

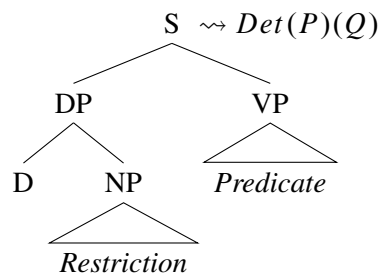
6. Introduction to Compositionality

6.1 Introduction

So far, we've talked about the meanings of lexical items and the meanings of sentences.

In order to link the two up, we've appealed to construction specific rules (e.g., a rule for quantificational subjects, a rule for sentences with a predicative adjective). Things like this:

- (1) **Rule D: Subjects with quantificational determiners**
If $D \rightsquigarrow Det$, $NP \rightsquigarrow P$ and $VP \rightsquigarrow Q$, then,



Now we're going to explore a more comprehensive theory of "composition" which will allow us to assign meanings to all different sizes of expressions between lexical items and sentences, such as noun/verb phrases or parts thereof.

In the process, we'll talk about some major areas in semantics:

- Guiding principles of semantic theory
- The interpretation of definite descriptions
- A typology of modifier (adjectival) meanings
- The importance of vagueness and context-dependence
- Some limits of compositionality

6.2 What is a compositional meaning?

Partee: “One of the starting points for thinking about what a semantic theory should be like is very similar to the main starting point of syntax: We need to account for a language user’s ability to understand novel sentences, of which there are a potential infinity.”

- (2)
- a. John said that Mary asked whether John said that Mary thought that
 - b. The dog’s ear’s point’s scratch’s shape’s corner’s ...
 - c. Angela, Barry, Chen, Dianne, Faroukh, and Zion.

6.2.1 Guiding principles

Partee gives the following definition of *compositionality*:

- (3) **Principle of Compositionality:**
 The meaning of a whole is a function of the meanings of the parts and of the way they are syntactically combined. Partee 1995: p313

Importantly, the notion of ‘parts’ here is informed by the syntactic structure of the sentence. Is (1) above compositional in this sense?

Partee invokes the advice philosophers of language:

- (4) **Lewis’s Advice:**
 “In order to say what a meaning is, we may first find what a meaning does, and then find something that does that.” Lewis 1970

We’ve talked about what the meaning of a sentence *does*: provide truth conditions — characterize what the world would be like in order to render the sentence as true.

What about the meanings of proper names? Of quantificational determiners?

For Lewis, semanticists should be designing formal objects which are able to carry out these tasks.

- (5) **Cresswell’s “Most Certain Principle”:**
 “For two sentences α and β , if (in some possible situation – BHP) α is true and β is false, α and β must have different meanings.” Cresswell 1982

We’ve carried out this kind of reasoning several times in this course. Any examples (from homeworks, lectures)? What does Cresswell’s principle say about these examples?

What does Cresswell’s principle say about *these* examples?

- (6)
- a. Your damn dog crawled through the hole in my fence.
 - b. Your dog crawled through the damn hole in my fence.

One goal of compositionality is to extend principles like these two down to the sub-sentence level.

6.2.2 Below the sentence

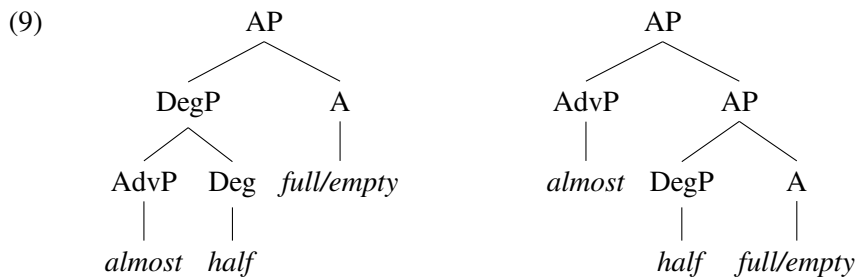
Partee suggests the following are synonymous:

