

# Derivational morphemes exhaustify roots: a hypothesis on the relationship between language and concepts

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## 1 Introduction

- The grammatical theory of exhaustivity, as spelled out by Chierchia et al. (2012), posits a syntactically represented Exh(aust) operator.
  - It operates over a set of alternatives, which can be shaped by alternative-triggering expressions, but these expressions have no grammatical link to Exh.
  - ➡ Alternative-triggering expressions do not require the presence of an Exh operator, and if one is present, they do not directly govern where it appears. Exh is ‘free.’
- Today, I make two points:

1. There are cases (viz. some predicates, technically ‘cohyponyms’) where a closer relationship exists between Exh and alternative-triggering expressions; these predicates have generally not previously been analyzed as involving exhaustivity.
  - They not only require Exh (cf. Magri 2009, Bade 2016), but also dictate Exh’s syntactic position: at first approximation, it must scope immediately above them.
2. One way to capture this close relationship is to assume that derivational morphemes ( $n^0$ ,  $a^0$ , etc.) not only select roots, but also Agree with Exh, hence requiring it somewhere in their projection.

- Beyond grammar, the proposal has consequences for our understanding of concepts (Margolis & Laurence 2021). An apparent property of concepts, viz. the mutual incompatibility of same-domain concepts, is actually a fact not (only) of the concepts themselves but of the words used to refer to them.

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## 2 Cohyponyms' apparent exclusivity as an exhaustivity effect

- Hyponymy is the 'kind of' relation, and 'co-hyponyms' are sisters in the hierarchy.
  - e.g., *poodle* and *red* are hyponyms of *dog* and *colour*; *poodle* and *labrador* are cohyponyms, as are *red* and *blue*.
- Co-hyponyms are usually mutually exclusive of one another; Cann (2011:459) gives the example (1), involving hyponyms of *animal* or *mammal*.

(1) #That sheep is a horse.

- But there is nothing particularly interesting about (1): we know that biologically, animals cannot be two species at once.
- In spite of this, in this section, I show that the exclusivity property of cohyponyms is in fact not a matter of world knowledge. Then, I show that it is also not a matter of conceptual geometry/categorization or the lexicon, but in fact of grammar.

### 2.1 Cohyponyms' exclusivity is not reducible to world knowledge

- Rather than (1), consider examples like (2):

- (2)
- a. #The white flag is green.
  - b. #Some animated films are live-action.
  - c. #Some comedies are tragedies.
  - d. #This fork is a spoon.
  - e. #Some federal responsibilities are provincial.
  - f. #This train is a plane.

- In contrast to (1), world knowledge is clearly not a factor in some of these examples, and less clearly so for others.
  - Perhaps most clearly, it is possible for objects to have more than one colour (2a). Another example referring to mereology is (2b): one can imagine films with animated parts and live-action parts.
  - (2c) and (2d) notably can't refer to things we even have portmanteaus for, viz. *tragicomedy* and *spork*

- (2e) is aligned with some real-world examples, for example healthcare in Canada (which is technically provincial but has significant federal involvement, not least in funding)
- Finally, (2f) is an ambiguous case: on the one hand, there are no ‘train-plane’ vehicles in the real world, but on the other, the sentence is intuitively bad even if we imagine an adequate sci-fi possible world.
- In spite of this, the sentences in (2) are all judged as self-contradictory.

- ➡ Cohyponyms are mutually exclusive *even when we control for world knowledge as a possible source of mutual exclusivity*.
- ➡ Thus, the exclusivity must be imposed in some other way, either from the structure of concepts or something linguistic.

- Before moving on, let’s just check that this is really a fact of cohyponymy. The following sentences take predicates from *different* domains rather than the same domain. That is, they are not cohyponymic with one another. Crucially, the contradiction effect disappears.
    - (3a–d) mix and match predicates from different domains in (2); (3d–f) (maybe also (3c)) explicitly attempt unlikely combinations, still not reaching the contradiction effect of (2).
- (3)
- |    |                                    |                   |
|----|------------------------------------|-------------------|
| a. | This train is green.               | cf. (2a) and (2f) |
| b. | Some animated films are tragedies. | cf. (2b) and (2c) |
| c. | Some forks are provincial.         | cf. (2d) and (2e) |
| d. | Some forks are tragedies.          | cf. (2c) and (2d) |
| e. | This spider is an accountant.      |                   |
| f. | Green ideas sleep.                 | cf. Chomsky 1957  |
- The meaning of (3c) and especially (3d) and (3f) is obscure, but not contradictory like (2).

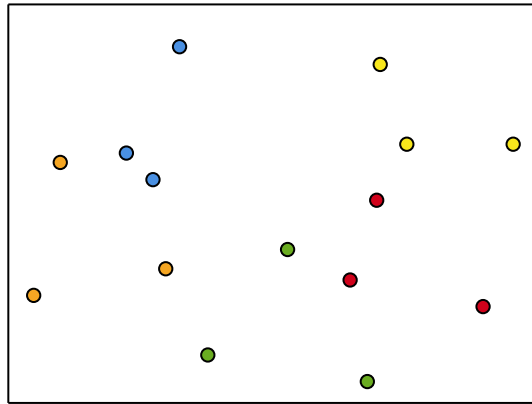
## 2.2 Some prior literature on exclusivity

- What, then, underlies cohyponyms’ exclusivity?
- Two proposals exist in the literature: either (i) concepts from a given domain are inherently incompatible (as a fact of categorization ‘overriding’ world knowledge), or (ii) the structure of the lexicon creates this incompatibility.

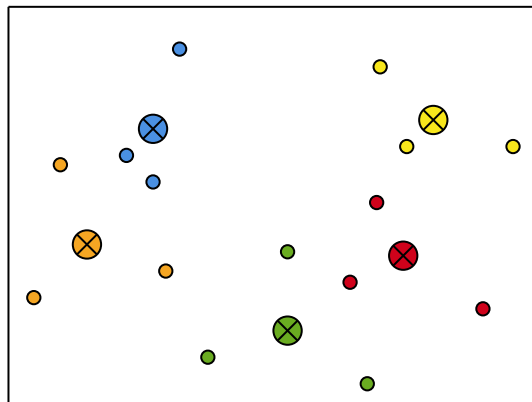
### 2.2.1 Exclusivity from partitioned conceptual geometries

- Gärdenfors (2000)’ captures cohyponyms’ incompatibility as the result of the geometry of concepts.
  - For him, concepts exist in a geometric space, where they are associated with regions of the space.
  - ➡ Since the regions do not overlap, concepts within a given space are inherently incompatible.
  - To deal with the above observations, one could say that this occurs regardless of world knowledge because the partitioning of conceptual space is imposed even over an entirely gradient set of exemplars.
- Let’s see how this works by building up a conceptual space.

