

# Introducing Arguments Redux\*

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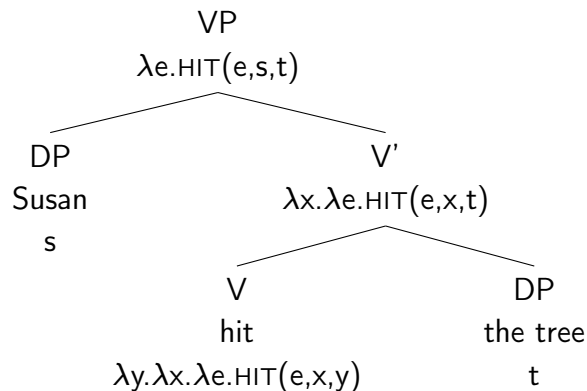
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## 1 Introduction

- One of the fundamental assumptions about the syntax and semantics of clauses is that **the predicates that form their backbone project arguments**, whatever syntactic categories these arguments are e.g., DPs, PPs, CPs.
- From a formal, compositional semantic point of view, **predicates are modelled as n-ary functions**, with **arguments of the appropriate type serving to saturate a predicate's argument positions**.
- Focusing on verbs that take DP arguments, one simple view then might be that the syntactic structure corresponds one-to-one with the order of arguments a verbal predicate takes. This is illustrated below, assuming that verbs also take event arguments (Davidson, 1967).

(1) Susan hit the tree.

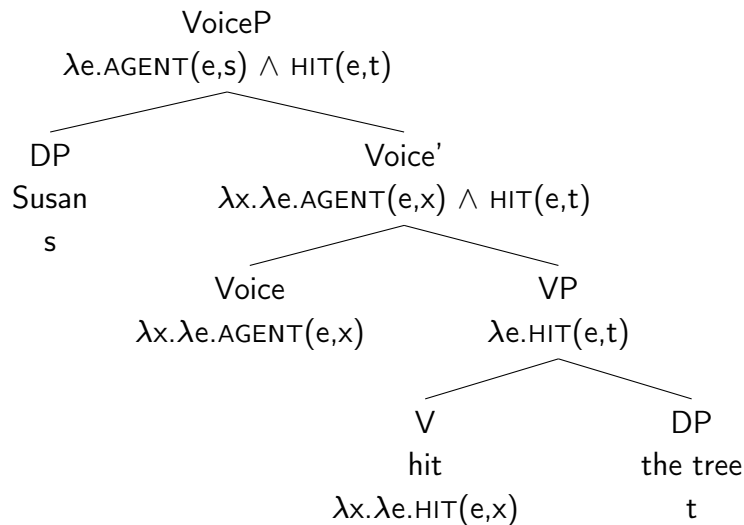


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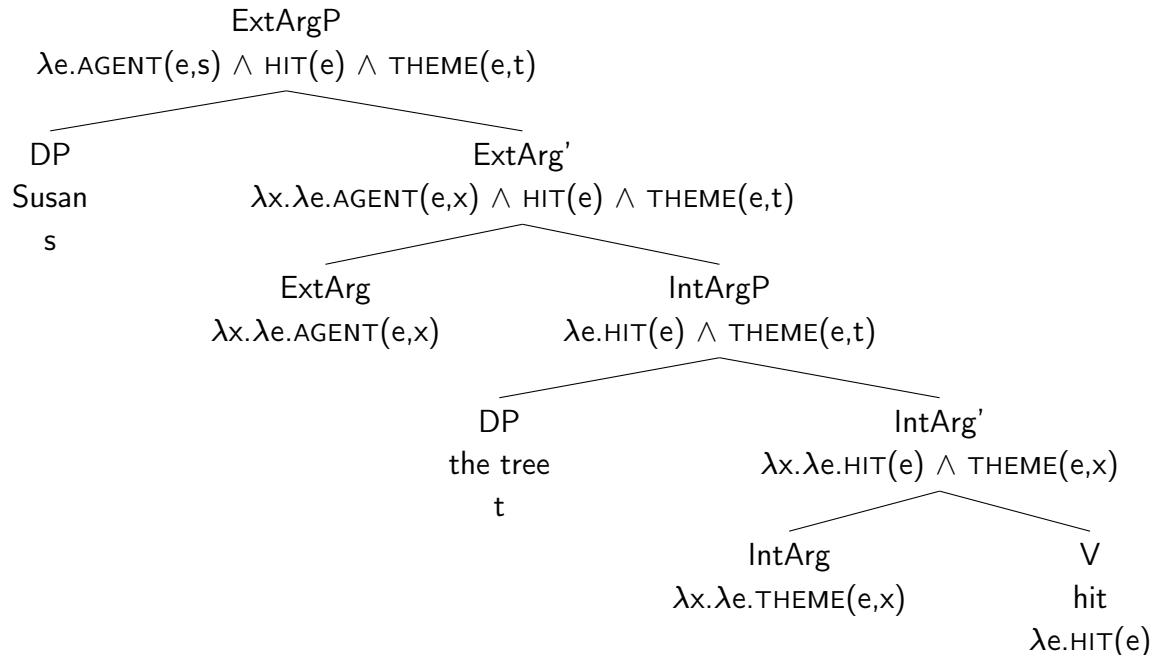
- In recent times, this basic picture has been suggested to be incorrect. One influential proposal is that of Kratzer's (1996). Building on the observation of Marantz (1984), who observes that **internal arguments can condition special interpretations of the verb while external arguments rarely do**, Kratzer proposes that **the external argument is severed from the syntax and semantics of the verb**.
- Syntactically, **the external argument is introduced by a functional head VOICE**; semantically, **VOICE is a function from individuals to a predicate of events, relating that individual to an event through thematic roles like AGENT**.
- A compositional rule of **EVENT IDENTIFICATION**, a variant of PREDICATE MODIFICATION, combines VOICE with the VP.

(2) Susan hit the tree.



- Others propose to take this view even further and that **even internal arguments are introduced through functional heads** (e.g., Schein, 1993; Borer, 2005). Under this view, **verbs are bare predicates of events** (Schein, 1993); they play no role in determining the syntactic structure since they do not project arguments and **merely contribute real-world information about the type of event they denote** to the derivation.

