Semantik, Modul 1003

Modification: functional application vs. predicate modification

Heim & Kratzer (1998), ch. 4.3

Leipzig University

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Recap: Non-verbal predicates

- we looked at non-verbal predicates like adjectives, nominals, and prepositions
- many adjectives and nominals can be treated as one-place predicates:

(1) a. $[\![\textit{student}]\!] = \lambda y_{\langle e \rangle}[\text{student}(y)]$

b. $[\![\textit{happy}]\!] = \lambda y_{\langle e \rangle}[\text{happy}(y)]$

- prepositions are two-place predicates if they contribute meaning,

(2) a. Spiderman is above Hulk.

b. $[\![\textit{above}]\!] = \lambda y_{\langle e \rangle}\lambda x_{\langle e \rangle}[\text{above}(x, y)]$

- if they don't contribute meaning, we treat them as identity functions

(3) a. John gave a present to Mary.

b. $[\![\textit{to}]\!] = \lambda y_{\langle e \rangle}[y]$

Recap: Modification

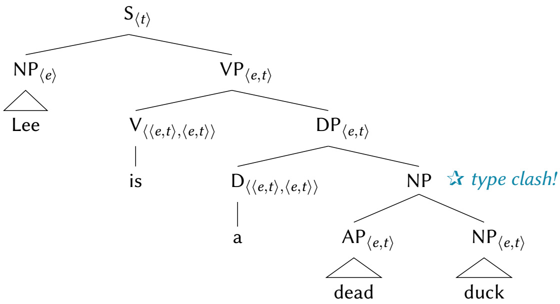
We agreed on the following definition for modifiers:

Modifiers *(McNally, 2016, 243)*

An expression that combines with an unsaturated expression to form another unsaturated expression of the same type.

- arguments, in contrast, do saturate predicates
- combining adjectives with nominals creates a type clash

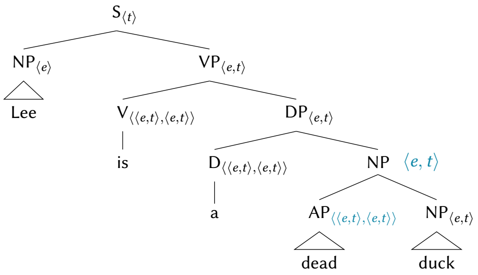
(4)



Modification: the lexical approach

One way of giving *dead duck* the type $\langle e,t\rangle$ is by changing the semantics of *dead* (or *duck*) into $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$.

(5)



(6)

a. $[\![\textit{duck}]\!] = \lambda x_{\langle e\rangle}[\text{duck}(x)]$ *Lex*

b. $[\![\textit{dead}_{attr}]\!] = \lambda P_{\langle e,t\rangle}\lambda y_{\langle e\rangle}[\text{dead}(y)\wedge P(y)]$ *Lex*

c. $[\![\textit{dead}_{attr}]\!]([\![\textit{duck}]\!]) = \lambda P_{\langle e,t\rangle}\lambda y_{\langle e\rangle}[\text{dead}(y)\wedge P(y)](\lambda x_{\langle e\rangle}[\text{duck}(x)])$ *FA*

d. $[\![\textit{dead}_{attr}\ \textit{duck}]\!] = \lambda y_{\langle e\rangle}[\text{dead}(y)\wedge\ \lambda x_{\langle e\rangle}[\text{duck}(x)](y)]$ *λ-C*

$= \lambda y_{\langle e\rangle}[\text{dead}(y)\wedge\ \text{duck}(y)]$ *λ-C*

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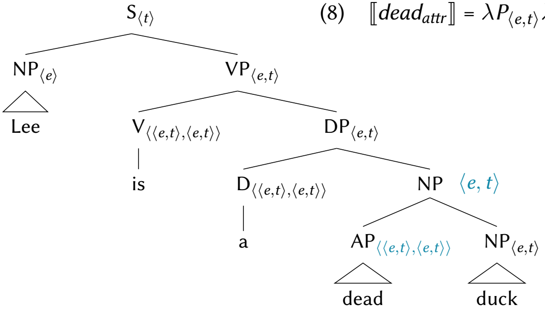

