Predicate-modifier asymmetries and the syntax-semantics interface
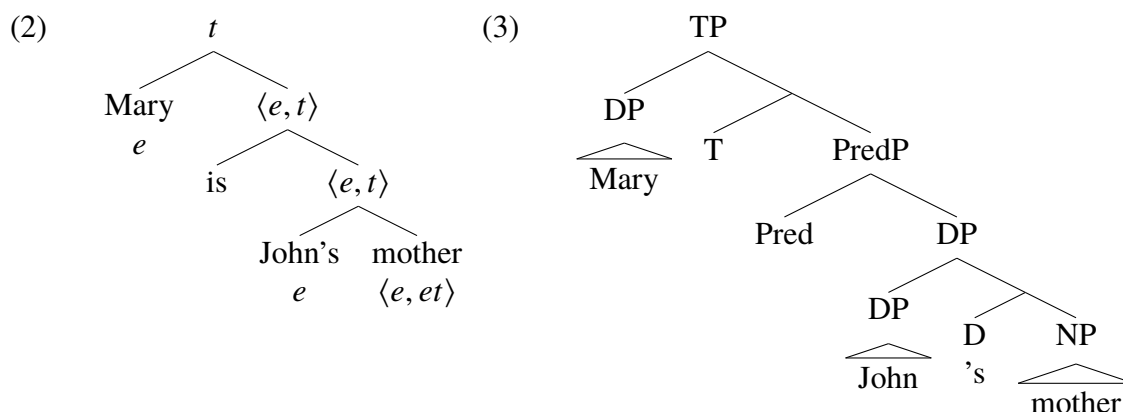
Curt Anderson (Heinrich-Heine-Universität Düsseldorf)

email: andersc@hhu.de   web: curtanderson.github.io

Introduction   In this paper, I raise two points of interest for understanding the syntax-semantics interface, and the phenomena of modification and predication. First, I argue that there is a conceptual tension between syntax and semantics. Second, I develop a new account of the syntax-semantics interface that helps dissolve this conceptual tension, building a new division of labor between syntax and semantics. I use this account to understand cases of predicate-modifier asymmetries, where readings available for attribute adjective disappear when the same adjectives are used predicatively.

Mainstream theories in formal semantics that are descended from the work of Montague rely on ordered argument lists; saturation of lambda bound variables, such as in (1), returns progressively lower types as the arguments are saturated. The order of saturation can be visualized as a tree structure, and many authors in the tradition exemplified by Heim & Kratzer (1998) take the hierarchical structure from argument saturation to be equivalent to the hierarchical structures in generative syntax.

(1) a. $[\![mother]\!] = \lambda y \lambda x.\mathbf{mother}(x, y)$
     b. $[\![John's\ mother]\!] = \lambda x.\mathbf{mother}(x, \mathbf{j})$
     c. $[\![Mary\ is\ John's\ mother]\!] = \mathbf{mother}(\mathbf{m}, \mathbf{j})$

(2)

$$
\begin{array}{c}
t \\
\swarrow \quad \searrow \\
\text{Mary} \quad \langle e, t \rangle \\
e
\end{array}
$$

(3)

Therein lies the tension: ordered argument lists in the semantic representation duplicate information from the syntactic component, namely the hierarchical order of arguments; ordered lists of arguments are how the semantics interfaces with the syntax, but otherwise are completely dispensable in the semantics. There is no semantic reason that the order of arguments for e.g. *mother* should be ordered as they are. All things being equal, we should prefer a grammatical model where information is not duplicated across different levels of representation. I argue that, since argument order is duplicated across both syntax and semantics, a semantic representation where argument order is not represented is preferred to a view that it is.

I propose a stricter division of labor between syntax and semantics. In my model, syntax checks **thematic role features** on DPs. These features are semantically interpretable and determine how the referent of the DP participates in an event. Semantics **unifies** semantic representations (which I take to be **frames**). Unification of frames is constrained by the type information available within the frame (Petersen 2007), including the information contributed by thematic role features. The effect of function application is captured by the combination of thematic role features and frame unification, but function application itself does not exist as a rule of semantic composition.