- First, we need **dimensions** to create an  $n$ -dimensional space. For instance, the space for colours is three-dimensional: the dimensions correspond to values for brightness, hue, and saturation.
- We then populate that space with **exemplars**: individual points with a coordinate for each dimension, placing them in the space.
  - Gärdenfors (2000) seems to assume that at least early on in the building of a particular conceptual space, exemplars *are* associated with a concept, but this is done on a case-by-case basis.
  - In the following diagram, I have a hypothetical two-dimensional space populated with exemplars assigned to various concepts through their colours.<sup>1</sup>

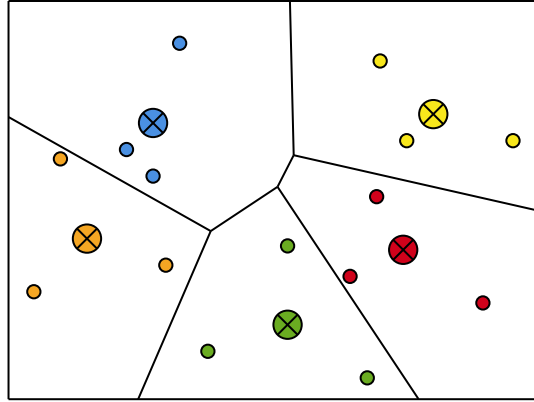


- From these exemplars, we mentally abstract away from them by creating **prototypes** (cf. Rosch & Mervis 1975; Rosch 1978; Hampton 2006).
  - The prototype is a point in the space whose coordinates correspond to **the mean value for each dimension of all the exemplars** for this concept.
  - A prototype does not need to correspond to an actually-existing exemplar; it is an idealization.



- Now that the space is populated with abstract prototypes corresponding to concepts, Gärdenfors (2000) posits that the space is partitioned, such that each prototype is associated with a region comprising all the points that are closer to it than to any other prototype (this is a **Voronoi partition**).

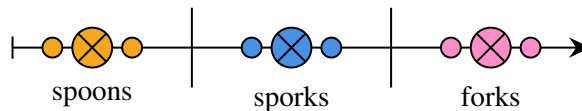
<sup>1</sup>See Gärdenfors (2000:88, 124) for diagrams similar to the following three figures. The Voronoi partition in the third figure was made using Alex Beutel's online generator (<http://alexbeutel.com/webgl/voronoi.html>, accessed Nov. 4, 2021).



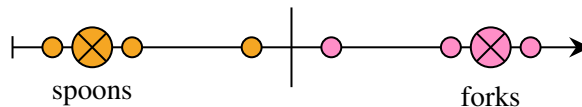
- A concept, then, is a cell in the Voronoi partition; and a conceptual domain is the entire space.
  - This theory captures prototype effects (how close an exemplar is to the prototype), gradient similarity between different concepts (if cell B is between cells A and C, concept A is more similar to B than to C), and the possibility to actively categorize new exemplars (viz. by checking their coordinates and seeing in the cell of which concept they fall).
- To see how this works in explaining cohyponyms' incompatibility regardless of world knowledge, consider (4). I'll assume for simplicity that utensils are in a one-dimensional geometry (based on length of prongs).

(4) #This fork is a spoon.

- Either the word *spork* is active, in which case we have (at least) three cells:



- Or it isn't, in which case we have two, and exemplars in the middle-ground are forcibly categorized as forks or spoons.<sup>2</sup>



- Either way, the world knowledge that there are exemplars in the middle-ground between forks and spoons, which could reasonably be described as having properties of both, is 'overridden' by the conceptual partitioning
  - The middle-ground exemplars are either sporks (and not spoons/forks) or spoons (and not forks) or forks (and not spoons).

<sup>2</sup>For simplicity, the figure overlooks movement of the prototypes based on the inclusion of middle-ground exemplars.

### 2.2.2 Exclusivity as a fact of the lexicon

- Another proposal is to treat this exclusivity as a fact of the lexicon. This is in fact the basis of structuralist linguistics (de Saussure 2011[1916]).
- de Saussure viewed the lexicon as forming a *structure* in which words' meaning is delimited by other adjacent words: "the value of each term results solely from the simultaneous presence of others" as in his famous diagram (de Saussure 2011[1916]:114-115):



- de Saussure's examples begin with content vocabulary (something approaching cohyponyms).
  - The famous example (p. 115) is that French has a single word, *mouton*, for sheep and their meat, whereas English has a word for each concept, *sheep* and *mutton*. "The difference in value between *sheep* and *mutton* is due to the fact that *sheep* has beside it a second term while the French word does not" (de Saussure 2011[1916]:116).
- de Saussure's view is that there is a 'universal' conceptual space unaffected by a language's lexicon; what changes language to language is which part of the space is associated with which lexical items.
  - Conceptual space is gradient (there are no boundaries), but the lexicon superimposes a non-gradient partition over it.
  - The upshot is that, given the distinction between the conceptual space and the lexicon, de Saussure (2011[1916]) could say about (2) that there's overlap/gradience in the conceptual space, but not in the lexicon, hence why the sentences are judged as contradictory *in spite of* world knowledge.<sup>3</sup>
- Another significant distinction arises between this theory and Gärdenfors' is in grammatical vocabulary, which de Saussure wants to treat in the same way as content vocabulary:
  - His example is grammatical number, where "the value of a French plural does not coincide with that of a Sanskrit plural" because Sanskrit has a dual whereas French does not (de Saussure 2011[1916]:116).<sup>4</sup>
  - This notion of the meaning of the plural being dependent on (think: strengthened by) non-plural number(s) is a clear antecedent for the modern notion (Sauerland et al. 2005) of the plural being unmarked and strengthened through exhaustivity ('not singular').
    - \* This is well aligned with modern theorizing.
  - On the other hand, it's quite out of step with modern theorizing that de Saussure collapsed exhaustivity effects (e.g., the meaning of plurality) with effects around content vocabulary like *sheep* and *mutton*.<sup>5</sup>

<sup>3</sup>He just doesn't predict for there to be much of a way of *talking* about the underlying compatibility of the concepts, since the lexical items we use are themselves mutually incompatible.

<sup>4</sup>Other example include languages (e.g., Proto-Germanic) with no future: "to say that the future [in Proto-Germanic] is expressed by the present is wrong, for the value of the present is not the same in Germanic as in languages that have a future along with the present" (p. 117).

<sup>5</sup>That is: content vocabulary other than Horn scales like {warm, hot} (Horn 1972).

## 2.3 Exclusivity as a fact of grammar

- Despite moving the explanation for exclusivity from a non-linguistic conceptual module to the lexicon, de Saussure's (2011[1916]) proposal has an important point in common with Gärdenfors' (2000):
  - Since incompatibility is a fact of categorization or the lexicon, these two theories converge in predicting **incompatibility to be impossible to remove linguistically**
  - (or only removable through kinds of non-intersective modification, viz. *a fake gun* or *the buildings are big and small*).
- Now consider again these examples, repeated from (2):

(5)    a. #The white flag is green.  
         b. #Some comedies are tragedies.
- Is this exclusivity really non-removable? In fact, language comes with several lexical items capable of removing the contradiction.
  - I'll focus on conjunction (6) and additive particles (7), but there are others (8).