- (7) a. half full
b. half empty

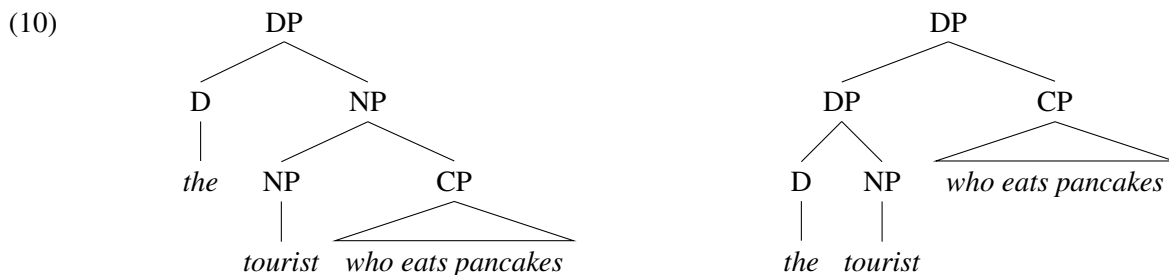
But these are not.

- (8) a. almost half full
b. almost half empty

The principles of compositionality above could inform an argument about the syntactic structures of (8). How do they help us choose between the following?



Compositionality gives us clues about the structures of noun phrases. Here are two potential structures for noun phrases with relative clauses. (NB: the labels aren't super important for semanticists)



First a meaning provided by Partee for *the* (see also Heim and Kratzer 1998:§4.4)

- (11) where $NP \rightsquigarrow \alpha$, *the NP* \rightsquigarrow the individual a such that a is the sole member of $[\alpha]$.

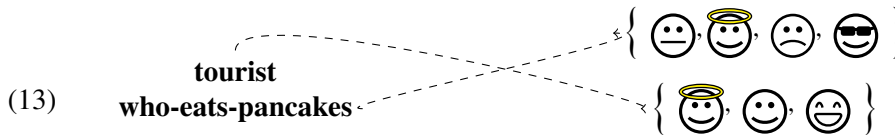
Partee's insight:

The noun *teacher* denotes a set of individuals, and so does the PP *from France*; similarly, for the noun *student* and the relative clause *who was curious*. Under analysis [on the left], the two set-denoting expressions are first combined to form a complex set-denoting expression, which can be interpreted as denoting the intersection of the two sets.

Partee 1995:321

assuming the following model, what is the denotation of:

- (12) a. *tourist*
 b. *who eats pancakes*
 c. *tourist who eats pancakes*
 d. *the tourist who eats pancakes*



6.3 Adjectival meanings

An intuitive theory of the meaning of adjectives (see, e.g., Heim and Kratzer 1998:§4.3).

- (14) **The intersective hypothesis:**
 Let $\text{Adj} \rightsquigarrow \alpha$, $\text{N} \rightsquigarrow \beta$, and the structure $[\text{Adj N}] \rightsquigarrow \gamma$.
 $\llbracket \gamma \rrbracket = \llbracket \alpha \rrbracket \cap \llbracket \beta \rrbracket$.

This theory explains the following inference. Why?

- (15) Smiley is a Swedish student.
Smiley is a violinist.
 Smiley is a Swedish violinist.

But it doesn't last long until we find the intersective hypothesis only works for a restricted set of adjectives. Compare the following inference:

- (16) Smiley is a skillful student.
Smiley is a violinist.
 #Smiley is a skillful violinist.

We have to classify adjectives based on these sorts of inferences. *Swedish* is an “intersective” adjective, but *skillful* is not.

- (17) **Intersective adjectives:**
 Let $\text{Adj} \rightsquigarrow \alpha$, $\text{N} \rightsquigarrow \beta$, and the structure $[\text{Adj N}] \rightsquigarrow \gamma$.
 If Adj is ‘intersective’, then $\llbracket \gamma \rrbracket = \llbracket \alpha \rrbracket \cap \llbracket \beta \rrbracket$.

We can say that *skillful* is ‘subsective’.

- (18) **Subsective adjectives:**
 Let $\text{Adj} \rightsquigarrow \alpha$, $\text{N} \rightsquigarrow \beta$, and the structure $[\text{Adj N}] \rightsquigarrow \gamma$.
 If Adj is ‘subsective’, then $\llbracket \gamma \rrbracket \subseteq \llbracket \beta \rrbracket$.

From subsectivity we can obtain the following inference:

- (19) Smiley is a skillful violinist.
 Smiley is a violinist.