This division of labor suggests that, in the absence of a thematic role checking relationship, more interpretations should generally be available. Indeed, this is the case with attributive adjectives and predicative adjectives; attributive adjectives generally allow for a larger field of interpretations than predicative adjectives. For instance, adjectives such as *beautiful* lose their event-related interpretation in predicative position, as shown in the familiar contrast in (4) and (5).

(4) a beautiful dancer (5) This dancer is beautiful.
  a. a dancer who looks beautiful a. This dancer looks beautiful.
  b. a dancer who dances beautifully b. *This dancer dances beautifully.

I examine case studies (two are presented in this abstract) of meaning asymmetries between predicates and modifiers, and develop an account of composition that divorces syntactic composition from semantic composition. This allows for flexibility in how attributive adjectives are interpreted, a better understanding of the division of labor between syntax and semantics, and a principled account of a variety of predicate-modifier asymmetries. Along the way, this also provides a clearer idea of how to link frame semantics with a Minimalist-style syntax, a project which has largely not been undertaken and hinders the broader adoption of frames as a semantic representation.
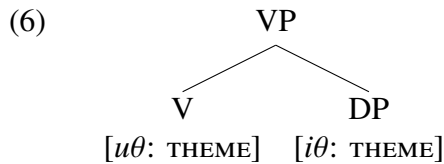
Thematic role features and frame semantics The basic proposal is to divorce semantic composition (e.g., argument saturation and identification of variables) from syntactic composition. I make use of several pieces of equipment: frame semantics for the semantic component, and Minimalist generative syntax with a feature-checking mechanism for the syntactic component.

I consider the semantics of natural language, at least for the fragment I am concerned with, to be adequately captured using frame semantics (Löbner 2017, Petersen 2007), recursive attribute-value structures with functional (roughly speaking, type $\langle e, e \rangle$) attributes. Composition between two frames is modeled as frame unification: two frames can unify if one frame subsumes the other, or there is a minimal third frame that subsumes both.

For the syntax, I use a Minimalist-style syntax with a Pesetsky & Torrego (2001) style feature system making use of interpretable and uninterpretable features. This feature system is important because it provides the interface between syntax and semantics. Interpretable features must be valued in the course of the syntactic derivation, otherwise the syntactic derivation fails, while uninterpretable features may be left unvalued. This reflects that interpretable features play a role in semantic interpretation, while uninterpretable features are purely creatures of the narrow syntax.
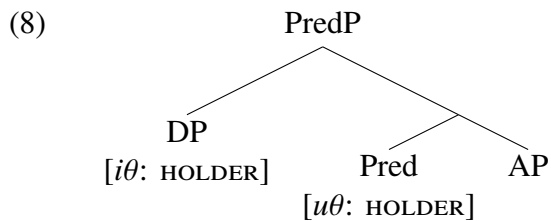
I use **thematic role features** to provide an interface between the syntax and the semantics: a thematic role feature $[i\theta]$ is valued by a finite set of thematic role labels (e.g., AGENT, THEME, etc.) corresponding to thematic role attributes in a frame. Thus, the AGENT valuation of the $[i\theta]$ feature is systematically related to the AGENT attribute in an event frame, THEME to a THEME attribute, and so on. Interpretable syntactic features denote frames; a feature maps one node (variable) to another via a frame attribute.

VP example: Frames for verb phrases follow a neo-Davidsonian model; the referential node of the frame is of an event type, with a conjunctive list of thematic role attributes mapping the event to thematic participants, partially inspired by Larson (2014). The $[i\theta$: THEME] feature on the internal argument constrains the referent of the DP to be interpreted as a THEME in an event. This underspecified event that the referent of the DP is a participant of is identified with the event node of the verb frame (the event denoted by the verb, here simply **V**, is a subtype of **event**).

