

## EVENTS AND SEMANTIC ARCHITECTURE

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What are the basic semantic operations in natural language?<sup>2</sup> From a certain, by now, traditional perspective, one may answer Functional Application, and most likely also add Predicate Modification, Lambda Abstraction and type shifting. One version or other of this view has certainly been the most prominent way of practicing semantics the past 30 years (see [Heim and Kratzer 1998](#) for an accessible overview). However, anyone committed to an internalist conception of language should raise his or her eyebrows. Are these the right kinds of operations?

Paul Pietroski's book considers exactly this question. His answer is a plea for a theory of semantics using different kinds of operations than what Functionalism (as he calls the standard practice, as opposed to his own approach, Conjunctivism) does. As such, his project (followed by [Pietroski Forthcoming](#)) is part of a general trend of rethinking how the structure of natural semantics looks (see [Cappelen and Lepore 2005](#); [Ramchand 2008](#), [Forthcoming](#); [Uriagereka 2008](#) for other suggestions, and in particular [Schein \(1993\)](#), forthcoming for a proposal closely related to Pietroski's).

Pietroski's overall thesis is that expressions of natural language consist of concatenation of two simpler expressions. Constituents are to be understood as monadic predicates, and concatenation signifies conjunction. Put differently, meaning is determined by the two constituents and by the meaning of the concatenation operation itself. Pietroski builds on Davidson's work on events, though modifying it based on important work by Frege, Tarski, Higginbotham, Boolos and Schein. To give an example, the sentence in (1) has the meaning in (2), which can more formally be expressed as in (3).

- (1) Pat hugged Chris quickly.
- (2) There was something such that it was done by Pat, and it was a hugging, and it happened to Chris, and it was quick.
- (3)  $\exists x[\text{Agent}(x, \text{Pat}) \ \& \ \text{Hugging}(x) \ \& \ \text{Theme}(x, \text{Chris}) \ \& \ \text{Quick}(x)]$

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On a more traditional picture, the verb is semantically associated with some function; the syntactic arguments are associated with some entities in the domain of that function; and concatenating a predicate with appropriate arguments yields an expression associated with the value of the relevant function as applied to the relevant entity. Just from this simple case, it should be clear that there are important differences between Functionism and Conjunctivism. There is no function which maps entities to truth values in (3), though the sentence/proposition of course is truth-evaluable.

There is an important question to ask concerning the way Pietroski uses *concatenation*. Concatenation is usually used in its technical meaning, where it means that two things are put together in a finite-state manner. We know that human language clearly is not only finite-state since we find many properties that go beyond finite-state. In what sense is Pietroski using the term concatenation? As far as I can see, Pietroski uses the term exactly in this technical way. He seems to be suggesting that concatenate is a *semantic* operation, but he hardly says anything about what the relationship is between the syntax and the semantics. It's a weakness of the book that this is not worked out in more detail since it really seems important for his project. I will return to this point again below.

The major portion of Pietroski's book is devoted to showing that Conjunctivism can cover all textbook cases (various argument structures, quantification) equally well, and in some cases better, than Functionism. He is also able to show that his framework gives us a toolbox to deal with sentential complements and plurality. I will not replicate all his arguments here, but let us consider one interesting facet of Pietroski's view (I will return to other aspects below): adjunction is no longer the oddball in the system, but the 'default' operation (see also [Hinzen 2006, 2007](#)). As he puts it: 'if the open-endedness of natural language resides mainly with adjunction, it seems odd to treat adjunction as the semantically special case. If the significance of concatenation is uniform, why think that the uniformity is tailored to predicate-argument combinations, while all the other cases reflect a semantic interaction effect?' (p. 75). Again, we encounter the problem of how *concatenation* is used. I think Pietroski must have in mind that the syntax delivers hierarchical expressions to the LF interface, and that the LF interface is then stringing these expressions together by virtue of concatenation. In a neo-Davidsonian perspective, Pietroski argues that the LF representation (the event structure) represents whether something is an external or an internal argument. This is clearly dependent upon syntax, and this shows that the semantics is dependent on the syntax in order to identify something as an external or internal argument. However it is not clear from this book how exactly this relationship is analyzed. Pietroski would have benefited from being clearer on this as it is an important issue to understand how he thinks about the syntax-semantics relationship.

