}{\mathsf{ton}}\right)}$
    - $\langle ed,\langle ed,ed\rangle\rangle$: $\lambda g_{\langle e,d\rangle}\lambda f_{\langle e,d\rangle}\lambda x\,.\,\frac{f(x)}{g(x)}$ $\Uparrow_{gg}$ $\langle d,\langle d,d\rangle\rangle$: $\lambda d\lambda q\,.\,\frac{q}{d}$ — *per*
    - $\langle e,d\rangle$: $\lambda x\,.\,\frac{\mathsf{weight}(x)}{\mathsf{ton}}$ $\Uparrow_{of}$ d: ton — *ton*

Note: The denominator at the top is the weight of x divided by one ton – a weight divided by a weight. Since it is a ratio of two quantities of the same dimension, it is a dimensionless quantity.

If the cost of x is a quantity of dimension 'money', then the result of dividing by the complex denominator is also a quantity of money; dividing by a dimensionless quantity does not change the dimension.

(how) expensive per person

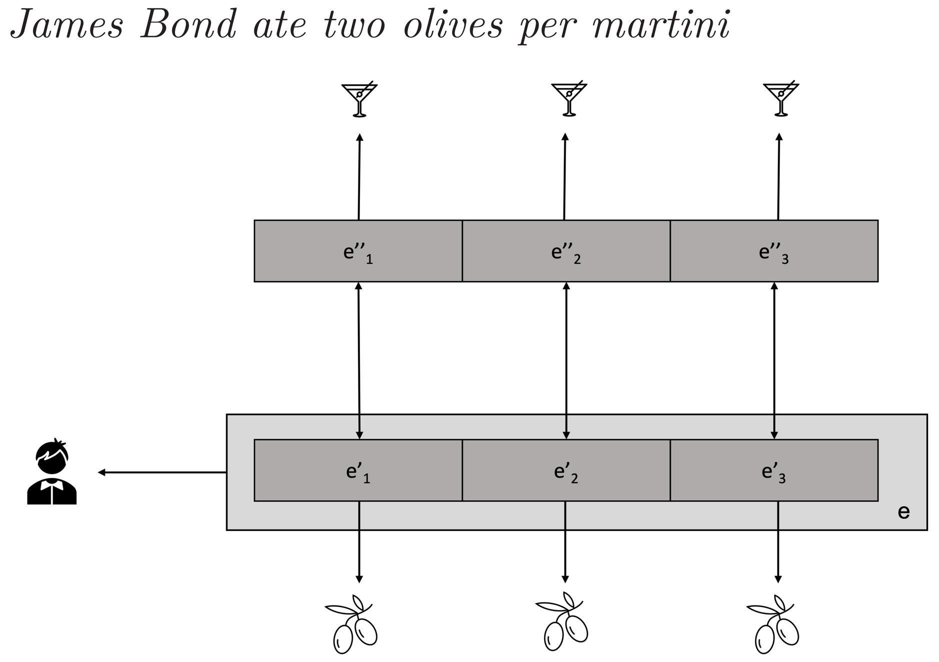
$$\approx \frac{\text{cost of x}}{\text{\# of people x measures}}$$

- $\langle e,d\rangle$: $\lambda x\,.\,\frac{\mathsf{expensive}(x)}{\left(\frac{\mu_{\#\mathsf{person}}(x)}{\mathsf{unit}(\#\mathsf{person})}\right)}$
  - $\langle e,d\rangle$: $\lambda x\,.\,\mathsf{expensive}(x)$ — *expensive*
  - $\langle ed,ed\rangle$: $\lambda f\lambda x\,.\,\frac{f(x)}{\left(\frac{\mu_{\#\mathsf{person}}(x)}{\mathsf{unit}(\#\mathsf{person})}\right)}$
    - $\langle ed,\langle ed,ed\rangle\rangle$: $\lambda g_{\langle e,d\rangle}\lambda f_{\langle e,d\rangle}\lambda x\,.\,\frac{f(x)}{g(x)}$ $\Uparrow_{gg}$ $\langle d,\langle d,d\rangle\rangle$: $\lambda d\lambda q\,.\,\frac{q}{d}$ — *per*
    - $\langle e,d\rangle$: $\lambda x\,.\,\frac{\mu_{\#\mathsf{person}}(x)}{\mathsf{unit}(\#\mathsf{person})}$ $\Uparrow_{of}$ d: $\mathsf{unit}(\#\mathsf{person})$ — *person*

A comparative operator that expects a measure function (as in e.g. Wellwood 2015) could apply to this, for a case like *more expensive per person*.