Is *Swedish* also subsective? What's the relationship between subsectivity and intersectivity?

Are all adjectives subsective? What about *former*, *alleged*, and *counterfeit*? How do we know?

(20) **Non-subsective adjectives:**

Let $\text{Adj} \rightsquigarrow \alpha$, $\text{N} \rightsquigarrow \beta$, and the structure $[\text{Adj N}] \rightsquigarrow \gamma$.

If Adj is 'non-subsective', then $\llbracket \gamma \rrbracket \not\subseteq \llbracket \beta \rrbracket$.

(21) Smiley is an alleged violinist.

#Smiley is a violinist.

(22) Smiley is an alleged violinist.

#Smiley is not a violinist.

The final category is 'privative'.

(23) **Privative adjectives:**

Let $\text{Adj} \rightsquigarrow \alpha$, $\text{N} \rightsquigarrow \beta$, and the structure $[\text{Adj N}] \rightsquigarrow \gamma$.

If Adj is 'privative', then $\llbracket \gamma \rrbracket \cap \llbracket \beta \rrbracket = \emptyset$.

Something like *fake* or *former* is plausibly privative.

(24) Smiley is a former violinist.

#Smiley is a violinist.

(25) Smiley is a former violinist.

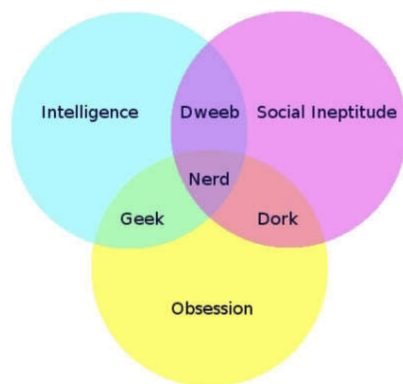
Smiley is not a violinist.

Is 'alleged' privative? What's the relationship between privativity and non-subsectivity?

For each of the four categories show whether the modifier *pseudo-* is in that category.

- (26) a. Intersective
b. Subsective
c. Non-subsective
d. Privative

An application, from *greatwhitesnark.com*



(27)

How would you classify the following?

- (28) a. future

- b. so-called
- c. virtual
- d. foreign
- e. boring
- f. current
- g. actual
- h. non-
- i. simulated

Partee's insight here: the relationship between the meaning of [Adj N] and the meaning of [N] seems to be determined by the semantic category of [Adj]. Following Lewis's advice:

- (29) **Adjectives as functions:** The meaning of an [Adj] is a **function** which maps an input [N]-meaning to an output [Adj N]-meaning.

What are some possible outputs given the following input [N]-meanings?

- (30) a. $\llbracket \text{swedish} \rrbracket^M(\{ \text{😊}, \text{😞}, \text{😎} \}) =$
 b. $\llbracket \text{skillful} \rrbracket^M(\{ \text{😊}, \text{😞}, \text{😎} \}) =$
 c. $\llbracket \text{former} \rrbracket^M(\{ \text{😊}, \text{😞}, \text{😎} \}) =$
 d. $\llbracket \text{alleged} \rrbracket^M(\{ \text{😊}, \text{😞}, \text{😎} \}) =$

This idea that **meanings are functions** is essentially the core of compositional semantics in the tradition of Montague, Lewis, Partee and so on.

6.4 Introducing context-dependence

6.4.1 Vagueness and comparison class

What's the semantic category of *tall* given the following attempted inference?

- (31) Smiley is a tall 13-year old.
 Smiley is a basketball-player.
 #Smiley is a tall basketball-player.

But *tall* is a vague adjective, and maybe it is interpreted differently in the premise ... and the conclusion ...; if so, maybe this test is not conclusive. When an adjective is vague, like *tall* or *young* or *blue*, the lexical semantics is not simply a matter of classifying entities into those that are *tall* and those that are not. Intuitively, it seems that for vague adjectives, there may be some clear positive cases and/or some clear negative cases, and there are unclear cases, or a "range of indeterminacy", in between. (Partee 1995)

This view of *tall* is plainly incompatible with our view of adjectives on previous handouts (below). Why?

- (32) For any Adj_{intr} , $[\text{Adj}_{\text{intr}}] \rightsquigarrow \text{pred}$, such that $\llbracket \text{pred} \rrbracket \subseteq U$.