There are two very central aspects of the present book, namely the analysis of quantification and of plurality. I will give a snapshot from each of these domains, so that the reader gets a flavor of what's going on.

Consider first quantification. The problem essentially involves examples such as (4)–(5).

(4) Every bottle fell.

(5) He broke every bottle.

Pietroski's leading idea is that even these constituents are interpreted as monadic predicates conjoined with others. The general thought, essentially from Frege, is the following: pair the bottles with sentential Values (minimally truth (**t**) and falsity (**f**)), so that each bottle is associated with **t** if it fell and **f** otherwise; then ask whether every one of the resulting pairs associates something with **t**. Obviously, the important task is to formulate this within a general and plausible theory without lapsing into a paradox, as Frege did. Let us see how Pietroski attempts at solving this.

By now it's fairly standard to assume that determiners like *every* take internal and external arguments. There are two possibilities for Conjunctionists: either one can say that determiners take ordered pairs of sets as values (this is close to the traditional Functionist theory), or one can say that the Values of determiners are of the form  $\langle \mathbf{t}, x \rangle$  or  $\langle \mathbf{f}, x \rangle$ ; where  $x$  is an entity in the relevant domain. Pietroski clearly argues in favor of the latter option. In part, the motivation is theoretical. He claims that saying that determiners express relations between sets of Values violates the spirit of Conjunctionism. This is so because if one recodes the relationality permitted by Functionism in the lexical meanings, one is not faithful to the idea that grammatical arguments, like Davidsonian adjuncts, are interpreted as monadic predicates. Furthermore, to say that for each predicate there is a set whose elements are all and only the things that satisfy this predicate is problematic (cf. Boolos 1984, 1998; Schein 1993). One simple reason is Russell's paradox.<sup>3</sup> A more appealing view, Pietroski argues, is that a predicate can have many Values, which need not form a set (more below). Finally, we have the fact that all determiners of natural language are conservative: Every bottle fell is true if every bottle is a bottle that fell.<sup>4</sup> I will return to the latter shortly, but let us first consider a few more details about structures such as (4). Determiners and their arguments are interpreted as monadic plural predicates, whose Values are ordered

[3] Functionists can handle the truistic (i), but they have trouble with the equally truistic (ii).

(i) Every pet that does not own itself is a pet.

(ii) Every set that does not contain itself is a set.

While there may be a set of all the nonselfowning pets, there is no set of all the nonselfelemental sets.

[4] Formally, using Barwise and Cooper's (1981) terminology, we can say that a relation  $R$  is conservative iff for any sets  $\alpha$  and  $\beta$ ,  $\alpha$  bears  $R$  to  $\beta$  iff  $(\alpha \cap \beta)$  bears  $R$  to  $\beta$ .

pairs consisting of an entity and a sentential Value. The Values of determiners like *every* and *some* are of the form  $\langle t, x \rangle$  or  $\langle f, x \rangle$ , where  $x$  is the internal element. Pietroski calls these pairs ‘Frege-Pairs’ since they reflect Frege’s insight that an open sentence like ‘-fell’ can be viewed as an expression that associates each relevant entity with a sentential Value. Specifically, the semantics of (4) is as follows (somewhat simplified for expository convenience):

- (6)  $\text{Val}(t, \langle [[\text{every internal-bottle}] \text{external-fell}] \rangle)$  iff  
 $\exists O[\text{Val}(O, \text{every}) \ \& \ \text{Val}(O, \text{internal-bottle}) \ \& \ \text{Val}(O, \text{external-fell})]$