(8) $[\![dead_{attr}]\!] = \lambda P_{\langle e,t\rangle}\lambda x_{\langle e\rangle}[\text{dead}(x) \wedge P(x)]$

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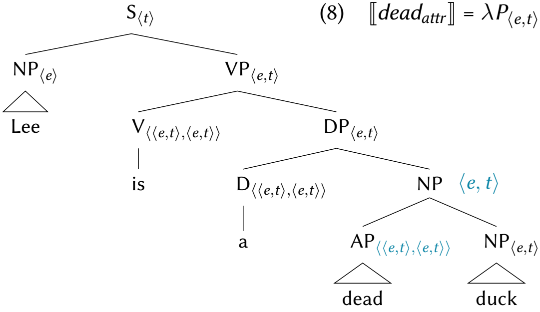

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Advantage:
Semantic composition is done exclusively by functional application (Frege's conjecture).

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(7) $[_{S_{\langle t\rangle}}\ [_{NP_{\langle e\rangle}}\ \text{Lee}]\ [_{VP_{\langle e,t\rangle}}\ [_{V_{\langle\langle e,t\rangle,\langle e,t\rangle\rangle}}\ \text{is}]\ [_{DP_{\langle e,t\rangle}}\ [_{D_{\langle\langle e,t\rangle,\langle e,t\rangle\rangle}}\ \text{a}]\ [_{NP\ \langle e,t\rangle}\ [_{AP_{\langle\langle e,t\rangle,\langle e,t\rangle\rangle}}\ \text{dead}]\ [_{NP_{\langle e,t\rangle}}\ \text{duck}]]]]]$

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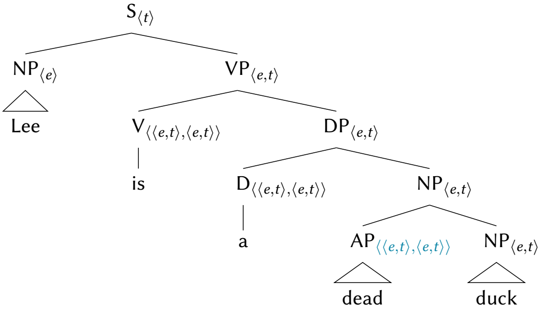
Advantage:
Semantic composition is done exclusively by functional application (Frege's conjecture).

Disadvantage:
Adjectives are ambiguous between a predicative meaning and an attributive meaning.

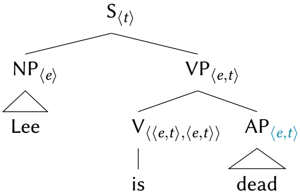
Modification: the lexical approach

Ambiguous meaning for *dead*:

(9) $[\![dead_{attr}]\!] = \lambda P_{\langle e,t\rangle}\lambda x_{\langle e\rangle}[\text{dead}(x) \wedge P(x)]$



(10) $[\![dead_{pred}]\!] = \lambda x_{\langle e\rangle}[\text{dead}(x)]$



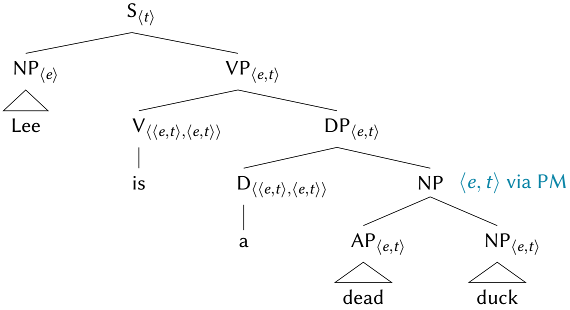
Modification: the compositional approach

Another way of giving *dead duck* the type $\langle e, t\rangle$ is by introducing a new compositional rule.

