

Predicate-modifier asymmetries and the syntax-semantics interface

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Introduction

Two puzzles for a theory of adnominal modification and adjectival predication

This talk: syntax and semantics of attributive adjectives (modification) and predicative adjectives (predicates).

Two puzzles for an account of the semantics of adnominal modifiers:

- 1 How to account for the many semantic relationships that a modifier can have with the noun modified
- 2 How to account for asymmetries between attributive modification and adjectival predication

Puzzle 1: Many semantic relationships

Modifiers can predicate of different qualities of a noun, or otherwise perform different operations over some inherent event/temporal structure.

- (1) a big city
 - a. a city with a large area
 - b. a city with a large population
- (2) a red pen
 - a. a pen with red ink
 - b. a pen with a red barrel
- (3) an old friend
 - a. a friend who is old
 - b. a friend who has been a friend for a long time
- (4) the old president
 - a. the aged president
 - b. the former president

Puzzle 2: Asymmetries in attribution and predication

Often find that attribution and predication are asymmetric. Different readings for the same adjective in attributive versus predicative position.

- (5) a. a beautiful dancer (individual or event reading)
b. This dancer is beautiful. (*event; individual-only)
- (6) a. an old friend
(i) a friend who is old
(ii) a friend who has been a friend for a long time
b. My friend John is old.
(i) John is old.
(ii) *John has been a friend for a long time.
- (7) a. a big idiot (degree or property)
b. That idiot is big. (*degree; property-only)

Big picture and roadmap

Big picture: How do we expose and correctly constrain lexical and contextual information in the course of the semantic derivation?

Claim for today: Semantics combines concepts, syntax tells what to combine plus adds constraints.

- Depart from usual assumption of semantic composition via argument saturation or intersection (e.g., the Heim & Kratzer (1998) view)
- Semantic composition via unification of semantic representations. Move to unification-based framework.
- Unification allows for composition in any way that is licit based on types within semantic representation.
- Fine-grained lexical decomposition for nominal/adjectival meanings.
- Syntax constrains semantic composition via thematic role features.
- In the absence of thematic role features, unification is thus unconstrained.

Additionally, two case studies: color adjectives and readings driven by context, and event-related adjectives (*beautiful*)

Syntax mediated composition

Evidence for this view

The proposal, restated: semantics puts together concepts in any semantically licit way, unless constrained by syntax.

The data from Puzzle 1 and Puzzle 2 contribute to the view that syntax only partially determines composition.

- Data from Puzzle 1 shows we need a flexible account for how A relates to N.

(8) red pen

- a. pen with red ink
- b. pen with red barrel

- Fine-grained lexical decomposition with a unification-based semantics can provide this flexibility.
- But, data from Puzzle 2 shows that syntax constrains this flexibility.

(9) a. beautiful dancer

b. This dancer is beautiful.

(*event reading)

- Syntax-semantic interface built around interpretable features can provide these constraints.

Ingredients of the analysis

Semantic component:

- Lexical decomposition is essentially a neo-Davidsonian representation
- Adopt frame semantics as a representational format.
- Unification-based semantic framework.

Syntactic component:

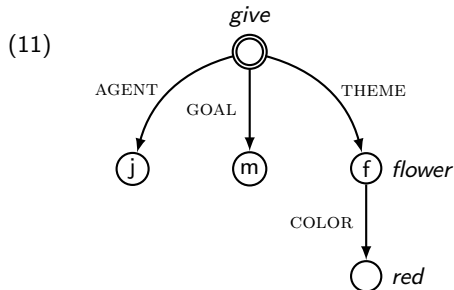
- Minimalist syntax with Agree-based feature checking
- Finite set of (values for) thematic role features ([AGENT], [THEME], [HOLDER], ...). Interpretable thematic role features directly denote frames.
- Thematic role features on “argumental” DPs

The semantic representation: frame semantics

- Version of Düsseldorf frame semantics (Löbner, 2014, 2017; Petersen, 2007, a.o.).
- A frame is a recursive attribute-value structure.
 - ▶ Types for values are properties (roughly speaking, $\langle e, t \rangle$)
 - ▶ Functional attributes (roughly speaking, type $\langle e, e \rangle$)
 - ▶ One value within a frame is distinguished as the “central node” or “referential node,” which provides the type of the frame.
 - ▶ Values can have their own attributes, making frames recursive.
- Core idea: data structure describing an individual, with attributes and values that give additional semantic information about that individual.
- Representable in many ways (this talk: predicate logic, frame diagrams)
- Important: Composition of two frames via unification.
 - ▶ Identify sub-frames based on compatible types.
 - ▶ Possibly many ways of unifying two frames.
 - ▶ Two frames can unify if one frame subsumes the other, or if a third minimal frame subsumes them both.
 - ▶ Function Application and Predication Modification are special cases of unification.