(3) Susan hit the tree.



- In this talk, we review what we have learned about the way arguments are introduced, utilizing a well-known diagnostic: **repetitive presuppositions introduced by the presupposition trigger *again* and the ambiguities it produces.**
- In particular we make two claims based on different empirical generalizations:
  - The **lexical semantics of verbs can determine the way in which external arguments are introduced** and that verbs fall into well-defined classes in this regard.
  - The **presence of an internal argument can affect how external arguments are introduced and semantically composed, necessitating a novel theory of how arguments compose with their predicates.**
- Overall, this presents a more complex picture of the interaction between syntax, semantics, and the lexicon in determining argument structure and how arguments are introduced.

## 2 Setting the Scene: Repetitive Presuppositions

- *Again*-ambiguities have long been used to diagnose syntactic and semantic decomposition of verbs since the GENERATIVE SEMANTICS tradition (e.g., McCawley, 1968; Dowty, 1979, *a.o.*).
- More recent syntactic implementations of lexical decomposition have argued that *again*-ambiguities demonstrate that certain verb classes must be syntactically decomposed e.g., *open* as CAUSE TO BECOME OPEN, based on the ambiguity between a repetitive and restitutive interpretation of *again*'s presupposition (e.g., von Stechow, 1996; Beck and Johnson, 2004).

- We focus here on a different ambiguity produced by *again*, namely, the availability of a **subjectless repetitive presupposition**.
- Standard analyses of the semantics of *again* take it to be truth-conditionally contentless, serving only to introduce a repetitive presupposition. It is hence **an identity function over predicates of events in the assertion, while presupposing an identical event of the type denoted by its complement happened at a prior time** (Dowty, 1979; von Stechow, 1996; Beck and Johnson, 2004).

(4)  $\llbracket \textit{again} \rrbracket P$  is defined iff  $\exists e^1 \exists e^2 [e^1 \prec e^2 \prec E \ \& \ P(e^1) \ \& \ \neg P(e^2)]$ .

When defined,  $\llbracket \textit{again} \rrbracket P = P$

$\langle \langle v, t \rangle, \langle v, t \rangle \rangle$

(Bale, 2007)

- If external arguments are introduced by VOICE via EVENT IDENTIFICATION, defined as below, then we make a novel prediction: *again* can attach to VOICE's sister constituent, excluding the external argument in the calculation of its repetitive presupposition i.e., a **subjectless repetitive presupposition** (Bale, 2007).

(5) EVENT IDENTIFICATION:

$f_{e,vt} + g_{vt} \rightarrow \lambda x. \lambda e. f(x)(e) \wedge g(e)$

- Bale (2007) shows that in regards to the availability of subjectless presuppositions, verbs fall into at least **three well-defined classes that cross-cuts two properties: eventivity vs stativity and transitivity**.
- **Eventive transitive verbs readily exhibit subjectless presuppositions when modified with *again***, allowing the prior event satisfying this presupposition to have a different subject argument.

(6) CONTEXT: Seymour's dryer broke. He called a repairwoman who simply hit the dryer until it started working. The dryer broke down two days later. So...  
**Seymour hit the dryer again.**

- **Intransitive verbs, whether unergative or unaccusative, systematically disallow such contexts to satisfy *again*'s presupposition**, in contrast with eventive transitive verbs.

(7) a. CONTEXT: Last week, Jon's wife ran all morning. Then after she got home, Jon was able to do some exercise. So...  
**# Jon ran again.**

b. CONTEXT: Seymour's wife was the first person ever to arrive at the new airport. Then a week later...  
**# Seymour arrived again.**

- Finally, **stative transitive verbs also disallow subjectless presuppositions like intransitive verbs**, in contrast to eventive transitive verbs.

(8) CONTEXT: Seymour's mother loved Frank, although she was the only one who did. After a while she no longer cared for him. However, Seymour became attached to the man, and developed strong feelings for him after his mother's love subsided. So...  
# Seymour loved Frank again.

- Bale (2007) concludes then that at least two ways of modelling how verbs take their arguments are needed: **eventive transitive verbs introduce their external arguments outside the verb as in (2)**, while **intransitive verbs and stative transitive verbs introduce all their arguments directly, regardless of how many they have and what thematic role they bear, as in (1)**.

### 3 External Arguments and Verb Classes

#### 3.1 Eventive Transitive Verbs and Intentionality

- Utilizing the above diagnostic, we see that **it is not the case that verbs introduce their external arguments the same way, even within the classes Bale (2007) identified**.
- Consider the canonical killing verb *kill*; as Bale (2007) shows, it readily admits subjectless presuppositions with *again*, as expected under Bale's classification of verbs.

(9) CONTEXT: In a Hollywood monster movie, Seymour's father killed the zombie. But, being a Hollywood movie, of course they came back to life. But in the end ...  
**Seymour killed the zombie again.**

- Yet **other verbs of killing that further specify the manner in which the killing event was carried out do not behave as expected**. We consider here verbs like *murder*; **other verbs that behave similarly include *assassinate*, *massacre***, etc. See Ausensi et al. (2021) for contexts and examples for these verbs.

(10) CONTEXT: In a Hollywood slasher movie, Mike Myers murdered Bill. Bill was revived by a sorcerer, but after chasing the revived Bill down, ...  
a. # Freddy murdered Bill again.  
b. Mike Meyers murdered Bill again.

- It seems then that Bale (2007) is not completely correct in singling out eventive transitive verbs as a general class that introduce their external arguments directly. We could refine Bale's generalization and suggest **there are sub-classes of eventive transitive verbs like *murder* that take their external arguments as semantic arguments**.

- Doing so, however, amounts to restating the empirical facts; **what might be the source of this difference between verbs like *kill* and verbs like *murder*?**
- One possible answer: **it is well-known that a semantic difference between *kill* and *murder* is *intentionality*.** This manifests in the **possibility of non-intentional/animate subject and of targeting this intentionality with modifiers** (Talmy, 1991; Dowty, 1991; Van Valin and Wilkins, 1996; Folli and Harley, 2005; Grano, 2017).

- (11)
- Floods killed thousands.
  - Cancer killed two million people last year.
  - That weapon killed thousands.

