Quantifier float with overt restriction*

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1 Introduction

A prima facie violation of the θ-criterion: the same predicates appearing with n and $n+1$ arguments.

(1) a. All (of) the cats are asleep
b. The cats are all asleep

(2) a. Both (of the) cats are asleep
b. The cats are both asleep

(3) a. Each of the cats ate a fish
b. The cats each ate a fish

The second 'nominal' seems to be a bare determiner. Sportiche's (1988) solution: one of the nominals originated within the other one. The number of arguments stays the same.[1]

(4) [$_{\text{TP}}$ [$_{\text{DP}}$ **The cats**]$_i$ [$_{v\text{P}}$ [$_{\text{DP}}$ each (of) **t**$_i$] [$_{\text{VP}}$ ate a fish]]

2 The FQ isn't a bare determiner

(5) *kol mitmoded ʃavar et ha-si ʃel-o*
each contestant broke.SG DOM the-record of-him
'Each contestant broke his record.'[2] (no floating)

(6) *hem ʃavru [kol *(mitmoded)] et ha-si ʃel-o*
they broke.PL each contestant DOM the-record of-him

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[1] Another θ-criterion satisfying solution is to say that only one of the nominals is actually an argument, whereas the other one is an adverb (Dowty & Brodie 1984).

[2] DOM stands for DIFFERENTIAL OBJECT MARKER.

‘Their record breaking was such that each contestant broke his record.’[3]

(7) *ha-mitmodedim ʃavru [kol *(exad)] et ha-si ʃel-o*
the-contestants broke.PL each one DOM the-record of-him
‘The contestants’ record breaking was such that each contestant broke his record.’

An imaginable reconciliation of the data with Sportiche’s stranding-partitive analysis:

(8) $[_{\text{TP}}$ $[_{\text{DP}}$ **They / The contestants**$]_i$ $[_{v\text{P}}$ $[_{\text{DP}}$ each one/contestant (of) $\mathbf{t}_i]_j$ $[_{\text{VP}}$ broke his$_j$ record]]

3 Against partitivity: congruence and θ-sharing

3.1 Congruence

Surprisingly for the stranding analysis, the FQ construction does not have the range of meanings that its partitive counterpart has. The sum of the restrictor’s members has to be coextensive with—and not merely a proper part of—**the antecedent**. The contrast between (9a) and (9b) is not expected.

(9) a. *[kol martsa me-hem] matsiga et ha-projekt ʃel-a*
each lecturer.[F] from-they.[M] presenting.F.SG DOM the-project of-her
‘Each female lecturer among them is presenting her project.’ (no floating)

b. ****hem*** *matsig-im [kol martsa] et ha-projekt ʃel-a*
they.[M] presenting.M.PL each lecturer.[F] DOM the-project of-her

c. ***hen*** *matsig-ot [kol martsa] et ha-projekt ʃel-a*
they.[F] presenting.F.PL each lecturer.[F] DOM the-project of-her
‘They are presenting projects as follows: each female lecturer is presenting her project.’

(10) (Context: *they* are a group of {1–5}-year students.) *What did the students eat at the party?*

a. *[kol student ʃana ʃnija me-hem] axal mana axeret*
each student year second from-them ate.SG dish other
‘Each 2nd year student among them ate a different dish.’

b. #***hem*** *axlu [kol student ʃana ʃnija] mana axeret*
they ate.PL each student year second dish other
‘Their eating was as follows: each 2nd year student ate a different dish.’

[3]Note that the floated quantifier follows the verb, arguably because Hebrew verbs move to T (Doron, 1983; Shlonsky, 1987).

Multiple FQs: the sum of the FQ's restrictors must be coextensive with the antecedent.

(11) a. ***ha-jeladot*** *tsavʔu [kol jalda mi-kita alef] igul ve-[kol jalda mi-kita bet] meʃulaʃ*
the-girls painted each girl from-class A circle and-each girl from-class B triangle
'The girls' painting was as follows: each first-grader painted a circle and each second-grader painted a triangle.'

b. #*ʃʔar ha-jeladot tsavʔu ribuʔa / ribuʔim*
rest the-girls painted square / squares
'The rest of the girls painted a square / squares.'

