

Let me start by thanking Professors Santorio and Szabo for their insightful comments and careful readings of *Conjoining Meanings* (*CM*). They highlight the main theses and describe the project in helpful ways.<sup>1</sup> So instead of multiplying summaries, let me say a little about what motivated the project. Chomsky was influential. But teaching truth-theoretic semantics, for many years, really convinced me of the need for a different conception of linguistic meaning.

In a standard first course in semantics, students are told that the meaning of a declarative sentence determines—and perhaps just is—a “truth condition” that is compositionally determined by the denotations (or extensions, or “semantic values”) of the constituent words, given the grammatical structure of the sentence and a fundamental rule of semantic composition called “Function Application.” This claim is often illustrated with sentences like (1) and (2).

(1) Fido barked.

(2) Fido chased Felix.

Names like ‘Fido’ and ‘Felix’ are said to be entity denoters, of a basic semantic type  $\langle e \rangle$ , and declarative sentences are said to be truth-value denoters of another basic type  $\langle t \rangle$ . The idea is that ‘Fido’ and ‘Felix’ denote ordinary entities, perhaps a certain dog and a certain cat, while sentences denote truth or falsity.<sup>2</sup> The tensed verb in (1) is then described as an expression—of a non-basic type  $\langle e, t \rangle$ —that denotes a *function* that maps each entity to truth or falsity depending on whether or not that entity barked. The phrase ‘chased Felix’ is said to be an expression of the same type, corresponding to a function that maps each entity to truth or falsity depending on whether or not that entity chased Felix; and then ‘chased’ is said to be an expression—of the non-basic type  $\langle e, \langle e, t \rangle \rangle$ —that denotes a dyadic function that maps each entity,  $x$ , to a function that maps each entity,  $x'$ , to truth or falsity depending on whether or not  $x'$  chased  $x$ .

Students are often told that this begins to explain how the meaning of a sentence depends on the meanings of its parts and how those parts are arranged: at least one of the parts denotes a mapping from the denotations of one or more other parts (suitably ordered) onto certain abstract objects. Smart students are suspicious. The alleged denotations of verbs suggest sentence frames; and it seems lame to say that meaning is compositional because some sentence-parts are sentence-frames that get filled in by other sentence-parts. Moreover, the alleged truth value of (1) does not have parts that include Fido and a function. Nor is the function allegedly denoted by ‘chased’ any part of the function allegedly denoted by ‘chased Felix’. So it seems misleading to speak of semantic *composition*, as opposed to mere supervenience (see Szabo 2000) or recursive specifiability of truth. But the class moves on to a parallel and rather pretty story about (3).

(3) Every dog barked.

The quantificational phrase ‘every dog’ gets described as an instance of type  $\langle \langle e, t \rangle, t \rangle$  that denotes a second-order function that maps each first-order function,  $F'$ , of type  $\langle e, t \rangle$  to truth or falsity depending on whether or not  $F'$  maps every dog to truth. Then ‘every’ is described as an expression of type  $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$  that denotes a dyadic second-order function that maps each function,  $F$ , of type  $\langle e, t \rangle$  to a function of type  $\langle \langle e, t \rangle, t \rangle$  that maps each function,  $F'$ , of type  $\langle e, t \rangle$  to truth or falsity depending on whether or not every thing that  $F$  maps to truth is such that  $F'$  also maps that thing to truth.<sup>3</sup> From here on, things get less pretty.

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<sup>1</sup> For other introductions to *CM*, see Pietroski (2020a), Lindeman (2020), and Ramchand (2020).

<sup>2</sup> Don’t worry about what truth values are, what truth conditions are, or how (2) is understood if the example names lack denotations. Names like ‘Vulcan’ and ‘Sherlock Holmes’ also get set aside for later, as do names like ‘Smith’.