- (12)
- # Cancer murdered every man in that hospital.
  - # Floods murdered five US citizens.
  - # That weapon murdered my brother.

- ***Murder* requires an intentional agent while *kill* imposes no requirement on intentionality;** we might think of this as a the source of the difference between the availability of subjectless presuppositions between the two classes of verbs.
- This also makes formal sense; within an intensional, possible-world semantics, we would need to **make reference to an agent to access the possible worlds under consideration.**
- Importantly, we see that **this intentionality requirement, like the external argument, is always contained with *again*'s repetitive presupposition** and cannot be interpreted outside of it.
- In the context below, **the prior event is carried out by the same referent of the asserted subject argument but crucially, did not have intent to carry out the event.** Crucially, **this does not license the use of *again*, contrasting with *kill*.**
- Note that we have specified that **the manner of killing in the previous event is identical in every way with the asserted murdering event except the presence of intentionality,** confirming that intentionality is itself a part of the meaning of the verb *murder*.

- (13) CONTEXT: **John killed Frank when he accidentally fired his gun at him.** A sorcerer brought Frank back to life. Afraid of retribution, John **fired at Frank with his gun** and he immediately died.
- # John murdered Frank again.
  - John killed Frank again.

- Since **intentionality is contained within the verb itself** (cf. for example Folli and Harley 2005 where intentionality is encoded in a verbalizing head  $v_{DO}$ ) and **intentionality makes reference to an agent's intent-worlds,** *murder* necessarily **requires the presence of an agent regardless of the structure it is embedded in.** This is represented as a meaning

postulate in the lexical entry below (simplified from Ausensi et al. 2021). Except for example (14) below, we will suppress world arguments for brevity.

- (14)  $\llbracket \textit{murder} \rrbracket$ :  $\lambda w. \lambda x. \lambda y. \lambda e [ \text{AGENT}(e)(w) = y \wedge \text{MURDER}(e)(w) \wedge \text{THEME}(e)(w) = x ]$   
 where  $\text{MURDER}(e)(w) = 1$  iff  $\exists s [ \text{CAUSE}(e,s) \wedge \text{DEAD}(s) \wedge \text{HOLDER}(s) = \text{THEME}(e) ] \wedge$   
 $\forall w' [ \text{INTENTION}_{w'}^y(w) \rightarrow [ \text{AGENT}(e) = y \wedge \exists s [ \text{CAUSE}(e,s) \wedge \text{DEAD}(s) ] ] ]$

- There is therefore a deeper reason for the observation that there are verbs that systematically disallow subjectless presuppositions and introduce their external arguments directly: here, the lexical semantics independently require the semantic presence of an agent argument in order to track the intent worlds of their external arguments (cf. for example Wechsler 2020 who makes the same argument but across all verb types).

### 3.2 Stative Transitive Verbs and Possessors

- Given the conclusion in the previous section, is there reason to think that the same reasoning can apply to other verb classes that disallow subjectless repetitive presuppositions?
- We return to Bale's observation that stative transitive verbs like *love*, *hate*, and *respect* seem to systematically disallow subjectless repetitive presuppositions and therefore must introduce their subject experiencer arguments directly.

- (15) CONTEXT: Seymour's mother loved Frank, although she was the only one who did. After a while she no longer cared for him. However, Seymour became attached to the man, and developed strong feelings for him after his mother's love subsided. So...  
 # Seymour loved Frank again.

- One way of understanding this requirement comes from Hale and Keyser (2002), who suggest that verbs like *love* are endowed with a semantic index that must be bound *obviatively* by the external experiencer argument.
- Informally, one way of paraphrasing the meaning of *love* under their approach is *x has y's love*. This is in fact transparently reflected in a productive alternation in English based on the overt possessive verb *have* and also with a ditransitive construction based on *give*, which arguably has a covert *have*-based sub-structure (e.g., Harley, 2003; Harley and Jung, 2015).

- (16) a. Mary has John's love.  
 b. John<sub>i</sub> gives Mary his<sub>i</sub> love.  
 c. Mary<sub>i</sub> has her<sub>\*i/j</sub> love.  
 d. Mary<sub>i</sub> gives her daughter<sub>j</sub> her<sub>i/\*j</sub> love.

- Taking Hale and Keyser's basic insight, we may give an implementation whereby the surface verb *love* denotes a state of an individual experiencing love for someone/something;

the target of the individual's love is taken as an internal argument interpreted as the theme of the state (see Rothmayr 2009 for diagnostics that such verbs denote states even when syntactically verbal).

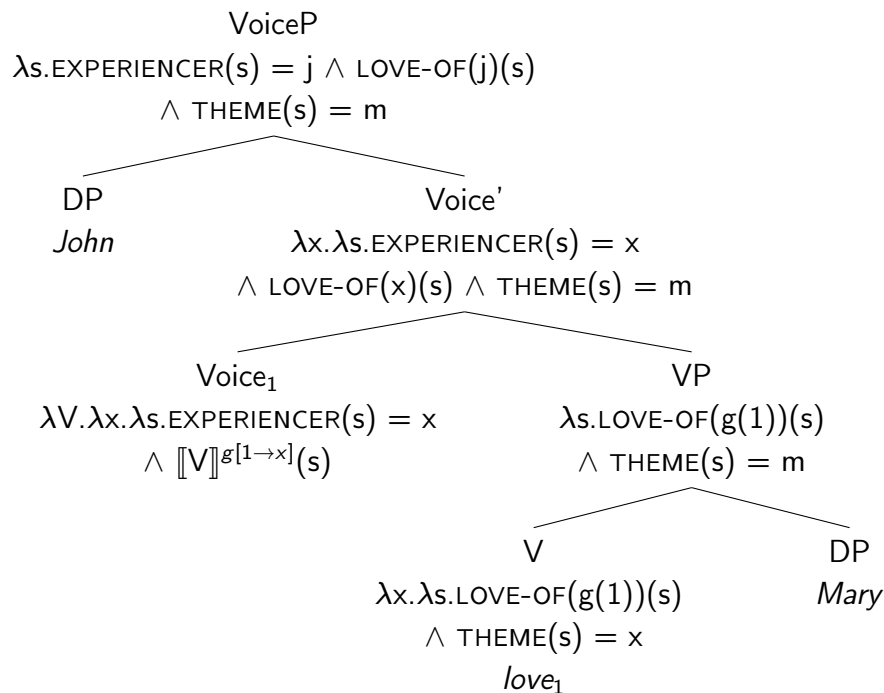
- The emotive state is relativized to a particular experiencer argument through the use of a numerical index  $n$ , which is mapped to an individual in the domain through an assignment function  $g$  i.e.,  $g(n)$  denotes this individual.