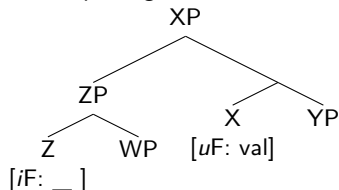
Frame example

(10) $\llbracket \text{John gave the red flower to Mary} \rrbracket = \lambda e \left[\begin{array}{l} \mathbf{give}(e) \\ \mathbf{j} = \text{AGENT}(e) \\ \mathbf{m} = \text{GOAL}(e) \\ \mathbf{f} = \text{THEME}(e) \\ \mathbf{flower}(\text{THEME}(e)) \\ \mathbf{red}(\text{COLOR}(\text{THEME}(e))) \end{array} \right]$

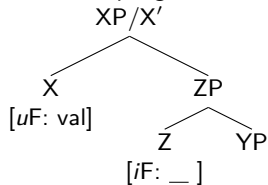


- Agree-based feature checking system with uninterpretable and interpretable features (e.g., Adger (2003); Pesetsky & Torrego (2001)).
- Interpretable features must be valued in the course of the syntactic derivation. Reflects status of being semantically active.
- No semantic interpretation for uninterpretable features.
- Assume agreement is possible under Head-Spec or Head-Comp configurations.

(12) Head-Spec Agreement



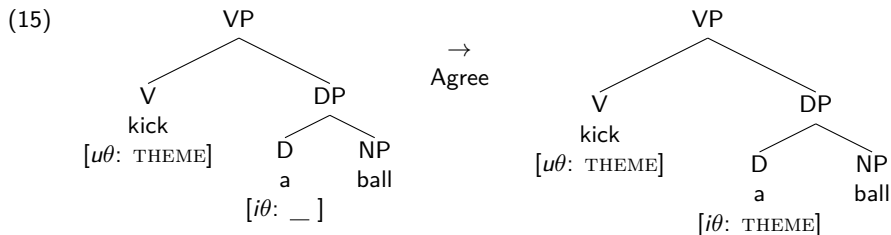
(13) Head-Comp Agreement



Thematic role features: syntax and semantics

- Thematic role features as an interface between syntax and semantics.¹
- Finite set of values: AGENT, THEME, GOAL, HOLDER, and so on
- Interpretable thematic role features denote event attributes in frame representations.

- (14) a. $\llbracket [i\theta : \text{THEME}] \rrbracket = \lambda e [x = \text{THEME}(e) \wedge \mathbf{event}(e) \wedge \mathbf{entity}(x)]$
b. $\llbracket [a \text{ ball } [i\theta : \text{THEME}]] \rrbracket =$
 $\lambda x [x = \text{THEME}(e) \wedge \mathbf{event}(e) \wedge \mathbf{entity}(x) \wedge \mathbf{ball}(x) \wedge \dots]$

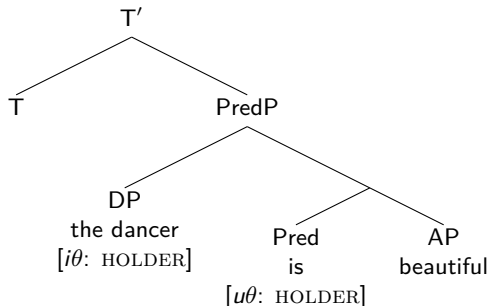


¹See also Larson (2014); Hornstein (1999) for thematic role features.

Syntax of predication

- PredP syntax for predication (Bowers, 1993, 2001; Baker, 2003)
- Pred head hosts a [$u\theta$: HOLDER] feature.
- The subject DP's [$i\theta$: $_$] feature valued by HOLDER.
- Unification of AP frame and DP frame is constrained by the [$i\theta$: HOLDER] feature.

