

fully, and with a pedagogically attractive style, it discusses topics related to expert systems (e.g., representation, rules, shells, explanation, and confidence factors) as well as topics related to natural language processing (e.g., conjunctions, inflection, left-recursion, question-answering, and scoping). All of this combines to provide a very concrete, yet readable, introduction to these fields. It achieves this through examples, woven with explanations that are clear. All coded examples have just enough odd details to reassure us that they have survived a process of close scrutiny and debugging.

Chapter 2 is of special note. "A Prolog to Prolog" by John Sowa is perhaps the best informal introduction to Prolog I have ever read. I found it both thorough and complete, but written in a style that makes it pleasant and delightful to learn. Pure Prolog techniques are applied to several classic and novel artificial intelligence problems. Simple, direct comparisons are made to standard logic (with quantifiers), to Pascal record structures, and to relational data bases. Unification is explained with a few simple examples and criteria for reversible predicates are given.

Chapter 3 discusses more advanced programming techniques in Prolog. Here, the book departs slightly from its concentration on classic artificial intelligence problems to discuss the more mundane issues of Prolog itself: data structures, unification, control structures, labels, and metavariables. Later in the chapter, techniques for representing and searching graphs and trees are presented along with a worked-out example of alpha-beta pruning. Throughout the book, principles of good Prolog programming style are emphasized. At the conclusion of this chapter, these are summarized into a neat list of 11 guidelines. Warnings about side effects and the judicious use of cuts are similarly presented.

*Sylog* (from "syllogism") is described in Chapter 4; it represents an expert system shell embedded in Prolog. It features some interesting ideas for implementing the interpreter based on *backchain iteration* which, when run, leads eventually to a fixed point representing the answer. Several sample expert systems built from *Sylog* are also presented in the chapter. *PLANTDOC*, for example, is a MYCIN-like system that diagnoses disease in garden plants. It serves to illustrate reasoning using confidence factors, frames, and explanation techniques.

In Chapter 5, the book presents a score of methods for constructing syntactic structures from inputs, a particular semantic model, and a set of techniques for mapping syntactic structures to semantic forms. It demonstrates the ease with which input sentences can be coerced into logical expressions of meaning (expressed in "Logical Form Language"). Much of this chapter has appeared in recent research articles by McCord and, to his credit, he is able to clearly present solutions to some rather complicated issues.

In the chapter, definite clause grammars (DCGs) are

introduced first. Since these are so clean and elegant in their simplicity, they nicely introduce some of the mechanisms for natural language processing in Prolog. Next, modular logic grammars (MLGs) are introduced and shown to allow for a greater degree of modularity between syntax and semantics. The bulk of the chapter is dedicated to deriving solutions to a variety of problems using MLG. The range of issues and the degree of detailed discussion are impressive. In the conclusion, a natural language question-answering system for a university data base is presented.

I have very few criticisms of the book. It is based entirely on IBM Prolog with little or no effort to provide information about other implementations of Prolog. An appendix is provided which serves as a type of reference manual for IBM Prolog. Perhaps the book could be more generic, but then I feel it would undermine its reliance on concrete examples that the reader can confidently run. Most readers will not find this to be a difficult problem and the slight effort required to overcome the problem is well worth it. I found very few errors and all were very minor (e.g., missing existential quantifier on page 49). They never detract from what the author is saying.

I was impressed with this book. Much of the credit for this certainly belongs with the editor, Adrian Walker, who does a marvelous job of weaving together a coherent book from the contributions of his co-authors. The credentials of the supporting cast are equally impeccable. I found many enjoyable segments in the book. Although an appendix is provided which discusses the logical basis of Prolog and *Sylog*, I think it would be difficult to use this book for the logical fundamentals of Prolog, as the authors suggest. However, it is certainly an important reference and could easily be used as a textbook in support of a course on artificial intelligence, Prolog programming, expert systems, or natural language processing.

*Stan Kwasny* holds a visiting appointment with the Department of Computer Science and is affiliated with the Center for Intelligent Computer Systems at Washington University in St. Louis, MO. He has over 15 years experience conducting research in computational linguistics. His address is: Washington University, Campus Box 1045, St. Louis, MO 63130. E-mail: sck@wucsl.wustl.edu

---

## BRIEFLY NOTED

### CATEGORIAL GRAMMAR

Wojciech Buszkowski, Witold Marciszewski, and Johan van Benthem (eds.)

(Adam Mickiewicz University, Warsaw University, and University of Amsterdam, resp.)

Amsterdam: John Benjamins Publishing, 1988, viii + 365 pp.

(Linguistics and literary studies in Eastern Europe 25)  
ISBN 90-272-1530-8, \$100.00, Dfl 225.00 (hb)

This book is devoted to mathematical foundations of categorial grammar, and to its linguistic and philosophical applications. There are two survey papers on the history of the discipline and current trends, and 17 research papers, twelve of which are new and five of which are reprints of 'classics.'