Here ‘O’ means that there are some things, the Os, such that..., and ‘Val(O...)’ means that the Os are Values of the expression in question. I set aside other aspects of the notation, though as it turns out, the notation is helpful when it comes to explaining the conservativity relation. Let us consider that before moving on to plurality. Pietroski takes some space to argue that Functionism does not give us an independent explanation of why determiners are conservative and why they are interpreted as restrictive quantifiers. The issue at stake is why there isn’t a non-compound word like ‘Tl’ with ‘Tl is green or grey’ meaning that every thing is green or grey. Put differently, we need to explain why certain logically possible relations do not exist. Pietroski does this by, as we have already seen, denying that determiners express relations. Hence they cannot express non-conservative relations. Determiners do impose restrictions on Frege-Pairs, so that if [internal-t fell] is the external argument of a determiner, each O has to be of the form  $\langle t, x \rangle$  if  $x$  fell. One can thereby show how determiners ‘live on’ their internal arguments. Pietroski offers more arguments and details than I have been able to do justice here, but hopefully this gives a preview of an essential aspect of his book.

Let us finally turn briefly to plurality. Following in particular [Schein \(1993\)](#), Pietroski argues that plural-entity theories are on the wrong track. They are required to postulate the existence of plural collections. So a sentence like (7), on a Functionist account, requires a six-membered collection of these turnips; call it ‘T6’. An obvious hypothesis is then that ‘T6’ is the value of ‘them’ in a context where speakers refer to six turnips.

- (7) Three surgeons stabbed six turnips.

Many people (see e.g. [Schwarzchild 1996](#)) have taken the view that predication is fundamentally singular, and that for things to collectively satisfy a predicate is to say that a collection, with those things as elements, satisfies a related predicate. However, predicates that seem to be essentially plural pose problems since these predicates can be true even if, as in (8), there is no single element that can rain down.

- (8) The rocks rained down on the huts.

[Schein \(1993\)](#) argues that plural-entity theories cannot explain these facts without running into Russell's paradox. Based on this and on [Schein \(Forthcoming\)](#), Pietroski argues that collective readings are to be understood in terms of events. Consider (9).

(9) Brutus stabbed six turnips.

(9) is true if Brutus performed *one or more events* of stabbing whose Themes were six turnips. Crucially, it is not necessary to describe Brutus' action in terms of a six-membered turnip-collection. Instead, following Boolos, Pietroski argues that we can appeal to plural predicates: 'Using capitalized subscripts to indicate plural variables that can be bound by a second-order existential quantifier, *some things*<sub>O</sub> have six turnips as their<sub>O</sub> Themes if there are *some things*<sub>X</sub> such that: there are six of them<sub>X</sub>; each of them<sub>X</sub> is a turnip; and they<sub>X</sub> are the Themes of them<sub>O</sub>' (p. 100). On this approach, to be six is not to be a set with six elements. It is impossible to say that one thing is six in the way that six things are six. A set is exactly one thing, even if it has several members. Summarizing, Pietroski argues that the meaning of *six turnips* can be represented as in (10).

(10) Theme(O, six turnips) iff  $\exists X[\text{Six}(X) \ \& \ \forall x:Xx(x \text{ is a turnip}) \ \& \ \text{Theme}(O,X)]$

Here 'Xx' means that x is one of the Xs, and 'Theme(O, X)' means that the Xs are the Themes of the Os. There is also a close relationship between quantification and plurality in Pietroski's book (recall that determiners are interpreted as monadic plural predicates), which he discusses quite extensively, but it goes beyond this review to show the details of this relationship.

An argument that Pietroski makes repeatedly is that concatenation gives you all you need. Put differently, one gets the impression that concatenation is the only basic operation required by the computational system that generates human language (see also [Hornstein and Pietroski Forthcoming](#) on this). Setting aside the problems surrounding the term concatenation, it is nevertheless not quite true that Pietroski gets away with only one operation, as he needs covert quantification over events and a (crucially) limited version of type shifting for arguments. Functionism requires this as well, but in a minimalist spirit, one should ask: is this really a necessary property of the Faculty of Language? Of course, existential closure is what gives us truth-conditions, so without existential closure we do not seem to be able to give ourselves truth conditions. However, if his theory is about meaning and not about truth per se (see below), it may be possible to do without existential closure. I have no definite answer to offer at this stage, but I think the question merits attention. *If* one could dispense with existential closure, we would indeed have an even more minimal (and hopefully equally adequate) theory. Needless to say, only future research will show us whether this is

a tenable way to go or not.