(16)



Predicative adjectives and [*i*θ: HOLDER]

- Predicative adjectives are frames describing states.
Not so dissimilar to how many verbs are frames describing events.
- Introduce \approx , which relates a state to a value of a frame attribute.²
- Referent of the DP is asserted to be the holder of the state via a syntactic feature [*i*θ: HOLDER] valued in SpecPredP.

$$(17) \quad \llbracket [i\theta: \text{HOLDER}] \rrbracket = \lambda s \left[\begin{array}{l} x = \text{HOLDER}(s) \wedge z = \text{ATTR}(x) \wedge \\ \mathbf{state}(s) \wedge s \approx z \end{array} \right]$$

- Example:

$$(18) \quad \llbracket DP_{[i\theta:\text{HOLDER}]} [Pred AP] \rrbracket = \lambda s \left[\begin{array}{l} z = \text{ATTR}(x) \wedge \mathbf{state}(s) \wedge \\ s \approx z \wedge x = \text{HOLDER}(s) \wedge \mathbf{A}(z) \dots \end{array} \right]$$

$$(19) \quad \llbracket a \text{ pen }_{[i\theta:\text{HOLDER}]} [Pred red] \rrbracket = \\ \lambda s \left[\begin{array}{l} \mathbf{pen}(x) \wedge z = \text{INK-COLOR}(x) \wedge \dots \wedge \\ \mathbf{state}(s) \wedge s \approx z \wedge x = \text{HOLDER}(s) \wedge \\ \mathbf{red}(z) \wedge \dots \end{array} \right]$$

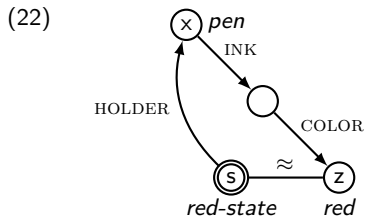
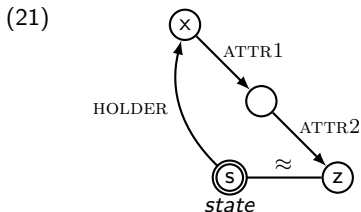
²See the analysis of the predicational copula from Maienborn (2003, 2005, 2007).

What is $[i\theta: \text{HOLDER}]$ doing?

- Value that the state is related to must be an attribute of the `HOLDER`
- Must be either an attribute directly possessed by the `HOLDER` or an attribute that could be constructed from “chaining” attributes (e.g., function composition).

$$(20) \quad \begin{array}{l} \text{a. } x = \text{HOLDER}(s) \wedge s \approx z \wedge z = \text{ATTR}(x) \\ \text{b. } x = \text{HOLDER}(s) \wedge s \approx z \wedge z = \text{ATTR}_2(\text{ATTR}_1(x)) \end{array}$$

- Essentially, building a bi-directional between a value of an attribute and the possessor of that value, mediated by a state.



Case study 1: Conceptual and referential affordances with color adjectives

Conceptual and referential affordances

How do attributive adjectives modify nouns? Where do targeted attributes come from?

- NP provides the suitable attributes for the modifier *red* to target.

(23) a red pen

- a. a pen with a red cap (attribute: CAP)
- b. a pen that writes in red (attribute: INK)

- Context can also step in to offer more possibilities for how to link *red* with *box*.

(24) (*Context: For a fundraising sale, Adam and Barbara are sorting donated scarves according to color in different, identical, brown cardboard boxes. Barbara distractedly puts a red scarf in the box containing blue scarves.*)

Adam: Hey, this one belongs in the red box! (McNally & Boleda, 2017)

Conceptual and referential affordances

Lose this contextually-driven composition in predicative adjectives.

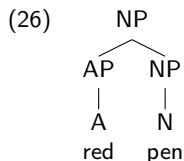
- Minimally changed example in (25):

(25) Adam: *Hey, this one belongs in the box that is red!

- Only properties of the nominal itself (e.g., color of the box) are able to drive composition with predicative adjectives.
- Asymmetry between attribution and predication with color adjectives such as *red*.
- What drives this asymmetry?

Analysis: attributive modification

- Attributive modification is a case of unmediated frame composition; absence of thematic role features.