(12) (World knowledge: carrots come in three colors: orange, purple, and white.)

a. *joni paras et* ***ha-gzarim*** *[kol gezer katom] le-prusot avot ve-[kol gezer sagol] le-prusot dakot*
Y. sliced DOM the-carrots each carrot orange to-slices thick and-each carrot purple to-slices thin
'Yoni sliced the carrots as follows: each orange carrot into thick slices and each purple carrot into thin slices.'

b. #*... et ha-gzarim ha-levanim hu taxan*
... DOM the-carrots the-white he ground
'... the white carrots he ground.'

3.2 θ-sharing

The main predicate has to be true both of the antecedent and of each member of *kol*'s restrictor. First, observe that it has to be true of the antecedent:

(13) a. ***ha-xevra*** *kanta [kol natsig] kise axer*
the-company bought each representative chair other
'The company's chair purchases were such that each representative bought a different chair.'

b. ***ha-opozitsja*** *jazma [kol xak] xok axer*
the-opposition initiated each MP law other
'The laws promoted by the opposition were such that each member of parliament (in it) promoted a different law.'

(14) a. ****ha-xevra*** *hitjaʃva [kol natsig] al kise axer*
the-company sat.down each representative on chair other

b. ****ha-opozitsja*** *nexkera [kol xak] al paraʃat ʃxitut axeret*
the-opposition was.interrogated each MP on affair corruption other

(15) a. *ha-xevra kanta kise*
the-company bought chair
'The company bought a chair.'

b. *ha-opozitsja jazma xok*
the-opposition initiated law
'The opposition promoted a law.'

c. **ha-xevra* *hitjaʃva*
the-company sat.down

d. **ha-opozitsja* *nexkera*
the-opposition was.interrogated

Again, partitives do not impose such a requirement:

(16) a. *kol natsig ʃel ha-xevra hitjaʃev al kise axer*
each representative of the-company sat.down on chair other
'Each representative of the company sat down on a different chair.'

b. *kol xak b-a-opozitsja nexkar al paraʃat ʃxitut axeret*
each MP in-the-opposition was.interrogated on affair corruption other
'Each member of the opposition was interrogated on a different corruption affair.'

Second, observe that the predicate also has to be true of each member of *kol*'s restrictor:

(17) a. ****ha-opozitsja*** *hitkansa [kol xak] be-ulam axer*
the-opposition gathered each MP in-hall other

b. *ha-opozitsja hitkansa*
the-opposition gathered
'The opposition gathered.'

c. **kol xak hitkanes*
each MP gathered

4 An event semantics analysis

4.1 Why event semantics

(18) ***ha-xevra*** *kanta [kol natsig] ʃloʃa kisaʔot*
the-company bought each representative three chairs
'The company's purchase was s.t. each representative bought three chairs.'

(19) **Desiderata** – entailments
(i) that each representative bought three chairs
(ii) that the company did some buying
(iii) that the company's buying and the representatives' buying are the same

To ensure (19-i), we can reconstruct V-to-T movement and interpret the FQ as the verb's (sole) external argument.

To ensure (19-ii), we need the antecedent and the verb, but not the rest of the VP.[4] Suppose a gapping structure in which multiple copies of the verb are interpreted while

[4]It is false that the company bought *three chairs* in (18), even under an *at least* interpretation of the numeral, as illustrated in (i).

(i) ***ha-xevra*** *kanta [kol natsig] ʃloʃa kisaʔot bidjuk*
the-company bought each representative three chairs exactly
'The company's purchase was s.t. each representative bought exactly three chairs.'

Do we need to say that the company bought *chairs*? (ii) shows that we do not.

only one is pronounced. Suppose further, that the pronounced copy of the verb has its object dropped and existentially bound: $\exists x$[the company bought x].

We can introduce a conjunction operator and assume a bi-clausal structure, but even then (19-iii) will not follow. If the company did some buying (e.g., it bought another company) and the representatives each bought three chairs for their living rooms, (18) would be wrongly predicted to be true.

