From roots to trees: Thematic roles and the lexicon-syntax interface

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0. Setting the scene

- The human language faculty is often assumed to consist of two fundamentally different components: the grammar and the lexicon.
- Our topic for today: how grammatical knowledge and lexical knowledge interface with each other in the domain of argument structure, with a focus on the concept of thematic roles (θ-roles).

1. Research question and goals of this study

- Consider the denotations in (1) and (2):

(1) a. Brutus stabbed Caesar.
b. λe. stab(e) $\wedge$ Agent(e)(Brutus) $\wedge$ Patient(e)(Caesar)

(2) a. Brutus kicked Caesar.
b. λe. kick(e) $\wedge$ Agent(e)(Brutus) $\wedge$ Patient(e)(Caesar)

- A speaker who understands these sentences knows not only that Caesar is a patient, but that he is a patient *of* a stabbing event or *of* a kicking event, respectively.
- What it means to be the patient *of* a stabbing or kicking event must somehow be determined by (at least) both the verb and the θ-role. How does this work?

Research question

How do speakers know what it means for an argument to be interpreted with a given θ-role in the context of a given event description? How is this knowledge encoded?

- This talk has three goals:
  - Convince you that this is a relevant question,
  - Refute a previous answer to this question (the individual role theory of θ-roles),
  - Develop an alternative answer.

2. Previous work (and its discontents)

- A preliminary note: what follows is a theory that has been proposed explicitly by Goldberg (1995, 2006) in the framework of Cognitive Construction Grammar. However, I believe that implicitly, it is assumed more widely, and I will give you a generalized version of it.

2.1. The idea

- Suppose that each verb is stored in the lexicon with a finite set of verb-specific *individual roles* that are then categorized by more abstract θ-roles. For example, *stab* would be stored with the individual role of a stabber (categorized as an agent) and a stabbee (categorized as a patient).
- We can imagine verb meaning as being stored in the form of a table, with θ-roles on the x-axis and verbs on the y-axis:

(3)

	agent	patient	goal	...
stab	stabber	stabbee		
run	runner			
hand	hander	handed	handee	
fall		faller		
...				

- Speakers know what it means to be, say, the patient of a stabbing event by looking up the relevant individual role.

2.2. The problems

- The theory presupposes that verb meaning takes the form of structured lexical entries in which each verb is represented with a finite list of arguments. However, verbs are highly flexible and productive with respect to the arguments they can combine with (4):

(4) a. The factory horns sirened throughout the raid.
b. The factory horns sirened midday and everyone broke for lunch.
c. The police car sirened the Porsche to a stop.
d. The police car sirened up to the accident site.
e. The police car sirened the daylight out of me. (Borer, 2005:8)

- The theory predicts that the interpretation of an argument should depend only on the verb and the argument's θ-role. However, the interpretation of the external argument can depend on the internal argument (5)–(6):

(5) a. take a book from the shelf
b. take a bus to New York
c. take a nap
d. take an aspirin for a cold
e. take a letter in shorthand

(6) a. kill a cockroach
b. kill a conversation
c. kill an evening watching TV
d. kill a bottle (i.e., empty it)
e. kill an audience (i.e., wow it)

(Marantz, 1984:25)

- The theory assumes that the individual roles and θ-roles of a given verb stand in a one-to-one mapping relation. *Variable linking* falsifies this prediction.

3. Data: Evidence from variable linking

3.1. Variable unaccusativity

- It is widely assumed that intransitives can realize two different underlying structures: unergative (with only an external argument) and unaccusative (with only an internal argument), as diagnosed by a range of diagnostics (Burzio, 1986; Perlmutter, 1978; Perlmutter and Postal, 1984).
- Some intransitives can show either behavior (7):

(7) a. *uṛ-ii (huu-ii) ciṛyaa
fly-PFV.FSG be-PFV.FSG bird.FSG
Intended: 'the flown bird'

b. uṛ-ii (huu-ii) patang
fly-PFV.FSG be-PFV.FSG kite.FSG
'the flown kite' (Ahmed, 2010:8f.)