- Attributive adjectives may freely target attributes of the NP frame.
- AP and NP frames may combine in any way that is licit given the lexical content of their respective frames, context, and the speaker's world knowledge; no constraints on unification.

$$(27) \quad \llbracket \text{red} \rrbracket = \lambda x[\text{red}(\text{COLOR}(x))]$$

$$(28) \quad \llbracket \text{pen} \rrbracket = \lambda x[\text{pen}(x) \wedge c = \text{BARREL}(x) \wedge i = \text{INK}(x) \wedge \dots]$$

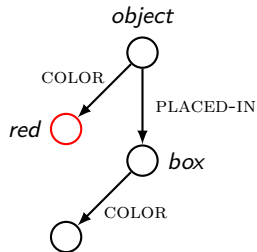
$$(29) \quad \text{a.} \quad \llbracket \text{red pen} \rrbracket = \lambda x[\text{pen}(x) \wedge \text{red}(\text{COLOR}(\text{BARREL}(x)))]$$

$$\text{b.} \quad \llbracket \text{red pen} \rrbracket = \lambda x[\text{pen}(x) \wedge \text{red}(\text{COLOR}(\text{INK}(x)))]$$

Additions from context: *red box*

- Rich view of context; context is a frame, and the NP frame includes context.
- Context frame can impose additional constraints on interpretation (i.e., background information regarding boxes as a location for objects of specific colors).
- Context is part of the semantic representation and not just as a free variable.

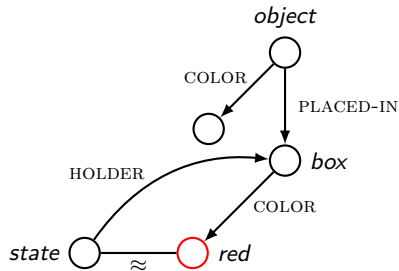
(30) *red box* (=box for red things)



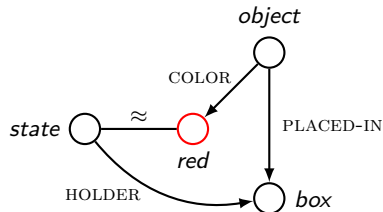
Analysis: Predicative adjectives

- More constrained representation for predicative adjectives.
- Recall: $[i\theta: \text{HOLDER}]$ states that the **HOLDER** of the newly created state must also be the possessor of the value the state is created from.
- Bi-directional relationship set up by a $[i\theta: \text{HOLDER}]$ feature rules out any unifications where the relevant attribute is not an attribute of the DP referent.

(31) licit: *The box is red*
(= red colored)



(32) illicit: *The box is red*
(=place to put red objects)



Case study 2: event-related adjectives

Event-related adjectives

- Event-related adjectives such as *beautiful* also exhibit a predicate-modifier asymmetry.

(33) Mary is a beautiful dancer.

- a. Mary is a dancer and she is beautiful. (intersective; referent-related)
- b. Mary is a dancer and she dances beautifully. (subsective; event-related)

(34) This dancer is beautiful.

- This dancer dances beautifully. (event-related unavailable)

- Well-known observation from Larson (1998) and Vendler (1968).

Event-related adjectives in attributive position

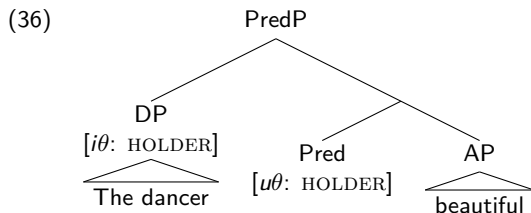
- Event-related attributive modifiers target an attribute of an event within the semantic representation of the nominal.
- Two relevant attributes:
 - ▶ A **MANNER** attribute of events that maps an event to the manner of that event
 - ▶ A **QUALITY** attribute of individuals that maps an individual to a subjective quality.
- Adjective *beautiful* contributes a type specification for these attributes

(35) *beautiful dancer*

$$\begin{array}{l} \text{a. } \llbracket \textit{beautiful dancer} \rrbracket = \lambda x \left[\begin{array}{l} \mathbf{person}(x) \wedge \mathbf{dance}(e) \wedge \\ x = \text{AGENT}(e) \wedge \mathbf{beautiful}(\text{MANNER}(e)) \end{array} \right] \\ \text{b. } \llbracket \textit{beautiful dancer} \rrbracket = \lambda x \left[\begin{array}{l} \mathbf{person}(x) \wedge \mathbf{dance}(e) \wedge \\ x = \text{AGENT}(e) \wedge \mathbf{beautiful}(\text{QUALITY}(x)) \end{array} \right] \end{array}$$

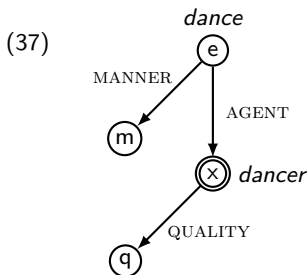
Event-related adjectives in predicative position

- In predicative position, a **HOLDER** thematic role links the referent of the subject DP to a state related to the adjective.



