Topics in the
Lexical Semantics–Morphosyntax Interface

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Polysemy and "co-composition", II:
Adjectival modification
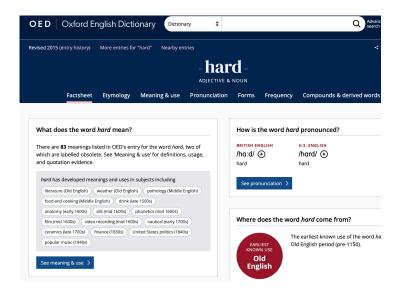
Outline for Part 4

- Adjectival modification: well-known problems
- Alternative analyses:
  - Basic compositional options
  - Effects of adding extra variables or arguments to noun and/or adjective denotations
  - Versions of the alternatives proposed for verbs

Adjective senses depend on noun

- ▶ Hugely general phenomenon: Cannot be set aside as "nonliteral" meaning.

- ▶ Interacts with gradability, antonymy.

(1)   a. red ball / hair / wine
        b. hot water / meal / look / debate
        c. warm water / meal / look / debate
        d. hard plastic / rain / problem
        e. soft plastic / rain / approach
        f. a fun game / person / day

Adjective senses depend on noun

Adjectives modify in varied ways

- ▶ Modification can affect "aspects" of noun denotation.

- ▶ Adjectives can supply information about event noun participant roles.

(2)   a.   fast reader ≈ "one who reads fast"*
      b.   an occasional beer ≈ "a beer drunk occasionally"
      c.   molecular activity ≈ "activity of molecules"

*Sample interpretations; others also possible.

Formal semantic classification of adjectives

Long tradition going back to Parsons (1970); Kamp (1975); see McNally (2016) for more references:

- Intersective: *female*, *sick*, *rectangular*

- Subsective: *good*, *fast*, *frequent*, *technical*

- Non-subsective [not discussed further in this course]

  - Privative: *fake*, *former*, *spurious*

  - "Plain" non-subsective: *alleged*, *possible*

Sources of subsectivity

Widely discussed; have inspired different analyses:

- ▶ Comparison class ("for a"): *a huge shrimp*

- ▶ Role ("as a"): *a good violinist*

- ▶ Event-relatedness ("Adj to V"): *a quick recipe*

- ▶ Subclass forming: *an international player*

The entailment diagnostic for intersectivity vs. subectivity

    (3)   a. Caroline Graham is a female player.

             b. $\Rightarrow$ Caroline Graham is a player.

             c. $\Rightarrow$ Caroline Graham is female.

    (4)   a. Caroline Graham is an international player.

             b. $\Rightarrow$ Caroline Graham is a player.

             c. $\nRightarrow$ Caroline Graham is international.

The distributional diagnostic for intersectivity vs. subectivity

- ▶ Intersective interpretations are intuitively property-of-entity interpretations.
  - ▶ Intersectively interpreted adjectives should behave syntactically like simple predicates.
- ▶ Subsective interpretations are intuitively not property-of-entity interpretations.
  - ▶ Subsectively interpreted adjectives should not behave syntactically like simple predicates.

The problem

The correlation between intersective entailment and predicate distribution can be hard to evaluate:

(5) a. That is a huge shrimp.
    b. That shrimp is huge.

(6) a. Olga is a beautiful dancer.
    b. Look at Olga dance - she's beautiful!

(7) a. *Glossa* is an international journal.
    b. If you want to publish in an international journal, *Glossa* is international.

Another example of the problem

Word order patterns in Romance languages do not neatly align with the entailment diagnostic:

(8)   a.   una jugadora **vieja**   [intersective reading]

       b.   una **vieja** jugadora   [non-intersective reading]

(9)   a.   ??una solución **supuesta**

       b.   una **supuesta** solución   [non-intersective reading]

(10)   a.   una jugadora **internacional**   [non-intersective reading]

       b.   ??una **internacional** jugadora

Before proceeding: Set aside gradability

Subsective behavior due to *comparison class* can be handled by introducing a comparison class variable C into the representation of the adjective (many variants in literature):

(11)   a. $\lambda x.\textbf{huge}(x)$
       b. $\lambda x.\textbf{huge}_C(x)$

Once comparison is represented, gradable adjectives denotations can, in principle, be treated as intersective.