(6)

$$\text{VP}$$

(tree diagram)
- VP dominates V and DP
- V: $[u\theta: \text{THEME}]$
- DP: $[i\theta: \text{THEME}]$

(7) a. $[\![\, [i\theta: \text{THEME}] \,]\!] = \lambda x[x = \text{THEME}(e) \wedge \mathbf{event}(e)]$
  b. $[\![DP_{[i\theta:\ \text{THEME}]}]\!] = \lambda x[x = \text{THEME}(e) \wedge \mathbf{event}(e) \wedge \mathbf{entity}(x)\ldots]$
  c. $[\![V\ DP_{[i\theta:\ \text{THEME}]}]\!] = \lambda e \exists x[x = \text{THEME}(e) \wedge \mathbf{event}(e) \wedge \mathbf{V}(e) \wedge \mathbf{entity}(x)\ldots]$

Adjective interpretation: I propose predicative adjectives introduce states, paralleling how many verbs introduce events. A PredP projection constructs a state from the meaning of the adjective ($\approx$ relates a state to a frame value), and the referent of the DP is asserted to be the holder of the state via a syntactic feature $[i\theta: \text{HOLDER}]$ which is valued in SpecPredP.

(8)

$$\text{PredP}$$

(tree diagram)
- PredP dominates DP and (Pred, AP)
- DP: $[i\theta: \text{HOLDER}]$
- Pred: $[u\theta: \text{HOLDER}]$
- AP

(9) a. $[\![\, [\imath\theta: \text{HOLDER}] \,]\!] = \lambda x[x = \text{HOLDER}(s)]$
  b. $[\![Pred\ AP]\!] = \lambda s[z = \text{ATTR}(y) \wedge \mathbf{A}(z) \wedge \mathbf{state}(s) \wedge s \approx z]$
  c. $[\![DP_{[i\theta:\ \text{HOLDER}]}\ Pred\ AP]\!] =$
    $\lambda s \exists x[z = \text{ATTR}(y) \wedge \mathbf{A}(z) \wedge \mathbf{state}(s) \wedge s \approx z \wedge x = \text{HOLDER}(s) \wedge \ldots]$

Importantly, the value that the state is related to must be an attribute of the HOLDER, either an attribute directly possessed by the HOLDER or an attribute that could be constructed from "chaining" attributes/function composition, as shown in (10).

(10) a. $x = \text{HOLDER}(s) \wedge s \approx z \wedge z = \text{ATTR}(x)$
  b. $x = \text{HOLDER}(s) \wedge s \approx z \wedge z = \text{ATTR}_2(\text{ATTR}_1(x))$

Attributive adjectives compose with the nouns they modify via unification, but this unification is not constrained by thematic role features.

Case study 1: Conceptual versus referential affordance Semantic composition that is afforded by the attributes inherent to the NP is possible in attributive position, as shown in (11). In these cases, the NP provides the suitable attributes for the modifier *red* to target.

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

(12) $[\![red]\!] = \lambda x[\mathbf{red}(\text{COLOR}(x))]$

McNally & Boleda (2017) observe that modifiers can relate to what they are modified in different ways. For instance, in an out of the blue context, *red box* specifies a box where the surface of the box is red. But, in certain cases, context can step in to offer more possibilities for how to link *red* with *box*. An example of this is seen in (13b): *red* specifies a color of something that is put into the box, but not an attribute of the box itself.

(13) a. Put the scarf in the red box!

b. *(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)

(14) $[\![red\ box]\!] = \lambda x[\mathbf{box}(x) \wedge \mathbf{red}(\textsc{color}(y)) \wedge x = \textsc{placed-in}(y)]$ (my analysis of (13b))

The example from (13b), minimally altered in (15) to use a predicative adjective, no longer supports contextually-driven composition; in this position, it is the conceptual properties of the nominal that drive composition, and hence *red* used predicatively is illicit, due to contextual properties being necessary to drive composition.

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

The meaning of attributive modifiers can be captured if we suppose that adjectives may freely target attributes of the NP. In particular, attributive modification is a case of unmediated frame composition: the AP and the NP frame may combine in any way that is licit given the properties of their respective frames as well as the speaker's world knowledge.