Event-related adjectives in predicative position

- [$i\theta$: HOLDER] will only allow for *beautiful* to specify the QUALITY attribute of the DP referent, and not the MANNER attribute of the event
- This is because MANNER attribute is not an attribute of the DP referent, inconsistent with the constraint contributed by [$i\theta$: HOLDER] .
- Thus, predicative adjectives cannot be interpreted as event-related (unless the subject DP itself denotes an event).



$$\lambda x \left[\begin{array}{l} \mathbf{dance}(e) \wedge m = \mathbf{MANNER}(e) \wedge \\ \mathbf{dancer}(x) \wedge x = \mathbf{AGENT}(e) \wedge q = \mathbf{QUALITY}(x) \end{array} \right]$$

Discussion and Conclusion

Hasn't this been done before? Why not the traditional view?

Why not the traditional view(s)?

- Uniform View 1: Adjectives are type $\langle e, t \rangle$:
Need two rules of composition, both argument saturation (predication) and intersection (modification),³ or a rule to raise adjective type in attributive position to $\langle et, et \rangle$.
- Uniform View 2: Adjectives are type $\langle et, et \rangle$:
Need a rule to lower adjective type in predicative position to type $\langle e, t \rangle$.
- Ambiguity View: Adjectives are ambiguous in type:
Duplication of content in the lexicon in many cases. Remove connection between attributive and predicative uses.

³This seems to be the preferred view currently, based on Heim & Kratzer (1998).

Hasn't this been done before? Why not the traditional view?

- Still need a lexical semantic theory: (38) doesn't give insight into where modifier-predicate asymmetries come from, or how lexical content is accessed.

$$(38) \quad \begin{array}{l} \text{a. } \llbracket \textit{red pen} \rrbracket = \lambda x. \mathbf{pen}(x) \wedge \mathbf{red}(x) \\ \text{b. } \llbracket \textit{The pen is red} \rrbracket = \mathbf{red}(\iota x \in C. \mathbf{pen}(x)) \end{array}$$

- Larsonian strategy of exposing certain lexical information in the argument structure implausible for many aspects of the lexical meaning.

$$(39) \quad \llbracket \textit{dancer} \rrbracket = \lambda e \lambda x [\mathbf{dance}(e) \wedge \mathbf{AGENT}(e, x)]$$

$$(40) \quad \llbracket \textit{pen} \rrbracket = \lambda i \lambda b \lambda w \lambda x [\mathbf{pen}(x) \wedge \mathbf{INK}(i, x) \wedge \mathbf{BARREL}(b, x) \wedge \mathbf{WELL}(w, x)]$$

My proposal: Single semantic composition rule along with a decompositional lexical semantics, at the cost of increasing the complexity of the syntax.

Overall view: How are attribution and predication distinguished?

- Attribution and predication syntactically distinguished by presence/lack of thematic role marking.
- Attribution contributes a type specification to a value.
- Adjectival predication adds an additional meaning postulate building (what is essentially) a bi-directional between individual and attribute value.
- Attribution is unconstrained; type specification can in principle be added anywhere within a frame.
- This is consistent with the hypothesis that unification is the sole means of semantic composition, but is constrained by syntax in certain cases.

Other extensions

- *Old* adjectives show well-known interactions with attribution, predication, and nominal lexical semantics.

(41) an old friend

- a. a friend who is old
- b. a friend who has been a friend for a long time

(42) My friend John is old.

- a. John is old.
- b. *John has been a friend for a long time.

- Obligatory distributivity with attributive adjectives (Schwarzschild, 2006; McKinney-Bock & Pancheva, 2019)?

(43) The (twelve) boxes are heavy. (distributive, collective)

(44) The (twelve) heavy boxes sat in a corner. (distributive, *collective)

- Other cases of asymmetries?

Conclusion

- Examined two questions:
 - ▶ How to expose lexical information in a compositional way
 - ▶ How to constrain lexical information to derive modifier-predicate asymmetries
- New way of thinking about this problem via the use of frame semantics and thematic role features.
- Interpretable thematic role features as a way of constraining frame representations.
- Modification as unconstrained frame unification, but predication as constrained unification.
- View of the grammar: Syntax tracks the order of concept composition, while semantics does the heavy lifting in combining concepts.
- Not pictured: This is the beginning of a general program for modeling syntax-semantics interface using frame semantics that adapts off-the-shelf syntactic machinery. No previous attempts made (to my knowledge) of using frame semantics with Minimalist syntax.

Thank you!

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