<sup>3</sup> Or equivalently: the extension of  $F'$  includes (perhaps improperly) the extension of  $F$ ; the extension of  $F$  minus that of  $F'$  is the empty set; etc. Students are not usually encouraged to ask if these specifications of the function allegedly denoted by ‘every’ are equally good specifications of what ‘every’ means; cp. Knowlton et. al. (202?).

Sentences like (4-11) introduce twists that could fill the rest of the course.

- (4) Fido chased every cat.
- (5) Fido barked loudly today.
- (6) Felix heard Fido bark.
- (7) Fido chased a cat.
- (8) Dogs chased cats.
- (9) Felix broke a vase, and so a vase broke.
- (10) Felix chased a mouse, and so a mouse was chased by Felix.
- (11) Hubbard gave Fido a bone.

As the twists unfold, the value of appealing to Function Application becomes less and less clear, in part because the corresponding hierarchy of types— $\langle e \rangle$ ,  $\langle t \rangle$ , and  $\langle \alpha, \beta \rangle$  if  $\langle \alpha \rangle$  and  $\langle \beta \rangle$  are types—seems so needlessly vast and powerful. Moreover, a different picture of composition begins to emerge, at least if one squints a bit; and given this picture, developed in *CM*, one need not adopt the hypothesis that ordinary sentences like (1-11) have truth conditions. At which point, it seems unreasonable to keep setting aside arguments against this hypothesis. In the book, I try to spell this out in detail. Here, let me just indicate the motivating line of thought.

One can maintain that in (4), ‘every cat’ is of type  $\langle \langle e, t \rangle, t \rangle$  by treating ‘Fido chased’ as a device for mapping each entity to truth if and only if Fido chased it. The idea is that ‘every cat’ somehow combines with an analog of the relative clause ‘which Fido chased’, which can be treated as an expression of type  $\langle e, t \rangle$  formed by abstracting ‘which’ from the direct object position of ‘chased’; see, e.g., Heim and Kratzer (1998). This highlights the question, discussed in *CM*, of why ‘every cat which Fido chased’ cannot be understood as a sentence that is true if and only if every cat is such that Fido chased it. But even if there is a good answer, the meanings of (4) and ‘which Fido chased’ are not determined solely by Function Application.

One way or another, neo-Fregean accounts of relative clauses and quantificational direct objects invoke a (syncategorematic) rule that permits conversion of an open *sentence* of type  $\langle t \rangle$  into a *predicate* of type  $\langle e, t \rangle$ . Not that there’s anything wrong with that. I posit an analogous rule in *CM*. I also review the reasons for positing a conjunctive rule of composition for phrases formed by combining nouns or verbs with modifiers, as in ‘grey cat (which/that) Fido chased’ and ‘dog that barked loudly today’. It has also become common to posit existential closures of predicates, as suggested by Davidson (1967b) and many others. Function Application is not the only rule invoked these days. So we can ask if it should be invoked at all, given event analyses.

The idea that ‘barked’ is of type  $\langle e, t \rangle$  often gets modified in favor of saying that the intransitive verb is a semantically dyadic expression—of type  $\langle e, \langle e, t \rangle \rangle$ —that corresponds to a function that maps each entity,  $x$ , to a function that maps each *event*,  $x'$ , to truth or falsity depending on whether or not  $x'$  was a *barking* by  $x$ . In which case, combining the verb with ‘Fido’ yields an expression corresponding to a function that maps events to truth values. This permits conjunctive composition with other such functions, like those corresponding to ‘loudly’ and ‘today’. But to get a plausible truth condition for (5), existential closure is needed.

Moreover, ‘Fido bark’ appears as the direct object of ‘heard’ in (6), which means roughly that Felix heard *an event of* Fido barking. So it seems that covert existential closure can be triggered by combining a verb with an untensed clause, and without yielding a truth-evaluable sentence; see Higginbotham (1983). There are good reasons for also positing such closure for the noun in (7), as suggested by Kamp (1981) and Heim (1982). The indefinite article ‘a’ is plausibly an English grammatical marker of the singular count noun, as opposed to a quantifier of type  $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$  that needs to combine with ‘cat’ and then ‘Fido chased’.