$$(17) \quad \llbracket \text{love}_n \rrbracket^g: \lambda x. \lambda s. \text{LOVE-OF}(g(n))(s) \wedge \text{THEME}(s) = x$$

- We may now address the question of how the external argument comes to bind this index in the lexical semantics of the verb. Specifically, we may follow Kratzer (2009) in assuming that binding is effected not by DP antecedents but by functional heads that introduce DP antecedents.
- Here, the locus of binding is VOICE, which introduces the external argument. However, this necessitates an analysis of VOICE whereby it does more than logically conjoin a thematic interpretation with the denotation of the VP through EVENT IDENTIFICATION; rather, it lambda abstracts over the semantic index in its complement, creating an open individual argument position.
- This then allows the index to be mapped to the external argument that saturates this open argument position; we notate this formally as  $g[n \rightarrow x]$ , an assignment function identical to  $g$  except that it maps an index  $n$  to  $x$ .

$$(18) \quad \llbracket \text{VOICE} \rrbracket^g: \lambda V. \lambda x. \lambda s. \text{EXPERIENCER}(s) = x \wedge \llbracket V \rrbracket^{g[n \rightarrow x]}(s)$$

(19) John loves Mary.





- Notably for present purposes, **the experiencer argument is indeed introduced by a functional head** as in theories like Kratzer's. However, this is **not via EVENT IDENTIFICATION**; rather, VOICE plays a crucial role in mapping the index provided by the verb itself to the external argument.
- The intuition is that **an emotion of love is always relativized to the experiencer of that love**, something we encode in the lexical semantics of the verb itself.
- Correspondingly, **even if *again*, as an event-modifier, can attach to the VP excluding the external argument, this does not suffice to predict the availability of subjectless presuppositions.**
- There contains **an index within this VP**, which is mapped to the experiencer argument by VOICE; **this experiencer is therefore going to be semantically represented in the calculation of *again*'s repetitive presupposition**, ruling out a subjectless presuppositions.

### 3.3 Interim Summary

- Proposals that sever the external argument and introduce it through functional heads and specialized compositional rules like EVENT IDENTIFICATION as in Kratzer (1996) **overgenerate subjectless repetitive presuppositions with *again*-modification.**
- **Verbs seem to systematically differ from each other in regards to how their external arguments are introduced**, as demonstrated by the possibility of the external argument being excluded from the repetitive presupposition introduced by *again*.
- This observation need not, however, simply be a quirk of verb classes and given an analysis that simply restates the empirical generalization.
- A more in-depth understanding of the lexical semantics of the verb classes that seem to semantically introduce their external arguments directly reveals deeper reasons for this requirement. That is, this can be **explained by either verb-specific lexical entailments like intentionality**, or to **the presence of semantic indices which indicate that the real-world concepts they denote are inherently tied to their external arguments.**
- On a broader, theoretical level, this underscores **the role of lexical properties in determining the way external arguments are introduced and semantically composed.**

## 4 The Role of Structural Contexts

- The previous section explored the role of the lexical verb's lexical semantics in determining how one argument they take, the external argument, combines semantically with the verb.
- It is, however, well-known that **a verb's structural context can also determine the syntactic and semantic properties of a verb's argument**; e.g., Folli and Harley (2005) observe that

the presence of a resultative particle can impose animacy conditions on a causative verb's external argument.

- We focus here on a largely unnoticed particular structural context that can affect the availability of subjectless presuppositions: **the presence of an optional internal argument**.
- Returning to Bale's generalization with intransitive verbs, **unergative verbs seem to disallow subjectless repetitive presuppositions**, prompting Bale to suggest they introduce their external arguments directly.

(20) CONTEXT: Last week, Jon's wife ran all morning. Then after she got home, Jon was able to do some exercise. So...  
# **Jon ran again**.

- Nonetheless, we observe not all unergative verbs reject subjectless presuppositions categorically; **optionally transitive unergative verbs produce subjectless presuppositions with *again* when they are transitive**.
- To illustrate, consider the following classes of unergative verbs that are optionally transitive, Levin's (1993) non-core transitive verbs, which **optionally take DP internal arguments**.

(21) Performance verbs: *dance, recite, sing, whistle, chant*  
Unspecified object alternation:  
a. Sandy sang.  
b. Sandy sang a song/a ballad.  
c. Sandy danced.  
d. Sandy danced a jig.

(22) Wipe verbs: *wipe, sweep, wash, rinse scrub*  
Unspecified object alternation:  
a. Brian was wiping the counter.  
b. Brian was wiping.  
c. John swept the floor.  
d. All last night, John swept.

(23) Physical attack verbs: *kick, punch, slap*  
Affectee alternation:  
a. John kicked.  
b. John kicked Bill.  
c. John punched.  
d. John punched Bill.

- Most notably, it seems that **the presence of the optional internal argument triggers the availability of subjectless presuppositions with *again***.