- Reduced relative clauses are an unaccusativity diagnostic. Thus, 'the bird' in (7a) is an external argument, but 'the kite' in (7b) an internal argument.
- Moreover, the argument of the unergative in (7a) has semantic properties associated with the agent θ-role, the argument of the unaccusative in (7b) with the patient θ-role. Taken together, the syntactic and semantic evidence thus indicates that the arguments receive different θ-roles.
- Variable unaccusativity is highly common cross-linguistically. Sorace (2000, 2004, 2011) has shown that a change in the syntactic behavior of intransitives systematically goes along with a change in the thematic properties of the argument.
- Under the individual role theory, the verb 'fly' would come with the individual role of a flyer, but this role would could then be variably mapped onto either an agent θ-role or a patient θ-role.

3.2. Direct causatives of unergatives

- In many languages, some verbs that as intransitives pass unergativity diagnostics can also form direct causatives (8):

(8) a. Rohan naach rahaa hai.
Rohan.M dance PROG.MSG be.PRS.3MSG
'Rohan is dancing.'

b. Shama Rohan-ko nach-aa rahii hai.
Shama.F Rohan-DOM dance-CAUS PROG.F be.PRS.3MSG
'Shama is making Rohan dance/twirling him around (the dance floor).'

(Bhatt and Embick, 2017:124)

- In the intransitive, 'Rohan' is an external argument, but in the transitive, an internal argument (see also Harris, 1981; Legate, 2014; Nie, 2020). This can be shown using reduced relative clauses (9), besides other diagnostics:

(9) a. *dauṛ-aa laṛkaa
run-PFV.MSG boy
Intended: 'the run boy'

b. [Ravi-dwaaraa dauṛ-aa-yaa gayaa] laṛkaa
Ravi-by run-CAUS-PFV PASS.PFV boy
'the boy run by Ravi' (i.e., the boy chased by Ravi) (Bhatt and Embick, 2017:124f.)

- We also find that semantically, the subject argument of the intransitive in (8a) is more agent-like, the object argument of the transitive in (8b) more patient-like.
- What the individual role theory would label a 'dancer' argument ('Rohan') would thus be mapped either onto an agent θ-role (8a) or a patient θ-role (8b). In addition, the agent of the verb 'dance' would be associated with different individual roles. Thus, these data equally falsify the idea that the individual roles and the θ-roles of a given verb stand in a one-to-one mapping relationship.

3.3. Other cases of variable linking

- My dissertation is concerned with four more cases of variable linking: direct causatives of ingestives, the agent-affectee alternation, statives of ingestives and pseudo-symmetric predicates.
- Examples and some notes on their analysis can be found in Appendix A. Ask me in the Q&A!

Interim summary

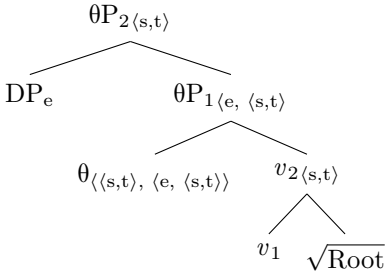
The research question we are pursuing is how speakers know what it means for an argument to be interpreted with a given θ-role in the context of a given event description. A previous answer to this question – the individual role theory – faces clear challenges. Next, we turn to an alternative proposal.

4. Proposal

4.1. Introducing the first argument

- Following Kratzer (1996) and much subsequent work, we will assume that arguments are introduced by functional heads (θ-heads) in the syntax.
- Unlike Kratzer, we will extend this treatment to all arguments (10), and our θ-heads will combine via Function Application (11). I will refer to a verbal element that has not yet combined with any θ-heads (v_2) as a *prethematic verb*.

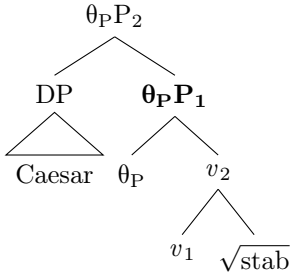
(10)



(11)
a. $[\![v_2]\!] = \lambda e.\ \text{Root}(e)$
b. $[\![\theta]\!] = \lambda P.\ \lambda x.\ \lambda e.\ P(e) \wedge \theta(e)(x)$
(e.g., Agent(e)(x), Patient(e)(x)...)
c. $[\![\theta P_1]\!] = \lambda x.\ \lambda e.\ \text{Root}(e) \wedge \theta(e)(x)$
d. $[\![\theta P_2]\!] = \lambda e.\ \text{Root}(e) \wedge \theta(e)(\text{DP})$

- The level of θP_1 corresponds to a θ-head that has combined with an event description and still awaits an entity argument. It thus denotes a θ-role interpreted in the context of a given event description.
- By way of example, let us return to *Brutus stabbed Caesar*, focusing on the first argument only (12). Here, $\theta_P P_1$ denotes what it means for x to be the patient of a stabbing event (13).