Intuitively, we can only get the 'yes' cases for *tall*, and the 'no' cases in a particular context.

(33) **Some terminology:**

- a. the 'no' cases: *the negative extension*
- b. the 'yes' cases: *the positive extension*

The following might be simultaneously true. Any thoughts why?

- (34)
- a. Squeaky the mouse is big.
 - b. Stampy the elephant is not big.

Does this help us understand why (31) seems invalid?

There are two ways of failing the following inference schema:

- (35)
- | | |
|--------------------------------|--|
| x is an Adj N ₁ | |
| x is a N ₂ | |
| x is an Adj N ₂ . | |

Either Adj is non-intersective, or Adj is *vague*.

Siegel 1976: non-intersective adjectives are modified with *as*, vague adjectives are modified with *for*.

- (36)
- a. It is tall *for*/?*as* a mountain.
 - b. He is skillful *for*/*as* a surgeon.
 - c. It is red *for*/?*as* a bell pepper.
 - d. It is viable ??*for*/*as* a operational strategy.

Vague adjectives: If [Adj] is 'vague', then individual *d* is in the positive extension of [Adj] only relative to some contextually determined 'comparison class'.

But how this comparison class comes to be part of the meaning is a big question.

Sometimes the comparison class is overtly stated. Then the inference in (31) is not mysterious.

- (37)
- | | |
|---|--|
| Smiley is a tall 13-year old (compared to other 13-year olds). | |
| <u>Smiley is a basketball-player.</u> | |
| #Smiley is a tall basketball-player (compared to other basketball players). | |

More insight comes from nouns which moonlight as adjectives. Partee suggests examples like the following are generally contradictory. To construct a non-contradictory reading, they must be evaluated relative to different comparison classes.

- (38)
- a. Smiley is a chief and Smiley is a servant.
 - b. Frowny is a juvenile and Frowny is a grown-up.
 - c. Cool is an expert and Cool is a novice.

However, the following are not contradictory in any sense.

- (39)
- a. Smiley is a chief servant.
Smiley is a servant chief.
 - b. Frowny is a juvenile grown-up.
Frowny is a grown-up juvenile.

- c. Cool is an expert novice.
Cool is a novice expert.

This tells us that the predicate serving as head noun is interpreted relative to the given “external” context [the utterance context] ..., and the predicate serving as the modifier appears to be “recalibrated” in such a way as to make distinctions within the class of possible referents for the head noun. (Partee 1995:333)

Based on these kinds of examples, Partee proposes two principles:

- (40) **Parallel Structure Effect:**
In a (syntactically) conjoined structure each conjunct is interpreted in a parallel way relative to its common context. (NB: maybe a default preference, probably violable)
- (41) **Head Primacy Principle:**
In a modifier-head structure, the head is interpreted relative to the context of the whole constituent, and the modifier is interpreted relative to the local context created from the former context by the interpretation of the head.

In a context in which we are discussing Cool’s capabilities in library science, compare how the interpretation of (38-c) and (39-c) proceeds.

An analysis which ensures the head-primacy principle

- (42) a. In an [Adj N]-structure, the [N] is the head and the [Adj] is the modifier.
b. Terms like *expert/novice* are interpreted relative to a comparison class (of library scientists, linguists, geographers).
c. $\llbracket \text{expert} \rrbracket$ and $\llbracket \text{novice} \rrbracket$ are functions from a comparison class to a positive extension.

How would you describe the following circumstance in plain English.

- (43) a. $\llbracket \text{expert} \rrbracket (\{ \text{😊} \cdot \text{😞} \cdot \text{😏} \cdot \text{😊} \}) = \{ \text{😞} \cdot \text{😏} \}$
b. $\llbracket \text{novice} \rrbracket (\{ \text{😊} \cdot \text{😞} \cdot \text{😏} \cdot \text{😊} \}) = \{ \text{😊} \}$
c. $\llbracket \text{novice} \rrbracket (\llbracket \text{expert} \rrbracket (\{ \text{😊} \cdot \text{😞} \cdot \text{😏} \cdot \text{😊} \})) = \{ \text{😏} \}$

Under this analysis, a basic sentence like ‘Smiley is an expert’ can only be given a truth value when a comparison class is chosen (even if it is not overtly stated).