- (24) a. CONTEXT: At a ball in honor of the king, John danced. The king was so impressed that he had his court dancer James learn this dance, and ...  
# **James danced again.**
- b. CONTEXT: At a ball in honor of the king, John danced the Irish jig. The king was so impressed that he had his court dancer James learn this dance, and ...  
**James danced the Irish jig again.**
- (25) a. CONTEXT: John decided to clean up the house he and Mary lived in ahead of a party so he swept. The next day, Mary, thinking John did not sweep the floor, picked up the broom and...  
# **Mary swept again.**
- b. CONTEXT: John decided to clean up the house he and Mary lived in ahead of a party so he swept the floor. The next day, Mary, thinking John did not sweep the floor, picked up the broom and...  
**Mary swept the floor again.**
- (26) a. CONTEXT: John forgot his computer on the train ahead of an important deadline. Frustrated, John kicked in anger. Later, Mary realized that she too had forgotten her computer at home and could not help John so...  
# **Mary kicked (in anger) again.**
- b. CONTEXT: John forgot his computer on the train ahead of an important deadline. Frustrated, John kicked the table in the classroom in anger. Later, Mary realized that she too had forgotten her computer at home and could not help John so...  
**Mary kicked the table (in anger) again.**

- These observations present a bit of a conundrum under views like Bale's and Kratzer's; **the external agent argument seems to be introduced directly within the verb when intransitive, but externally through functional heads like VOICE when transitive.**
- One could easily **postulate two separate lexical entries** for these verbs differing in whether the verb semantically takes the external argument as a semantic argument. However, this misses **the generalization that it is the presence of an internal argument** that affects the availability of subjectless presuppositions.
- As a way of capturing this dependence on an internal argument, the intuition we pursue is that **an optionally intransitive verb is compositionally not available for *again* to take as an argument prior to combining with any of its arguments**, whether it is the optional internal argument or its external argument.
- More generally, a surface verb and its arguments can be thought of as **an acategorial root embedded in a structure containing verbalizing and argument introducing functional heads as in the DISTRIBUTED MORPHOLOGY tradition** (e.g., Halle and Marantz, 1993; Pesetsky, 1995; Marantz, 1997, amongst others).

- In other words, this comes **close to the view of Borer (2005) and Schein (1993) schematized in (3)**. However, we make another assumption about the root at the base of the tree; the root specifies an argument position but **does not directly introduce the DP that saturates this argument position nor specify its thematic interpretation**.
- Formally, the root is a **function from thematic denotations to individuals to a predicate of events**, variables over thematic denotations we notate with  $\theta$ . An example denotation of the root of *dance* is given below.

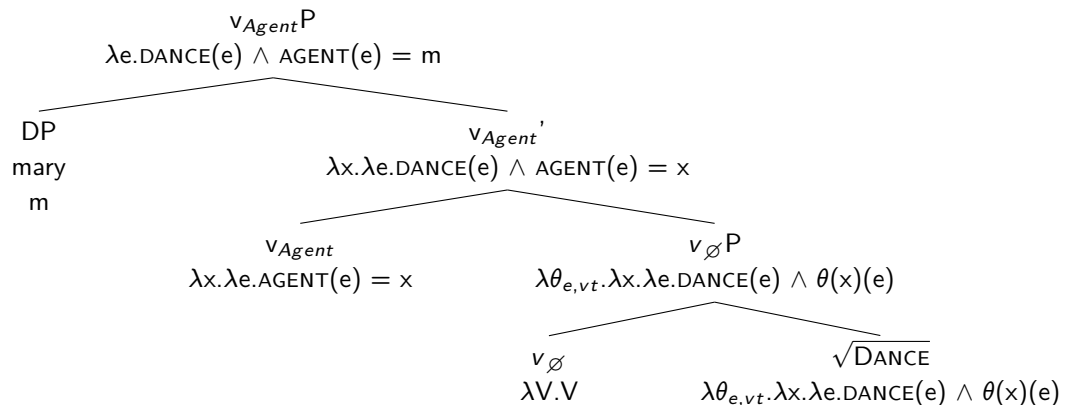
$$(27) \quad \llbracket \sqrt{\text{DANCE}} \rrbracket = \lambda\theta_{e,vt}.\lambda x.\lambda e.\text{DANCE}(e) \wedge \theta(x)(e)$$

- The role of verbalizing functional heads, one of which is the external argument introducing VOICE, serves to specify the thematic interpretation of  $\theta$ . We assume different flavors of such functional heads, which we generally label  $v$  (adopting the terminology of Folli and Harley 2005).
- VOICE can be seen as a specific flavor of  $v$  (Wood and Marantz, 2017); we further assume other  $v$  heads introducing roles like THEME, GOAL etc.  $v$  can also be interpreted expletively, semantically being simply an identity function (Wood, 2012; Myler, 2014; Wood and Marantz, 2017).

$$(28) \quad \begin{array}{l} \text{a. } \llbracket v_{Agent} \rrbracket: \lambda x.\lambda e.\text{AGENT}(e) = x \\ \text{b. } \llbracket v_{Theme} \rrbracket: \lambda x.\lambda e.\text{THEME}(e) = x \\ \text{c. } \llbracket v_{\emptyset} \rrbracket: \lambda V.V \end{array}$$

- Note now that **the semantic type of an argument introducing head is  $\langle e, \langle v, t \rangle \rangle$** , relating an individual to an event through thematic roles (Kratzer, 1996).
- This means that  **$v$  heads serve as the semantic argument of a root**. In the intransitive case, it is  $v_{Agent}$  **that supplies the first argument of the root** since it combines first with an expletive  $v$ , leaving the thematic role argument unsaturated.

(29) Mary danced.

