

Type-Logical Semantics

Bob Carpenter

(Lucent Technologies)

Cambridge, MA: The MIT Press
(Language, speech, and communication series), 1997, xxi+575 pp; hardbound, ISBN 0-262-03248-1, \$60.00; paperbound, ISBN 0-262-53149-6, \$35.00

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This is a very ambitious book, which tries to do several different things: give a detailed and self-contained introduction to type-logical semantics and categorial grammar; illustrate this framework with a comprehensive set of illustrations of semantic analysis of English; and relate all of this to current research within the categorial tradition. It apparently derives from the author's "introductory" course on natural language semantics, but the end result is very far from introductory (I suspect it would scare most beginning linguistics students to death) and the book contains a great deal of original and insightful analysis of interesting semantic phenomena.

The first chapter contains a potted introduction to the history of formal and linguistic semantics and related aspects of the philosophy of language and logic; the second consists of an extended introduction to the lambda calculus, combinators, types, etc, and the third is a development of the particular higher-order logic used later. Of these chapters, the first is relatively superficial, but the second and third are very detailed and, more importantly, very clear. I would guess Carpenter is an excellent teacher: he presents difficult material in an appealing way, and doesn't go overboard on terse notation or Greek letters.

Chapter 4 introduces various flavors of categorial grammar, and Chapter 5 describes the Lambek calculus. By this time we are 180 pages or so into the book, and I was beginning to realize that I didn't (even) know as much as I thought I did about categorial grammar.

Semantic analysis of English starts off with coordination and unbounded dependencies (Chapter 6). Carpenter provides his own analysis of these phenomena, incorporating various devices from the categorial literature. His reference to earlier work, here and throughout the book, is always very good, with short summaries of approaches to particular issues by other scholars, showing how they differ, or can be seen as different ways of doing the same thing.

Chapter 7 is a long discussion of quantifiers and scope problems. Carpenter starts with Montague's "quantifying in" and Cooper's storage approach to scoping, and then argues that the type-logical treatment he develops captures some of the good features of these approaches, while avoiding most of their descriptive and theoretical problems. He then goes on to a more general discussion of NP meanings, covering definites and indefinites, generics, and possessives, followed by a somewhat tangential but interesting approach to comparatives, and finally discussing existential sentences.

Chapter 8 provides an analysis of plural NPs, again giving some very useful summaries of earlier approaches, and gradually developing a semantics that can cope

with most of the familiar phenomena: collective, distributive, group readings, etc. Chapter 9 discusses those (rather few) cases of pronouns that lend themselves to a categorial treatment: reflexives and reciprocals, essentially.

The final three chapters look at various types of intensionality. Chapter 10 introduces tense and modal logic, and possible-worlds semantics, and presents them within the type-theoretical framework developed earlier. Chapter 11 analyzes various types of control phenomena, opacity with intensional verbs; and Chapter 12 describes tense, aspect, and various types of temporal modification. A substantial appendix gives some introductory material on set theory, first-order logic, and Boolean algebras.

This is a huge book, full of interesting material. You could read it as a synthesis of many current approaches to linguistic description within a categorial framework, or as an introduction to semantic analysis using higher-order logic. You can also dip into it as a reference book to get a quick summary of recent work within this tradition on one of the many areas of linguistic description covered.

There is little that is overtly computational, but much that could be easily translated into several different computational frameworks. I doubt whether it would be useful as an introductory textbook for anyone other than very advanced students, unless it was the basis of a very long course of instruction, but for students and researchers who are capable of following the technical developments, it is a rewarding and lively read. (Anyone who completes all the exercises successfully will know an awful lot about logic and semantics.)

I enjoyed the book, despite being initially daunted by its length, and I learned, and am learning, a lot from it. Persuade your librarian to buy it, but be careful not to drop it on your toe.

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Type-logical semantics studies linguistic meaning with the help of the theory of types. The latter originated with Russell as an answer to the paradoxes, but has the additional virtue that it is very close to ordinary language. In fact, type theory is so much more similar to language than predicate logic is, that adopting it as a vehicle of representation can overcome the mismatches between grammatical form and predicate logical form that were observed by Frege and Russell. The grammatical forms of ordinary language sentences consequently may be taken to be much less misleading than logicians

- 1 Introduction
- 2 Type-logical semantics (1970s-2000s)
- 3 Abstract type-logical grammar (2000s-)

Common thread: Higher-Order Logics and λ -Calculus. A friendly intro Farmer, William M. The seven virtues of simple type theory. *Journal of Applied Logic* 6 (2008):267–286. 5 / 34. 2 - Type-Logical Semantics. Types and lexical typing. e: entities t: truth-values. Simply typed lambda-calculus higher-order logic applicative categorial grammar the Lambek calculus coordination and unbounded dependencies quantifiers and scope plurals pronouns and dependency modal logic intentionality tense and aspect. Appendix: mathematical preliminaries.

@inproceedings{Carpenter1997TypeLogicalS, title={Type-Logical Semantics}, author={B. Carpenter}, year={1997} }. B. Carpenter. Published 1997. Mathematics. Simply typed lambda-calculus higher-order logic applicative categorial grammar the Lambek calculus coordination and unbounded dependencies quantifiers and scope plurals pronouns and dependency modal logic intentionality tense and aspect. Appendix: mathematical preliminaries. View PDF. Semantics of the Probabilistic Typed Lambda Calculus: Markov Chain Semantics, Termination Behavior, and Denotational Semantics. 222 Pages·2017·2.25 MB·581 Downloads·New! This book takes a foundational approach to the semantics of probabilistic programming Grammatical Analysis: Morphology, Syntax and Semantics: Studies in Honor of Stanley Starosta. 314 Pages·2000·26.57 MB·3,710 Downloads·New! the necessary minimum of theory. The book explains the grammar, semantics and use of classical logical languages Semantics: A Coursebook, SECOND EDITION. 366 Pages·2007·1.74 MB·2,711 Downloads. Review: Yehoshua Bar-Hillel, Logical Syntax and Semantics Fitch, Frederic B., *Journal of Symbolic Logic*, 1955. Review: Paul Diderichsen, Semantic Problems in Logic and Linguistics Wedberg, Anders, *Journal of Symbolic Logic*, 1959. Review: Saul A. Kripke, Semantical Considerations for Modal Logics Gabbay, Dov, *Journal of Symbolic Logic*, 1969. Review: B. J. Copeland, On When a Semantics is not a Semantics: Some Reasons for Disliking the Routley-Meyer Semantics for Relevance Logic van Benthem, Johan, *Journal of Symbolic Logic*, 1984. Book review: Melvin Fitting. Computability theory, semantics, and logic programming. Davis, Martin, *Notre Dame Journal of Formal Logic*, 1990.