be known; and finally, that it should be kept alive in research since it exists in the real human-communication process itself.

Reference

Klatt, Dennis, 1987. Review of text-to-speech conversion for English. *The Journal of the Acoustical Society of America* 82(3): 737–793.

Matti Karjalainen is a professor at the Helsinki University of Technology, Finland. His research activities include speech synthesis, analysis, recognition, and auditory modeling of speech perception. Karjalainen's address is Helsinki University of Technology, Acoustics Laboratory, Otakaari 5A, SF-02150 Espoo, Finland.

Japanese Phrase Structure Grammar: A Unification-Based Approach (Studies in Natural Language and Linguistic Theory)

Takao Gunji (Faculty of Language and Culture, Osaka University, Japan)

Dordrecht, Holland: D. Reidel, 1987, ix + 239 pp.
ISBN 1-55608-020-4, $64.50 (hb)/£49.50, Dfl 135.

Reviewed by
Pete Whitelock
University of Edinburgh, Scotland

Professor Gunji's book continues the tradition of explicitness in linguistic description so well demonstrated by Gazdar, Klein, Pullum, and Sag (1985) (GKPS). In theoretical orientation, too, there is a heavy debt to the latter. The details, however, show a certain trend towards the lexicalist position exemplified in theories such as head-driven phrase-structure grammar (Pollard and Sag 1987), and categorial unification grammar (Uszkoreit 1986, Karttunen 1986, Zeevat et al. 1986).

All these theories have been developed with a strong computational orientation. GKPS could be considered essential reading for anyone intending or attempting to develop a serious computational grammar for English, and Gunji's Japanese Phrase Structure Grammar (JPSG) stands in the same relation to Japanese. In fact, JPSG is used as the basis of the natural-language component of the Japanese Fifth Generation Computer project.

The book, a considerably revised version of the author's Ohio State M.A. thesis, presents a thorough and extensive analysis of the central syntactic phenomena of the Japanese language—control in complementation, reflexive and zero anaphora, unbounded dependencies, and word-order variation.

After a brief introduction, the apparatus to be used in the analysis is presented. Despite the book's title, the phrase-structure rule component is reduced to a single schematic rule, M → D H. The burden of constraining the well-formedness of the local trees licensed by this rule falls on several principles that govern the distribution of features in the categories M(other), D(aughter), and H(ead). These include the **head-feature principle** (HFP) and **foot-feature principle** (FFP), familiar from GKPS; an **adjunct-feature principle**, which requires the value of the ADJUNCT feature of the category D to unify with the category H; and a **SUBCAT feature principle** (SFP), which ensures the satisfaction of lexical complementation requirements, as in HPSG. SUBCAT is a feature that takes sets of case-marked categories as its value, and the SFP states that in complementation, the value of the mother's SUBCAT is that of the head minus the element that unified with the non-head daughter.

Gunji assumes for most of the book a semantics with β-reduction of λ-calculus expressions as the basic combination operation, and it is this that is explained in the preliminaries section. However, in the final chapter, on word order, he suggests that a semantic combination based on unification is more appropriate for handling a language with the word-order characteristics of Japanese.

Chapter 3, "Fundamental constructions", starts with a detailed argument for the existence of a verb phrase (VP) in Japanese, and by corollary for the importance of *subject*, since VP abbreviates the category V[SUBCAT{PP[SBJ]}]. The rest of the book crucially exploits the notion of VP. The remainder of Chapter 3 examines the productive processes of causativization, passivization, and benefactivization. These phenomena have been the focus of continuing research since Kuroda 1965, and have generally been treated by considering the causative, passive, and benefactive morphemes as verbs taking sentential complements in the deep structure, with obligatory *equi* or raising and predicate raising. In Gunji's analysis, these morphemes subcategorize for subject, (possibly dative) object, and a (crucially) unsaturated verbal constituent. The latter is either a VP (= V[SUBCAT{PP[SBJ]}]), in causatives and intransitive (adversity) passives, or a TVP (= V[SUBCAT{PP[SBJ],PP[OBJ]}]) for the transitive passive.

Given the unification-based semantics of the final chapter, the object control is captured simply by identifying the semantics of the object and the VP or TVP's subject in the lexical entries for the bound morphs. Gunji explicitly declines to give a consistent account of case marking in simplex sentences and these constructions, thus failing to explain why the causee may not be marked with accusative case when the embedded verb is transitive (the latter fact being captured with a feature co-occurrence restriction.) Neither does he appear to be worried by the existence of a phrase boundary occurring internally to a word, as in:

Ken ga Naomi ni [vp hon wo yom] ase ta
NOM DAT book ACC read CAUSE PAST
(Ken made Naomi read the book.)

where the causative *yomaseta* is clearly a word by the usual criteria.