(12)



(13) $[\![\theta_P P_1]\!] = \lambda x.\ \lambda e.\ \text{stab}(e) \wedge \text{Patient}(e)(x)$

- Thus, what it means to be the patient of a stabbing event is not already stored on the verb, but generated in the syntax by combining the prethematic verb *stab* (v_2) with a patient θ-head (θ_P).

Answering the research question

Speakers know what it means to be the patient of a stabbing event because they know the meaning of the ingredients that together generate this interpretation: the meaning of the prethematic verb *stab* and of the patient θ-head.

- To better understand what the meaning of the prethematic verb is, we return to variable unaccusativity. Recall that the Hindi-Urdu verb 'fly' can come either with an agent θ-role (14a) or a patient θ-role (14b):

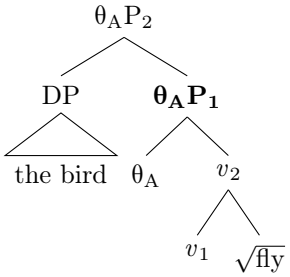
(14) a. *uṛ-ii (huu-ii) ciṛyaa
fly-PFV.FSG be-PFV.FSG bird.FSG
Intended: 'the flown bird'

b. uṛ-ii (huu-ii) patang
fly-PFV.FSG be-PFV.FSG kite.FSG
'the flown kite' (Ahmed, 2010:8f.)

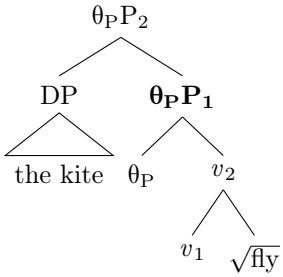
- We want to be able to derive the two variants in (14) from the same source: variable unaccusativity is a common and productive alternation, and the unergative and the unaccusative variant share a semantic core.

- To achieve this, we simply let the same prethematic verb ('fly') combine with either an agent θ-head (15a) or a patient θ-head (15b):

(15) a.



b.



- The boldfaced node in (15a) denotes what it means to be the *agent* of a flying event (16a) (i.e., what holds true of the bird), and the boldfaced node in (15b) what it means to be the *patient* of a flying event (16b) (i.e., what holds true of the kite):

(16) a. $[\![\theta_A P_1]\!] = \lambda x.\ \lambda e.\ \text{fly}(e) \wedge \text{Agent}(e)(x)$
b. $[\![\theta_P P_1]\!] = \lambda x.\ \lambda e.\ \text{fly}(e) \wedge \text{Patient}(e)(x)$

- What is the meaning of the prethematic verb 'fly' that gives rise to these two distinct but related interpretations? Of course it is not just 'move through the air' (17):

(17) a. She flew into his arms.
b. Time flies when you're having fun.
c. He flew into a rage.
d. The news flew across town.

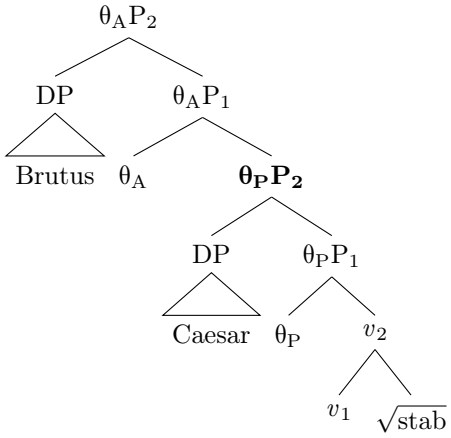
- Instead, I will define the meaning of the prethematic verb 'fly' as a name for the set of all events that we can describe as flying events.

4.2. Introducing additional arguments

- To recap: the interpretation of an argument is not already stored on the verb, but generated by merging a verbal event description with a θ-head. This also holds for the verb's second (and third) argument.