There is, according to Pietroski, an important and intuitive reason why Functionism may be wrong. Imagine the following homework task: Consider the following sentences, and provide a compositional semantic theory that associates each of the following word-strings with a correct truth-condition in a way that also helps explain any entailments due to meaning. If you also care about explanatory adequacy, show that it is possible to acquire the theory given minimal nativist assumptions.

- (11) The sky is blue.
- (12) Snow is white.
- (13) France is hexagonal, and it is also a republic.
- (14) It is raining.

How to analyze these sentences is by no means clear, regardless of whether one assumes Functionism or Conjunctivism. The issue relates to the following question, which Pietroski raises towards the end of the book: Do declarative sentences of natural language have *truth*-conditions, perhaps relative to contexts? To some this may seem like a preposterous question. [Stanley \(2008\)](#), at the end of his comprehensive history of the philosophy of language in the twentieth century, says that ‘any adequate theory of meaning fundamentally employs the notions of reference and truth’. Pietroski adopts this view throughout the book, as an idealization (p. 9). However, towards the end he raises a deeper question: is it possible that semantic theories really are about intrinsic features of linguistic expressions, where such features constrain but do not determine truth-conditions? His theory of Conjunctivism is a theory about *meaning*, not a theory about truth per se (see also [Pietroski 2005](#)). As he points out, this echoes Chomsky’s (1977; 2000) arguments against building a theory of meaning on a theory of truth-conditions. Consider in that respect the following illuminating quote:

[W]e cannot assume that statements (let alone sentences) have truth conditions. At most, they have something more complex: ‘truth indications’, in some sense. [...]

There is good evidence that words have intrinsic properties of sound, form, and meaning; but also open texture, which allows their meanings to be extended and sharpened in certain ways; and also holistic properties that allow some mutual adjustment. The intrinsic properties suffice to establish certain formal relations among expressions, interpreted as rhyme, entailment, and in other ways by the performance systems [...] ([Chomsky 1996](#), 52).

To illustrate this, consider the example that Pietroski uses, namely (13). Is there really some entity  $x$  such that  $x$  is France, and  $x$  is hexagonal, and  $x$  is a republic? If not, are we forced to say that the utterances of the sentence are false? It is likely that they have a syntax that is perfectly ok, which indicates that the problem may be located elsewhere. Pietroski argues that we should consider the possibility that this subtlety may lie in the relation between linguistic meaning and our use of language to talk about the world. He speculates that meaning may be ‘layered’, with some aspects that are strictly compositional because Conjunction is true, and other aspects that are sensitive to more global properties of expressions. As said, this question is only considered briefly towards the end of the book. A more detailed discussion can be found in [Pietroski \(2005\)](#), and especially in his forthcoming book that deals with this issue in detail.

A final point worth making is that the way Pietroski is thinking about semantics seems to align well with current minimalist trends. Currently a lot of effort is being put into reducing the wired-in principles to their barest essentials (cf. [Chomsky 2005](#)). Pietroski’s theory is clearly framed in such a perspective. However, he needs more than just concatenation (whatever that exactly may be), and it is also not clear how his theory aligns with the syntax. More recently he has expressed some views about this (see [Hornstein and Pietroski Forthcoming](#); see also [Boeckx 2008](#) for another implementation of Pietroski’s theory), but they are not stated in the book. Despite this, the general philosophy behind his project is very minimalist in spirit, and as such it merits careful consideration by any working syntactician or semanticist.

In conclusion, Pietroski’s book offers a fascinating view of how natural language semantics may be organized. He gives us an approach that seems to be able to deal with the data that people using a framework like the one in [Heim and Kratzer \(1998\)](#) are able to. In an ideal world, when we have two approaches that are able to deal with the data, we can start comparing alternative hypotheses. Pietroski’s book makes comparison possible, which by itself is an important achievement. His thesis is no doubt bold one, but also highly interesting. We can only look forward with excitement to the forthcoming book.

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