Nevertheless, the account of the coreference possibilities of the reflexive *zibun* made possible by his analysis is the most convincing to date within a monostratal framework. In a sentence like:

Ken ga [vp Naomi ni [vp zibun no hon wo yom] ase ta]
self GEN
(Ken made Naomi read his (= Ken's)/her (= Naomi's) book.)

the reflexive may be coreferential with the higher subject or the understood subject of the embedded predication. Long considered evidence for the biclausal nature of causative sentences, this ambiguity can be explained naturally in Gunji's framework as the possibility of coreference between *zibun* and the subject on the SUBCAT list of any dominating VP or TVP, whether the subject is realized explicitly or controlled by another element.

Chapter 4 continues the analysis of control, extending it to cover control of zero pronouns. The latter may be controlled syntactically, by a constituent with which they share grammatical function, or pragmatically. In the former case, the presence of a zero pronoun is reflected in a nonempty SUBCAT feature on a dominating node. In the latter, an empty lexical element is freely generated with an appropriate SLASH value. A general **Control Principle** then allows a category, such as an element of the SUBCAT, SLASH, or REFL feature of a complement, to be unified with an element of SUBCAT in the mother. The constituent that finally unifies with this element by SFP will thus control the anaphor. The Control Principle applies optionally, so the mother may in fact inherit SLASH or REFL by the FFP. Pragmatic control is implicated if such features have not been discharged at the root of the tree.

Chapter 5 applies the foot-feature apparatus to unbounded dependency constructions such as topicalization, relativization, and exhaustivization. In the adjunction structures that introduce the unbounded dependency, the FFP allows a foot feature on one of the daughters to unify with the other daughter. Elsewhere, the FFP licenses the percolation of SLASH, passing the dependency through the tree until it terminates at a category X[SLASH X], the lexical category of the empty string.

Finally, Chapter 6, though brief, offers two alternative analyses for the problem of scrambling. The first exploits the fact that SUBCAT is a set-valued feature, with no ordering defined over the members. This approach naturally captures the impossibility of coreference between subject and reflexive object in object-subject-verb sentences, since there is no VP dominating the reflexive. It is not clear, however, that it extends to the scrambling of constituents in, e.g., causative sentences, since the complements of the lexical and causative verbs are not members of the same SUBCAT feature. Though Gunji does not discuss this, he does point out the inadequacy of the SUBCAT approach for *unbounded scrambling*, and proposes an alternative account based on the use of the SLASH feature for this phenomenon. Quite justifiably, though, he rejects a SLASH-based treatment for clause-bounded scrambling as unnecessarily complex.

Though the extensive data and detailed argumentation do not always make for an easy read, Gunji's style is fluent and lively. The stories that provide the context to illustrate sentence meanings are amusing and informative. There are several sections devoted to the shortcomings of previous transformational approaches, though the style of Gunji's analyses are often similar to them, as he acknowledges, and not as radically lexicalist as they might be. Nevertheless, the precision and coverage of the data exceeds that of all other post-transformational grammars of Japanese. The details of JPSG will no doubt be superseded, but it will remain a yardstick against which Japanese grammars will be measured for some time to come.

References

Gazdar, Gerald, Klein, Ewan, Pullum, Geoffrey, and Sag, Ivan 1985 *Generalised Phrase-Structure Grammar*. Basil Blackwell, Oxford, England.

Karttunen, Lauri 1986. Radical Lexicalism. *Technical Report CSLI-86-68*. Center for the Study of Language and Information, Stanford University, Stanford, CA.

Kuroda, S-Y. 1965. *Generative Grammatical Studies in the Japanese Language*. PhD. diss. Massachusetts Institute of Technology, Cambridge, MA.

Pollard, Carl and Sag, Ivan 1988. Information-based Syntax and Semantics. Volume 1: Fundamentals (*CSLI Lecture notes 13*). Center for the Study of Language and Information, Stanford University, Stanford, CA.

Uszkoreit, Hans 1986. Categorial Unification Grammars. *Technical Report CSLI-86-66*. Center for the Study of Language and Information, Stanford University, Stanford, CA.

Zeevat, Henk, Klein, Ewan, and Calder, Jo 1987. An Introduction to Unification Categorial Grammar. In Haddock, N.J., Klein, E., and Morrill, G. (Eds.). *Edinburgh Working Papers in Cognitive Science 1: Categorial Grammar, Unification Grammar and Parsing*. Centre for Cognitive Science, University of Edinburgh, Edinburgh, Scotland.

Pete Whitelock is lecturer in artificial intelligence at the University of Edinburgh. From 1984 to 1986, he was in charge of an English-Japanese interactive machine-translation project at UMIST, Manchester, England, and his research continues to address issues in Japanese grammar and its computational applications. Whitelock's address is: Department of Artificial Intelligence, University of Edinburgh, 80 South Bridge, Edinburgh EH1 1HN, Scotland. Email: pete @ avia.edinburgh.uk.ac