Distributivity marker analysis

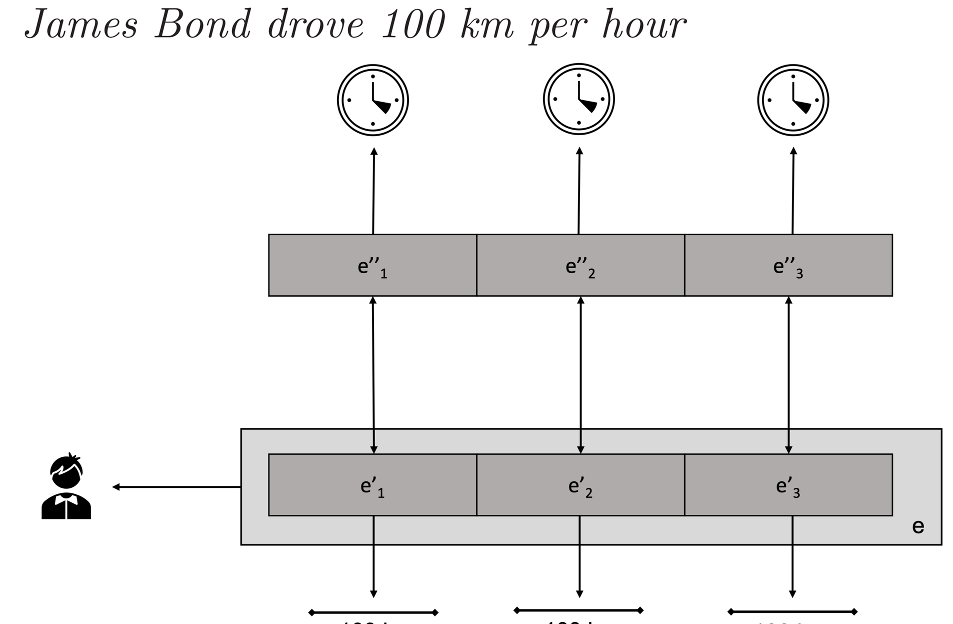
James Bond ate two olives per martini



$e \in {}^*\lambda e'\,.\,{}^*\mathsf{eat}(e') \wedge {}^*\mathsf{olive}({}^*\theta_{\text{share}}(e')) \wedge \mu({}^*\theta_{\text{share}}(e')) = 2 \wedge$
${}^*\mathsf{drink\text{-}martini}(\mathsf{match}(e'), {}^*\theta_{\text{key}}(\mathsf{match}(e'))) \wedge \mu({}^*\theta_{\text{key}}(\mathsf{match}(e'))) = 1$

(Panaitescu & Tovena 2019, building on Champollion 2016 i.a.)

James Bond drove 100 km per hour



(Incorrectly predicts that the event lasts at least one hour.)

Conclusion & Outlook

There *are* lexical items that conventionally express the concept of ratio, and *per* is one of them. Three ratio-related senses:
(i) quotient function;
(ii) quotient operator;
(iii) quotient of measure functions.

Bonus: The empirical arguments presented here indicate a potential methodology for deciding whether a given item conventionally expresses the concept of a ratio in a given language.

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Dogwhistles, Unmasking, and Polarization

Robert Henderson and Elin McCready

A Dogwhistle

George Bush's 2003 State of the Union address contains the following line.

(1) Yet there's power—wonder-working power—in the goodness and idealism and faith of the American people.

To most people this sounds like, at worst, a civil-religious banality, but to a certain segment of the population the phrase *wonder-working power* is intimately connected to their conception and worship of Jesus. When someone says (1), they hear (2).

(2) Yet there's power—Christian power—in the goodness and idealism and faith of the American people.

Two Kinds of Dogwhistles

We have argued extensively (e.g., Henderson & McCready 2019) that dogwhistle comes in two types:

Identifying Dogwhistles. Concern covert signals that the speaker has a certain sociolinguistic persona—i.e., involves social meanings only.