Adjectival modification: Two basic analyses

- Adjective as **property of properties** (e.g. Siegel 1976):

  $\lambda P \lambda x.(\mathbf{red}(P))(x)(\lambda y.\mathbf{hair}(y)) = \lambda x.(\mathbf{red}(\mathbf{hair}))(x)$

- Adjective as a **property of entities** that combines intersectively with the noun denotation via an ad hoc rule (e.g. Larson 1998; Chung and Ladusaw 2006; details vary):

  $\mathbf{MODIFY}(\lambda x.\mathbf{hair}(x), \lambda y.\mathbf{red}(y)) = \lambda x.\mathbf{red}(x) \wedge \mathbf{hair}(x)$

- The first analysis is more general than the second.

- Should both be used? Just one? Some alternative?

Uniform property-of-properties analysis

Parsons (1970), a.m.o.

(12)   a. $\lambda P \lambda x.(\mathbf{Adj}(P))(x)$

       b. $\lambda P \lambda x.(\mathbf{red}(P))(x)$

If desired, distinguish intersective adjectives with a **meaning postulate**:

(13)   a. $\forall P, x[(\mathbf{Adj}(P))(x) \equiv [\mathbf{Adj}(x) \wedge \mathbf{P}(x)]]$

       b. $\forall P, x[(\mathbf{red}(P))(x) \equiv [\mathbf{red}(x) \wedge \mathbf{P}(x)]]$

Uniform property-of-properties analysis

(14)   a. $\lambda P \lambda x.(\mathbf{Adj}(P))(x)$
       b. $\lambda P \lambda x.(\mathbf{red}(P))(x)$

If desired, distinguish intersective adjectives with a **meaning postulate**:

(15)   a. $\forall P, x[(\mathbf{Adj}(P))(x) \equiv [\mathbf{Adj}(x) \wedge \mathbf{P}(x)]]$
       b. $\forall P, x[(\mathbf{red}(P))(x) \equiv [\mathbf{red}(x) \wedge \mathbf{P}(x)]]$

- **Advantage:** Works for all adjectives.

- **Limitations:**

    - May imply a property-of-entities analysis for many adjectives as well (Siegel 1976).

    - No deep insight into polysemy data.

    - Not much insight into distributional patterns.

Uniform property-of-entities analysis

Larson (1998)

- ▶ Inspired in event semantics for verbs: All nouns have event arguments.

- ▶ Adjectives denote properties of entities, whether individuals or events or both.

- ▶ Subsective modification related to roles, events, is just ordinary intersective modification of the noun's event argument.

(16) Olga is a beautiful dancer.

(17) a. [[beautiful]] $= \lambda x/e.$**beautiful**(x/e)
      b. [[dancer]]: $\lambda x \lambda e.$**dancer**(x, e)
      c. [[beautiful dancer]]: $\lambda x \lambda e.$**beautiful**$(e) \wedge$ **dancer**(x, e)

Extension to subclass-forming adjectives

See McNally and Boleda (2004) on "relational" adjectives

- ▶ Combines Larson's strategy with intuition that nouns contribute kind descriptions (cf. Zamparelli 1995).

- ▶ Subclass-forming adjectives modify a contextually-valued kind argument in the representation of the noun.

(18)   a. *player*: $\lambda x_k \lambda y_o [R(y_o, x_k) \wedge \mathbf{player}(x_k)]$

   b. *international*: $\lambda x_k [\mathbf{international}(x_k)]$

   c. *international player*:
   $\lambda x_k \lambda y_o [R(y_o, x_k) \wedge \mathbf{player}(x_k) \wedge \mathbf{international}(x_k)](k_j)$
   $= \lambda y_o [R(y_o, k_j) \wedge \mathbf{player}(k_j) \wedge \mathbf{international}(k_j)]$

R: Carlson's (1977) Realization relation between instances and kinds.

Uniform property-of-entities analyses, overall

Advantages:

- ► Simpler unique type for (all?) adjectives.

- ► Fits well with predicative uses.

- ► Makes explicit (to some extent) the specific modifying effect of the adjective.

- ► Feeds an analysis of constraints on adjective ordering. (next slides)

Constraints on adjective ordering

(19)   a. a serious pulmonary infection

        b. ??a pulmonary serious infection

(20)   a. a young, fast, accurate typist

        b. a young, accurate, fast typist

        c. a fast, young, accurate typist

        d. a fast, accurate, young typist

        e. an accurate, fast, young, typist

        f. an accurate, young, fast typist

Uniform property-of-entities analyses, overall

Limitation 1:

- ▶ Proliferation of arguments in the representation of the noun for which there is little or no syntactic evidence (other than the adjective ordering facts).

Uniform property-of-entities analyses, overall

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- ▶ Proliferation of arguments in the representation of the noun for which there is little or no syntactic evidence (other than the adjective ordering facts).

