

The review has appeared in *The Philosophical Review* (2021) 130 (1): 171–175.
<https://doi.org/10.1215/00318108-8699617>

Paul Pietroski, *Conjoining Meanings: Semantics Without Truth Values*
Oxford: Oxford University Press, 2018. x + 393 pp.

What is the relation between semantics and cognition? There are at least two natural approaches to this question. One may argue that the relationship between meaning and psychology is permissive, i.e., meaning is externally specified and then in some way exported to our heads. On that view, it is often hard to systematically explain the connection between meaning and speakers' judgments of entailment or the truth of sentences in context. Another perspective on the issue is that the relationship between meaning and cognition is constrained, that is the ways in which meanings are specified are constrained by our cognitive organization. Paul Pietroski is a champion of the latter approach, arguing for the cognitive turn in semantics that would make justice to the inherent connections between meaning and cognition. In the last decade or so, semanticists have been slowly coming to terms with the need for viewing semantics through the lenses of cognitive science. Paul Pietroski's technical contributions to the field, e.g., well-known papers showing the relation between the meaning of the quantifier 'most' and human approximate number system, have played an important role in bringing that realization upon formal semantics. However, to a large degree, this current shift in attention towards cognitive aspects of meaning has not been properly absorbed by the philosophy of language. *Conjoining Meanings* attempts to bridge that gap by systematically unfolding the consequences of being 'realistic about human minds' for the philosophical debates surrounding language and logic.

In short, the book is a plea against meaning externalism. The main claim is that meanings are mental algorithms to access and compose concepts. But the algorithms have restricted computational capabilities imposing constraints on the meanings expressible in natural language. These constraints should be the main topic of investigations for language theory.

Chapter 1, looks closer at some of those limitations, starting by discussing *constrained* structural homophony, e.g., sentence (1) can be easily understood as (2) or (3) but not (4):

- (1) *A spy saw a man with a telescope.*
- (2) *A spy saw a man by using a telescope.*
- (3) *A spy saw a man who had a telescope.*
- (4) *#A spy saw a man and had a telescope.*

Therefore, Pietroski argues, we should focus on learnable Slangs, languages that children can acquire as native languages. Slangs connect meanings with pronunciations but, as the above sentences illustrate, obey various sets of constraints, i.e., distinct meanings, e.g., (2) and (3), can be connected with the same pronunciations (1) but certain meanings are ruled out (4). This is a kind of naturalistic puzzle the language theory should try to explain.

Chapter 2 tries to answer the question of what are concepts. As mentioned above, concepts play a crucial role in Pietroski's theory, they constitute the cognitive content accessed by the

meanings. But what are they and how they connect with Slangs' expressions? Words are notoriously polysemous. Just think of the following sentence, where "France" stands at the same time for the geographical and legal objects.

(5) *France is hexagonal, and it is a republic, but there are no hexagonal republics.*

Hence, according to Pietroski, we should not think of meanings as extensions of some idealized concepts. Communication does not require words having fixed denotations. We should relax our notion of meaning and think about meaning as instructions to access and assemble not necessarily ideal concepts. For Pietroski, concepts can be identified with some composable mental symbols. They are assembled within, probably not a very strong logical system, Language of Thought, in which monadic and dyadic concepts are the basic building blocks and conjunction plays a privileged role among operation combining concepts. The claim is that phrasal meanings are instructions for how to build conjunctive concepts (hence the title of the book).

Chapter 3 reviews some of the classic works in logic with an eye towards using fragments of the formal machinery to describe the language of thought underlying Slangs. It also emphasizes differences between the goals of semantic theory and the scientific project of Frege, Tarski, and Church. Pietroski admits that the logical toolkit could be initially useful for the semantics, highlighting some issues regarding representational format and compositionality, but also expresses concern that building foundations of semantic analysis on logic might have led to the mistake of meaning externalism.

Chapter 4 focuses on the application of liar paradoxes to natural language semantics. Liar paradoxes, according to Pietroski, prove that it is very hard to "squeeze theories of meaning out of truth theories". Chapter 5, strengthens the skepticism towards truth-theoretic approaches by investigating difficulties of formulating plausible truth-theoretic semantics for adverbial modifications in sentences like:

(6) *Al chased Theo gleefully and The chased Al gleelessly around the pole.*

Pietroski argues that to account for the meaning of such sentences within Davidsonian truth-theoretic semantics one needs to individuate events in many cognitively implausible ways. Based on this evidence, Pietroski claims that truth-theoretic approaches are ill-suited to the scientific project of describing meaning in Slangs. The last two content chapters of the book develop in some detail the alternative proposal.

In Chapter 6, Pietroski argues that words are more flexible than the concepts they lexicalize. For instance, proper nouns are not necessarily denoters, see sentence (7), verbs are flexible with respect to the number of arguments, see sentence (8), etc.

(7) *Both of the Tylers at the party talked with the little Ceasar.*

(8) *While a baby kicked, a woman kicked a bone, and so a bone was kicked.*

The proposed solution is to think about the words as instructions to fetch concepts that are monadic or dyadic.

