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)
- Unification allows for composition in any way that is licit based on types within semantic representation.
- Syntax constrains unification via interpretable thematic role features.
Roadmap

1. Frame semantics as a representational framework for concepts
2. Interpretable thematic role features, and how to interpret them
3. Two case studies: color adjectives with readings driven by context, and event-related adjectives (*beautiful*)
4. Discussion, wrap-up
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 syntactic features can provide constraints.
Ingredients of the analysis

Semantic component:
- Lexical decomposition in 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.
- Interpretable thematic role features on “argumental” DPs
The semantic representation: frame semantics

- Theory of representations inspired by psychologist Barsalou’s (1992) work on conceptual frames.
- A frame is a recursive attribute-value structure with functional attributes. Informally...
  - 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. Rich lexical structure.
The semantic representation: frame semantics

- 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.
  - See also grammatical frameworks like HPSG, and some varieties of DRT.
Frame example

(10) \[ \text{[John gave the red flower to Mary]} = \lambda e \]

\[
\begin{align*}
\text{give}(e) & \wedge \\
\text{j} = \text{AGENT}(e) & \wedge \\
\text{m} = \text{GOAL}(e) & \wedge \\
\text{f} = \text{THEME}(e) & \wedge \\
\text{flower} & \wedge \\
\text{red} & \wedge \\
\end{align*}
\]

(11)

\begin{align*}
\text{give} \\
\text{AGENT} \\
\text{GOAL} \\
\text{THEME} \\
\text{agent} \\
\text{goal} \\
\text{theme} \\
\text{flower} \\
\text{COLOR} \\
\text{red}
\end{align*}
Agree-based feature checking system with uninterpretable and interpretable features (e.g., Adger (2003), Pesetsky & Torrego (2001)).

Diacritic (u or i) specifies whether a feature is uninterpretable or interpretable.

Interpretable features must be valued in the course of the syntactic derivation. Reflects status of being semantically interpretable.

No semantic interpretation for uninterpretable features (deleted at LF).

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 eventuality frames.

\[(14)\]
\[a. \quad \llbracket i\theta : \text{THEME} \rrbracket = \lambda e [x = \text{THEME}(e) \land \text{event}(e) \land \text{entity}(x)] \]
\[b. \quad \llbracket \text{a ball} \ [i\theta : \text{THEME}] \rrbracket = \lambda x [x = \text{THEME}(e) \land \text{event}(e) \land \text{entity}(x) \land \text{ball}(x) \land \ldots ]\]

\[(15)\]

1. See also Larson (2014), Hornstein (1999) for thematic role features.
Syntax of predication

- Pred head hosts a \([u\theta: \text{HOLDER}]\) feature.
- The subject DP’s \([i\theta: \_\_]\) feature valued by \text{HOLDER}.
- Unification of AP frame and DP frame is constrained by the \([i\theta: \text{HOLDER}]\) feature.

(16)

```
T'
  /\      /
 T  PredP
   /\     /\     /
  DP  Pred AP
   /\  [i\theta: \text{HOLDER}] [u\theta: \text{HOLDER}]
 the dancer is beautiful
```


Predicative adjectives and \([i\theta: \text{HOLDER}]\)

- 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 \([i\theta: \text{HOLDER}]\) valued in SpecPredP.

\[
\begin{align*}
\llbracket [i\theta: \text{HOLDER}] \rrbracket &= \lambda s \left[ x = \text{HOLDER}(s) \land z = \text{ATTR}(x) \land \right. \\
&\hspace{1cm} \left. \text{state}(s) \land s \approx z \right]
\end{align*}
\]

Example:

\[
\begin{align*}
\llbracket DP [i\theta: \text{HOLDER}] [\text{Pred AP}] \rrbracket &= \lambda s \left[ z = \text{ATTR}(x) \land \text{state}(s) \land 
\right. \\
&\hspace{1cm} \left. s \approx z \land x = \text{HOLDER}(s) \land A(z) \ldots \right]
\end{align*}
\]

\[
\begin{align*}
\llbracket [\text{a pen} [i\theta: \text{HOLDER}] [\text{Pred red}] \rrbracket &= 
\lambda s \left[ \text{pen}(x) \land z = \text{INK-COLOR}(x) \land \ldots \land 
\right. \\
&\hspace{1cm} \left. \text{state}(s) \land s \approx z \land x = \text{HOLDER}(s) \land 
\right. \\
&\hspace{1cm} \left. \text{red}(z) \land \ldots \right]
\end{align*}
\]

What is \([iθ: \text{HOLDER}]\) doing?