Enriching Dogwhistles. Involve sending a message with an enriched truth conditional meaning whose recovery is contingent on recognizing the speaker's covertly signaled persona

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Unmasking

We have a clean explanation of speaker behavior when dogwhistles are used.

- But no story about why a speaker may choose to abandon the use of a dogwhistles and instead make an overt appeal that, without a doubt, allows listeners to detect they bear the taboo persona. These "mask off" moments require a novel explanation.

Proposal: unmasking tracks several factors related to political polarization:

1. change in the speaker's beliefs about the way their audience is understanding their social persona
2. change in who they take themselves to be addressing
3. and change in the value the speaker assigns to presenting with that persona.

The H&M model predicts this typology as certain model parameters are set to extreme values.

Case One: (In)effectiveness

The speaker no longer believes that dogwhistling is going to be effective.

- One way in which this can happen is when the speaker's audience already believes that she has the persona in question, or when the speaker believes that they do.

More technically: if the priors the audience has for the speaker's personas (or that she believes they have) are unbalanced enough that they will assign her the persona she's trying to hide regardless of whether she used the dogwhistle.

Slogan: 'If I'm already canceled, I'll just speak my mind (= not dogwhistle anymore).'

Case Two: Valuation

change in the way one assigns value to social personas by increasing the affective value assigned to the dogwhistle persona.

- As $\nu_{S_1}(p)$ for some persona p tends to ∞, dogwhistling becomes non-optimal.
- It is better to make an overt appeal and ensure all audience members assign you p, even if they don't like p.
- The speaker's own affective value for p will swamp whatever the audience values.

Slogan: 'I don't care what you think of me if you don't think like me.'

Case Three: Speaker Beliefs About Audience Composition

- If she comes to view the group she is addressing as one composed of same-believers, she won't have incentive any longer to use dogwhistles.
  - (Compare shifts in the group used for determining the truth value of epistemic modals, e.g. DeRose 1991)
- Social media like Twitter likely support this sort of shift, as one starts to pay more attention to likes (which are assigned mostly on ideological lines) than comments (which might be combative).

Slogan: 'I'm not talking to you anymore!'

Bayesian RSA for Dogwhistles

The literal listener computes the probability the speaker bears a persona given their message

$$L_0(p|m) \propto P(m|p) \times P(p)$$

where $P(m|p)$ can vary across the popluation, which is the ultimate source of doghwhistles.

Speaker utility for a message $U_{S_1}^{Soc}(m, L_0)$ relative to a listener (or group of listeners) is

$$\sum_{p \in [m]} ln(L_0(p|m)) + \nu_{S_1}(p) \times L_0(p|m) + \nu_{L_0}(p) \times L_0(p|m)$$

where ν_{S_1} and ν_{L_0} assign the speaker and listeners affective values for various personas.

Critically, a message's utility can be greatly increased when listeners fail to realize how tightly it is correlated with a persona they disapprove of. This is an identifying dogwhistle.

Enriching Dogwhistles

We model *enriching dogwhistles* with as *identifying dogwhistle*$^+$. After a listener identifies a speaker's persona, that persona may be linked to an ideology. The listener can then enrich the literal meaning of what was said based on the ideology.

Ideologies. An ideology $\iota = \langle \rho, \mathcal{B} \rangle$ consists of an affect-assigning function and an ideological base.

- ρ, think 'rate', takes individuals as input and yields real numbers as value.
- The base $\mathcal{B}$ of a ideology ι is the set of propositions (i.e., beliefs) common to all similar ideological variants, i.e., $\Pi_2(\iota) =_{df} \bigcap \Pi_2(\iota')$, where $\iota' \sim \iota$.

The final ingredient is *Social Sincerity*, defined as

$$\forall s, u, \pi[utter(s)(u) \wedge \pi \in \mathbf{emf}(u) \wedge \iota_\pi \rightarrow MOST(p \in \Pi_2(\iota_\pi))(Bel(s, p))]$$

'If a speaker utters a sentence compatible with persona π, they believe a significant number of the propositions comprising the basis for π.'