6.4.2 Perspective

Something we haven’t touched much have been *indexicals* and *demonstratives* (or *deictics*). NB: there isn’t a hugely meaningful distinction between the two.

- (44) **Indexicals:** *I, you, here, now, today*
Expressions whose reference changes depending on the utterance context.
- (45) **Demonstrative:** *this, those, these*
An indexicals incorporating (temporal, spatial, discourse) proximity.

Core intuition from Kaplan 1977: indexicals are referential only given a particular context.

Following Lewis's advice: indexicals are functions which take a context as an input and output a referent.

Contexts are very tricky to define. Let's start by analyzing a context as an individual, namely the speaker of the given utterance. NB: this is definitely not enough, but it will do for now.

- (46)
- $I \rightsquigarrow \mathbf{sp}$, a function from the speaker to the speaker
 - $you \rightsquigarrow \mathbf{addr}$, a function from the speaker to the person the speaker is addressing.
 - $here \rightsquigarrow \mathbf{loc}$, a function from the speaker to the speaker's location
 - $now \rightsquigarrow \mathbf{now}$, a function from the speaker to the speaker's time

These expressions will only have referents once the context (i.e., the speaker) is fixed.

- (47)
- $\llbracket \mathbf{sp} \rrbracket (\llbracket \mathbf{James} \rrbracket) =$
 - $\llbracket \mathbf{addr} \rrbracket (\llbracket \mathbf{James} \rrbracket) =$
 - $\llbracket \mathbf{loc} \rrbracket (\llbracket \mathbf{James} \rrbracket) =$
 - $\llbracket \mathbf{now} \rrbracket (\llbracket \mathbf{James} \rrbracket) =$

- (48) "He [Trump] has no known ideology except me." (Noam Chomsky on Trump's Victory, Al Jazeera, Nov 2016)

Lots of other expressions incorporate indexical components. What's indexical about these?

- (49)
- on the right/left*
 - in front of/behind*
 - go out and play!*
 - come in and play!*
 - bring it here*
 - take it there*
 - buy this fish*
 - sell this fish*

In each case, the expression can be treated like a function from a perspective holder (like the speaker) to a referent. What are the following saying in plain English?

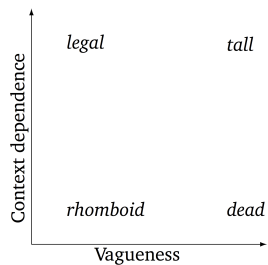
- (50)
- $\llbracket \mathbf{on\ the\ right} \rrbracket (\text{😊}) = \{ \text{😞}, \text{😏} \}$
 - $\llbracket \mathbf{on\ the\ right} \rrbracket (\text{😊}) = \{ \text{😊}, \text{😞}, \text{😏} \}$

Many of the meanings we've looked at, including vague adjectives and indexicals are a challenge to the principle of compositionality, repeated below. Why?

- (51) **Principle of Compositionality:**

The meaning of a whole is a function of the meanings of the parts and of the way they are syntactically combined. Partee 1995: p313

How common is it for words to have vague and/or context dependent meanings?



(52)

6.5 The definite article

The following analysis of *the*, see Strawson 1950, uses both of these notions of ‘meanings as functions’ and context dependence.

(53) where $NP \rightsquigarrow \alpha$, *the* $NP \rightsquigarrow$ the individual a such that a is the sole member of $[[\alpha]]$.

What are the values of the following?

- (54) a. $[[\mathbf{the}]](\{\text{☺}\})$
 b. $[[\mathbf{the}]](\{\text{☹}\})$
 c. $[[\mathbf{the}]](\{\text{☹}, \text{☺}\})$
 d. $[[\mathbf{the}]](\emptyset)$
 e. $[[\mathbf{the}]](\{\{\text{☹}\}\})$

How does this theory give a sense about these sentences. See Frazier 2006.

- (55) a. Sam bought a new house. The roof is a bit leaky.
 b. Ellen walked into her office. The computer seemed to have been stolen.
 c. Greg bought a dozen eggs. The egg was broken.
 d. At the coffee shop, Joan was reading near the back. The table was a bit tippy.
 e. At the coffee shop, Joan looked around for a place to sit. The table was a bit tippy.
 f. Kim started her computer. The steering wheel was cold.
 g. Hank closed the window. The bee was buzzing just outside it.
 h. Sam was browsing around the campus bicycle shop. The front wheel was misaligned.
 i. Sam brought his bicycle to the campus bicycle shop. The front wheel was misaligned.

