

Tackling fuzziness and uncertainty

F.H. George

Logic Machines and Diagrams.

By Martin Gardner.

Harvester/University of Chicago Press: 1982. Pp.176. Hbk £15.95, \$15; pbk £4.95, \$5.95.

MARTIN Gardner has written a very exciting book, one which anyone interested in what might broadly be called Information Technology should read. The emphasis is, as one might expect, primarily mathematical, taking us from the thirteenth-century world of Ramon Lull up to the present-day concepts of machine intelligence.

Mathematical logic plays a leading role in the book. Several chapters are devoted to methods of representing logic and logical arguments that are traditionally associated with the Euler-Venn diagrams (although Venn was associated primarily with a form of elliptical representation of class relationships more complicated than those circular representations associated primarily with Euler).

The part of the book of greatest current interest is to be found in a final chapter devoted to machine intelligence. Here such important matters as Robinson's Resolution method of theorem proving, and binary semantic trees are discussed, with probabilistic logic (now long established) and fuzzy logic (a much more recent development) also coming in for consideration. It is clear that the fuzziness in logic represents some of the fuzziness inherent in ordinary language; it serves as a reminder that this aspect of logic does not lie in the direction of the great traditional developments of mathematical logic, which were concerned primarily with the foundations of mathematics. It should be said that uncertainty in logical inference making can involve uncertainty over the class definition (e.g. the class of neurotic people) or over whether a particular member (person) belongs to that class (e.g. Is Charles neurotic?). The uncertainty over the latter point may merely occur because we do not know enough about Charles. Such uncertainty is represented in fuzzy logic.

Two especially thought-provoking questions are proposed by the author: "[is it] possible to formalize a computer language that will model fuzzy reasoning in useful ways"; and "is there a useful way . . . to diagram fuzzy logics with fuzzy diagrams?". The word "useful" stalks us in both these quotations, but certainly, as is acknowledged in the book, Zadeh himself (who first coined the expression "fuzzy system" in 1965) is working towards an answer to the first point. One can also think of a number of ways, using dotted lines and the like, that the second may be tackled,

although the usefulness of the results is uncertain. In both cases the key point seems to be, as with probabilities, that the language which describes uncertainty, which may or may not be measurable, is itself certain.

One assertion — perhaps the only one in the whole book — gave me pause, and cause for disagreement with Gardner: "How the human mind works remains, of course a profound mystery". Not really! We do not know with certainty, of course, but most people would say that we know a great deal about the mind, even if we are unsure of the exact workings of the mechanism.

This is a field where much remains to be done, though "profound mystery" is surely an exaggeration. But here, perhaps, Gardner has taken poetic licence. The question of Gödel's theorem and its relation to machine thinking has been disposed of and it is recognized that machines that hope to achieve human flexibility of thought must operate heuristically. Granted they can do so, there is no reason to argue that machines could not think and behave as intelligently as human beings can. All this is recognized by Martin Gardner, as is the close relationship between machine intelligence and philosophy, in this truly excellent book. □

F.H. George is Head of the Department of Cybernetics at Brunel University.

Counting the cost

Joseph Rotblat

The Medical Effects of Nuclear War.

The Report of the British Medical Association's Board of Science and Education.

Wiley: 1983. Pp.188. Pbk £4.50, \$8.95.

THE EFFECTS of nuclear war have been studied extensively for nearly four decades, and the argument has been advanced that we already know everything about the topic that there is to be known, at least in its scientific aspects. Indeed, at a recent debate in a prestigious scientific society in the UK this argument was successfully used to quash a project for further study.

It seems odd that such a view should be adopted by scientists in relation to a subject about which there is no experience, but which produces new phenomena at a rate of one per decade. Thus, it was not realized until the early 1960s that the malfunction of electronic equipment during nuclear tests was due to the electromagnetic pulse emitted at explosions. The depletion of the ozone layer in the stratosphere began to be discussed in the 1970s. And it was only a year ago that a new effect was predicted: the dramatic reduction of sunlight resulting from the injection into the troposphere of huge quantities of soot from the

Colour Science in Television and Display Systems

W N Sproson

Despite the use of advanced electronics, much of today's television equipment (eg cameras, systems, receivers) fails to achieve a high standard of colour reproduction, through designers' lack of proper attention to colorimetric principles. This book aims, therefore, to explain all aspects of colorimetry which are relevant to the theory and practice of TV and visual display systems, including the problems of accurately reproducing colour, and the solutions which have been found to create as lifelike a colour picture as possible.

June 1983 222pp hardcover
0-85274-413-7 £20.00

Instrument Science and Technology Volume 2

B E Jones (ed)

The second volume in a series on the new growth discipline of the science and technology of measuring instruments. The 13 articles in this volume have their emphasis on instrument technology, and are the work of leading experts in the field of measurement and instrumentation. They provide an accurate reflection of current international thinking and an authoritative guide and reference work on important aspects of the subject.

July 1983 148pp paperback
0-85274-753-5 £7.95

Physical Techniques in Cardiological Imaging

M D Short, D A Pay, S Leeman & R M Harrison (eds)

A comprehensive review of current practice and progress in this important area of medical science comprising 22 contributions by leading experts in the field from Europe and North America. They examine the physical principles underlying the various imaging disciplines (i.e. ultrasound, nuclear medicine, radiology and NMR), present clinical overviews, describe specific state-of-the-art procedures, and discuss the validity of each type of imaging procedure in specified clinical situations.

August 1983 214pp hardcover
0-85274-750-0 £17.00

Adam Hilger Ltd

Techno House, Redcliffe Way
Bristol BS1 6NX, England

Telephone: (0272) 276693 Telex: 449149

Adam
Hilger

Circle No.11 on Reader Service Card.