A higher-order plurality solution to Xiang's (2021) puzzle

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Dayal's presupposition

- Singular wh-questions presuppose uniqueness.
- Plural wh-questions don't.

(1) Which student passed the exam? (✗ Al and Beth.)

(2) Which students passed the exam? (✓ Al and Beth.)

Maximal informativity presupposition

- Questions presuppose that there is a maximally informative true answer (Dayal 1996).
- That is, a true answer that entails every other true answer.

(SG) $\{\lambda w \,.\, x \text{ passed}_w \mid x \text{ is an atomic student}\}$

- x passed cannot entail y passed (for $x \neq y$).
- Thus, if there is a maximally informative true answer, then there is only one true answer.
- Prediction: only one student passed. ✓

(PL) $\{\lambda w \,.\, x \text{ passed}_w \mid x \text{ is a plurality of students}\}$

- x passed can entail y passed, namely when y is a subpart of x.
- Thus, there may be multiple true answers.
- Prediction: mere existential presupposition. ✓

Xiang's puzzle

- With certain non-distributive predicates, a plural wh-question can have a list of pluralities as an answer.

(3) Which students solved the problem together?
(✓ Al and Beth, and Cara and Dimitri.)

$\{\lambda w \,.\, x \text{ solved the problem together}_w \mid x \text{ is a plurality of students}\}$

- x solved the problem together cannot entail y solved the problem together (for $x \neq y$).
- Same logical signature as singular wh-questions.
- Prediction: only one plurality of students solved the prob. together. ✗

Xiang's proposal

Xiang (2021) proposes that:

- Such questions have higher-order readings, ranging over generalized quantifiers over students (Spector 2007).
- "Which GQ G over students is such that G students solved the problem together?"
- A possible G is $(\text{Al} + \text{Beth})^{\Uparrow} \cap (\text{Cara} + \text{Dimitri})^{\Uparrow}$.
- "$+$" is plurality formation. "$\Uparrow$" is Montagovian lift.
- Result: Al and Beth solved the problem together, and so did Cara and Dimitri.

Alternative solution: Higher-order plurality

Today's contribution, new arguments:

- against a higher-order reading solution
- for a higher-order plurality (HOP) solution (cf. Fox 2020)

First new argument for a HOP solution

(4) *Context: This class consists of students from France, Italy, Russia, and China. The French students solved the problem together, and so did the Italian students.*

(5) Which students solved the problem together?

a. The French students and the Italian students.

b. The students from the two Mediterranean countries.

- Conjunctive DP: easily handled with a group-forming operator, "$\uparrow$" (Landman 1989).
- Non-conjunctive DP: scope *the two Mediterranean countries* out of its group-denoting DP (Buccola, Kuhn, and Nicolas 2021).

(6) a. $\uparrow$[the French students] and $\uparrow$[the Italian students]

b. [the two Mediterranean countries] λx $\uparrow$[the students from x]

- The HOP plays the same role as any ordinary plurality: gets fed to *solved the problem together*, which applies to each sub-plurality.
- Same logical signature as ordinary plural wh-questions.
- Prediction: mere existential presupposition. ✓

Second new argument for a HOP solution

- The predicates Xiang discusses are what Grimau (2020) calls "plurality-distributive": they distribute down to sub-pluralities.
- Hence the important role of conjunction ($\cap$) in the GQ answer.
- But the same readings arise even for "plurality-collective" predicates (*hit each other*, *meet in adjacent rooms*), which do not distribute.
- Buccola, Kuhn, and Nicolas (2021) analyze such readings under the label "symmetric readings".

(7) *Context: This class consists of students from France, Italy, Russia, and China. A fight broke out, and the French students hit the Italian students, and vice versa.*

(8) Which students hit each other?

a. The French students and the Italian students.

b. The students from the two Mediterranean countries.

- GQ $(\text{the FS})^{\Uparrow} \cap (\text{the IS})^{\Uparrow}$ yields the wrong (distributive) reading. ✗
- Applying either HOP to *hit each other* yields that the French group hit the Italian group, and vice versa. ✓

Summary

- Xiang's puzzle not only can, but must be solved with HOP.
- Solution extends recent findings from the declarative to the interrogative domain.
- Adds to the growing evidence that natural language makes use of HOP, even in the absence of conjunction.

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