- One more look at *Brutus stabbed Caesar* (18):

(18)



- The interpretation of the external argument (*Brutus*) is determined by merging the agent θ-head with the verbal event description in its complement (19). Crucially, this event description already contains the first argument: Brutus is not the agent of a stabbing event, but of a stabbing-Caesar event.

  (19) $[\![\theta_P P_2]\!] = \lambda e.\ \text{stab}(e) \wedge \text{Patient}(e)(\text{Caesar})$

- Recall that the internal argument can affect the interpretation of the external argument (20)–(21): the agent arguments in question are agents of different events.

  (20)
  a. take a book from the shelf
  b. take a bus to New York
  c. take a nap
  d. take an aspirin for a cold
  e. take a letter in shorthand

  (21)
  a. kill a cockroach
  b. kill a conversation
  c. kill an evening watching TV
  d. kill a bottle (i.e., empty it)
  e. kill an audience (i.e., wow it)

  (Marantz, 1984:25)

- By contrast, the external argument does not affect the interpretation of the internal argument (22):

  (22)
  a. Harry killed NP.
  b. Everyone is always killing NP.
  c. The drunk refused to kill NP.
  d. Silence can certainly kill NP.
  e. Cars kill NP.

  (Marantz, 1984:26)

- Marantz (1984) takes this contrast to indicate that the internal argument is an argument of the verb, whereas the external argument is an argument of the entire *v*P (anticipating Kratzer, 1996). This falls out as a simple effect of constituency.

4.3. Proto-properties and exemplars

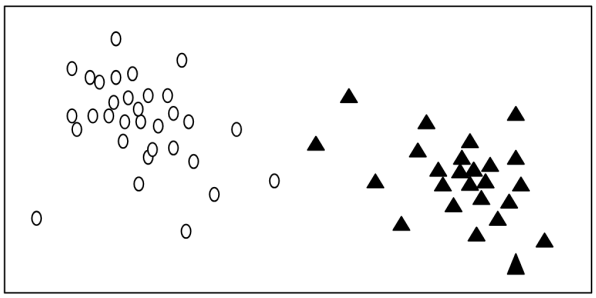
- We still need to account for the fact that arguments with the same θ-role share semantic properties associated with a proto-role (Dowty, 1991).
- Recall (by way of example) the denotation of the agent θ-head (23):

  (23) $[\![\theta_A]\!] = \lambda P.\ \lambda x.\ \lambda e.\ P(e) \wedge \text{Agent}(e)(x)$

- The agent θ-head does not directly denote what it means to be an agent, but generates *exemplars* of agents: the agent of flying, the agent of dancing, the agent of stabbing Caesar, the agent of taking a nap...

- Arguments with the same θ-role are semantically similar because the output produced by a given θ-head clusters together semantically. Different θ-heads generate different clusters. For instance, imagine that the ovals are exemplars of agents and the triangles exemplars of patients (24):

(24)



- Under this view, θ-role labels such as agent and patient are abstractions formed over the output generated by different θ-heads.

5. Conclusion

- Our research question for today was how speakers know what it means for an argument to be interpreted with a given θ-role in the context of a given event description.
- I pursued three goals in this talk:
  - Convince you that the research question is a relevant question,
  - Refute a previous answer (the individual role theory of θ-roles),
  - Develop an alternative answer.
- Some questions I have left open and that you could ask me in the Q&A:
  - What are the other cases of variable linking? (Appendix A)
  - How should we analyze causatives of unergatives (but also causatives in general)? (Appendix B)
  - How does the grammar encode in which syntactic frames a verb can be used? (Appendix C)
  - What is ultimately the nature of prethematic verb meaning, and what role does polysemy play?

Take-home message

Lexical meaning should not be treated as a black box that does not affect our theories of syntax and compositional semantics. Understanding the interface between grammatical knowledge and lexical knowledge is one of the major tasks for linguistic theory.

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Appendix A: More evidence from variable linking

Direct causatives of ingestives

- Example (25) is from Sason Arabic; the pattern is also attested in Amharic, Acehnese, Ahtna, Eastern Armenian, Berber, Cora, Egyptian Arabic, Hindi-Urdu, Jarawara, Lubukusu, Malayalam, Marathi and Tariana.