Chapter 7 goes into some more details on the core of the proposal: the mental algorithms to access and compose concepts. The chapter focuses on some textbook constructions, including prediction and adverbial modification, tense, sentences, relative clauses, and quantification. For instance, Pietroski sketches a new explanation for the semantic universal

of conservativity in the generalized quantifier theory based on postulating a specific restriction on concepts that can be fetched by quantificational determiners. This is possible by postulating a new representational format for quantification.

Of course, one can raise questions about a book of this scope and ambition. Pietroski claims that concepts, expressible in Slangs, are assembled in a mental language and he even proposes the first sketch of such language of thought. Mental language must be expressive enough to capture relevant linguistic phenomena but it needs not to be too strong to still remain psychologically plausible. This resembles some of the debates in the '80s about how much of computational resources is needed to describe grammars of natural languages. Soon this has also become a widespread question in semantic investigations. And researchers have proposed rich theoretical toolbox to explicitly talk about such restrictions, either in terms of computational complexity or logical definability.¹ Pietroski's program seems to share many similarities with these approaches. The main one may be an emphasis on the minimality/complexity of cognitive representations underlying semantics. This leads to very natural questions one would like to ask about a mental language posited by Pietroski. How expressive is it really in comparison to other logical systems? Or, how tractable are the mental operations of concept composition within this language? In other words, to what extent do the meanings compose? Answering these sort of nontrivial questions with relevant expressivity/complexity results would allow locating the Pietroski's proposal on the Fregean map.

Much more recently, these logical and computational approaches to semantics merged with cognitive modeling have led to explicit computational cognitive models of Language of Thought trying to account for human linguistic behavior.² None of the exciting more recent work on the Language of Thought is discussed in the book, maybe with the exception of the Natural Logic paradigm that is very briefly mentioned. These topics seem pressing since it is a legitimate question to ask how the proposal advocated by Pietroski fits into this broader project of cognitive science. Let me just mention a few issues: Can LoT (concepts) be described in non-referential (non-externalist) terms? How can we identify LoT primitives (and is it even necessary for the project)? Of course, instead of complaining about topics not covered, one could just say that Pietroski's book prepares a philosophically solid ground to ask such more 'technical' questions.

As for what is included, I felt that a bit more might have been said about the cross-linguistic universals, and especially about intriguing linguistic observations that certain types of concepts, e.g., non-convex functional and content words, seem to be never lexicalized in any natural language.³ In Chapter 4.1 Pietroski attempts such analysis for the famous universal property of natural language quantification, conservativity, but it is not completely

¹ For more historical discussion and examples see: Jakub Szymanik, *Quantifiers and Cognition. Logical and Computational Perspectives* (Amsterdam: Springer, 2016).

² See, e.g.: Steven Piantadosi, Joshua Tenenbaum, Noah Goodman "The logical primitives of thought: Empirical foundations for compositional cognitive models", *Psychological Review* 123 (2016): 392-424. Charles Kemp and Terry Regier "Kinship categories across languages reflect general communicative principles", *Science* 336(2012): 1049-1054.

³ Emmanuel Chemla, Brian Buccola, and Isabelle Dautriche, "Connecting content and logical words", *Journal of Semantics* 36 (2019): 531-547.

clear to me how such analysis can be straightforwardly extended to cover other intriguing cases of missing words, e.g., no language has an expression “Nall” (meaning “not all”) or “Least” (meaning “less than half”, although quite some languages have “most”).⁴ I expect that going more into the explanation of such issues would require revoking samples of techniques mentioned in the previous paragraph but also going into a more detailed discussion of what concepts really are and how are they precisely represented in the brain. In particular, I would be curious to read how Pietroski’s thinking about meaning relates to geometrical approach to concepts and semantics.⁵

In Summary, the book is a well-composed and well-reflected philosophical argument for thinking about the meaning in cognitive terms as an outcome of a mental procedure combining concepts in a psychologically limited way. To better understand the meaning it is necessary to understand the limited ways in which mental symbols are assembled. Even though logic may help us with realizing what the task is, we need not assume that classic logical theories are the right vocabulary to describe cognitive underpinnings of meaning. The limitation of the book is its relative silence on the recent logical, computational, experimental, and cognitive approaches that seems to be relevant to the task at hand. Combining the philosophical stance defended in the book with these interdisciplinary approaches, as Pietroski seems to do himself in many of his papers, should lead to a significant scientific progress in the study of meaning. The future of semantics may therefore depends on its ability to absorb further influences from cognitive science, AI, and computer science.

*Jakub Szymanik*⁶

University of Amsterdam

⁴ See Shane Steinert-Threlkeld and Jakub Szymanik "Learnability and Semantic Universals, Semantics & Pragmatics (forthcoming) for a suggestion that conservativity may differ from other semantic universals.

⁵ Peter Gärdenfors, *The Geometry of Meaning* (Massachusetts: MIT Press, 2014).

⁶ The author has received funding from the European Research Council under the European Union’s Seventh Framework Programme (FP/2007–2013)/ERC Grant Agreement n. STG 716230 CoSaQ.