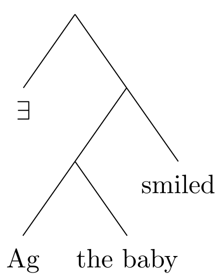
4.2 Assumptions

(20) Verbs are 1-place event predicates
$[\![smile]\!] = \lambda e_v.\ Smile(e)$

(21) Arguments are introduced as sisters to thematic-heads
$[\![Ag]\!] = \lambda x_e.\lambda e_v.\ Ag(x)(e)$

(22) Different event predicates in the scope of the same event quantifier compose intersectively (PM)

a.



b. $\lambda e_v.\ Ag(\text{the baby})(e)$
c. $\lambda e_v.\ Ag(\text{the baby})(e) \wedge Smile(e)$
d. 1 iff $\exists e : Ag(\text{the baby})(e) \wedge Smile(e)$

Cumulativity of events, theta-roles, and lexical verbs (Krifka, 1989; Kratzer, 2003; Champollion, 2016a, i.a.)

(23) For any lexical verb P, if $P(e_1)$ and $P(e_2)$ for some events e_1, e_2 s.t. $e = e_1 \oplus e_2$, then $P(e)$. For example, $(e = e_1 \oplus e_2 \wedge Smile(e_1) \wedge Smile(e_2)) \rightarrow Smile(e)$

(24) "For any thematic role θ and any subset E of its domain:
$\theta(\bigoplus E) = \bigoplus(\lambda x.\exists e \in E : \theta(e) = x)$" (Champollion, 2016a, ex. 34 with slight notational modifications). Therefore, an individual who is the θ of some plural event is the sum of those individuals which are the θs of that event's parts. For example, $(e = e_1 \oplus e_2 \wedge Ag(x)(e_1) \wedge Ag(y)(e_2)) \rightarrow Ag(x \oplus y)(e)$

(ii) ***ha-xevra*** *kanta etmol [kol natsig mi-maxleket kisaʔot] ʃloʃa kisaʔot*
the-company bought yesterday each representative from-department chairs three chairs
ve-[kol natsig mi-maxleket ʃulkanot] ʃnej ʃulxanot
and-each representative from-department tables two tables
'The company's purchase was s.t. each chairs-dept. representative bought three chairs and each tables-dept. representative bought two tables.'

Thematic uniqueness Thematic relations are functions. Therefore, for any thematic role θ and event e, if both $\theta(x)(e)$ and $\theta(y)(e)$ are true, then $x = y$ (Carlson, 1984; Parsons, 1990).

(25) $(Ag(\text{the baby})(e) \wedge Ag(\text{Jill})(e)) \rightarrow \text{the baby} = \text{Jill}$

QR Due to the type of thematic heads, a type mismatch will arise with any quantificational DP introduced as their argument, since such DPs are not of type e. Such a type mismatch is resolved by Quantifier Raising as with quantifiers in object position of verbs in Heim & Kratzer (1998). QR will also allow for pronoun binding by the FQ.

Kol Kratzer's (2000; 2001) meaning for *every*, following Schein (1993):

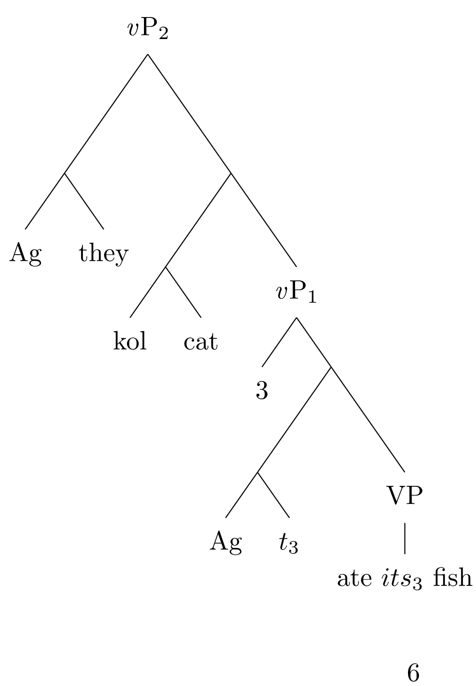
(26) $[\![kol]\!] = \lambda P_{et}.\lambda R_{e,vt}.\lambda e_v.\forall x \in P\ \exists e' \leq e : R(x)(e')$
$\wedge e = \sigma e''[\exists y \in P : R(y)(e'') \wedge e'' \leq e]$

As shown in (27), the DP *kol xatul* 'each cat' will take a relation R and return a set of (sum-)events in which for each cat there is a sub-event of R-ing by that cat. Additionally, those sum-events contain only R-ings by cats.