This avoids the need to posit covert quantificational words in (8) and translations of (7) in languages (e.g., Japanese) with no articles. Burge (1973) and others offer independent support for predicative analyses of names. So one can plausibly maintain that (7) and (8) are understood as existential generalizations that include predicates formed by existential closures, along the lines of (7a) and (8a); where **bold** indicates plural variables, whatever those turn out to be.<sup>4</sup>

(7a)  $\exists e\{\text{Past}(e) \ \& \ \exists x'\exists x[\text{Fido}(x') \ \& \ \text{ChaseByOf}(e, x', x) \ \& \ \text{Cat}(x)]\}$

(8a)  $\exists e\{\text{Past}(e) \ \& \ \exists x'\exists x[\text{Dogs}(x') \ \& \ \text{ChaseByOf}(e, x', x) \ \& \ \text{Cats}(x)]\}$

I think this illustrates a broader pattern in the semantics literature, especially since the early 1980s: lots of proposed logical forms with tokens of ‘ $\exists$ ’ and ‘&’ that do not plausibly correspond to *components* of Slang expressions, but instead seem like reflections of *combining* meaningful expressions. A related trend has been to replace appeal to polyadic representations of verb meanings—e.g., ‘ChaseByOf(e, x', x)’—with multiple dyadic representations as in (7b);

(7b)  $\exists e\{\text{Past}(e) \ \& \ \exists x[\text{Agent}(e, x) \ \& \ \text{Fido}(x)] \ \& \ \exists x[\text{ChaseOf}(e, x) \ \& \ \text{Cat}(x)]\}$

where ‘ChaseOf(e, x)’ might be further analyzed as ‘Chase(e) & PatientOf(e, x)’. This is quite puzzling if Function Application is the fundamental mode of semantic composition for Slangs. But logical forms like (7b) are expected if Slangs have the semantic character posited in *CM*: lexical predicates, monadic or dyadic, are repeatedly conjoined and  $\exists$ -closed.

Discussions of causative and passive constructions, as in (9) and (10), play a large role in the relevant literature because such constructions invite a cluster of related questions. Why does the first conjunct of (9) imply the second? Why does each conjunct of (10) imply the other? And why is the subject of a transitive verb so often associated with being the agent or experiencer of an event, as opposed to being the patient or theme? If the verb in the first conjunct of (9) denotes the triadic function  $\lambda x.\lambda x'.\lambda e.\text{BreakByOf}(e, x', x)$ , then why are there no corresponding verbs in other Slangs that denote the “thematically inverted” function  $\lambda x.\lambda x'.\lambda e.\text{BreakOfBy}(e, x', x)$ ?

In many Slangs, causative verbs are formed by adding an overt morpheme to intransitive verbs. Studies of this phenomenon revitalized the old idea that a clause like ‘Felix break a vase’ includes two verbal elements that have combined; see Baker (1988) on incorporation. On this view, the atomic verb ‘break’ takes a single argument that corresponds to the things that break in events of breaking, and agent positions are associated with a covert morpheme akin to the light verb ‘make’ in ‘make a baby smile’. In which case, the subject and object of ‘Felix break a vase’ are understood as parts of conjoinable event predicates like ‘ $\exists x[\text{AgentOf}(e, x) \ \& \ \text{Felix}(x)]$ ’ and ‘ $\exists x[\text{BreakOf}(e, x) \ \& \ \text{Vase}(x)]$ ’. If ‘Felix’ is understood this way in (9), it is unsurprising if ‘Felix’ is understood the same way in the prepositional phrase in (10). The indirect object of (11) can also be treated like the prepositional phrase in ‘Hubbard gave a bone to Fido’, especially in light of Larson’s (1988, 2014) discussion of ditransitive constructions.

