be used in educational applications. Bakker, van der Korst, and van Schaaik put a new twist on using a generator to implement and test a linguistic theory: they propose using such a program to teach a particular theory (in this case lexical functional grammar) in a computational linguistics course.

An odd fact about the book is that it is published in two volumes, each relatively short (under 200 pages). The topics are split between the volumes, with half the papers from each category in each book. I could find no particular motivation for finding a paper in one volume or the other. The foreword, introduction, and contents are repeated in both books, and each has an index, which unfortunately is split between the volumes, so you need to look up topics twice to find all the papers that address them. Overall, the division into volumes is more annoying than useful (I inevitably found myself on the right page of the wrong volume when looking for a particular paper), and since there is no organization to the division, it is unlikely that someone would be interested in one volume and not the other.

Despite these complaints with the presentation and some of the papers, the book is useful for researchers in NLG and related fields to see the range of work going on in Europe. While the papers themselves are short, their bibliographies can lead the interested reader to a wealth of related material. Furthermore, workshops such as the one motivating this book are important and their results need to be published. In a young field such as NLG the focus of the workshops needs to be broad so that it can define what the major issues are. Collections such as this one and Kempen (1987) help other researchers see how their work interacts with the field as a whole. As the field matures, however, these workshops need to become more focused. As in the AAAI-88 workshop (Hovy, McDonald, and Young 1988), the organizers and the editors need to formulate questions and encourage researchers to address them directly. This will provide more unity in the resulting collections, allowing a reader to get a complete picture of issues rather than isolated snapshots of individuals' work.

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Marie Meteer is an associate scientist working on natural language generation in the AI Department of BBN Systems and Technologies Corporation. She is the primary developer of the SPOKESMAN generation system, which combines a newly designed text planner and the linguistic realization component Mumble-86. She is also finishing her Ph.D. at the University of Massachusetts at Amherst on decision making and revising in natural language generation. Meteer's address is: BBN Systems and Technologies Corporation, 10 Moulton Street, Cambridge, MA 02138. E-mail: mmeteer@bbn.com

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NATURAL LANGUAGE PARSING SYSTEMS

Reviewed by
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This volume, containing nine systematic studies on several of the most advanced parsers, fulfills very well the editor's aim characterized in his short preface, namely to present detailed accounts of research by outstanding specialists. The need for a complex overview of the present state of research in the field is mentioned here as a point for subsequent work.

J.G. Carbonell and P.J. Hayes point out in their contribution (pp. 1–32) how a multi-strategy approach (dynamically changing the procedures according to kinds of constructions being parsed) together with fail-soft heuristics and with user interaction can be used for an efficient treatment of semantic and structural ambiguity. Two implemented experimental parsers integrating several parsing strategies are characterized: CASPAR, combining a case-oriented strategy (based on domain semantics) with linear pattern matching, and thus obtaining the flexibility and robustness needed to handle several kinds of deviations from grammaticality; and DYPAR, including a context-free grammar (with domain information grouped into hierarchical semantic categories), a pattern matching component, and a mapping into a canonical form (accounting for semantic equivalence). Furthermore, an integration of the strategies involved is discussed, yielding a multi-strategy algorithm that uses top-down case-frame expectations to constrain bottom-up pattern matching. ATNs with logical variables and unification are compared with definite clause grammars and used as the basic ingredients of the system described by T.W. Finin and M. Stone Palmer (pp. 33–48). A similarity between the applied framework and certain aspects of lexical functional grammar are pointed out.

The third contribution, by J.G. Neal and S.C. Shapiro (pp. 49–92), stresses the role of natural language understanding, pointing out that natural language serves as its own metalanguage. A system understanding sentences about the use of language is described, which includes a kernel language (expressing the knowledge necessary for a poor language user to be able to be

further instructed) and a set of inferences making it possible to construct a knowledge base. No clear boundary between syntax, semantics, and world knowledge is preferred, and the semantic network consists of nodes representing intensional concepts and arcs corresponding to non-conceptual binary relations between them. Many examples illustrate how a parser (with applicable rules activated in parallel and with bi-directional inference) can be used to enrich the knowledge system.