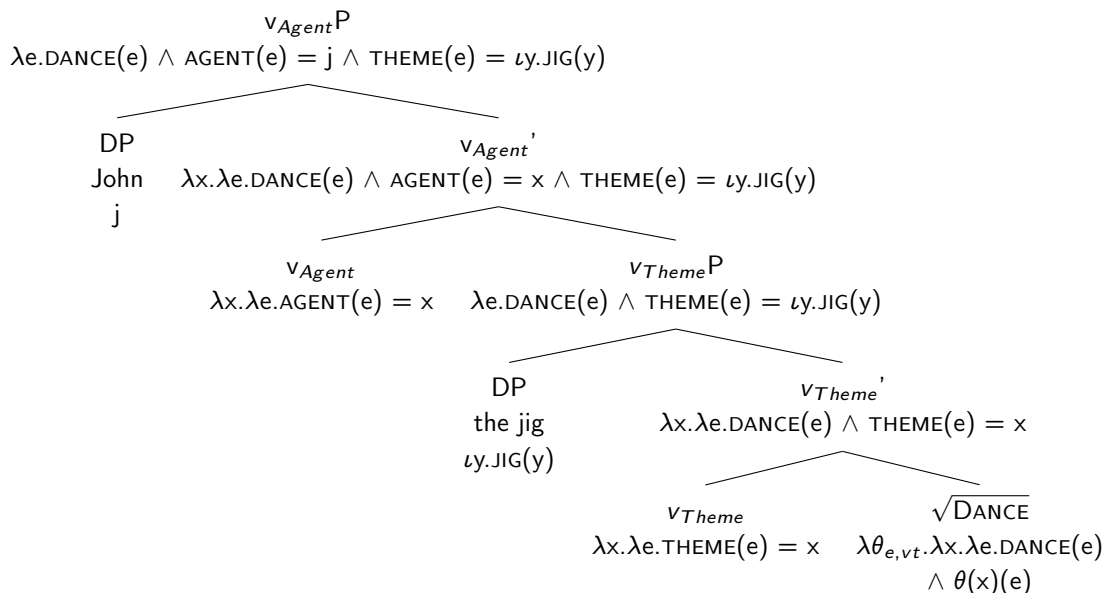


- Notably, there is **no type  $\langle v, t \rangle$  constituent to serve as *again's* first argument until *after* the external argument has been introduced**, as required by the root denotation.

This successfully predicts that the intransitive version of *dance* disallows subjectless presuppositions.

- The transitive variant, on the other hand, will require  $v_{Theme}$  to first introduce the internal argument and supply the roots thematic role argument. The external argument is then introduced by  $v_{Agent}$  via EVENT IDENTIFICATION, as per Kratzer (1996).

(30) Mary danced the jig.



- Note now that  $v_{Theme}P$  is now of the appropriate type i.e.,  $\langle v,t \rangle$  to serve as *again's* first argument, predicting a subjectless presupposition as required.
- Here, we maintained that a verb's arguments are introduced through functional heads as per Kratzer (1996), Borer (2005), and Schein (1993). Crucially, we differ in the specific semantics of the lexical root, which we assume provides an argument position but does not specify its thematic denotation, which it requires as a semantic argument.
- We therefore successfully capture the observations with optionally transitive unergative verbs, whereby subjectless repetitive presuppositions depend on the presence of an internal argument (see Smith and Yu 2021 for analysis of optional PPs which also license subjectless presuppositions).

## 5 A General Theory of Argument Introduction

- Taking stock, we see using the subjectless repetitive presupposition diagnostic that they way arguments are introduced, both external and internal, are sensitive both to the lexical semantics of the verbal roots involved as well as their structural context.
- To adequately account for the facts observed, we proposed analyses along two lines; 1) enriching the semantic representations of verbal roots to reference specific arguments and 2)

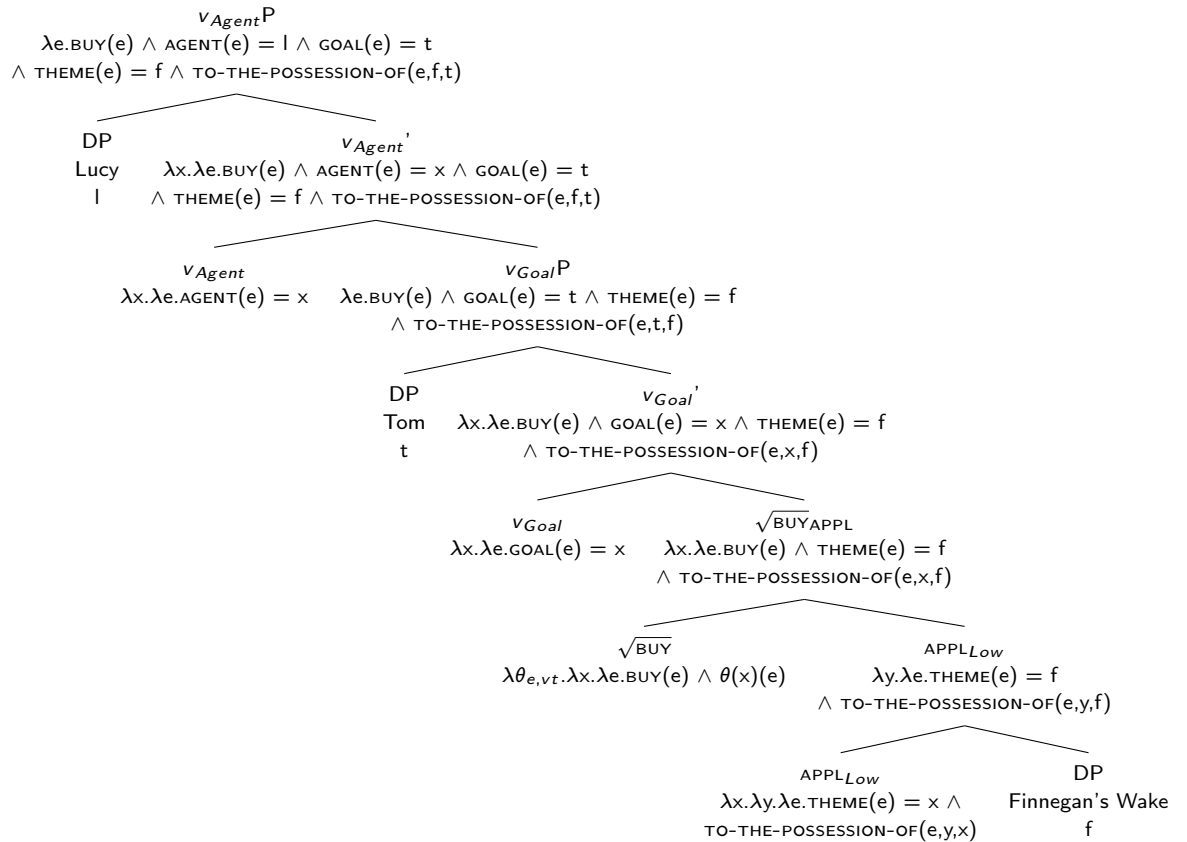
abstracting away from the thematic interpretation of arguments and allowing verbal roots to take thematic denotations as arguments.