Predicate Modification adapted from *(Heim and Kratzer, 1998, 65)*

If α is a branching node with $\{\beta, \gamma\}$ as its set of daughters, and $[\![\beta]\!]$ and $[\![\gamma]\!]$ both denote in $D_{\langle e,t\rangle}$, then: $[\![\alpha]\!] = \lambda x_{\langle e\rangle}.[\![\beta]\!](x) \wedge [\![\gamma]\!](x)$

(11)



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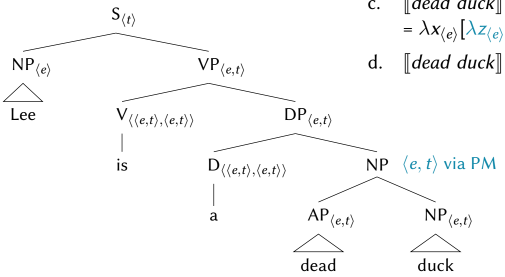

(13)

a. $[\![\textit{duck}]\!] = \lambda y_{\langle e\rangle}[\text{duck}(y)]$ *Lex*

b. $[\![\textit{dead}]\!] = \lambda z_{\langle e\rangle}[\text{dead}(z)]$ *Lex*

c. $[\![\textit{dead duck}]\!] = \lambda x.[\![\textit{dead}]\!](x) \wedge [\![\textit{duck}]\!](x)$
$= \lambda x_{\langle e\rangle}[\lambda z_{\langle e\rangle}[\text{dead}(z)](x)] \wedge [\lambda y_{\langle e\rangle}[\text{duck}(y)](x)]$ *PM*

d. $[\![\textit{dead duck}]\!] = \lambda x_{\langle e\rangle}.\text{dead}(x) \wedge \text{duck}(x)$ *λ-C*

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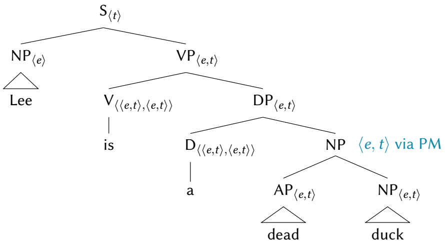

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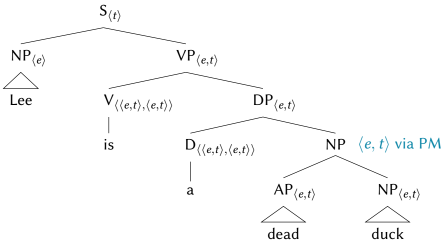

Advantage:
Adjective have the same denotation, in predicative and in attributive position.

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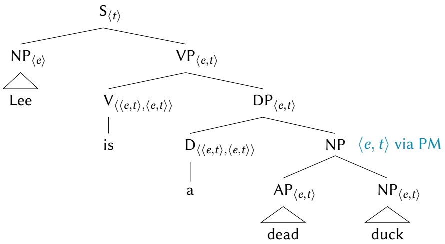

Advantage:
Adjective have the same denotation, in predicative and in attributive position.

Disadvantage:
Not all semantic composition is done by functional application. We add predicate modification.

Exercise

Give the denotation of the following sentence by using predicate modification:

(15) Plagwitz ist ein Kiez in Leipzig.

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f. $[\![ein]\!] = \lambda P_{\langle e,t \rangle}[P]$; $[\![ist]\!] = \lambda P_{\langle e,t \rangle}[P]$ *Lex*

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$= \text{kiez}(\text{Plagwitz}) \wedge \text{in}(\text{Plagwitz},\text{Leipzig})$
$= 1$ gdw Plagwitz ist ein Kiez in Leipzig *FA,λ-C*

Types of modifiers: intersective

So far we have only dealt with intersective modifiers. In set terms:

(17) a. $[\![\textit{Kiez}]\!]$ = {x | x ist ein Kiez}

b. $[\![\textit{in Leipzig}]\!]$ = {x | x ist in Leipzig}

c. $[\![\textit{Kiez}]\!] \cap [\![\textit{in Leipzig}]\!]$ = {x | x ist ein Kiez und x ist in Leipzig}

(18) a. $[\![\textit{duck}]\!]$ = {x | x is a duck}

b. $[\![\textit{dead}]\!]$ = {x | x is dead}

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Modifiers are often classified in terms of which kinds of inferences they allow. "$\models$" can be read as "entails" or "implies". Entailments are relations between propositions: $S_1 \rightarrow S_2$ means in any situation in which S_1 is true, S_2 is also true.