In the next study (pp. 93–135), J. Pitrat brings arguments in favor of declarative knowledge. The interpreter presented here (parsing chess comments in French) is general enough for the knowledge formalism to take an arbitrary form, although (as the author states) it does not yet use its knowledge as a metaknowledge and is not more powerful than ATNs, especially in dealing with word order.

M. Thiel's contribution (pp. 137–159) is devoted to issues of probabilistic parsing with weights introduced into the lexicon as well as into the set of grammar rules and the control structures. Weights of words and rules are modified in accordance to text type and subject domain.

The word is the central notion of the approach described by S.L. Small (pp. 161–201), who takes all complex expressions of natural language as basically idiomatic and attempts to substitute all syntactic and semantic rules with word experts, which interact together and with higher-order (pragmatically based) processes. One may ask whether the procedural definition language is suitable for a specification of a word expert of such a general character. In any case, the lexically based treatment of syntax and semantics certainly is of great significance.

A. Sågvall Hein presents the Uppsala Chart Processor, using R. Kaplan's approach and points out how efficient the parsing by such a system may be (pp. 203–266). The main advantages of the processor are summarized as consisting, first of all, in a clean cut between the processor and the language, a clean control structure provided by the active chart, the uniformity in processing, the generality and flexibility of the formalism, and the implementation with good tracing facilities.

A breadth-first parser is described by W.A. Martin, K.W. Church, and R.S. Patil (pp. 267–328), who use an adapted version of J. Earley's context-free algorithm, with a procedural grammar, several procedures supporting modularity, and G. Gazdar's treatment of unbounded dependencies. Some difficult grammatical phenomena are treated as "exceptions", without an adequate degree of generality.

The volume is concluded by W. Dilger's discussion of the syntax-directed translation in the system PLIDIS (Karlsruhe), which uses a tree-directed grammar (pp. 329–361). On the basis of formal definitions and proofs it is shown here that the grammars of this kind have less computational capacity than transformational gram-

mars; the latter are understood as unsuitable for translating the input sentences into semantic representations, since the complex transformational manipulation of trees makes the grammar not only too strong, but also too difficult to control.

This book consists of well-chosen contributions, representing some of the main developments in parsing, a field whose importance keeps growing thanks to the growing relative weight of natural language comprehension within AI and to the broadening interest in machine translation. Among the developments not represented in Bolc's volume, perhaps the most interesting is that working with dependency grammar (as for English, recent results of a long-term project can be found in Kirschner 1987; for a framework attempting at an integration of unification and dependency, see Hellwig 1988; this approach seems to be more advantageous than the constituency-based trends especially in what concerns the treatment of free word order (which has already been recognized as being far from marginal and playing an important role in the topic–focus articulation, relevant for the issues of quantifier scopes; see Sgall et al. 1986).

It is to the merit of the book that English is by far not the only language handled. Such aspects as the attention paid to the ease of control and enrichment of parsers, to their flexibility with respect to various subject areas, and to the integration of accounting for syntactic and semantico-pragmatic phenomena make the volume a valuable contribution to the development of computational linguistics. Even though progress in the domain has brought new achievements during its production, the volume remains worth reading, since many basic ideas and significant insights are contained, and several original approaches illustrated there are by far not obsolete.

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Sgall, Petr; Hajičová Eva and Panevová, Jarmila 1986 *The Meaning of the Sentence in its Semantic and Pragmatic Aspects*. Reidel, Dordrecht, The Netherlands and Academia, Prague, Czechoslovakia.