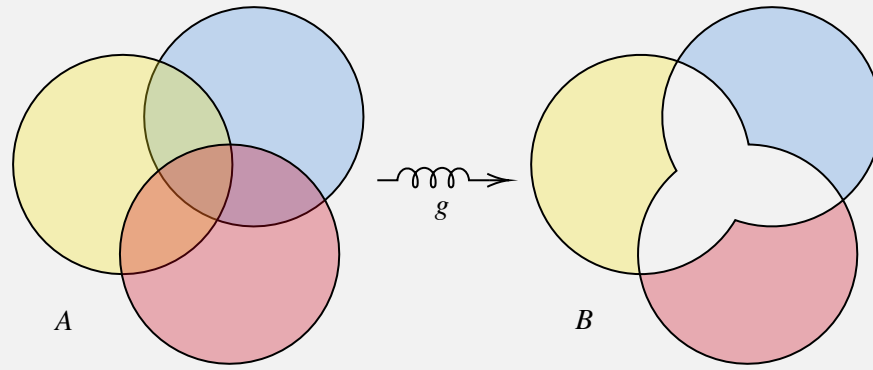
(6)    a. The flag is white **and** green.  
         b. Tragicomedies are plays that are both comedies **and** tragedies.

(7)    a. The white flag is **also** green.  
         b. Tragicomedies are comedies that are **also** tragedies.

(8)    Some comedies are **simultaneously** tragedies.
- It's not clear how it could be maintained that the predicates are inherently conceptually/lexically incompatible in light of this.
  - For (6), the *and* is intersective, so there is no way around the concepts' underlying compatibility.
    - \* For (6a): there is no non-intersective *and* at all with atomic subjects (Winter 2001; Paillé 2021).
    - \* For (6b): *both*, at least in this syntax, marks intersective conjunction (Schwarzschild 1996; Paillé 2021, a.o.)
  - As for (7), it's never been claimed that there was a non-intersective *also* (its presupposition refers anaphorically to a proposition).

### The conclusion so far

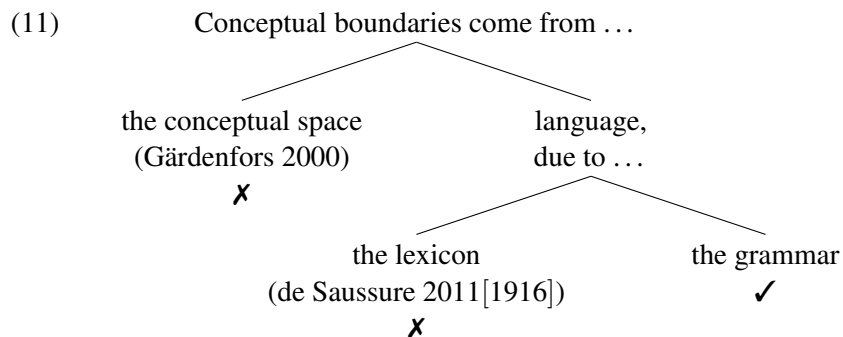
- Many conceptual spaces actually involve overlap (A).
- Given this, there must be a grammatical process ( $g$ ) that obscures this in basic sentences, giving conceptual space the **appearance** of being neatly divided (B).



- Of course, the claim isn't that conceptual structure is *never* involved in sharply partitioning concepts; as seen in (9), some predicates' incompatibility is non-removable. There are also borderline cases like (10).

- (9) a. #Some triangles are **also** squares.  
 b. #This shape is a triangle **and** a square.
- (10) a. #A labradoodle is a labrador that is a poodle.  
 b. #A labradoodle is a labrador that is **also** a poodle.  
 c. A labradoodle is **like** a labrador that {is, was} **also** a poodle.

- I'll be putting these cases aside.
- (11) provides a summary of the claim, modulo (9)–(10).



- One last point, especially since we'll see many examples from colour terms:
  - In the case of colour terms in particular, examples like (12b) highlight an important judgment, viz. that the incompatibility is not so much conceptual as it has to do with quantification over parts: the problem with (12a) is that both colour terms are interpreted universally, and the effect of a conjunction or additive is to weaken this to an existential.



- (12) a. #The white flag is green.  
 b. (i) The flag is white and green.  
 (ii) The white flag is also green.

– Here, what we learn is not so much about the conceptual structure of colours, as it is that their lexical meaning is existential:

$$(13) \quad \llbracket \text{green} \rrbracket = \lambda x. \exists y [y \sqsubseteq x \wedge \text{green}(y)].$$

## 2.4 Exclusivity as a product of exhaustivity

- If cohyponyms' exclusivity is grammatical, this is a strengthening effect.
  - e.g., the core (conceptual) meaning of *comedy* doesn't exclude tragicomedies, but its strengthened meaning does.
- We want to strengthen predicates' meaning in a way that is compatible with additives (*also*) being one of the ways to weaken/remove the strengthening:

- (14) The white flag is #(also) green.

► I'll follow Bade (2016) (cf. Krifka 1998; Sæbø 2004; Aravind & Hackl 2017) in taking **obligatory additive effects to be a marker of exhaustivity**.

- Bade makes this argument from data like (15).

- (15) a. Aisha sang. Ben #(also) sang.  
 b. Aisha sang. Ben didn't (also) sing.

- While the obligatory additive in (15a) could in principle be the result of *Maximize Presupposition!* (assuming a scale like  $\{\emptyset, \text{also}\}$ ), this would wrongly predict the additive to be equally obligatory in (15b). The negation should have no effect, since presuppositions project past it.
- This is not the case, so Bade favours an account where the additive is obligatory in (15a) because otherwise, the second sentence would contradict the first, as in (16).

$$(16) \quad \llbracket \text{Exh}_{\text{ALT}} [\text{Ben}_F \text{ sang}] \rrbracket = 1 \text{ iff Ben sang \& Aisha didn't sing.}$$

- This effect is formalized through the Exh(aust) operator; (17) is from Chierchia et al. (2012:2304).

$$(17) \quad \llbracket \text{Exh}_{\text{ALT}}(S) \rrbracket^w = 1 \text{ iff } \llbracket S \rrbracket^w = 1 \text{ and } \forall \phi \in \text{ALT} (\phi(w) = 1 \rightarrow \llbracket S \rrbracket \subseteq \phi)$$

- In light of Bade's argument, I propose to explain cohyponyms' incompatibility by claiming that they form a set of alternatives and trigger exhaustification over this set. Something like (18)—to be modified!

- (18) a.  $\text{Exh}_{\text{ALT}} [\text{this is green}]$ .  
 b.  $\text{ALT} = \{\text{this is green, this is white, this is red, } \dots\}$   
 c.  $\llbracket (18a) \rrbracket = 1 \text{ iff this is green \& this is not white \& this is not red \& } \dots$

### 3 The distribution of exhaustivity: a new desideratum due to cohyponyms

- We now turn to seeing that if this Exh account of cohyponyms' exclusivity is adopted, it comes with an important consequence.
- As described by Chierchia et al. (2012), Exh has the following properties; call this 'free exhaustivity.'