(27) $[\![kol\ xatul]\!] = \lambda R_{e,vt}.\lambda e_v.\forall x \in Cat\ \exists e' \leq e : R(x)(e')$
$\wedge e = \sigma e''[\exists y \in Cat : R(y)(e'') \wedge e'' \leq e]$

To illustrate, a structure for (28) after QR and without V-to-T movement is provided in (29).

(28) ***hem*** *axlu [kol xatul] et ha-dag ʃel-o*
they ate each cat DOM the-fish of-his
'Their eating was as follows: each cat ate its fish.'

(29)


(30) $[\![vP_1]\!] = \lambda x_e.\lambda e'_v.[Ag(x)(e') \wedge Eat(e') \wedge Theme(\iota z[Fish(z) \wedge of(x)(z)])(e')]$

(31) a. $\exists e : Ag(they)(e) \wedge \forall x \in Cat\, \exists e' \leq e[Eat(e') \wedge Ag(x)(e') \wedge Theme(\iota z[Fish(z) \wedge of(x)(z)])(e')]$
$\wedge e = \sigma e''[\exists y \in Cat[Eat(e'') \wedge Ag(y)(e'') \wedge Theme(\iota z[Fish(z) \wedge of(y)(z)])(e'') \wedge e'' \leq e]]]$

b. There is a (sum-)event whose agent is *they*; for every atomic cat, there is an eating sub-event whose theme is that cat's fish and whose agent is that cat; the sum-event is the sum of such feline eating-one's-fish events.

Congruence By cumulativity, the agent of the sum event, *they*, is the sum of agents of the sub-events. Thus, we have derived congruence: *they* are all and *only* the cats. If *they* were to denote a plurality containing some non-cats, that plurality would also have to be a sum of feline-only agents (the agents of the sub-events), which is impossible.

Coordinated FQs Recall that in (12)–(11) we saw that a single antecedent can antecede multiple floated *kol* phrases. The same point is illustrated in (32), where *the animals* has to be the sum of the dogs and the cats due to congruence.[5]

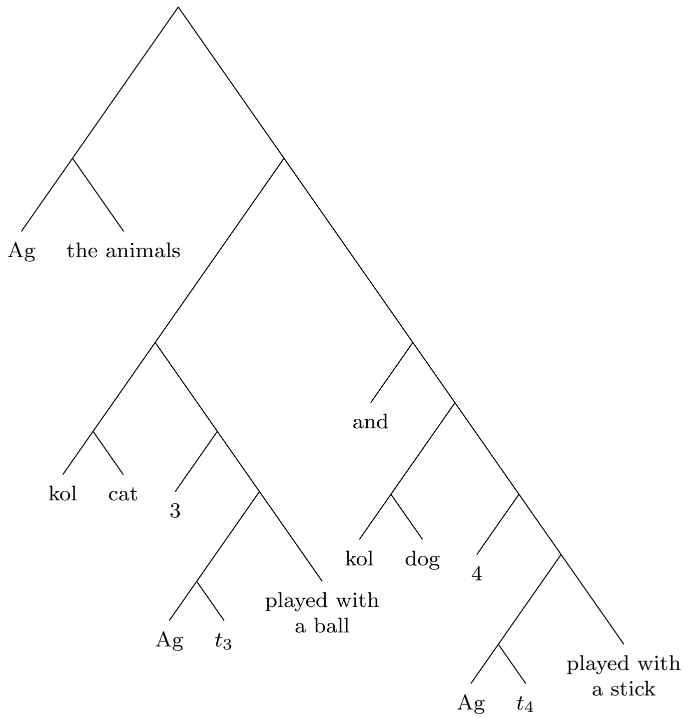
(32) ***ha-xajot*** *sixku [kol xatul im kadur] ve [kol kelev im makel]*
the-animals played each cat with ball and each dog with stick
'The animals' playing was as follows: each cat played with a ball and each dog played with a stick.'

Below is a proposed structure for (32), ignoring ATB verb movement.

[5] Evidence for the generality of this strategy:

(i) *hem nixnesu miri l-a-salon ve-joni l-a-mitbax*
they entered M. to-the-livingroom and-Y. to-the-kitchen
'They entered s.t. Miri entered the living room and Yoni to the kitchen.'