(19) Lee is a dead duck. S_1

a. $\models$ Lee is dead. S_2

b. $\models$ Lee is a duck. S_2

Types of modifiers: subsective

There are other kinds modifiers which do not allow such inferences.

(20) Mike is a beautiful dancer.

a. $\models$ Mike is a dancer.

b. $\not\models$ Mike is beautiful.

Why?

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Why? Mike might not be beautiful, only his dancing is.

This reading is also called a subsective reading. They signal that the modifier picks out a subset of individuals within the extension of the expression they modify.

(21) a. $[\![\textit{dancer}]\!] = \{x \mid x \text{ is a dancer}\}$

b. $[\![\textit{beautiful}]\!] = \{x \mid x \text{ is beautiful}\}$

c. $[\![\textit{beautiful dancer}]\!] \subseteq [\![\textit{dancer}]\!]$ iff for all x,
if $x \in [\![\textit{beautiful dancer}]\!]$, then $x \in [\![\textit{dancer}]\!]$

Types of modifiers: subsective

A modifier like *beautiful* is ambiguous between a subsective and an intersective reading. There are modifiers which can only get a subsective reading.

(22) Mike is a typical linguist.

a. $\models$ Mike is a linguist.

b. $\not\models$??Mike is typical.

(23) a. $[\![\textit{linguist}]\!] = \{x \mid x \text{ is a linguist}\}$

b. $[\![\textit{typical}]\!] = \{x \mid x \text{ is typical}\}$

c. $[\![\textit{typical linguist}]\!] \subseteq [\![\textit{linguist}]\!]$ iff for all x,
if $x \in [\![\textit{typical linguist}]\!]$, then $x \in [\![\textit{linguist}]\!]$

Types of modifiers: subsective

The modifiers *beautiful* and *typical* are different from each other in that the former allows for two readings, whereas the latter only allows for one reading.

(24) Mike is a beautiful dancer.
$\rightsquigarrow_{reading1}$ Mike is beautiful and he is a dancer. *intersective*
$\rightsquigarrow_{reading2}$ Mike dances beautifully. *subsective*

(25) Mike is a typical linguist.
$\not\rightsquigarrow_{reading1}$ Mike is typical and he is a linguist. *intersective*
$\rightsquigarrow_{reading2}$ Mike does linguistics in a typical fashion. *subsective*

A consequence of being ambiguous is that one reading can be confirmed while the other is being denied within the same sentence. Exclusively subsective modifiers cannot occur in such sentences.

(26) a. That beautiful dancer isn't beautiful.
b.?? That typical linguist isn't typical.

Exercise

Find out whether the modifiers in the following sentences are ambiguous or exclusively subsective.

(27) Emma ist eine erfahrene Autofahrerin.

(28) Max is a big idiot.

(29) Luise is an old friend.

Exercise

Find out whether the modifiers in the following sentences are ambiguous or exclusively subsective.

(27) Emma ist eine erfahrene Autofahrerin.
$\not\rightsquigarrow_{reading1}$ Emma ist erfahren und sie ist eine Autofahrerin. *intersective*
$\rightsquigarrow_{reading2}$ Emma ist erfahren als Autofahrerin. *subsective*

(28) Max is a big idiot.

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$\rightsquigarrow_{reading1}$ Max is physically big and an idiot. *intersective*
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$\rightsquigarrow_{reading1}$ Max is physically big and an idiot. *intersective*
$\rightsquigarrow_{reading2}$ Max is very idiotic. *subsective*

(29) Luise is an old friend.
$\rightsquigarrow_{reading1}$ Luise is old and a friend. *intersective*
$\rightsquigarrow_{reading2}$ Luise has been a friend for a long time. *subsective*

Types of modifiers: subsective

(30) Mike is a beautiful dancer.
$\leadsto$ Mike is beautiful and he is a dancer. *intersective, see (31a)*
$\leadsto$ Mike dances beautifully. *subsective, see (31b)*

(31) a. $[\![\textit{beautiful}]\!] \cap [\![\textit{dancer}]\!]$ = {x | x is beautiful and x is a dancer}

b. $[\![\textit{beautiful dancer}]\!] \subseteq [\![\textit{dancer}]\!]$ iff for all x, if x $\in [\![\textit{beautiful dancer}]\!]$, then x $\in [\![\textit{dancer}]\!]$

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The fact that a lot of modifiers have a subsective reading has led some scholars, most famously Montague (1970), to argue for the lexical approach of modification. A subsective analysis can be (informally) given in (32b), see (Morzycki, 2016, 42) for discussion. See also Siegel (1976) who argues for the necessity of both approaches.