(19) **Free exhaustivity:**

- a. Exh is optional.
  - b. Exh is syntactically free (although dispreferred in DE contexts).
- In other words, there is no 'direct' link between Exh and alternative-triggering expressions.
    - Such expressions may or may not be exhaustified, and if they are, they have no say on where the Exh operator is located in the syntax.
  - In contrast, **Exh with cohyponyms is both obligatory and necessarily (very) local to the predicate.** We take these facts in turn.

#### 3.1 Exh is obligatory

- Exh is standardly portrayed as optional. For example, it is absent from examples like (20), where *some* is not strengthened to mean 'some but not all.'

(20) Mary ate some cookies. In fact, she ate all of them.

- (20) does not involve the speaker correcting themselves.
- Now consider colour terms in a virtually identical context, as in (21). In contrast to (20), the sentences in (21) do not successfully convey that the flag is partly white and partly green.

(21) #The flag is white. In fact, it's green.

- The second sentence in (21) can only serve as a self-correction.
- The claim that Exh can be obligatory is not new (e.g., Magri 2009, Bade 2016, Bar-Lev 2018). But in what follows, I show cohyponyms not only *require* Exh, but also *dictate its syntactic position*.

#### 3.2 Exh must be (very) local

- The empirical observation is that cohyponyms are interpreted as incompatible regardless of the syntactic structure or semantic environment they are in (unless there is conjunction, an additive, etc.). Under the Exh account, this can only be captured by strictly restricting Exh's syntax.
- I turn to some different ways to see this.
- I'll just use colour examples. For ease of presentation, pretend that the only colours are blue, white, and red. I'll emphasize colour adjectives' existential meaning by writing them out as '(colour)<sub>∃</sub>'.

### 3.2.1 Predicating two cohyponyms of a single referent

- I start with precisely the kinds of examples that motivated concepts' incompatibility in the first place: the impossibility of predicating two cohyponyms of a single referent, *even in a single sentence*:

(22) #The blue flag is white.  
( $\approx$  the entirely blue flag is entirely white)

- If Exh could take scope anywhere, (22) would in fact be non-contradictory:<sup>6</sup>
  - Exh could scope globally, from where its prejacent would entail both the whiteness and blueness of the flag. Neither colour would be excluded.
  - Thus we'd have the non-contradictory (23a), rather than something like (23b), which is precisely what is needed for a contradiction.<sup>7</sup>

(23)  $\llbracket \text{Exh}_{\text{ALT}} [\text{The blue flag is white}] \rrbracket$   
 a. = 1 iff the blue $_{\exists}$  flag is white $_{\exists}$  &  $\neg$ [the blue $_{\exists}$  flag is red $_{\exists}$ ].  
 b.  $\neq$  1 iff the blue $_{\exists}$  flag is white $_{\exists}$  &  $\neg$ [the blue $_{\exists}$  flag is blue $_{\exists}$ ] &  $\neg$ [the blue $_{\exists}$  flag is red $_{\exists}$ ].

### 3.2.2 Cohyponyms with another scope-bearing element

- Now consider an example of Exh co-occurring with some other scope-bearing element, for example a universal quantifier.

(24) Every flag is blue.  
( $\approx$  every flag is entirely blue)

- Yet, global Exh yields (25):

(25)  $\llbracket \text{Exh}_{\text{ALT}} [\text{every flag is blue}] \rrbracket$   
 = 1 iff every flag is blue $_{\exists}$  &  
 $\neg$ [every flag is white $_{\exists}$ ] &  
 $\neg$ [every flag is red $_{\exists}$ ].

- (25) would be true and felicitous if all flags were only half blue, with some flags half red and the rest half white, contrary to the intuition.

### 3.2.3 Cohyponyms with a scalar expression

- Also consider cases where a colour term co-exists with another alternative-bearing element, such as an existential quantifier:

(26) Some flags are blue.  
( $\approx$  some but not all flags are entirely blue)

- Again, global Exh gives the wrong result. If all non-entailed alternatives are excluded, we obtain (27).<sup>8</sup>

<sup>6</sup>Of course, the sentence would require a scenario motivating why one colour term is attributive and the other is predicational.

<sup>7</sup>For ease of exposition, (23) only shows the predicative adjective *white* as having alternatives, but presumably *blue* does so too; nothing hinges on this.

<sup>8</sup>I assume that the alternatives in sentences with more than one alternative-triggering expression constitute all the possible sentences obtained by replacing one or more alternative-triggering expression with one of its alternatives (cf. Sauerland 2004).

- (27)  $\llbracket \text{Exh}_{\text{ALT}} [\text{some flags are blue}] \rrbracket$   
 = 1 iff some flags are blue<sub>∃</sub> &  
 $\neg[\text{some flags are white}_{\exists}]$  &  
 $\neg[\text{some flags are red}_{\exists}]$  &  
 $\neg[\text{all flags are blue}_{\exists}]$  &  
 $\neg[\text{all flags are white}_{\exists}]$  &  
 $\neg[\text{all flags are red}_{\exists}]$ .

- Taken together, the prejacent and the three bolded excluded alternatives are contradictory: there are flags that are partly blue, not all flags are partly blue, and no flags are of any colour other than blue.
- So these alternatives are not innocently excludable (Fox 2007), and aren't excluded at all, leaving us with (28):

- (28)  $\llbracket \text{Exh}_{\text{ALT}} [\text{some flags are blue}] \rrbracket$   
 = 1 iff some flags are blue<sub>∃</sub> &  
 $\neg[\text{all flags are white}_{\exists}]$  &  
 $\neg[\text{all flags are red}_{\exists}]$ .

- (28) has the same problem as (25): it only means that some flags are partly blue, not entirely blue.<sup>9</sup>

### 3.2.4 Cohyponyms in downward-entailing environments

- Exhaustivity normally optionally disappears in DE contexts, depending on whether Exh is located above or below the DE operator. For instance, a disjunct in a DE context can be interpreted as exclusive or inclusive.

- (29) a. If you take salad or dessert, you'll be really full.  
 b. If you take salad or dessert, you pay \$20; but if you take both there is a surcharge.  
 (Chierchia et al. 2012:2306)

- This is not the case with cohyponyms:

- (30) If the flag is white, the battle ends.  
 (≈ If the flag is entirely white, the battle ends.)

- But global exhaustivity creates the meaning in (31), where the flag is only (at least) partially white.

- (31)  $\llbracket \text{Exh}_{\text{ALT}} [\text{If the flag is white, the battle ends}] \rrbracket$   
 = 1 iff if the flag is white<sub>∃</sub>, the battle ends &  
 $\neg[\text{if the flag is red}_{\exists}, \text{the battle ends}]$  &  
 $\neg[\text{if the flag is blue}_{\exists}, \text{the battle ends}]$ .