(33)



(34) Non-Boolean conjunction (Krifka, 1990; Lasersohn, 1995; Winter, 2001; Champollion, 2015):
$[\![and_\oplus]\!] = \lambda V_{vt}.\lambda W_{vt}.\lambda e_v.\exists e', e'' \leq e : V(e') = W(e'') = 1 \wedge e = e' \oplus e''$

In the case of (33), because of *kol*, V and W are each a complex event predicate of the following form, where P is either *cat* or *dog* and *play* is either *play with a ball* or *play with a stick*. To save space I abbreviate in the scope of the σ operator '$Ag(x)(e) \wedge P(e)$' as '$P(x)(e)$'.

(35) $\lambda e_v.\forall x \in P\ \exists e' \leq e[Ag(x)(e') \wedge play(e')] \wedge e = \sigma e'[\exists x \in P : play(x)(e') \wedge e' \leq e]$

The predicates $play_b$ and $play_s$ in (36) are shorthand for *play with a ball* and *play with a stick*, respectively. The predicates C and D stand for *cat* and *dog*, respectively.

(36) $[\![(33)]\!] = 1$ iff $\exists e : Ag(\bigoplus Animal)(e) \wedge \exists e', e'' \leq e : e = e' \oplus e'' \wedge$
$\forall c \in C\ \exists e''' \leq e'[Ag(c)(e''') \wedge play_b(e''')] \wedge e' = \sigma \ddot{e}[\exists c \in C : play_b(c)(\ddot{e}) \wedge \ddot{e} \leq e']$
$\wedge \forall d \in D\ \exists \hat{e} \leq e''[Ag(d)(\hat{e}) \wedge play_s(\hat{e})] \wedge e'' = \sigma \tilde{e}[\exists d \in D : play_s(d)(\tilde{e}) \wedge \tilde{e} \leq e'']$

Thus, we predict that (33) is true iff there exists an event whose agent is the sum of the animals, and that event is composed of exactly two events e' and e''; e' is a sum of feline-only events of playing with a ball, whereas e'' is a sum of canine-only events of playing with a stick.

4.3 Previous analyses cannot account for binding

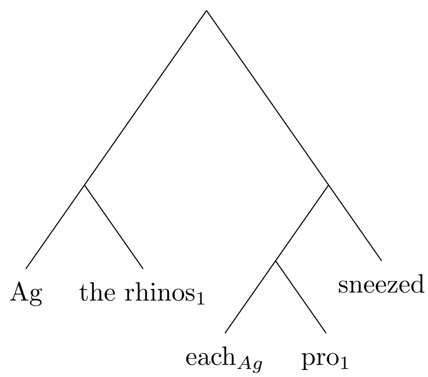
(37) a. $[\![each_\theta]\!] = \lambda \mathbf{V}_{\mathbf{vt}}.\lambda e_v.\ e \in *\lambda e'[V(e') \wedge Atom(\theta(e'))]$
(Champollion, 2016b, 23)

b. $[\![each_\theta]\!] = \lambda X_e.\lambda \mathbf{V}_{\mathbf{vt}}.\lambda e_v.\ \forall x \leq X[\exists e' \leq e[\theta(e', x) \wedge V(e')]]$
(Modified from LaTerza, 2014, 55)

To see how these meanings work, let's consider (38). Ignore the index on *the rhinos*. I will get to binding and to *each*'s restrictor shortly.

(38) The rhinos each sneezed

(39) a.



b. C: 1 iff $\exists e : Ag(e, \bigoplus Rhino) \wedge e \in *\lambda e'[Sneeze(e') \wedge Atom(Ag(e'))]$

c. LT: 1 iff $\exists e : Ag(e, \bigoplus Rhino) \wedge \forall x \leq \bigoplus Rhino[\exists e' \leq e[Sneeze(e') \wedge Ag(e', x)]]$