- Putting all the pieces together, we might begin to develop a **unified, general theory of how arguments are introduced**.
- The first obvious extension to the view presented in section 4 is to **generalize it to all verb classes, in particular those that are obligatorily transitive**.
- The extension is relatively simple: we add the assumption that **functional  $v$  heads can specify the roots that they combine with** (Merchant, 2019). In particular, the difference between obligatorily transitive verbs, obligatorily intransitive unergative verbs, and optionally transitive unergative verbs, boils down to **the classes of roots  $v_{\emptyset}$  selects for**.
- $v_{\emptyset}$  selects for roots like  $\sqrt{\text{DANCE}}$ ,  $\sqrt{\text{WIPE}}$ ,  $\sqrt{\text{KICK}}$  etc. On the other hand,  $v_{Theme}$  selects for a set of roots that is a superset of  $v_{\emptyset}$ , including not just  $\sqrt{\text{DANCE}}$ ,  $\sqrt{\text{WIPE}}$ ,  $\sqrt{\text{KICK}}$  but also  $\sqrt{\text{HIT}}$ ,  $\sqrt{\text{KILL}}$  etc.
- In this way, we encode the fact that **some classes of verbs must always be transitive and allow subjectless presuppositions**, while **others are optionally transitive and allow subjectless presuppositions only when transitive**, using a **root selectional feature on categorial heads** which is independently motivated elsewhere (see again Merchant 2019 for detailed arguments from PPs).
- The proposal here **can also be straightforwardly extended to ditransitive verbs**. Take, for instance, ditransitive verbs that appear in the double-object construction; we may follow Pylkkänen (2008) in assuming that a **possession relation is introduced by a low applicative head  $\text{APPL}_{Low}$**  (denotation adapted from Pylkkänen 2008, see Larson 2010 for arguments against her specific implementation).

$$(31) \quad \llbracket \text{APPL}_{Low} \rrbracket = \lambda x. \lambda y. \lambda e. \text{TO-THE-POSSESSION-OF}(e, x, y)$$

- Using all the pieces we have amassed so far, we can assume that **the ditransitive verb root takes  $\text{APPL}_{Low}$  that has combined with its first argument as its semantic argument**, given it is the semantic type of a thematic role denotation i.e., type  $\langle e, \langle v, t \rangle \rangle$ .
- We can then have  $v_{Goal}$  **introduce the direct object argument via PREDICATE MODIFICATION**, and the agent introduced via  $v_{Agent}$  via **EVENT IDENTIFICATION**. The syntax here is hence similar to proposals in e.g., Bruening 2010, 2020.

$$(32) \quad \text{Lucy bought Tom Finnegan's Wake.}$$



- Even more interestingly, we can now use the possibility of arguments in general being stranded outside *again*'s presupposition as a diagnostic for determining how they are introduced semantically.

- The relevant example here is a ditransitive verb that appears only in the prepositional dative frame such as *donate*. The observation is that the sole presence of the direct object is sufficient to license subjectless presuppositions; however, the sole presence of the PP is not sufficient to do so.

- (33)
- Mary donated.
  - Mary donated the books.
  - Mary donated to the library.
  - Mary donated the books to the library.

- (34) CONTEXT: Mary donated a large number of books to her local library. The library returned the books, noting they were damaged. Later, Bill repaired the damage to the books and took and gave them to the library, who accepted them this time. So...
- # Bill donated again.
  - Bill donated the books (to the library) again.
  - # Bill donated to the library again.

- From the perspective developed here, the observations with (34-a) and (34-b) are not

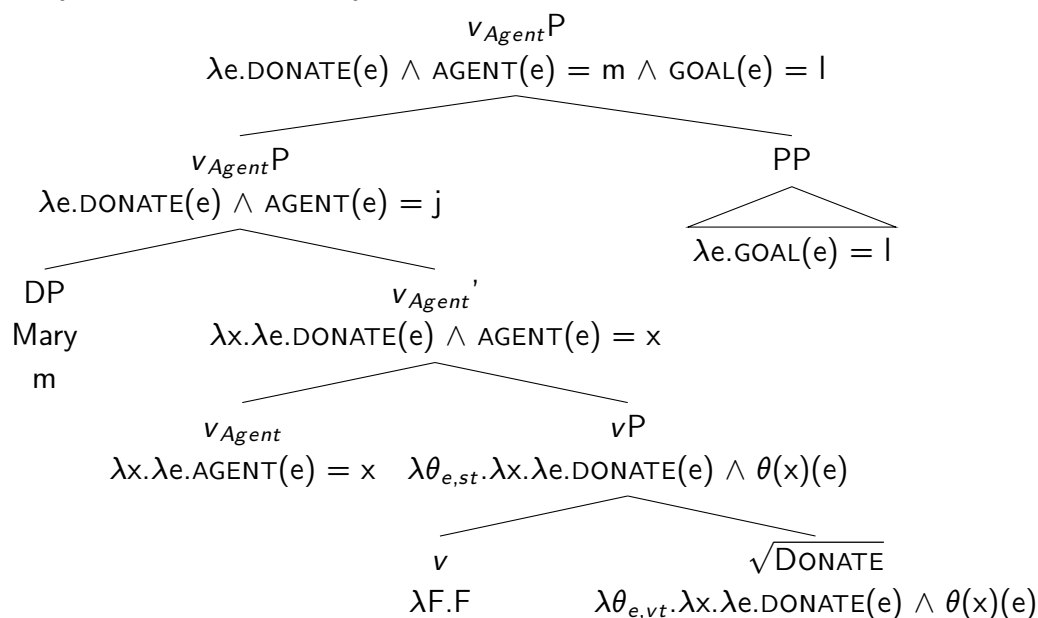
surprising; that is, we expect to need at least one argument (the direct object) outside the external argument to license subjectless presuppositions.

- What is perhaps surprising is (34-c). Under our perspective, if we assign the same semantics to the root of *donate* as requiring a thematic role argument, it seems **the dative PP alone is not sufficient to saturate the verb root's thematic role argument and hence not license subjectless presuppositions.**

$$(35) \quad \llbracket \sqrt{\text{DONATE}} \rrbracket = \lambda \theta_{e,vt}. \lambda x. \lambda e. \text{DONATE}(e) \wedge \theta(x)(e)$$

- In other words, it seems that the dative PP argument of a ditransitive verb like *donate* does not in fact behave like it is an actual semantic argument. The **thematic role argument of the verb root is saturated by the agent argument** when the direct object is absent, and **the dative PP argument is best thought of as adjunct-like, combining with the verb via something like PREDICATE MODIFICATION.**

(36) Mary donated to the library.