### 3.2.5 Exh immediately above cohyponyms

- To be sure, for all these examples, the meanings observed *can* be generated, with the stipulation that the Exh must be very local to the cohyponym:

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<sup>9</sup>Bringing in the concept of 'innocent inclusion' (Bar-Lev & Fox 2017; Bar-Lev 2018) would not make things any better: the sentence would now assert that there are flags of every colour.

- (32)  $\llbracket \text{The } [\text{Exh}_{\text{ALT}} \text{ blue}] \text{ flag is } [\text{Exh}_{\text{ALT}} \text{ white}] \rrbracket$   
 = 1 iff the  $[\text{blue}_{\exists} \ \& \ \text{not white}_{\exists} \ \& \ \text{not red}_{\exists}]$  flag is  $[\text{white}_{\exists} \ \& \ \text{not blue}_{\exists} \ \& \ \text{not red}_{\exists}]$   
 $\Rightarrow$  contradiction
- (33)  $\llbracket \text{Every flag is } [\text{Exh}_{\text{ALT}} \text{ blue}] \rrbracket$   
 = 1 iff every flag is  $[\text{blue}_{\exists} \ \& \ \text{not white}_{\exists} \ \& \ \text{not red}_{\exists}]$   
 $\approx$  every flag is entirely blue
- (34)  $\llbracket \text{Exh}_{\text{ALT}} [\text{some flags are } [\text{Exh}_{\text{ALT}} \text{ blue}]] \rrbracket$   
 = 1 iff some flags are  $[\text{blue}_{\exists} \ \& \ \text{not white}_{\exists} \ \& \ \text{not red}_{\exists}]$  &  $\neg$ [all flags are  $[\text{blue}_{\exists} \ \& \ \text{not white}_{\exists} \ \& \ \text{not red}_{\exists}]$ ]  
 $\approx$  some but not all flags are entirely blue
- (35)  $\llbracket \text{If the flag is } [\text{Exh}_{\text{ALT}} \text{ white}], \text{ the battle ends} \rrbracket$   
 = 1 iff if the flag is  $[\text{white}_{\exists} \ \& \ \text{not blue}_{\exists} \ \& \ \text{not red}_{\exists}]$ , the battle ends  
 $\approx$  if the flag is entirely white, the battle ends

- We've already seen that the exhaustivity account of cohyponyms' exclusivity involves Exh being *obligatory*; this is not unheard of in the literature on exhaustivity.
- But now we have **something quite new**:<sup>10</sup> **colours' obligatory Exh must be local to them** (and this locality requirement is even more stringent than just 'the same clause': (32)–(34)). Why would this be?

## 4 Roots, derivation, and the conceptual system

- So far:

- Cohyponyms' exclusivity is the result of Exh.
- But this Exh has the following twin properties:
  1. Exh is obligatory with cohyponyms.
  2. Exh is always very local to cohyponyms.

- In this section, I first define the locality requirement: Exh must be somewhere in cohyponyms' maximal projection.
- Then I suggest that Exh's obligatoriness and locality come from derivational morphology requiring Exh; specifically, such morphemes Agree with it.

### 4.1 Exh's locality horizon as the cohyponym's maximal projection

- In most of the examples above (32)–(35), it's not clear just how local Exh has to be to the colour term (it could be adjoined at  $\nu\text{P}$ , AP, etc.)
- To move forward, consider this minimal pair:

- (36) a. The white and green flag is torn up.

<sup>10</sup>Modulo, probably, Bar-Lev 2018.

b. #The white green flag is torn up.

- Given that (36a) is non-contradictory, there must be a single Exh above both colour terms. But given that (36b) is contradictory, each colour term must have its own Exh.

- (37) a. (i) The  $[_{AP} \text{Exh}_{ALT} [_{AP} \text{white and green}]]$  flag is torn up.  
 (ii)  $\text{Exh}_{ALT}$  [the white and green flag is torn up].  
 b. #The  $[_{AP} \text{Exh}_{ALT} \text{white}]$   $[_{AP} \text{Exh}_{ALT} \text{green}]$  flag is torn up.

- Some possible locality requirements wouldn't capture this:
  - If the requirement was semantic ('no scope-bearing operator can intervene between Exh and its cohyponym,' explaining (32)–(35)), we'd predict (36a) to be contradictory (an Exh over the whole conjunction would have *and* intervening between it and *green*, so Exh would be forced to be local to each colour term) and (36b) to be acceptable.
  - If the requirement was syntactic along the lines of 'Exh must be in the same phase/ $\nu$ P/DP as the cohyponym,' the two sentences in (36) should pattern the same way.
- Instead, I suggest to rely on the hypothesis that conjunctions inherit the category of the conjuncts: conjoining APs forms another AP.<sup>11</sup>
  - The two colour terms are in a single AP in (36a), but in two separate APs in (36b).

➡ The locality requirement is that Exh must be within the maximal projection of the cohyponym.

- (32)–(35) as well as (36b) follow immediately, e.g.:

- (38) a.  $[[\text{the } [_{\text{Exh}_{ALT}} \text{white}] [_{\text{Exh}_{ALT}} \text{green}]] \text{flag}]$   
 $\approx \text{the } [\text{white}_{\exists} \& \text{not green}_{\exists} \& \text{not red}_{\exists}] [\text{green}_{\exists} \& \text{not white}_{\exists} \& \text{not red}_{\exists}] \text{flag}$   
 b. \*the  $[_{\text{Exh}_{ALT}} [\text{white green flag}]]$

- For conjunctions, this means that Exh has some flexibility. We obtain (39a), as desired, but (39b) is syntactically available too. This is fine, as long as the non-contradictory (39a) is available as well.

- (39) a.  $[[\text{The flag is } [_{\text{Exh}_{ALT}} [\text{green and white}]]]]$   
 $= 1 \text{ iff the flag is } [\text{green}_{\exists} \& \text{white}_{\exists} \& \text{not red}_{\exists}].$   
 b.  $[[\text{The flag is } [_{\text{Exh}_{ALT}} \text{green}] \text{ and } [_{\text{Exh}_{ALT}} \text{white}]]]$   
 $= 1 \text{ iff the flag is } [\text{green}_{\exists} \& \text{not white}_{\exists} \& \text{not red}_{\exists}] \text{ and } [\text{white}_{\exists} \& \text{not green}_{\exists} \& \text{not red}_{\exists}].$

- Note that, by extrapolation, even in a simple sentence like (40a), where no difference in meaning is predicted to be observable based on whether Exh is local or global, Exh must in fact be local to the cohyponym (40b).

- (40) a. The flag is green.  
 b.  $[[\text{The flag is } [_{\text{Exh}_{ALT}} \text{green}]]]$   
 $= 1 \text{ iff the flag is } [\text{green}_{\exists} \& \text{not white}_{\exists} \& \text{not red}_{\exists} \& \dots]$

<sup>11</sup>See e.g. Bresnan 1976, Williams 1978, McCloskey 1986, Burton & Grimshaw 1992, McNally 1992, Williams 2015:49. It is more common nowadays to view conjunctions as having their own label (the phrase is a ConjP or &P) (e.g., Camacho 2003). As far as I'm aware this has only been done to respect *and*'s status as a head, binary branching, and X'-theory generally. But in fact, even among authors proposing ConjP, it is common to posit inheritance of other features from conjuncts to the phrase (e.g., Kiss 2012, Franks & Willer-Gold 2014). As such, it would hardly be a stretch for category to be inherited as well, without breaking from binary branching.