(25) a. ayal-e Leyla badincan.
eat-F Leyla tomatoes
'Leyla ate tomatoes.'

b. ayyil-tu Leyla badincan.
eat.CAUS-1SG Leyla tomatoes
'I fed Leyla tomatoes.' (Lit. 'I ate Leyla tomatoes.')

- Example (25a) is a regular transitive with an agent external argument and a patient internal argument; (25b) is the corresponding direct causative.
- The causative has a regular ditransitive structure. The dative argument ('Leyla') is realized as an indirect object, as can be demonstrated using depictives and null arguments (Sason Arabic), and case marking and object shift (Hindi-Urdu).
- I argue that in the causative, 'Leyla' is interpreted as a goal/recipient. This is supported by the fact that ingestive verbs appear to be the only transitives that can form direct causatives: their original agent argument can be reinterpreted as a goal/recipient.
- Direct causatives of ingestives mirror direct causatives of unergatives, with an additional argument (the patient) whose syntactic position and interpretation remains constant.

The agent-affectee alternation

- Example (26) is from Spanish; the pattern is also attested in Agul, Albanian, Basque, Bulgarian, German, Greek, Hungarian, Italian, Polish, Romanian, Serbo-Croatian and Slovenian.

(26) a. El tintorero quemó los pantalones de Carolina.
the dry-cleaner burnt.SG the trousers of Carolina
'The dry-cleaner burnt Carolina's trousers.'
b. Al tintorero se le quemaron los pantalones de Carolina.
to.the dry-cleaner REFL CL.DAT burnt.PL the trousers of Carolina
'Carolina's trousers got burnt on the dry-cleaner.'
'The dry-cleaner (accidentally) burnt Carolina's trousers.' (Cuervo, 2003:186)

- Example (26a) is a regular causative with an agent external argument and a patient internal argument. Example (26b) is an unaccusative with an additional dative (high applicative) argument.
- The argument 'the dry-cleaner' occupies different syntactic positions in (26a) and (26b). Moreover, while there is disagreement on the θ-role of the dative argument in (26b) (and whether there is only one), it is not that of an agent.
- The agent-affectee alternation mirrors variable unaccusativity, with an additional argument (the patient) whose syntactic position and interpretation remains constant.

Statives of ingestives

- Example (27) is from Greek; the pattern is also attested in English, Hebrew, Italian and Latin.

(27) a. I Maria efaje.
the Mary eat.PST.3SG
'Mary ate.'
b. I Maria ine faɣo-men-i.
the.NOM Mary.NOM be.3SG eat-PTCP-F.NOM
'Mary is eaten.' / 'Mary has eaten.' (Paparounas, 2025:23)

- The argument of statives usually corresponds to the patient internal argument of the matching eventive verb, but in statives of ingestives such as (27b), it can also correspond to the agent external argument.
- As in regular statives, the argument of pseudo-agentive statives is interpreted as the holder of a result state.

- However, (27b) now suggests that being the holder of the state resulting from an eating event can mean two different things: being devoured (the cannibalistic reading) and being done eating (the pseudo-agentive reading).
- In Hindi-Urdu, these statives can surface with an additional argument that I show to have properties of pseudo-incorporated arguments (e.g., 'wine-drunk'). I hypothesize that pseudo-agentive statives without such an overt additional argument involve incorporation of a null argument (e.g., Mary is in the state of having eaten *something*.)
- As a result, the two readings of (27b) correspond to Mary being the holder of two different result states, one with and one without an incorporated null argument.

Pseudo-symmetric predicates

- Strictly symmetric predicates (e.g., *marry*, *meet*, *resemble*) allow for both a transitive use (28a)–(28b) and an intransitive use with a plural subject (28c). All three variants in (28) entail each other (e.g., Winter, 2016, 2018).

  (28) a. Joel married Clementine.
  b. Clementine married Joel.
  c. Joel and Clementine married.

- Pseudo-symmetric predicates (e.g., *hug*, *kiss*, *collide*) equally allow for all three alternants, but they do not entail each other (29):

  (29) a. Joel hugged Clementine.
  b. Clementine hugged Joel.
  c. Joel and Clementine hugged.

