Review of *Logic Primer*, by Colin Allen and Michael Hand, A Bradford Book, The MIT Press, Cambridge, Massachusetts, U.S.A., 1992. 171 + xiv pages. £ 11.75. ISBN 0–262–51065–0.

Varol Akman
Bilkent University, Ankara

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There are some little books which make a difference. This was my impression when I first studied Knuth's *Surreal Numbers* [7] or to take another example, Perry's *A Dialogue* ... [9]. These books, despite their unimpressive sizes (approximately 120 pp. and 50 pp., respectively) dealt with such deep problems in such an elegant and thought-provoking manner that I remember carrying them with me all the time for a couple of months.

Logic Primer is also a little book. (Only a little more than the half of the book is the real text; the remainder is the set of answers to some exercises.) And I have good things to say about it, too. But I must probably first try to put things into a little bit of perspective.

For a while, my favorite self-contained introduction to logic was Hodges' masterpiece [6]. Starting with the notion of consistency and assuming no previous knowledge of logic, Hodges introduces logical expressions, symbols, and notations in a clear and frequently entertaining way. He gives assorted examples to illustrate the ties that bind truth and (English) sentence-structure. His treatment of consistency and truth is accompanied by tableau proofs, and there are optional chapters for the interested reader on context-free grammars, purely referential occurrences, the logic of probability, etc.

Later, I became familiar with Barwise and Etchemendy's *Tarski's World*, an innovative computer-based environment for learning first-order logic from a semantic point of view [1, 2]. In this environment—which is available in common platforms such as a Mac or a PC [3, 4]—students solve problems involving relations between well-formed formulas and a diagram showing the spatial positions of several objects varying in shape and size (a Blocks World, to use a common terminology in artificial intelligence). In the process of solving these problems, students are encouraged by the program to interpret the meanings of constants, variables, predicates, connectives, and quantifiers in logical expressions.[1]

Now comes Allen and Hand's introductory text and I must confess that I, as a reviewer, initially found myself in a difficult position. After all, [6] and [1] are already highly

[1] *Tarski's World* later evolved to the *Hyperproof* [5] project. The goal of *Hyperproof* is to provide a family of computer applications that allow the user to reason using both sentences and diagrams. This is commonly known as "heterogeneous reasoning"—reasoning in which information is presented in more than one representational form. *Hyperproof* also allows the student to solve reasoning problems whose domain is a simple Blocks World. Information is supplied to the user in the form of a partial picture of the Blocks World, plus sentences expressing additional information about this world. The inference system enables the user to modify both diagram and sentences. This is achieved via rules that preserve the information content available from the two perspectives.

satisfactory for me; so, who needs yet another introduction to logic?

I think this question can be answered in various ways. First, *Logic Primer* (*LP* from now on) is designed to be used with a teacher. "So what?" one may be inclined to mutter; aren't the others as well? Well, the point is that *LP must* be used with a teacher, viz. a prospective student should not expect to learn logic from this book *alone*. A & H minimized the amount of introductory material, trusting the instructor to explain the ideas in detail in the classroom. It is no wonder that sometimes one gets the impression that one is reading a crib sheet, prepared to accompany a final exam in LOGIC 101. In the words of A & H [p. ix], "[the] goal has been to produce a text in which all of the material is important, thus saving [the student] the expense of a yellow marker."

A & H make cite interesting reasons for writing *LP*. They say that they were dissatisfied with the logic texts now available, because the authors of those texts allegedly populate their works with page after page of explanation. A & H's one major goal has been to produce an extremely terse text (a text of "minimal chattiness" to use their phrase), leaving to the teacher the task of providing detailed explanations. They have organized the text into definitions, comments, examples, and exercises in a visually pleasing format. They kept comments to a minimum so that definitions and examples are frequently on the same page, making it easy for the reader to scrutinize the definition.

A & H prefer systems of natural deduction to other ways of representing arguments, and adopt Lemmon's technique [8] of explicitly tracking assumptions on each line of a proof. This technique indeed clarifies the relation between conclusions and premises better than any other device I've seen so far.[2]

Here's a coarse road-map of *LP*:

- Chapter 1: Sentential Logic (29 pp.)
- Chapter 2: Truth Tables (13 pp.)
- Chapter 3: Predicate Logic (23 pp.)
- Chapter 4: Models (12 pp.)
- Answers to Selected Exercises (72 pp.)

I commend the authors for their precision and attentiveness to minute detail. I couldn't simply spot an error in *LP*, not even a typo! While it is true that I didn't check the answers to the exercises thoroughly I have a feeling that that part is also bug-free. (There are more than 500 exercises, with solutions to more than half of them.)

On the other hand, there a a couple of missing elements which would make the book more useful. First, I would like to see a (short) reading list for the interested student. True, A & H cite—however incompletely—Lemmon [8], and Neil Tennant's *Natural Logic* in the Preface, but clearly a longer list of references is required. Second, it would be very useful to include a brief history of logic, say as Chapter 0. I understand that this is no easy job, and that there are many such reviews (brief or detailed), but in any case, my experience has been that students like to know something about the history of the subject they are expected to study. Third, a somewhat lengthier discussion of models (Chapter 4) would be a welcome addition. Obviously, the last two points reflect my preferences (biases?) and

[2] There are half a dozen differences between A & H's system and Lemmon's; these are treated at length in the preface of *LP*, the only part of the book which needs some maturity on the part of the reader.

the authors should not be blamed for having omitted a historical review or cutting short a discussion of models. Finally, regarding the mathematical fonts, I would like to believe that a better looking syntactic turnstile (viz. $\vdash$ rather than $|-$) and a more symmetric notation ($\wedge$ rather than &) might be adopted in the upcoming editions of the book. (I have a feeling that this book will be reprinted many times.)

I believe that A & H wrote a useful and remarkably original book. (In this age of commonplace, this must be one rare use of this adjective.) So it is apt to conclude this review with a slight paraphrase from Strawson [10, Preface]. While there are in existence many text-books and technical treatises on formal logic, the authors have not sought in this little book to add to their number.

References

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[2] Jon Barwise and John Etchemendy, *The Language of First-Order Logic (including the IBM-compatible Windows version of Tarski's World 4.0)*, 3rd edition, revised and expanded, CSLI Lecture Notes No. 34, Center for the Study of Language and Information, Stanford, CA (1992).

[3] Jon Barwise and John Etchemendy, *Tarski's World: Version 4.0 for the Macintosh*, CSLI Lecture Notes No. 25, Center for the Study of Language and Information, Stanford, CA (1993).

[4] Jon Barwise and John Etchemendy, *Tarski's World: Version 4.0 for MS Windows*, CSLI Lecture Notes No. 45, Center for the Study of Language and Information, Stanford, CA (1993).

[5] Jon Barwise and John Etchemendy, *Hyperproof*, CSLI Lecture Notes No. 42, Center for the Study of Language and Information, Stanford, CA (1994, to appear).

[6] Wilfrid Hodges, *Logic*, Penguin Books, Harmondsworth, Middlesex, UK (1977).

[7] D. E. Knuth, *Surreal Numbers (How two ex-students turned on to pure mathematics and found total happiness)*, Addison-Wesley, Reading, MA (1974).

[8] E. J. Lemmon, *Beginning Logic*, Nelson, London, UK (1965).

[9] John Perry, *A Dialogue on Personal Identity and Immortality*, Hackett Publishing Company, Inc., Indianapolis, IN (1978).

[10] P. F. Strawson, *Introduction to Logical Theory*, University Paperback, Methuen, London, UK (1963, reprinted 1985).