Predicative adjectives are given a more constrained representation, due to the HOLDER attribute. The Pred head links a state to the value provided by the adjective, and the HOLDER attribute links this state to the referent of the DP the feature lives on. Attributes of the referent of the DP may be available for composition (see discussion of HOLDER above, but (in the example illustrated) the COLOR attribute is not an attribute of the referent, nor is it accessible via a chain of attributes.

Case study 2: Subsective modification with event-related modifiers   Event-related adjectives such as *beautiful* also exhibit a predicate-modifier asymmetry, well-known from work from e.g., Larson (1998). Larson argues that this is due to the presence/absence of a Davidsonian event argument.

(16)   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)

(17)   This dancer is beautiful. $\nrightarrow$ This dancer dances beautifully. (event-related unavailable)

I consider event-related attributive modifiers to target an attribute of an event within the semantic representation of the nominal. For simplicity, I use a MANNER event attribute that maps an event to the manner of that event, and a QUALITY attribute of individuals that maps individuals to a subjective quality. The adjective *beautiful* restricts the range of values associated with either of these attributes by contributing a type specification for the values of these attributes, shown in (18).

(18)   *beautiful dancer*

    a. $[\![beautiful\ dancer]\!] = \lambda x \begin{bmatrix} \mathbf{person}(x) \wedge \mathbf{dance}(e) \wedge \\ x = \textsc{agent}(e) \wedge \mathbf{beautiful}(\textsc{manner}(e)) \end{bmatrix}$

    b. $[\![beautiful\ dancer]\!] = \lambda x \begin{bmatrix} \mathbf{person}(x) \wedge \mathbf{dance}(e) \wedge \\ x = \textsc{agent}(e) \wedge \mathbf{beautiful}(\textsc{quality}(x)) \end{bmatrix}$

In predicative position, a HOLDER attribute links the referent of the DP to a state related to the adjective. This only allows for *beautiful* to specify the QUALITY attribute of the DP referent, and not the MANNER attribute of the event; the MANNER attribute is not an attribute of the DP

referent. Thus, predicative adjectives cannot be interpreted as event-related, unless the subject DP denotes an event.

Discussion and Conclusion   This work examines two questions: how are predication and attribution distinguished in their syntax and semantics, and how can we develop a cleaner separation between the work done in the syntactic component and in the semantic component? I provide a new way of thinking about this problem via the use of thematic role features, using interpretable thematic role features as a way of constraining frame representations. This sheds light on how to integrate frames with Minimalist syntax, yields a new view on the relationship between syntax and semantics, gives insight on what distinguishes modification from predication, and is a step towards a theory for how to link lexical information with a compositional semantics.

References

Heim, Irene & Angelika Kratzer. 1998. *Semantics in generative grammar*. Wiley-Blackwell.

Larson, Richard K. 1998. Events and modification in nominals. In Devon Strolovitch & Aaron Lawson (eds.), *Proceedings of Semantics and Linguistic Theory 8*, 145–168.

Larson, Richard K. 2014. *On shell structure*. Routledge.

Löbner, Sebastian. 2017. Frame theory with first-order comparators: Modeling the lexical meaning of punctual verbs of change with frames. In Helle Hvid Hansen, Sarah E. Murray, Mehrnoosh Sadrzadeh & Henk Zeevat (eds.), *Logic, language, and computation: 11th international Tbilisi symposium on logic, language, and computation*, 98–117. Dordrecht: Springer.

McNally, Louise & Gemma Boleda. 2017. Conceptual versus referential affordance in concept composition. In *Compositionality and concepts in linguistics and psychology*, 245–267. Springer.

Pesetsky, David & Esther Torrego. 2001. T-to-C movement: Causes and consequences. In Michael Kenstowicz (ed.), *Ken Hale: a life in language*, MIT Press.

Petersen, Wiebke. 2007. Representation of concepts as frames. *The Baltic International Yearbook of Cognition, Logic and Communication* 2. 151–170.