## 4.2 Derivational morphemes require Exh

- We can now refine the research question:

The research question

Why is there obligatorily an Exh operator in cohyponyms' XP?

- I suggest a path forward based on the observation that there is another grammatical process, from the domain of morphology, which also has the twin properties of being obligatory and of taking individual predicates rather than phrases
  - ‘taking individual predicates rather than phrases’ is not quite what I described for Exh (which has to be anywhere in the XP)—we’ll get back to this!
- This is **derivational morphology**: functional morphemes ( $n^0$ ,  $v^0$ ,  $a^0$ , etc.) that assign grammatical category to **roots** (e.g., Marantz 1997, 2001, 2007; Harley & Noyer 1997; Arad 2003, 2005; Borer 2014; Harley 2014).

My proposal

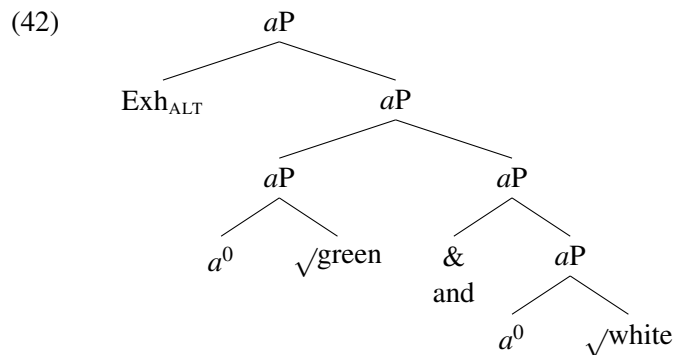
Derivational morphemes require Exh within their projection, effectively partitioning conceptual space.

- In addition to being obligatory and local to roots, the idea of using derivational morphology to explain cohyponyms' exclusivity fits nicely with some work in the morphosyntax/biolinguistics literature.
  - Indeed, roots are the part of language that “add conceptual meaning to the structures built by syntax” (De Belder & van Craenenbroeck 2015), and they thereby “serve as the interface between [language] and the broader cognitive system” (Harley 2014:248).
  - Boeckx (2011) proposes to explain the demodularization of concepts in the human mind (Spelke 2000, 2003; Spelke & Kinzler 2006, 2009; Kinzler & Spelke 2007; Ott 2009) as the result of roots (concepts) being made mergeable through derivational morphology.
- That is, derivational morphemes deal directly with linguistic material (roots) that interfaces with concepts.
- What we’re adding today is the idea that the derivational morphemes also exhaustify the root they select, as in (41) for the adjective *green* (putting aside whether Exh is either phrasally or head-adjoined):

(41)  $[_{aP} [_{a^0} \text{Exh}_{\text{ALT}} [_{a^0} a^0 \sqrt{\text{green}}]]]$

## 4.3 Formalizing the proposal: derivational morphemes Agree with Exh

- We need to formalize the need for Exh in (41) in a way that provides enough flexibility to also generate (42), where some distance separates Exh from  $a^0$ :



#### Formalizing why derivational morphemes require Exh

- How should the relationship between Exh and derivation be formalized to allow the flexibility in (43) (where Exh has some distance from the root selected by  $a^0$ , and there is a single Exh for two  $a^0$  heads)?

- $a^0$  can't be *selecting* Exh, in which case there would be an Exh for each  $a^0$ .
- On the other hand, if  $a^0$  merely *Agrees* (e.g., Chomsky 2001) with Exh, we'll get the flexibility we need.

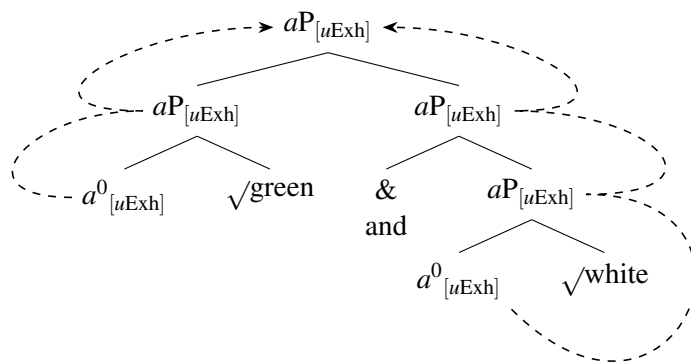
➡ Derivational morphemes have a  $[u\text{Exh}]$  feature.

- The first thing to note is that the idea of Agree with Exh, while new (as far as I know) for Exh, has a close cousin in the proposal by Lee (2004) and Hirsch (2017) that there is agreement with *only* (based on an  $[\text{ONLY}]$  feature), due to overt *only* (in Korean and English, respectively) surfacing in the 'wrong' place for the semantics.
  - Horvath (2007) in fact has an 'exhaustive identification' ( $[\text{EI}]$ ) feature she uses to distinguish between the syntactic behaviour of *only* and *even* in Hungarian; if the agreement with *only* that Lee (2004) and Hirsch (2017) posit is really with an  $[\text{EI}]$  feature, it's intuitively right that this would stand for Exh as well.
- What we'll need in order to capture the flexibility in (42) is to allow Agree to take place not just with heads, but also their labels (or just labels; see in particular Béjar & Rezac 2009:48–49).<sup>12</sup>
  - That is, the  $[u\text{Exh}]$  feature of  $a^0$ , if not dealt with at the merger of  $a^0$ , will percolate upwards, such that Agree takes place between  $a\text{P}$  (the label for  $[a^0 \text{ green and } a^0 \text{ white}]$ ) and Exh.
- First, we let the  $[u\text{Exh}]$  feature percolate to the right level. Percolation is shown with a dotted arrow.

<sup>12</sup>See also Sells 1985; Lieber 1989; Pollard & Sag 1994; Kobele 2005; Tsarfaty & Sima'an 2007; Kiss 2012; Franks & Willer-Gold 2014 on feature percolation, as well as Chomsky's work on labelling and bare phrase structure (Chomsky 1995, 2013, 2015).