6.6 Gradability in adjectives

6.6.1 Scale structure

Look at the following inferences involving *metaphysical counterfactuals*. NB: ‘counterfactual’ means reasoning about possible states of the world which are false. ‘metaphysical’ involves reasoning about the way the world could be given basic laws of the universe.¹

- (56) $\frac{\text{Smiley is tall.}}{\text{Smiley could be taller.}}$ $\frac{\text{The cup is full}}{\# \text{ The cup could be more full.}}$

¹The relationship between scale structure and metaphysical modality is briefly touched on in Djalali 2016, but there is more to explore.

- (57) Smiley is tall. The cup is full
 #Smiley could not be taller. The cup could not be more full.

Adjectives like *tall* are ‘relative’, adjectives like *full* are ‘absolute’ (see Kennedy and McNally 2005; Rotstein and Winter 2004 etc).

- (58) a. **Relative adjectives**
 An adjective is ‘relative’ if it measures an individual along a scale with no intrinsic maximum or minimum.
 b. *tall, short, wide, narrow, fat, thin, old, expensive, big, small, delicious, disgusting*
- (59) a. **Absolute adjectives**
 An adjective is ‘absolute’ if it measures an individual along a scale with does have an intrinsic maximum or minimum.
 b. with a ‘maximum’: *full, closed, invisible, flat, straight, pure*

Whether an adjective is relative or absolute depends on the scale is associates with. Scales either have or don’t have natural endpoints. Do the following scales have endpoints?

- (60) a. *tall/short* - height
 b. *wide/narrow* - width
 c. *young/old* - age
 d. *(in)visible* -
 e. *clear/opaque* -
 f. *full/empty* -
 g. *delicious* -

We can start to model this with our view of meanings as functions. Let’s say HEIGHT is a function which maps individuals to their heights.

$$(61) \quad \text{HEIGHT} = \left[\begin{array}{l} \text{😊} \mapsto 175 \\ \text{😬} \mapsto 147 \\ \text{😊} \mapsto 190 \\ \text{😞} \mapsto 181 \\ \text{😐} \mapsto 170 \end{array} \right]$$

We need to enrich our ontology. So far we have truth values and individuals. Now we need ‘degrees’, which for now can just be natural numbers.

Now we can deconstruct the predicate **tall**, denoting the set of individuals whose height is greater than some contextual standard for ‘tallness’ θ . See Lassiter and Goodman 2017.

$$(62) \quad \llbracket \text{tall} \rrbracket = \{ x \mid \text{HEIGHT}(x) \geq \theta \}$$

What type of object is θ ? How do you think θ is calculated? How do you think it relates to the comparison class discussed above?

The height scale is ‘open’: as long as an individual occupies physical space, it will map to a degree $\in (0, 1)$. NB: for any $n \in (0, 1)$, there’s always $n' < n < n''$.²

How would you describe the next function?

$$(63) \quad \text{INVISIBLE} = \left[\begin{array}{l} \text{☺} \mapsto 1 \\ \text{☹} \mapsto 0.01 \\ \text{☺} \mapsto 0.01 \\ \text{☹} \mapsto 1 \\ \text{☹} \mapsto 0.04 \end{array} \right]$$

Unlike the height scale, the visibility scale is ‘closed’. There’s an upper limit at which point you can’t be ‘more invisible’.

Thus INVISIBLE maps individuals to a degree $\in (0, 1]$, meaning if $n = 1$, there’s no $n' > n$.

Finally, the predicate **invisible** maps individuals to a set of individuals such that their degree of invisibility is at the maximum. Take **max** to map a scale to its maximum degree.

$$(64) \quad \llbracket \mathbf{invisible} \rrbracket = \{ x \mid \text{INVISIBLE}(x) = \mathbf{max}(\text{INVISIBLE}) \}$$

There are two components here which create adjectives:

- Whether the associated scale (e.g., HEIGHT, INVISIBLE) is closed or open
- Do the individuals in the denoted set outrank some arbitrary standard θ , or are at the **max**.