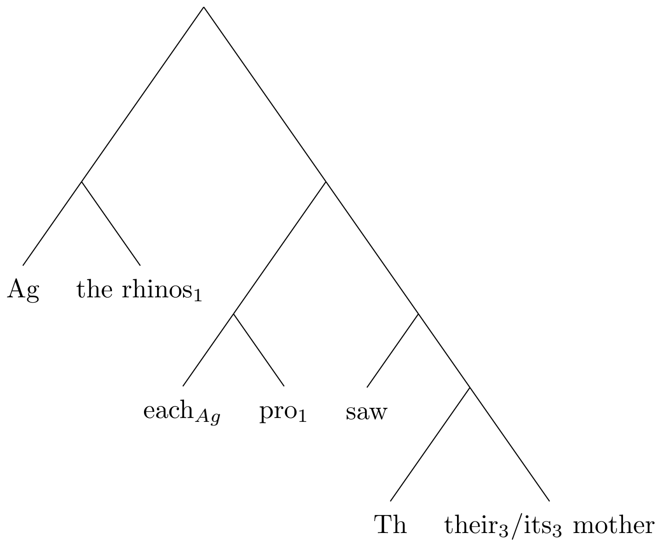
Treating *each*'s argument as an event-predicate is convenient in a Neo-Davidsonian system where multiple constituents, including the VP, denote event-predicates. However, there is a crucial problem; it fails to predict these quantifiers' ability to bind pronouns, as demonstrated in (40). To bind pronouns a quantifier needs to interact with an abstraction over individuals. In other words, the quantifier has to take a variable of type $\langle e, \alpha \rangle$, where α is some semantic type.

(40) *Context: each rhino has a different mother.*
The rhinos each saw its/their mother

(41) *ha-karnafim raʔu [kol exad] et ʔima ʃel-o*
the-rhinos saw.3PL each one DOM mother of-his
'The rhinos each saw its/their mother.'

To illustrate the problem, let's try to use the entries in (37) on (41) and see why we fail. First, if we try simply without binding in the syntax, as in (42) below, *it* gets interpreted as a free variable. The rhinos will all be predicted to have seen the same mother—that of some contextually salient individual. This is not the reading we are looking for.

(42) a.

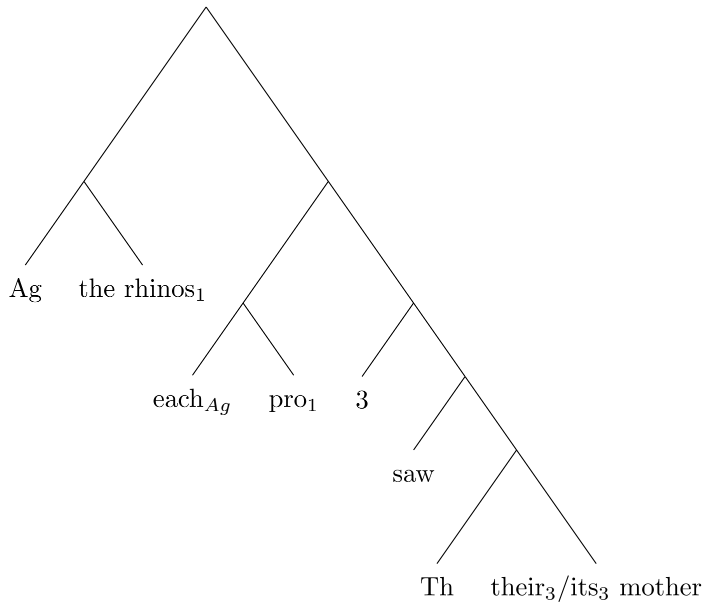


b. C: 1 iff $\exists e : Ag(e, \bigoplus Rhino) \wedge e \in *\lambda e'[See(e') \wedge Atom(Ag(e'))$
$\wedge\, Th(e', g(3)'s\ mother)]$

c. LT: 1 iff $\exists e : Ag(e, \bigoplus Rhino) \wedge \forall x \leq \bigoplus Rhino[\exists e' \leq e[See(e') \wedge Ag(e', x)$
$\wedge\, Th(e', g(3)'s\ mother)]]$

Suppose we have actual binding in the syntax, as in (43). Then the VP does receive an interpretation which involves abstraction over individuals whose mothers were seen, but *each* cannot combine with such an argument. *Each* requires an event predicate (type $\langle v, t\rangle$), but instead receives a relation between individuals and events (type $\langle e, vt\rangle$).