Given evidence that these ideas are on the right track, semanticists should at least consider the possibility that while Slang lexical items can be semantically dyadic, *polyadicity* is unattested—or at least rare—because the operative compositional principles for phrasal syntax are geared to monadic predicates, and relationality is introduced via semantically dyadic lexical items that immediately combine with grammatical arguments (whose positions get existentially closed) to form monadic predicates that can be conjoined with others. *CM* explores this possibility from both formal and cognitive perspectives.

On the technical front, I show how this typologically spare conception of meaning can handle the standard textbook constructions and more, without appeal to Function Application.

<sup>4</sup> *CM* includes a specific proposal, inspired by Boolos (1998) and Schein (1993); see also Pietroski (2005).

This homework exercise doesn't show that the proposal is correct. But advocates of more familiar views are equally in the position of having a proposal that is not the only game in town. So arguments against appeal to Function Application and Fregean typology should be considered without prejudice. I suspect that when people talk about how impressive standard theories of meaning are, they are often thinking about the framework they were initially offered for sentences like (1-3)—while forgetting or downplaying the ways in which that framework creaks, under the pressure of constructions that get considered later—and not considering alternative models of composition. So I offered a specific alternative that can be modified in various ways.

In terms of cognition, I stress that my proposals about Slangs are fully compatible with humans having many concepts that are neither monadic nor dyadic. Indeed, I think children regularly lexicalize singular concepts and polyadic concepts, and that the process of lexicalization involves using concepts of diverse types to *introduce* concepts that can be fetched and combined via certain severely limited “conjoin and close” operations. This predicts various kinds of circumlocution that would otherwise be puzzling. Consider (12).

(12) The bone is between Fido and Felix.

To express the idea of one thing being between two others, speakers of English resort to using ‘is’ and ‘and’, instead of a triadic verb that would allow for sentences like (13); cp. (11).

(13) The bone twixts Fido Felix.

Taken together, these considerations highlight the questions of whether appeals to Function Application are needed or wanted in theories of meaning for Slangs—and if not, whether we should maintain the assumption that sentences like (1-12) have truth conditions. In my replies to Santorio and Szabo, I'll focus more on my general skepticism about attempts to characterize meaning in terms of truth. But I suspect that characterizing *truth*, even for the restricted range of thoughts that are naturally available to members of our species, will require appeal to many polyadic notions. (Modern logic is, for good reason, deeply relational.) In this sense, my spare conception of natural semantic composition is interwoven with my internalist conception of Slang meanings as instructions for how to assemble concepts of a *limited* sort.<sup>5</sup>

Davidsonians, who also eschew appeal to Function Application, may feel unfairly left out of the discussion so far. But as I try to show in *CM*, the empirical issues—concerning human cognition and semantic composition in Slangs—remain largely the same if talk of verbs denoting (potentially polyadic) functions is replaced with talk of verbs being satisfied by sequences of entities. And with few exceptions (e.g., Larson and Segal 1995), textbook details tend to look more like Lewis (1970) or Montague (1974) than Davidson (1967a) or Tarski (1944).

That said, let me end this introduction with an opinionated reminder about the field's history. Current theories of linguistic meaning descend from Davidson and Lewis, whose proposals emerged in an environment of “Semantic Quineanism:” a rabid form of extensionalism that was motivated by an odd mix—prevalent at Harvard in the 1960s—of externalism, a kind of nominalism, residual behaviorism that often morphed into instrumentalism about psychology, admiration of Tarski combined with a fondness for eliminativism with regard to meanings, and a willingness to treat regimentation as description. It wouldn't be amazing if theories born in this setting need to be significantly revised given empirical investigations of Slangs.

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<sup>5</sup> In *CM*, I note that neo-Fregean accounts of composition can be combined with an instructionist conception of meanings, and that (given enough metaphysics) expressions that are not polysemous could have extensions that are characterizable in my terms. But as discussed below, my specific proposals about composition are interwoven with hypotheses about actual lexical items.