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

\[(20)\]

\[\begin{align*}
\text{a. } x & = \text{HOLDER}(s) \land s \approx z \land z = \text{ATTR}(x) \\
\text{b. } x & = \text{HOLDER}(s) \land s \approx z \land z = \text{ATTR}_2(\text{ATTR}_1(x))
\end{align*}\]

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

\[(21)\]

\[(22)\]
Case study 1: Conceptual and referential affordances with color adjectives
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.

(26) NP
    AP  NP
    ┌──┘  ┌──┘
    A    N
red  pen

- 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) \([\text{red}] = \lambda x[\text{red}(\text{COLOR}(x))]\]
(28) \([\text{pen}] = \lambda x[\text{pen}(x) \land c = \text{BARREL}(x) \land i = \text{INK}(x) \land \ldots] \]
(29) a. \([\text{red pen}] = \lambda x[\text{pen}(x) \land \text{red}(\text{COLOR}(\text{BARREL}(x))))]]
    b. \([\text{red pen}] = \lambda x[\text{pen}(x) \land \text{red}(\text{COLOR}(\text{INK}(x))))]]

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Predication and modification
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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) \textit{red box} (=box for red things)

\begin{center}
\begin{tikzpicture}

\node (red) at (0,0) {\textit{red}};
\node (box) at (1,0) {\textit{box}};
\node (object) at (0,1) {\textit{object}};

\draw[->] (red) -- (box) node[midway, below] {\texttt{PLACED-IN}};
\draw[->] (box) -- (object) node[midway, below] {\texttt{COLOR}};
\draw[->] (red) -- (object) node[midway, below] {\texttt{COLOR}};

\end{tikzpicture}
\end{center}
Analysis: Predicative adjectives

- More constrained representation for predicative adjectives.
- Recall: \([i\theta: \text{HOLDER}]\) states that the \text{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) \textit{The box is red}  
\(= \text{red colored}\)

(32) \textit{*The box is red}  
\(= \text{place to put red objects}\)
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.

\[\not\rightarrow\] 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

a. \[ [\text{beautiful dancer}] = \lambda x \left[ \text{person}(x) \land \text{dance}(e) \land x = \text{AGENT}(e) \land \text{beautiful}(\text{MANNER}(e)) \right] \]

b. \[ [\text{beautiful dancer}] = \lambda x \left[ \text{person}(x) \land \text{dance}(e) \land x = \text{AGENT}(e) \land \text{beautiful}(\text{QUALITY}(x)) \right] \]
In predicative position, a **HOLDER** thematic role links the referent of the subject DP to a state related to the adjective.

\[(36)\]

![Diagram](image)

- The dancer \([iθ: \text{HOLDER}]\)
- Pred \([uθ: \text{HOLDER}]\)
- AP **beautiful**
Event-related adjectives in predicative position

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

\[(37)\]

\[
\lambda x \left[ \text{dance}(e) \land m = \text{MANNER}(e) \land \text{dancer}(x) \land x = \text{AGENT}(e) \land q = \text{QUALITY}(x) \right]
\]
Discussion and Conclusion
Hasn’t this been done before? Why not the traditional view?

Why not more traditional view(s)? Different perspectives on semantic type of adjectives:

- **Uniform View 1**: (At least some) 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.

---

\(^3\)This 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: representations in (38) don’t give insight into where modifier-predicate asymmetries come from, or how lexical content is accessed by modifiers.

(38)  

a. \([\text{red pen}] = \lambda x. \text{pen}(x) \land \text{red}(x)\)  
b. \([\text{The pen is red}] = \text{red}(\lambda x \in C. \text{pen}(x))\)

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

(39) \([\text{dancer}] = \lambda e \lambda x [\text{dance}(e) \land x = \text{AGENT}(e)]\)

(40) \([\text{pen}] = \lambda i \lambda b \lambda i \lambda x [\text{pen}(x) \land i = \text{INK}(x) \land b = \text{BARREL}(x) \land i = \text{INK}(x)]\)
Hasn’t this been done before? Why not the traditional view?

This talk: 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 relation 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.
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 (frame) composition plus imposes constraints, while semantics does the heavy lifting in combining concepts (frames)
- **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.
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