(43)



4.4 What governs the distribution of thematic heads?

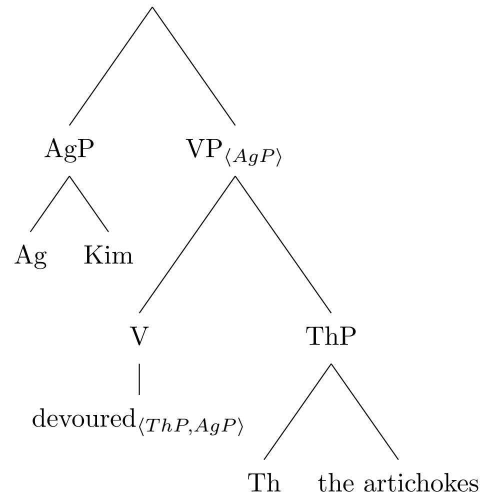
General problem: since θ-phrases, being predicates of events, compose intersectively with the verb, they can be easily added and omitted. How to prevent unaccusative verbs from having agents, unergative verbs from having themes, or transitive verbs from being intransitive?

Larson (2014) and Williams (2015) put the load of ruling out such illicit structures on the syntax. Consider (44) under the assumption that *devour* is stored in the lexicon with an ordered list of its syntactic arguments, represented as 'devour$_{\langle ThP, AgP \rangle}$', a notational variant of Williams (2015).[6]

(44) a. Kim devoured the artichokes.

[6]Larson's (2014) proposal is similar in essence, but is technically more complex and comes with additional assumptions about features in syntax.

b.



The verb agrees with ThP upon merging with it and projects a VP with the remaining AgP feature. This assumes that agreement involves checking of features **and their subsequent deletion**. The process repeats itself with AgP. By assumption, if *devour* does not merge with a ThP, agreement fails and the derivation crashes. Thus, what ensures that *devour* takes exactly one theme and exactly one agent is the features it comes with from the lexicon and the feature deletion following agreement.

How can we weaken the system to allow several identical θPs for FQ *kol*? Suppose that feature deletion after agreement was merely *possible*, not obligatory. Then, multiple agents, themes, etc. can be generated with the same verb. Is this a problem? Consider (45) below, where *sneeze*'s agent feature is not deleted upon agreement with the lower AgP, allowing a second AgP to be merged. (45) is ruled out on semantic grounds; thematic uniqueness dictates that each event has only one agent (if any). This entails that *the cat* and *the dog* refer to same individual, which is impossible given that *cat* and *dog* denote mutually exclusive sets of individuals. The doubling of other θPs (46) is ruled out in the same way.

(45) a. *The cat the dog sneezed
b. [Ag the cat] [[Ag the dog] sneezed]

(46) a. *The cat licked the dog the mouse
b. [Ag the cat] [[licked [Th the dog]] [Th the mouse]]

The following example is also ruled out by thematic uniqueness, but for a different reason. Since proper names are definite descriptions, they carry uniqueness and existence presuppositions. *Felix* and *Garfield* each presuppose the existence of a unique individual with that name. Due to thematic uniqueness, this is possible only if these two individuals are the same.

(47) a. *Felix Garfield sneezed
b. [Ag Felix] [[Ag Garfield] sneezed]

Example (48) below is not ruled out by thematic uniqueness but directly by the syntax. *Sneeze* is listed in the lexicon only with an agent feature, so *the dog* cannot be merged as its theme.

(48) a. *The cat sneezed the dog
b. [Ag the cat] [sneezed [Th the dog]]

Finally, (49) is ruled out both by the syntax and by the semantics. Syntactically, both verbs require an agent, but only one AgP was merged. Even if the structure were licit, a semantic problem would arise; the same event cannot be both a sneezing and a jumping.

(49) *The cat sneezed jumped

5 Conclusion

- The stranding analysis explains a discontinuous DP of the form $DP \ldots D$ as derived from a partitive *D of DP*
- Hebrew floating is of the pattern $DP_1 \ldots DP_2$
- If $DP_1 \ldots DP_2$ were derived from a partitive $[D_2\ [NP_2\ of\ D_1\ NP_1]]$, it would be surprising that
  (i) NP_1 and NP_2 must be coextensive
  (ii) DP_1 and DP_2 are both interpreted as arguments of the main predicate
- Event semantics provides us with
  - Thematic uniqueness and Schein-Kratzer subevent quantification, ensuring (i)
  - Syntactically present thematic heads, allowing (ii)
  - An abstraction over events, allowing multiple phrases to describe the same event
- For future research
  - Requirements on *kol*'s scope (Differentiation, Tunstall 1998)
  - Restricting the distribution of thematic heads
  - Generalizing to other quantifiers and other languages

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