- This might seem counter-intuitive and argues against analyses that suggest the dative PP argument is a direct semantic argument of a ditransitive verb, again as in Larson (1988), Bruening (2010, 2020) and Harley and Jung (2015).
- However, this in fact makes a correct prediction: since the PP combines via PREDICATE MODIFICATION, it can in principle **attach higher than *again* and be excluded from its repetitive presupposition**, most notably when it surfaces linearly to the right of *again* (Bale, 2007).

(37) CONTEXT: Lucy donated some books to the library, but the library returned them, saying they were too old and fragile. Later on...  
**Mary donated them again to the local museum**, where they are now on display.



- The proposal sketched above therefore can be **extended beyond transitive and intransitive verbs to ditransitive verbs**. We can further shed light on **whether arguments of particular ditransitive verbs are taken as semantic arguments or not**. See further Zhang (2022) for an example of a potential extension of the same subjectless presupposition diagnostic to other languages.
- What remains is **how to integrate the observation that the root's lexical semantics can also affect whether subjectless presuppositions are available**, as with verbs like *murder* and *love*.
- As a first pass, the general strategy might be to **utilize semantic binding as with the analysis for verbs like *love***. That is, these verbs similarly **take thematic role arguments but impose additional semantic conditions that make reference to their external arguments through semantic indices**.

$$(38) \quad \begin{aligned} \text{a. } & \llbracket \sqrt{\text{MURDER}_n} \rrbracket^g: \lambda\theta.\lambda x.\lambda e.\lambda w. [\text{MURDER}(e)(g(n))(w) \wedge \theta(x)(e)(w)] \\ & \text{where } \text{MURDER}(e)(g(n))(w) = 1 \text{ iff } \exists s[\text{CAUSE}(e,s) \wedge \text{DEAD}(s) \wedge \text{HOLDER}(s) = \text{THEME}(e)] \\ & \wedge \forall w'[\text{INTENTION}_{w'}^{g(n)}(w) \rightarrow [\text{AGENT}(e) = g(n) \wedge \exists s[\text{CAUSE}(e,s) \wedge \text{DEAD}(s)]]] \\ \text{b. } & \llbracket \sqrt{\text{LOVE}_n} \rrbracket^g: \lambda\theta.\lambda x.\lambda s. \text{LOVE-OF}(g(n))(s) \wedge \theta(x)(s) \end{aligned}$$

- Consistent with what we have seen so far, *again* will only have a constituent of the right semantic type to take as argument once the first thematic role argument and individual argument assigned that thematic role have been saturated.
- $v_{Theme}$  will supply this first thematic role argument via **FUNCTIONAL APPLICATION**, and  $v_{Agent/Experiencer}$  **supplies the external agent or experiencer argument and maps any indices in its complement to the external argument as discussed previously**.
- For *murder*, we will require the agent be represented twice, **once in the lexical semantics of the verb root and once introduced by  $v_{Agent}$ , in order to capture the fact that subjectless repetitive presuppositions are disallowed**. See again e.g., Wechsler (2020) for arguments that this is independently needed in any case.
- With stative transitive verbs, we need not represent the external argument twice, since **the specific relation denoted by the root is always relativized to the experiencer argument**.
- A question: **why is it always  $v_{Agent/Experiencer}$  that induces binding of the index present in the root, and never  $v_{Theme}$ ?**
- On our approach, this follows from the fact that  $v_{Theme}$  **is always the sister of the verb root, as well as the verb root's type:  $v$  heads capable of binding need to take a predicate of events as their argument, but the root is of type  $\langle\langle e, vt \rangle, \langle e, vt \rangle\rangle$** . If  $v_{Theme}$  is introduced locally to the verb root, then any variant of it that effects binding would be unable to compose with the root due to a type-clash.

- This accounts for **Hale and Keyser's (2002) observation that indices in stative transitive verbs are bound *obviatively***: it is the structurally more distant, rather than the structurally closest argument, that effects binding (i.e., *murder* involves intent of the murderer rather than the murdered, *love* involves the love of the lover rather than the lovee etc.).

## 6 Summary

- We began by reviewing current understandings about how a verb's arguments are semantically introduced: **1) they are all introduced directly as semantic arguments of the verb, 2) some arguments are introduced by the verb, others by functional heads, and 3) verbs do not semantically introduce their arguments at all and only functional heads do.**
- Utilizing the repetitive presupposition introduced by the trigger *again*, we were able to isolate two factors that bear on the question of how a verb's arguments are semantically introduced: **the lexical semantics of the root** in question and **the presence of internal arguments.**
- Root classes can determine if their external arguments need to be represented internally to their lexical semantics, examples of which include **certain kinds of transitive killing verbs** as well as **transitive stative verbs of emotion.**
- The relevant observations are that these verbs either **encode intentionality** or **express some emotive property of the external argument**, which necessitates referring to them **independently of where the external argument is introduced.**
- Furthermore, we observed that the presence of internal arguments for optionally transitive unergative verbs can also determine the availability of subjectless repetitive presuppositions, suggesting that **something fundamental about the semantic composition changes when internal arguments are introduced.**
- The proposed analysis suggests that verb roots take thematic role arguments, which specify the thematic interpretation of a verb's given argument position. This captures the dependence of subjectless presuppositions on the presence of an internal argument.
- This is **easily extendable to other verb classes like ditransitives with minimal additional assumptions not already present in the literature** and we show that **other unnoticed predictions about PP arguments of ditransitive verbs are also borne out.**
- Finally, we sketched a potential way to incorporate root-specific lexical semantics into this general picture utilizing semantic indices, though some finer details remain to be worked out.
- It is taken for granted that verbs taking arguments can be modelled as functions taking n-ary arguments in one way or other; we hoped to have illustrated that **the empirical facts are much more complex and messy than the generally assumed picture** and that what we present here provides a **useful window into further exploration, both between verb classes in a single language and across languages.**

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