**PROPERTIES, TYPES, AND MEANING. VOLUME I: FOUNDATIONAL ISSUES, AND VOLUME II: SEMANTIC ISSUES**

**Gennaro Chierchia, Barbara H. Partee, and Raymond Turner (eds.)**  
(Cornell University; University of Massachusetts; and University of Essex)

Dordrecht: Kluwer Academic Publishers, 1989, Vol I: viii + 258 pp., Vol II: viii + 307 pp.  
(Studies in linguistics and philosophy 38 and 39)  
Vol I: ISBN 1-55608-067-0, Dfl 135.00, \$69.00, £39.00 (hb);  
Vol II: ISBN 1-55608-069-7, Dfl 145.00, \$77.00, £42.00 (hb)

*Contents of volume I:* Algebraic semantics for intensional logics, by Peter Aczel; Motivating ramified type theory, by Richmond Thomason; Two issues in the foundations of semantic theory, by Raymond Turner; Self-reference, attitudes, and paradox, by Nicholas Asher and Hans Kamp; On properties and property theory, by Michael Jubien; Fine-grained type-free intensionality, by George Bealer; Semantic type-change and syntactic recognition, by Johan van Benthem.

*Contents of volume II:* Type-shifting rules and the semantics of interrogatives, by Jeroen Groenendijk and Martin Stockhof; On the semantic content of the notion of "thematic role," by David Dowty; Structured meanings, thematic roles, and control, by Gennaro Chierchia; On the semantic composition of English generic sentences, by Gregory Carlson; Generically speaking or using discourse representation theory to interpret generics, by Lenhart Schubert and Francis Jeffrey Pelletier; Realism and definiteness, by Henk Zeevat.

#### LANGUAGE PROCESSING IN SOCIAL CONTEXT

**Rainer Dietrich and Carl F. Graumann (eds.)**  
(University of Heidelberg)

Amsterdam: North-Holland, 1989, ix + 302 pp.  
(North-Holland linguistic series 54)  
ISBN 0-444-87144-6, Dfl 225.00, \$109.75 (hb)

This book presents an interdisciplinary analysis of social, cognitive, situational, and contextual aspects of language and language processing by first and second language speakers. Linguists and psychologists formulate theoretical models and empirical analyses of the influence of such factors as on various levels of language processing. These relate specifically to syntactic and semantic parsing, lexical selection, and text production. The issue of "hearer orientation" in language use lies at the forefront of interest in this anthology, and is tackled from such different fields as linguistics, text linguistics, formal semantics, social psychology, psychology of language, artificial intelligence, and second language acquisition.

—From the publisher's announcement

*The contents of the volume are:* Language processing in social context: An interdisciplinary view, by Rainer Dietrich and Carl F. Graumann; Grammatical construction theory and the familiar dichotomies, by Charles J. Fillmore; Referential movement in descriptive and narrative discourse, by Christiane von Steutterheim and Wolfgang Klein; The theoretical description of speaker-hearer hypotheses, by Klaus Muderbach; Perspective setting and taking in verbal interaction, by

Carl F. Graumann; Collaborating on contributions to conversations, by Herbert H. Clark and Edward F. Schaefer; Inference in language understanding: What, when, why, and how, by Alan Garnham; Requests in different contexts, by Theo Herrmann and Peter Winterhoff-Spurk; The representation of knowledge and the use of knowledge in discourse comprehension, by Walter Kintsch; The three phases (faces?) of second-language research, by Barry McLaughlin; Communicating with few words: An empirical account of the second language speaker's lexicon, by Rainer Dietrich; Language learning in social context: The view from research in second language learning, by Lily Wong Fillmore.

#### BOOKS RECEIVED

Books listed below that are marked with a † will be reviewed in a future issue.

Readers who wish to review books for the journal should write, outlining their qualifications, to the book review editor, Graeme Hirst, Department of Computer Science, University of Toronto, Toronto, Canada M5S 1A4. Obviously, we cannot promise the availability of books in anyone's exact area of interest.

Authors and publishers who wish their books to be considered for review in *Computational Linguistics* should send a copy to the book review editor at the address above. All books received will be listed, but not all can be reviewed.

**Proceedings, First International Conference on Principles of Knowledge Representation and Reasoning (KR '89), Toronto, May 1989** edited by Ronald J. Brachman, Hector J. Levesque, and Raymond Reiter (AT&T Bell Labs and University of Toronto)

San Mateo, CA: Morgan Kaufmann Publishers, 1989, ix + 520 pp.  
ISBN 1-55860-032-9 (sb)

**Readings in cognitive science: A perspective from psychology and artificial intelligence** edited by Allan Collins and Edward E. Smith (BBN Systems & Technologies Corporation and University of Michigan)

San Mateo, CA: Morgan Kaufmann Publishers, 1988, ix + 661 pp.  
ISBN 0-55860-013-2 (sb)

†**Naive semantics for natural language understanding** by Kathleen Dahlgren (IBM Los Angeles Scientific Center)  
Boston: Kluwer Academic Publishers, 1988, x + 258 pp.  
(The Kluwer international series in engineering and computer science; Natural language processing and machine translation)  
ISBN 0-89838-287-4, \$52.50 (hb)

†**Relational models of the lexicon: Representing knowledge in semantic networks** edited by Martha Walton Evens (Illinois Institute of Technology)  
Cambridge, England: Cambridge University Press, 1988, ix + 300 pp.  
(Studies in natural language processing)  
ISBN 0-521-36300-4, \$34.50 [20% discount to ACL members] (hb)

**English-Japanese, Japanese-English dictionary of computer and data-processing terms** by Gene Ferber  
Cambridge, MA: The MIT Press, 1989, 470 pp.  
ISBN 0-262-06114-7, \$75.00 (hb)

**Knowledge in flux: Modeling the dynamics of epistemic states** by Peter Gärdenfors (Lund University)  
Cambridge, MA: The MIT Press, 1988, xi + 262 pp.  
ISBN 0-262-07109-6, \$27.50 (hb)