Everything that Linguists have Always Wanted to Know about Logic* *but were ashamed to ask

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Most introductory courses on logic teach only the syntax of first-order predicate calculus and give a few simple proofs, usually of theorems in arithmetic. Advanced courses are taught in mathematics departments, where they lead to topics that have little or no application to linguistics. In one of the standard textbooks, Schoenfield (1967) explicitly states "Mathematical logic has always been closely connected with the philosophy of mathematics. I have generally avoided philosophical issues except when they were closely connected with the mathematical material" (p. iii). Schoenfield dismisses the relationship between language and logic with a few terse comments like "we introduce the symbol & to mean *and*" (p. 10). Given such logic books and courses, people studying natural language would find it hard to see any relevance to their interests. With this book, McCawley has done a great service in bringing together a wealth of material on the applications of logic to linguistics and philosophy.

The first third of the book introduces the standard topics of propositional calculus, predicate calculus, proofs, sets, and models. Unlike mathematical texts that skip over the mapping from language to logic as quickly as possible, McCawley illuminates it with pointed examples. He counters the common claim that "If A, then B" is synonymous with "A only if B," by citing examples like the following:

> If butter is heated, it melts.
> Butter is heated only if it melts.

After covering the standard topics, McCawley spends the remaining two thirds on important issues that are rarely mentioned in introductory texts: definite descriptions, comparatives, speech acts, conversational implicature, presupposition, modal logic, relevance logic, counterfactual conditionals, possible worlds, many-valued logic, fuzzy logic, lambda calculus, Montague's intensional logic, and nonstandard quantification.

The book does have some shortcomings, many of which stem from the same source as some of its strengths—McCawley's idiosyncratic approach to the subject matter. As might be expected from one who views English as a VSO language, McCawley adopts a prefix notation, writing ⊃(∧AB,C) instead of the more

common A∧B⊃C. He also replaces the standard terms *conjunction* and *disjunction* with the terms *and-conjunction* and *or-conjunction*. He deliberately blurs the distinctions between axioms, rules of inference, and meaning postulates: "I maintain that the difference between 'axiom' and 'rule of inference' is best regarded as one of detail rather than one of general nature: axioms are merely rules of inference that involve no premises" (p. 45); "The distinction between meaning postulate and rule of inference is only as good as the difference between 'nonlogical element' and 'logical element,' which is to say that it is far from clear that the difference has any substance" (p. 46). Although some people might agree with McCawley, others believe that those distinctions are important for a semantic theory or a knowledge representation language. In a book as general as this one, he should at least have given a more sympathetic treatment of the distinctions. Besides controversial stands, the book also makes some statements that are wrong or at least misleading. In discussing branching quantifiers, for example, McCawley says that they extend "the combinatory possibilities of first-order quantifiers in such a way as to match the expressive power of second-order quantifiers" (p. 450). In fact, branching quantifiers provide only a subset of the power of second-order logic, not all of it (Walkoe 1976).

Despite some flaws, this book provides a good coverage of logic and its use in clarifying semantic issues. Since McCawley wrote it for an introductory course, he does not assume that the reader is fluent in juggling the symbolism and provides extensive commentary on the formal operations. Even though it is an introductory text, a reader who has not had previous exposure to symbolic logic may find it rather difficult for self study. Logic teachers who do not adopt it as a primary textbook will still find it an excellent source of examples. Readers who would like a quick review of logic should also consider *Logic in Linguistics* by Allwood et al. (1977); it is not as comprehensive as McCawley's book, but its terminology is more standard.

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References

Allwood, Jens, Lars-Gunnar Andersson, Osten Dahl (1977) *Logic in Linguistics*, Cambridge University Press, Cambridge.

Schoenfield, Joseph R. (1967) *Mathematical Logic*, Addison-Wesley, Reading, MA.

Walkoe, Wilbur, Jr. (1976) "A Small Step Backwards," *American Mathematical Monthly*, vol. 83, pp. 338-344.