- Relative adjectives (like *tall*, *wide*, *happy*) are [OPEN, θ].
- Absolute adjectives (like *invisible*, *full*, *closed*) are [CLOSED,**max**].

Could there be a [OPEN,**max**] adjective? What would **max**(HEIGHT) be?

(66) **Kennedy’s Puzzle:**

There are **no** adjectives in natural language which are [CLOSED, θ], even though it is not ruled out in the ontology.

See Kennedy 2007, Potts 2008 for ideas about why this universal holds, but so far there’s no consensus about what predicts this generalization, or if it’s even empirically justified.

Adverbs of maximality (*completely*, *totally*, *fully*, *perfectly*) can only modify one type of adjective, which one? What’s some supporting data? (see Kennedy and McNally 2005; Syrett and Lidz 2010).

6.6.2 Scalarity in acquisition

Syrett, Kennedy, and Lidz 2009 is an experimental paper about the interpretation of gradable adjectives with different scale structures by adults and children.

Thirty children representing three age groups participated in this task: 10 three-year-olds (five boys and five girls, range: 3;5–3;11, M: 3;8); 10 four-year-olds (four boys and six

²Of course the heights in (63) have to be normalized into (0,1).

girls, range: 4;1–4;11, M: 4;5) and 10 five-year-olds (three boys and seven girls, range: 5;1–5;8, M: 5;5). Twenty-four adults served as controls.

Children were introduced to a puppet (played by a second experimenter) and were told that the purpose of the game was to help the puppet learn how to ask for things. They were then told that they would be shown two objects at a time and that every time they saw two objects, the puppet would ask for something. Their job was to determine if they could give the puppet what he asked for based on his request, and if they could not, to tell him why not. Each request included a singular definite DP of the form *the A one*, where A was an adjective (e.g. ‘Please give me the red one’).

(67)

Adjective	Stimuli	Pragmatic status of request
Colour		
<i>Yellow</i>	Pictures of a yellow bird and a black bird	Felicitous
<i>Red</i>	Red poker chip and a white poker chip	Felicitous
<i>Green</i>	Purple yo-yo and yellow yo-yo	Infelicitous (existence)
<i>Red</i>	Pictures of a red square and a red circle	Infelicitous (uniqueness)
Shape		
<i>Square</i>	Pictures of a blue square and a yellow circle	Felicitous
<i>Round</i>	Pictures of a red triangle and a red square	Infelicitous (existence)
Mood		
<i>Sad</i>	Pictures of a sad face and a happy face	Felicitous
<i>Happy</i>	Pictures of a sad face and an angry face (a)	Infelicitous (existence)
<i>Happy</i>	Pictures of a sad face and an angry face (b)	Infelicitous (existence)

(68)

Adjective	Stimuli	Pragmatic status of request
Relative		
<i>Big</i>	Two big blocks, one bigger than the other	Felicitous
<i>Big</i>	Two small blocks, one bigger than the other	Felicitous
<i>Long</i>	Two long rods, one longer than the other	Felicitous
<i>Long</i>	Two short rods, one longer than the other	Felicitous
Absolute		
<i>Spotted</i>	Two disks, one with some spots, one with none	Felicitous
<i>Spotted</i>	Two disks, one with some spots, one with more	Infelicitous (uniqueness)
<i>Full</i>	Two jars, one full, one about 2/3 full	Felicitous
<i>Full</i>	Two jars, neither full, one fuller than the other	Infelicitous (existence)



(69)

			Age group							
			3 years		4 years		5 years		Adults	
			1	0/2	1	0/2	1	0/2	1	0/2
1	Control	(felicitous)	98	2	100	0	100	0	100	0
2	Control	(infelicitous)	4	90	0	98	0	100	0	100
3	<i>Big</i>	(big)	100	0	100	0	100	0	100	0
4	<i>Big</i>	(small)	90	10	90	10	100	0	96	4
5	<i>Long</i>	(long)	80	20	90	10	100	0	100	0
6	<i>Long</i>	(short)	100	0	100	0	100	0	96	4
7	<i>Spotted</i>	(felicitous)	100	0	100	0	100	0	100	0
8	<i>Spotted</i>	(infelicitous)	20	80	30	70	10	90	4	96
9	<i>Full</i>	(felicitous)	100	0	100	0	100	0	96	4
10	<i>Full</i>	(infelicitous)	60	40	70	30	70	30	12	88

(70)

- (71) a. ‘1’ means the participant handed the puppet the expected item.
 b. ‘0/2’ means the participant handed neither item or both items.