Petr Sgall, born 1926, graduated in general and Indo-European linguistics at Charles University, Prague, in 1949, and has been working at the university since then, predominantly in theoretical and computational linguistics. Since 1959 he has been the head of a research group in machine translation and language comprehension. Together with Eva Hajičová and Jarmila Panevová, he published *The Meaning of the Sentence in its Semantic and Pragmatic Aspects*, presenting the synthesis of the group's approach to a stratificational and functional linguistic description. Sgall's address is: MFF UK—

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PHILOSOPHY, LANGUAGE, AND ARTIFICIAL
INTELLIGENCE: RESOURCES FOR PROCESSING NATURAL
LANGUAGE

Jack Kulas, James H. Fetzer, and Terry L. Rankin
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Sometimes philosophers and linguists say things that
are of interest to computer scientists or would be of
interest if properly explained. Unfortunately, philosophical work and theoretical linguistics are seldom
explained in ways that make them seem relevant to
computer scientists. That is, they are seldom explained
in ways that suggest directions for future research.
Given this communication problem, there is a definite
need for a volume that can bring together some of the
best work in the philosophy of language, linguistics, and
natural language processing, and show how work in the
philosophy of language and linguistics has been and can
be applied to problems in natural language processing.
Unfortunately, despite the title[1] and the promotional
literature, this volume does not fulfil the need. Part of
the problem is that none of the papers in the volume
describe work in which the theoretical insights of philosophers and linguists are *implemented*. There are
simply no papers on natural language processing. There
is an introduction by Kulas that is supposed to show
why these essays are important to AI researchers. But
while the introduction occasionally provides reasonable
summaries of the essays, it doesn't come close to
suggesting applications of the theoretical work to AI. It
may well be that computer scientists ought to be familiar with the essays in the book. Most of the essays are,
after all, classics. But it is pedagogically naive to think
that one can drop, for example, Davidson's "Truth and
Meaning" in the lap of a computer scientist and suppose
that it suggests anything in the way of a research
program.

Another part of the problem is that the volume has
been limited to papers that originally appeared in books
or journals published by D. Reidel. This is unfortunate,
for a number of sections of the book could have been
greatly strengthened with the addition of material published elsewhere. Now it may be that the editors intended to provide something like "D. Reidel's Greatest
Hits", but such a strategy seems to me misguided.
There is nothing intrinsically interesting about the fact
that a paper was first published in a Reidel journal. It
may be that the move was inspired by the desire to hold
down costs,[2] but if the editors were successful in
holding down costs, the savings certainly were not
passed along to the customer. The price of the 12-essay
volume is $99!

Thus far my comments have been strong, but general. I think a section-by-section discussion of the book
may be in order, to point out specific concerns and to
suggest ways in which the collection might have been
improved.

The book begins with a prologue entitled "Modes of
Meaning", which contains Grice's "Utterer's Meaning,
Sentence Meaning, and Word Meaning"—a great paper, but what it is supposed to suggest to the AI
researcher is unclear. Nor is Kulas's introduction much
help here, as he offers only a one-sentence summary of
the paper.

Part 1 of the book is entitled "Formal Syntax of
Natural Language", but is really about the question of
whether natural languages are context-free. The first
essay has no place in this volume. It is a short piece that
Pullum wrote as a "Topic . . . comment" column for
Natural Language and Linguistic Theory, which attempts to sort out who was the first to show that natural
language is not context-free. The piece is not, nor do I
believe it intended to be, a serious piece of academic
research. (Pullum has even expressed amusement that
"Topic . . . comment" columns have been indexed and
abstracted.)[3] This is not a criticism of Pullum; he has
other work on the problem of the context-freeness of
natural language (e.g., Pullum 1983) that would have
made much better additions to the volume. For that
matter, Gazdar and Pullum (1985) would also have been
a better choice. The second piece in Part 1 is Shieber's
"Evidence Against the Context Freeness of Natural
Language", which is a solid piece showing how Swiss-German is weakly non–context-free. But Shieber would
be the first to admit that the implications of the result for
natural language processing are of no great moment.

Part 2 of the collection is entitled "Semantic Aspects
of Natural Language" and contains Davidson's "Truth
and Meaning" and Hintikka's "Semantics for Propositional Attitudes". I've already noted that the import of
Davidson's paper (which makes no concessions to the
non-philosopher) is never made clear. As for Hintikka's
paper, it isn't really about semantics, but is an application of possible-world semantics to the problem of the
attitudes. It more properly belongs with the Perry and
Stalnaker papers in Part 5. What is unfortunate about
this part of the collection is that there really has been
confusion between philosophers and computer scientists about what semantics is—a confusion that could
have been straightened out here. Most computer scien-