- Pseudo-symmetric predicates have sometimes been analyzed as covert reciprocals, such that all individuals making up the plural subject are both agent and patient (e.g., Wehbe, 2025). However, unlike true reciprocals, intransitive pseudo-symmetric predicates do not stand in a biconditional entailment relationship to the conjunction of the corresponding transitives (30) (Kruitwagen, 2024).

  (30) a. Joel and Clementine hugged each other. $\leftrightarrow$ Joel hugged Clementine and Clementine hugged Joel.
  b. Joel and Clementine hugged. $\nleftrightarrow$ Joel hugged Clementine and Clementine hugged Joel.

- Following Kruitwagen (2024) and Winter (2016, 2018), a.o., I argue that in intransitive pseudo-symmetric predicates, the subject argument is interpreted with a single θ-role (31):

  (31) $[\![\text{Joel and Clementine hugged}]\!] = \lambda e.\ \text{hug}(e) \wedge \text{Agent}(e)(\text{Joel and Clementine})$

- As predicted, in (32), the interpretation of the agent arguments differs because they are agents of different events: a hugging event and a hugging-the-speaker event.

  (32) a. $[\![\text{My parents hugged me}]\!] = \exists e.\ \text{hug}(e) \wedge \text{Agent}(e)(\text{the speaker's parents}) \wedge \text{Patient}(e)(\text{speaker})$
  b. $[\![\text{My parents hugged}]\!] = \exists e.\ \text{hug}(e) \wedge \text{Agent}(e)(\text{the speaker's parents})$

- However, the denotations in (32) wrongly predict (32a) to entail (32b). This might either falsify the analysis or point towards problems with the formal framework used here.

Appendix B: Causatives

- In direct causatives of unergatives, a single individual role (a 'dancer') is realized either as an agent or as a patient, and a single θ-role (an agent) corresponds to different individual roles (33):

(33) a. Rohan naach rahaa hai.
Rohan.M dance PROG.MSG be.PRS.3MSG
'Rohan is dancing.'
b. Shama Rohan-ko nach-aa rahii hai.
Shama.F Rohan-DOM dance-CAUS PROG.F be.PRS.3MSG
'Shama is making Rohan dance/twirling him around (the dance floor).'
(Bhatt and Embick, 2017:124)

- The latter fact can seemingly be explained by assuming a complex subevent structure for causatives: in the intransitive, Rohan is the agent of a dancing event, but in the transitive, Shama is the agent of a causing event (34).

(34) a. $[\![\text{Rohan danced}]\!] = \lambda e.\ \text{dance}(e) \wedge \text{Agent}(e)(\text{Rohan})$
b. $[\![\text{Shama danced Rohan}]\!] = \lambda e_2.\ \exists e_1.\ \text{dance}(e_1) \wedge \text{Patient}(e_1)(\text{Rohan}) \wedge \text{Cause}(e_2, e_1) \wedge \text{Agent}(e_2)(\text{Shama})$

- However, describing Shama as the agent of a causing event fails to distinguish the interpretation that the argument receives in (34b) from the one it receives in (35):

(35) $[\![\text{Shama bounced the ball}]\!] = \lambda e_2.\ \exists e_1.\ \text{bounce}(e_1) \wedge \text{Patient}(e_1)(\text{the ball}) \wedge \text{Cause}(e_2, e_1) \wedge \text{Agent}(e_2)(\text{Shama})$

- Parallel to what we saw for arguments, a causing event is always a causing event *of* a particular eventuality: Shama is an agent *of* a causing event *of* a dancing event, and *of* a causing event *of* a bouncing event, respectively.

Appendix C: Verb distribution

- What determines the syntactic behavior of a given verb (for instance, unergative, unaccusative or variable), and how is this knowledge encoded in speakers' grammars?
- Listing each verb with all syntactic frames in which it can appear fails to account for variation and gradience.
- Instead, take the idea that the meaning of a lexical item is determined by the contexts in which it can occur. If θ-heads are analyzed as independent, verb-external elements, then they are equally included in the set of elements to which a lexical item can stand in a co-occurrence relation.
- This makes it possible to argue that, for instance, a predominantly unergative verb has a strongly agentive meaning *because* it frequently occurs in the context of an agent θ-head. Thus, the syntactic usages of a verb determine its meaning, not vice versa.