In rejecting the puppet’s request, children often offered responses such as ‘Oh, but I have TWO red ones!’; ‘What red one? He should say what shape!’; ‘He thinks there must be two different colours!’; or ‘They’re ALL spotted!’

There were no significant differences between control trials and relative adjectives in any group (rows 1–6).

Both children and adults are able to felicitously interpret ‘*the long/big one*’ in cases with two objects of differing size. How does our theory of ‘*the*’ and adjectives explain this? Let’s assume ‘*long one*’ and ‘*long*’ mean the same thing.

(72) $\llbracket \text{long} \rrbracket = \{ x \mid \text{LENGTH}(x) \geq \theta \}$

(73) where $\text{NP} \rightsquigarrow \alpha$, *the NP* \rightsquigarrow the individual a such that a is the sole member of $\llbracket \alpha \rrbracket$.

What do children/adults do in order to make sure that ‘*Hand me the long/big one*’ is executable?

Children’s responses only diverged from adults’ in one instance (row 10). Instead of rejecting the puppet’s request when shown the infelicitous full pair, as adults categorically did, children gave the puppet the fuller of the two containers when asked for *the full one*.

Possible explanations:

- Children interpret *full* as a $[\text{OPEN}, \theta]$ adjective
- Children interpret *full* as a comparative *more full*.
- Children set the **max** for fullness on an ad-hoc basis, based on what’s presented to them.

6.7 Possible paper topics

- There have been a few cited cases in which the grammar seems to be sensitive to whether an adjective is subsecutive/privative. For example, a rough generalization is that English non-subsecutive adjectives cannot be predicates (e.g., **The spy is alleged*, **The husband is former*).

Greek adjectives are marked with their own definite articles, but only if they are intersective (Velegrakis 2011). What about Turkish/Persian *ezafe*?

- Cinque 2005 (and Dryer 2018) argue that many languages have all different kinds of orderings of determiners and adjectival modifiers. How does this cohere with our theory of definite articles and how they are sensitive to how the NP has been modified? Do these languages have different kinds of meanings for NPs or should some part of the theory be altered?
- Syrett, Kennedy, and Lidz 2009 go into a fair bit more detail about how children interpret scalar expressions within definites. There's much more to be understood about how children understand adjectival meanings. What about properties relating to subsectivity and so on? What about sensitivity to perspective/indexicality?
- Kaplan 1977 suggests that indexicals always have to be evaluated relative to the utterance context. But cases where they seem to not be are very easy to find in corpora, for example things like 'Next Thursday I'll be nervous because I'll be thinking that I have to give a talk tomorrow', or 'As the challenged, I am traditionally allowed the choice of weapon' (from Sæbø 2015). Are these errors? Metaphors? Quotes? Are words like 'I' or 'tomorrow' ambiguous between indexicals and non-indexicals?

6.8 Further reading

- For more on the issues raised by this article for cognitive science more generally, see Kamp and Partee 1995.
- The very preliminary theory of indexicals follows from Kaplan 1977. See Elbourne 2008; Nunberg 2004; Sæbø 2015 for some modern takes.
- The theory of the definite article laid out above is pretty standard by now, stemming from Partee 1986; Strawson 1950 in particular, though see e.g., Russell 1905, or Coppock and Beaver 2015.
- The theory of scale structure follows primarily from Rotstein and Winter 2004 and Kennedy and McNally 2005. See Burnett 2016; Djalali 2016; Sassoon 2013 for some fleshing out of the formal foundations.
- The question of how ' θ ' is set is a big question in pragmatics. See Lassiter and Goodman 2017 for a particularly precise, satisfying theory, or Qing and Franke 2014.
- The assignment cites some studies which are worth reading for general interest: Levin, Glass, and Jurafsky 2019; Samonte and Scontras 2019; Scontras and Nicolae 2014, and Hankamer and Mikkelsen 2005.

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