(32) a. $[\![\textit{beautiful}]\!] = \lambda P_{\langle e,t\rangle}\lambda x_{\langle e\rangle}[\text{beautiful}(x) \wedge P(x)]$ *intersective*

b. $[\![\textit{beautiful}]\!] = \lambda P_{\langle e,t\rangle}\lambda x_{\langle e\rangle}[\text{beautiful-as-P}(x) \wedge P(x)]$ *subsective reading*

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Why is this an argument against the compositional approach?

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Why is this an argument against the compositional approach?

Because for predicate modification the modifier needs to be truth-conditionally independent from the noun it modifies. In (32b), however, P is a part of both conjuncts.

Types of modifiers: subsective

(33) Mike is a beautiful dancer
$\rightsquigarrow$ Mike is beautiful and he is a dancer. *intersective*
$\rightsquigarrow$ Mike dances beautifully. *subsective*

There is also a way to maintain the compositional analysis. Larson (1998) proposed a unified analysis for attributive adjectives and predicative adjectives, making use of *event semantics* (Davidson, 1967). The idea is that some nouns are not only predicates over individuals, they also introduce an event variable of type $\langle v \rangle$.

(34) $$\underbrace{[\![dancer]\!]}_{\langle e,\langle v,t\rangle\rangle} = \underbrace{\lambda z_{\langle e \rangle}}_{\langle e,} \underbrace{\lambda e_{\langle v \rangle}}_{\langle v,} \underbrace{[dancer(z)(e)]}_{t\rangle\rangle}$$

Types of modifiers: subsective

(33) Mike is a beautiful dancer
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The intuition of the subsective reading is that *beautiful* modifies the event of dancing, whereas under the intersective reading *beautiful* modifies the individual.

(35) a. $[\![\textit{beautiful dancer}]\!] = \lambda z_{\langle e\rangle}\lambda e_{\langle v\rangle}[\text{dancer}(z)(e) \wedge \text{beautiful}(z)]$ *intersective*

b. $[\![\textit{beautiful dancer}]\!] = \lambda z_{\langle e\rangle}\lambda e_{\langle v\rangle}[\text{dancer}(z)(e) \wedge \text{beautiful}(e)]$ *subsective reading*

Types of modifiers: subsective

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b. $[\![\textit{beautiful dancer}]\!] = \lambda z_{\langle e\rangle}\lambda e_{\langle v\rangle}[\text{dancer}(z)(e) \wedge \text{beautiful}(e)]$ *subsective reading*

Note that one has to modifiy the rule of predicate modification since the nominal does not denote in $D_{\langle e,t\rangle}$ anymore, but in $D_{\langle e,\langle v,t\rangle\rangle}$. Moreover, PM will apply in two different ways, depending on the reading.

Types of modifiers: intensional

There are modifiers which are neither intersective nor subsective.

(36) Barack is a former president.

a. $\not\models$ Barack is a president.

b. $\not\models$??Barack is former.

c. $\models$ Barack is not a president now.

In set terms:

(37) a. $[\![\textit{former president}]\!] \neq [\![\textit{former}]\!] \cap [\![\textit{president}]\!]$

b. $[\![\textit{former president}]\!] \not\subseteq [\![\textit{president}]\!]$

These modifiers are termed intensional because they operate on the noun's **intension** (understood here as a function from possible circumstances/times to sets of individuals): it is unclear how they could be given an analysis with our semantics so far since we cannot model information about sets of individuals at different times or in different possible circumstances.

Types of modifiers: intensional

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a. $\not\models$ Barack is a president.

b. $\not\models$??Barack is former.

c. $\models$ Barack is not a president now.

Larson's proposal can capture the meaning of intensional modifiers. This is not surprising since event semantics is a kind of intensional semantics.