- ▶ Puestjovsky's (1995) solution: Ad hoc rule to allow adjective to apply to any variable within a rich noun representation.

  - ▶ Only advantage over a Larson-style account: Does not increment noun argument structure.

  - ▶ Like co-composition, challenging to implement technically.

$$\begin{bmatrix} \textbf{typist} \\ \text{ARGSTR} = \begin{bmatrix} \text{ARG1} = \textbf{x:human} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{FORMAL} = \textbf{x} \\ \text{TELIC} = \textbf{type(e,x)} \end{bmatrix} \end{bmatrix}$$

Uniform property-of-entities analyses, overall

Limitation 2:

- ▶ So far no solution to "argument saturating" uses of adjectives or "hard" cases of polysemy

- ▶ Arsenijević *et al.* (2014): Kinds of events can involve specific individuals; add abstract **Origen** entailment to *Korean*, etc.

(21)   a.   (Blinken's) Korean visit
       b. $\lambda y_o[R(y_o, k_j) \wedge \textbf{visit}(k_j) \wedge \textbf{Korean}(k_j)]$
       c.   For all $\alpha, \textbf{Korean}(\alpha)$ iff $\textbf{Origen}(\alpha, \textbf{Korea})$
       d.   For all $\alpha, \beta, \textbf{Origen}(\alpha, \beta)$ iff α comes into existence within the spatial domain of β.

Uniform property-of-entities analyses, overall

Limitation 2:

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- ▶ Arsenijević *et al.* (2014): Kinds of events can involve specific individuals; add abstract **Origen** entailment to *Korean*, etc.

(22)   a. (Blinken's) Korean visit
       b. $\lambda y_o [R(y_o, k_j) \land \textbf{visit}(k_j) \land \textbf{Korean}(k_j)]$
       c. For all $\alpha, \textbf{Korean}(\alpha)$ iff $\textbf{Origen}(\alpha, \textbf{Korea})$
       d. For all $\alpha, \beta, \textbf{Origen}(\alpha, \beta)$ iff α comes into existence within the spatial domain of β.

- ▶ Turns the problem into explaining **Origen** and finding comparable abstract predicates for other subclasses of adjectives (see McNally and Boleda 2017).

What about the other tools we saw?

Indexicality (Bosch 1983; Rothschild and Segal 2009; Kennedy and McNally 2010)

- ▶ As with verbs, use a contextual variable to fix the denotation.

- ▶ Different from comparison class variable – cannot vary under quantification!

(23)   a.   Everything is hard.
       ⇒ Everything is hard in the same sense, though not necessarily to the same standard.

       b. $\lambda c \lambda y \lambda x.\textbf{hard}_{c,C}(x, y)$

- ▶ Works technically, but as with verbs, little insight into lexical patterns.

What about the other tools we saw?

Rich types, polymorphism (Buecking and Maienborn 2019)

- ▶ Assign adjectives and nouns types in rich ontology.

- ▶ Allow adjectives to impose type presuppositions on nouns.

- ▶ π factors in conceptual knowledge.

[[quick]]: $\lambda P \lambda x \lambda \pi. \text{QUICK}(x, \pi * \text{ARG}_1^P : \text{TY}^{ps}(P) * \text{ARG}_1^{quick} : \text{EVENT}) \wedge P(x)(\pi)$

[[cigarette]]: $\lambda x \lambda \pi. \text{CIGARETTE}(x, \pi)$

[[quick cigarette]]:
$\lambda x \lambda \pi. \text{QUICK}(x, \pi * \text{ARG}_1^P : \text{TY}^{ps}(P) * \text{ARG}_1^{quick} : \text{EVENT})$
$\wedge \text{CIGARETTE}(x)(\pi)$

See also Chatzikyriakidis and Luo (2017); Asher *et al.* (2016)

Rich type analysis: Comments

- As with co-composition, adjective interpretation is influenced by the noun denotation.

- But syntactically the adjective is not the noun's argument.

- Buecking and Maienborn argue that getting the details to work requires a property-of-properties analysis, rather than MODIFY-type rule.

- **Limitation:** Predicative uses of adjectives now a problem.

- **Advantages:**

  - Rich types (like Pustejovsky's representations) offer some basis for describing intra-/cross-linguistic generalizations.

  - Hope for connection to vector-based semantics (Asher *et al.* 2016, Part 6).

Summary

- Though the syntactic details are different, adjectival modification resembles verb complementation in revealing a mutual influence between expressions in composition.

- Indexical accounts leave hard questions unanswered.

- No solution (yet) can avoid variables for conceptual content or context.

- **Next step:** Bringing verb complementation and adjectival modification a bit closer.

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