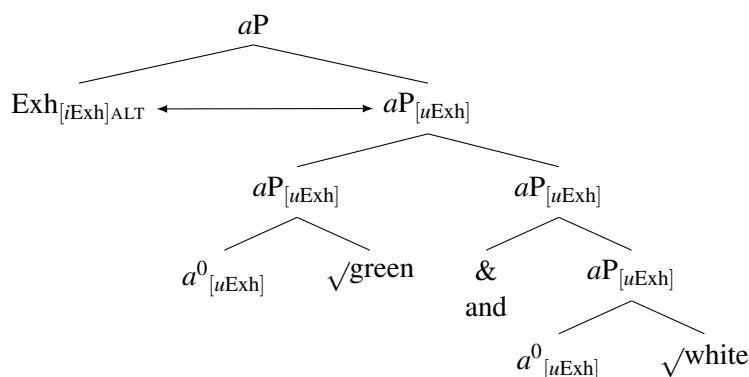


(43)



- Then we merge Exh and have the label  $aP_{[uExh]}$  Agree with it (and pass this down the feature valuation to the two  $a^0$  heads; this is omitted). Agree is shown with a solid arrow.<sup>13</sup>

(44)



- Given the proposed syntax, there is nothing forcing Exh to be in this particular position within the  $aP$ ;<sup>14</sup> other parses with a lower Exh (one in each conjunct) would simply be contradictory, and therefore not chosen.
- Crucially, the proposal (that Exh is required due to  $[uExh]$  on derivational morphemes) rules out any parse where the only Exh is higher than a cohyponym's XP, given the lack of upward Agree (Chomsky 2000, 2001).

➡ As desired, Exh ...

1. is obligatory;
2. must be no higher than the top of the cohyponym's XP;
3. has flexibility in its particular location within the XP, including the ability to scope above entire conjunctions.

<sup>13</sup>Alternatively, it could be the topmost  $aP$  label that Agrees downward with Exh (cf. Béjar & Rezac 2009). Nothing hinges on this.

<sup>14</sup>With some assumptions about ordering of operations. To wit, it must be possible to externally merge *and* and Exh in either order. If  $[uExh]$  had to be dealt with before the external Merge of *and*, we would need two Exh operators, one for each conjunct. It may be that a numeration with only one Exh will force the slow checking of  $[uExh]$ ; doing otherwise would lead to one of the  $[uExh]$  features with nothing to Agree with.

## 5 Conclusion

- We started by observing that cohyponyms display an exclusivity effect, which persists even when we control for world knowledge.
- This effect disappears with intersective conjunction and additives, suggesting it does not come from conceptual geometries or the lexicon.
- I suggested that the effect is instead the result of an Exh operator. But such an account comes with an unusual-looking explanandum: this Exh would have to be both obligatory and subject to a strict locality requirement.
- Turning to another area of grammar that is obligatory and local with predicates, viz. derivational morphology, can clear up this picture:
  - Derivational morphemes Agree with Exh, forcing one to appear within their XP.

- When derivational morphemes take a root (roughly: a concept) and make it linguistically usable by giving it a category, they also strengthen the meaning of the concept so as to exclude other concepts.
- ➡ The effect of this is **as if derivational morphemes were cleaning up the nonlinguistic conceptual space by ensuring that predicates’ meaning does not overlap.**
- This can come at the cost of ‘unnecessarily’ creating contradictory sentences like *#This comedy is a tragedy*.

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## References

- Arad, Maya. 2003. Locality constraints on the interpretation of roots: The case of Hebrew denominal verbs. *Natural Language & Linguistic Theory* 21:737–779.
- Arad, Maya. 2005. *Roots and patterns: Hebrew morpho-syntax*. Dordrecht: Kluwer Academic Publishers.
- Aravind, Athulya, & Martin Hackl. 2017. Against a unified treatment of obligatory presupposition trigger effects. In *Proceedings of SALT 27*, ed. Dan Burgdorf, Jacob Collard, Sireemas Maspong, & Brynhildur Stefánsdóttir, 173–190. Washington, DC: The Linguistic Society of America.
- Bade, Nadine. 2016. Obligatory presupposition triggers in discourse: Empirical foundations of the theories *Maximize Presupposition* and *Obligatory Implicatures*. Doctoral dissertation, University of Tübingen, Tübingen.
- Bar-Lev, Moshe E. 2018. Free Choice, homogeneity, and Innocent Inclusion. Doctoral dissertation, The Hebrew University of Jerusalem, Jerusalem.

- Bar-Lev, Moshe E., & Danny Fox. 2017. Universal Free Choice and Innocent Inclusion. In *Proceedings of SALT 27*, ed. Dan Burgdorf, Jacob Collard, Sireemas Maspong, & Brynhildur Stefánsdóttir, 95–115.
- Béjar, Susana, & Milan Rezac. 2009. Cyclic Agree. *Linguistic Inquiry* 40:35–73.
- Boeckx, Cedric. 2011. Some reflections on Darwin's Problem in the context of Cartesian biolinguistics. In *The biolinguistic enterprise: New perspectives on the evolution and nature of the human language faculty*, ed. Anna Maria di Sciullo & Cedric Boeckx, 42–64. Oxford: Oxford University Press.
- Borer, Hagit. 2014. The category of roots. In *The syntax of roots and the roots of syntax*, ed. Artemis Alexiadou, Hagit Borer, & Florian Schäfer, 112–148. Oxford: Oxford University Press.
- Bresnan, Joan W. 1976. On the form and functioning of transformations. *Linguistic Inquiry* 7:3–40.
- Burton, Strang, & Jane Grimshaw. 1992. Coordination and VP-internal subjects. *Linguistic Inquiry* 23:305–313.
- Camacho, José. 2003. *The structure of coordination: Conjunction and agreement phenomena in Spanish and other languages..* Dordrecht: Kluwer Academic Publishers.
- Cann, Ronnie. 2011. Sense relations. In *Semantics: An international handbook of natural language meaning*, ed. Claudia Maienborn, Klaus von Heusinger, & Paul Portner, volume 1, 456–479. Berlin: de Gruyter Mouton.
- Chierchia, Gennaro, Danny Fox, & Benjamin Spector. 2012. Scalar implicatures as a grammatical phenomenon. In *Semantics: An international handbook of natural language meaning*, ed. Claudia Maienborn, Klaus von Heusinger, & Paul Portner, volume 3, 2297–2331. Berlin: De Gruyter Mouton.
- Chomsky, Noam. 1957. *Syntactic structures*. The Hague: Mouton.
- Chomsky, Noam. 1995. Bare phrase structure. In *Evolution and revolution in linguistic theory*, ed. Héctor Campos & Paula Kempchinsky, 51–109. Washington DC: Georgetown University Press.
- Chomsky, Noam. 2000. Minimalist inquiries: The framework. In *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*, ed. Roger Martin, David Michaels, Juan Uriagereka, & Samuel Jay Keyser, 89–155. Cambridge, MA: MIT Press.
- Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A life in language*, ed. Michael Kenstowicz, 1–52. Cambridge, MA: MIT Press.
- Chomsky, Noam. 2013. Problems of projection. *Lingua* 130:33–49.
- Chomsky, Noam. 2015. Problems of projection: Extensions. In *Structures, strategies and beyond: Studies in honour of Adriana Belletti*, ed. Elisa Di Domenico, Cornelia Hamann, & Simona Matteini, 1–16. Amsterdam: John Benjamins.
- De Belder, Marijke, & Jeroen van Craenenbroeck. 2015. How to merge a root. *Linguistic Inquiry* 46:625–655.
- Fox, Danny. 2007. Free choice and the theory of scalar implicatures. In *Presupposition and implicature in compositional semantics*, ed. Uli Sauerland & Penka Stateva, 71–120. Basingstoke, Hampshire (UK): Palgrave Macmillan.