(39) a. $[\![\textit{former president}]\!] = \lambda z_{\langle e\rangle}\lambda e_{\langle v\rangle}[\text{president}(z)(e) \wedge \text{former}(z)]$ *# intersective*

b. $[\![\textit{former president}]\!] = \lambda z_{\langle e\rangle}\lambda e_{\langle v\rangle}[\text{president}(z)(e) \wedge \text{former}(e)]$ *intensional reading*

We use # to indicate semantic oddness, as opposed to * for grammatically unaccepatable (for syntactic reasons).

Types of modifiers: gradable

The last type of modifiers, we will discuss today, are gradable adjectives. They are a subtype of subsective adjectives. Entailments are preserved only if we appeal to comparison classes (Cresswell, 1976), (von Stechow, 1984), see (40c). If we do so, we can treat them as intersective.

(40) Mo is a small elephant.

a. $\models$ Mo is an elephant.

b. $\not\models$ Mo is small.

c. $\models$ Mo is small (for an elephant).

In set terms:

(41) $[\![small]\!]$ = {x | x is small in comparison to a contextually determined comparison class}

Here is an intersective treatment of gradable modifiers:

(42) $[\![small\ elephant]\!] = \lambda x \in D_e.\ small(x)(C) \wedge elephant(x)$ *(Morzycki, 2016, 21)*

"C" is what is referred to when we talk about comparison classes.

Types of modifiers: gradable

To get to (43), we can use the lexical or the compositional approach.

(43) $[\![\textit{small elephant}]\!] = \lambda x_{\langle e \rangle}[\textit{small}(x)(C) \wedge \textit{elephant}(x)]$

Given that *elephant* denotes a one-place predicate:

(44) $[\![\textit{elephant}]\!] = \lambda x_{\langle e \rangle}[\textit{elephant}(x)]$

What is the denotation of *small* within the lexical approach?

Types of modifiers: gradable

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Given that *elephant* denotes a one-place predicate:

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What is the denotation of *small* within the lexical approach?

(45) $[\![\textit{small}]\!] = \lambda P_{\langle e,t \rangle} \lambda x_{\langle e \rangle}[\textit{small}(x)(C) \wedge P(x)]$

Types of modifiers: gradable

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(45) $[\![\textit{small}]\!] = \lambda P_{\langle e,t \rangle} \lambda x_{\langle e \rangle}[\textit{small}(x)(C) \wedge P(x)]$

What is the denotation of *small* within the compositional approach?

(46) $[\![\textit{small}]\!] = \lambda x_{\langle e \rangle}[\textit{small}(x)(C)]$

Types of modifiers: gradable, subsective

In contrast to *small*, other modifiers can get a gradable as well as a subsective reading.

(47) Dumbo is a small elephant.
$\rightsquigarrow_{reading1}$ Dumbo is small for an elephant. *gradable*
$\not\rightsquigarrow_{reading2}$ Dumbo is small as an elephant. *subsective*

(48) Mike is a beautiful dancer.
$\rightsquigarrow_{reading1}$ Mike is beautiful for a dancer. *gradable*
$\rightsquigarrow_{reading2}$ Mike is beautiful as a dancer. *subsective*

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(49) Max is a skillful surgeon.

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In contrast to *small*, other modifiers can get a gradable as well as a subsective reading.

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$\leadsto_{reading1}$ Dumbo is small for an elephant. *gradable*
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(48) Mike is a beautiful dancer.
$\leadsto_{reading1}$ Mike is beautiful for a dancer. *gradable*
$\leadsto_{reading2}$ Mike is beautiful as a dancer. *subsective*

(49) Max is a skillful surgeon.
$\leadsto_{reading1}$ Max is skillful for a surgeon. *gradable*
$\leadsto_{reading2}$ Max is skillful as a surgeon. *subsective*

(50) That is an expensive Honda.

Types of modifiers: gradable, subsective

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$\rightsquigarrow_{reading1}$ Max is skillful for a surgeon. *gradable*
$\rightsquigarrow_{reading2}$ Max is skillful as a surgeon. *subsective*

(50) That is an expensive Honda.
$\rightsquigarrow_{reading1}$ That is expensive for a Honda. *gradable*
$\not\rightsquigarrow_{reading2}$ That is expensive as a Honda. *subsective*

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