

reviews

Neurones or semiconductors?

On Machine Intelligence. By Donald Michie. Pp. xi+199. (Edinburgh University: Edinburgh, April 1974.) £2.50.

THIS book is a collection of "semi-popular essays written over the past ten years or so". The author's criterion for inclusion is stated with candour: "If I enjoyed writing the essay in the first place, and if now I enjoy re-reading it, then I have put it in, otherwise not". The book contains a great deal of repetition—the same tables appear in several different articles, and the same themes occur over and over again with little variation in their treatment. Some articles even contain quotations from others.

Since the essays were originally intended to be popular, the only work that is described in detail is of a very simple nature such as the author's device for learning to play a good game of noughts and crosses by trial and error. Games playing programs receive adequate coverage but there is little attempt to describe the principles behind more recent programs designed to analyse scenes or to understand natural language. Readers are told that "powerful new programming aids, such as the PLANNER, QA 4, and CONNIVER languages have come into play", but they are not told what it is about these languages that makes them an advance on previous information processing languages. The author has considerable expository skills, and within the limits he sets himself the writing is lively and clear. It is a great pity that he has not sat down to write from scratch a systematic introduction to artificial intelligence for the general scientific reader: such a book is badly needed and there are few people as well qualified to write it as Donald Michie.

The book makes two major claims. Michie asserts that developments in artificial intelligence, or as he prefers to call it machine intelligence, will bring about a technological revolution. According to "experts", robot chauffeurs and computer psychiatrists will be commercially available by the year 2000 though it will take a further 10 years before automated "general factotums" come off the automated assembly line. It may or may not be technically feasible to produce machines that can make as intelligent a use of a wide range of

knowledge as do chauffeurs and psychiatrists. Leaving this problem aside, there are two arguments, not considered by Michie, which suggest that machine intelligence may not have such a wide role in human affairs by the end of the century.

First, in automating a given system, it is often best to redesign it so as to obviate the need for any application of intelligence. Automatic pilots do not function in an intelligent way: they land planes by flying down a radar beam, and this slavish procedure circumvents the complex perceptual processes used by human pilots. It will probably be cheaper and safer to redesign road transport systems in this sort of way, rather than to provide robot chauffeurs that will have to make the same kind of intelligent decisions as a human driver.

Second, where automation by the use of unintelligent machines cannot be achieved, as presumably in the case of the psychiatrist, human intelligence is likely to remain for a long time to come a cheaper method of doing the job than the use of large computing systems. I once estimated that the cost of a neurone in the brain of a young professionally qualified adult was about 0.00004 new pence. This estimate includes the programming costs for the whole system and it is orders of magnitude cheaper than the cost of a Japanese semiconductor. The extent to which artificial intelligence makes a contribution to technology depends on cost-effectiveness, and even if the problems of making intelligent systems were solved, it is by no means obvious that they would be the cheapest means of undertaking tasks requiring intelligence.

Michie's second claim is that machine intelligence is likely to provide new insights into the working of the human mind, and this assertion is perhaps less disputable. Until recently, psychologists did not have a language in which they could couch well formulated theories of how complex information processing tasks are carried out. Computer languages provide the appropriate symbolism and the digital computer itself provides a method of rigorously exploring the consequences of a given theory. It is perhaps unlikely, however, that programs that simulate the details of the way the brain operates will be

written merely by reflecting on the best way in which to program a computer to undertake a particular task. It will be necessary also to take into account the experimental evidence on how the brain actually does process information. Michie (page 123) asks his readers whether, when parsing a grammatically ambiguous sentence, "you generate the alternative parsings, subsequently to be eliminated by semantic hindsight. Of course you don't. We can be sure that we do not do this consciously". But recent psychological evidence indicates that at least in some cases we do generate different interpretations at an unconscious level. Only one of these may be selected as a result of semantic disambiguation, and it is only the results of such selection that appear in consciousness. The study of the mind from an armchair or a programmer's stool contains dangers of this sort, and it is likely that our understanding will be best forwarded by using the computer as a tool with which to construct and to explore theories, at the same time being careful to base the theories on the best experimental evidence available.

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Teaching the heart

Universities Between Two Worlds. By Roy W. Niblett. Pp. viii+179. (University of London: London, June 1974.) £2.85.

ARE we, in the Western world, at a watershed of civilisation, "between two worlds"? Professor Niblett believes that we are, and in this book he spells out what he regards as some of the consequences for universities. His theme is familiar: the growing disenchantment with the emphasis which universities put upon the cognitive, the rational, the analytical approach to phenomena; the insufficiency of this approach to solve the problems of contemporary society; the need, therefore, for universities to provide experience in "sensate culture", to ask questions about ends as well as means, about values as well as facts, to engage (as Niblett puts it) the "individual mind and heart" in the process of higher education. It is a plea to university teachers to impart not just knowledge, but wisdom, to their pupils.

That Western man is deficient in wisdom and has, if anything, a surfeit of knowledge (much of it useless) is a proposition few would challenge. But