- Franks, Steven, & Jana Willer-Gold. 2014. Agreement strategies with conjoined subjects in Croatian. In *New insights into Slavic linguistics*, ed. Jacek Witkoś & Sylwester Jaworski, 91–115. Frankfurt am Main: Peter Lang.
- Gärdenfors, Peter. 2000. *Conceptual spaces: The geometry of thought*. Cambridge, MA: MIT Press.
- Hampton, James A. 2006. Concepts as prototypes. In *Psychology of learning and motivation*, ed. Brian H. Ross, volume 46, 79–113. New York: Academic Press.
- Harley, Heidi. 2014. On the identity of roots. *Theoretical Linguistics* 40:225–276.
- Harley, Heidi, & Rolf Noyer. 1997. Mixed nominalization, short verb movement and object shift in English. In *Proceedings of NELS 28*, ed. Pius N. Tamanji & Kiyomi Kusumoto, 143–157. Amherst, MA: GLSA, University of Massachusetts, Amherst.
- Hirsch, Aron. 2017. An inflexible semantics for cross-categorical operators. Doctoral dissertation, MIT, Cambridge, MA.
- Horn, Laurence. 1972. On the semantic properties of logical operators in English. Doctoral dissertation, UCLA, Los Angeles.
- Horvath, Julia. 2007. Separating “focus movement” from focus. In *Phrasal and clausal architecture*, ed. Simin Karimi, Vida Samiian, & Wendy K. Wilkins, 108–145. Amsterdam: John Benjamins.
- Kinzler, Katherine D., & Elizabeth S. Spelke. 2007. Core systems in human cognition. *Progress in Brain Research* 164:257–264.
- Kiss, Katalin É. 2012. Patterns of agreement with coordinate noun phrases in Hungarian. *Natural Language & Linguistic Theory* 30:1027–1060.
- Kobelev, Gregory M. 2005. Features moving madly: A formal perspective on feature percolation in the minimalist program. *Research on Language and Computation* 3:391–410.
- Krifka, Manfred. 1998. Additive particles under stress. In *Proceedings of SALT 8*, ed. Devon Strolovitch & Aaron Lawson, 111–129. Ithaca, NY: Cornell University.
- Lee, Youngjoo. 2004. The syntax and semantics of focus particles. Doctoral dissertation, MIT, Cambridge, MA.
- Lieber, Rochelle. 1989. On percolation. In *Yearbook of Morphology*, ed. Geert Booij & Jaap van Marle, volume 2, 95–138. Berlin: De Gruyter Mouton.
- Magri, Giorgio. 2009. A theory of individual-level predicates based on blind mandatory implicatures. Constraint promotion for Optimality Theory. Doctoral dissertation, MIT, Cambridge, MA.
- Marantz, Alec. 1997. No escape from syntax: Don’t try morphological analysis in the privacy of your own lexicon. *University of Pennsylvania working papers in linguistics* 4:201–225.
- Marantz, Alec. 2001. Words. University of Southern California: Handout from WCCFL 20.
- Marantz, Alec. 2007. Phases and words. In *Phases in the theory of grammar*, ed. Sook-Hee Choe, 191–222. Seoul: Dong In.
- Margolis, Eric, & Stephen Laurence. 2021. Concepts. In *The Stanford encyclopedia of philosophy*, ed. Edward N. Zalta. Metaphysics Research Lab, Stanford University, Spring 2021 edition.

- McCloskey, James. 1986. Inflection and conjunction in Modern Irish. *Natural Language & Linguistic Theory* 4:245–281.
- McNally, Louise. 1992. VP coordination and the VP-internal subject hypothesis. *Linguistic Inquiry* 23:336–341.
- Ott, Dennis. 2009. The evolution of I-language: Lexicalization as the key evolutionary novelty. *Biolinguistics* 3:255–269.
- Paillé, Mathieu. 2021. Exhaustivity and the meaning of colour terms. In *Proceedings of the 38th West Coast Conference on Formal Linguistics*, ed. Rachel Soo, Una Y. Chow, & Sander Nederveen, 334–344. Somerville, MA: Cascadia Press.
- Pollard, Carl, & Ivan Sag. 1994. *Head-driven phrase structure grammar*. Chicago: University of Chicago Press.
- Rosch, Eleanor. 1978. Principles of categorization. In *Cognition and categorization*, ed. Eleanor Rosch & Barbara Lloyd, 27–48. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Rosch, Eleanor, & Carolyn B. Mervis. 1975. Family resemblances: Studies in the internal structure of categories. *Cognitive Psychology* 7:573–605.
- Sæbø, Kjell Johan. 2004. Conversational contrast and conventional parallel: Topic implicatures and additive presuppositions. *Journal of Semantics* 21:199–217.
- Sauerland, Uli. 2004. Scalar implicatures in complex sentences. *Linguistics and Philosophy* 27:367–391.
- Sauerland, Uli, Jan Anderssen, & Kazuko Yatsushiro. 2005. The plural is semantically unmarked. In *Linguistic evidence: Empirical, theoretical, and computational perspectives*, ed. Stephan Kepser & Marga Reis. Berlin: De Gruyter Mouton.
- de Saussure, Ferdinand. 2011[1916]. *Course in general linguistics*. New York: Columbia University Press.
- Schwarzschild, Roger. 1996. *Pluralities*. Boston: Kluwer Academic.
- Sells, Peter. 1985. *Lectures on contemporary syntactic theories*. CSLI lecture notes 3. Stanford, CA: CSLI Publications.
- Spelke, Elizabeth S. 2000. Core knowledge. *American Psychologist* 55:1233–1243.
- Spelke, Elizabeth S. 2003. What makes us smart? Core knowledge and natural language. In *Language in mind: Advances in the study of language and thought*, ed. Dedre Gentner & Susan Goldin-Meadow, 277–311. Cambridge, MA: MIT Press.
- Spelke, Elizabeth S., & Katherine D. Kinzler. 2006. Core knowledge. *Developmental Science* 10:89–96.
- Spelke, Elizabeth S., & Katherine D. Kinzler. 2009. Innateness, learning, and rationality. *Child Development Perspectives* 3:96–98.
- Tsarfaty, Reut, & Khalil Sima'an. 2007. Three-dimensional parametrization for parsing morphologically rich languages. In *Proceedings of the 10th Conference on Parsing Technologies*, ed. Harry Bunt & Paola Merlo, 156–167. Prague: Association for Computational Linguistics.
- Williams, Alexander. 2015. *Arguments in syntax and semantics*. Cambridge: Cambridge University Press.

Williams, Edwin. 1978. Across-the-board rule application. *Linguistic Inquiry* 9:31–43.

Winter, Yoad. 2001. *Flexibility principles in Boolean semantics*. Cambridge, MA: MIT Press.