Michie

MACHINE INTELLIGENCE 5

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edited by

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PREFACE

The impact of computers on modern practice and thought can be analysed into four blocks of about five years each, beginning in 1948. During the course of the first five years the world became sprinkled with a sufficiently large handful of computers to arouse popular interest in them. It was in 1953 accordingly that I wrote an introduction to Lord Bowden's popular best-seller *Faster than Thought*, which represented a response to this interest. The problems of those days were mostly concerned with hardware design, particularly reliability. These problems were solved by the coming of the transistor with microcircuits on the horizon during the course of the second block of five years. Software problems began to become urgent during the course of the third block of five years. The demand of users for higher order languages threw a tremendous burden on compiler writers as FORTRAN, COBOL, and ALGOL were evolved, and it gradually became clear that problems of compiler writing, logic, syntax, and semantics were all involved with one another together with other non-numerical uses of computers and the simulation of other types of hardware (e.g. neural networks capable of learning) in an interdisciplinary complex which has become known as computing science.

Five years ago, at the beginning of the fourth block of five years, the Department of Scientific & Industrial Research recognized this subject and the need to provide for it as part of its grant-aiding machinery by setting up a Computing Science Committee, of which I became the first chairman. When DSIR was reconstructed the Committee continued in being under the successor-body, the Science Research Council, with whose funds much of the research published here has been carried out.

The University of Edinburgh was at that time becoming aware of an energetic and computer-minded young Reader in the Medical Faculty – Donald Michie – who undertook a survey of all computing science going on in the United Kingdom on behalf of the Committee of which he later became a member. He is now Professor Michie of the Department of Machine Intelligence and Perception at Edinburgh University, and his annual 'Machine Intelligence Workshop' is increasingly becoming an international rather than a domestic event. This, the third volume of *Machine Intelligence*, published

with commendable speed after the conclusion of the 'workshop', records many of the papers given on the occasion of its third meeting.

The workshop, as its name implies, is not a conference devoted to speculation but a venue where hard results are hammered out and reported on, nearly all of them by young men.

From the beginning this has been a young man's subject. The creative imagination and energy of youth have been released on an unprecedented scale into this essentially interdisciplinary field. Looking at the range covered it is probable that only the young could assimilate the interconnections of such a ramifying field of subject matter.

With this commendation I wish the publication as wide a circulation as it deserves, for progress in computing science is at breakneck speed and the problem of keeping up with it is a very severe one.

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INTRODUCTION

In a recent conversation, R.A.Brooker referred to an early categorization of the two schools which divide the world of computer science as the 'primitives' and the 'space cadets'. At no point is the need to find a meeting place and a market place between these schools more pressing than in the attempt to specify and construct intelligent machinery.

The space cadet operates with abstractions not because he enjoys being above anybody's head but because he believes that only by profound theoretical *coups* can our goals become even remotely attainable. So might early mechanical engineers have reasoned in planning the creation of an automotive engine: first develop the abstract notion of an automotive principle; then a mathematical theory to enshrine it; then invent the steam engine; only then develop the crafts of the designer, the wheelwright and the gear-cutter. By contrast, the passion of the primitives is to make something and to make it work, not shrinking from any methods however earthy. Their defence: that one Law of Thermodynamics, or even three, does not make a steam engine.

There is of course everything to be said against a doctrine which denies the arts of *ad hoc* implementation a central role in the development of a technology. Certainly, Machine Intelligence is no more than a technology, although perhaps the most rapidly growing of all on the contemporary scene. Yet the present decade is one of special excitement precisely because we are beginning to see the first great conquests (such as J.A.Robinson's contribution to the present volume) in the mathematics of mechanizable reasoning, without which all the most ingenious primitivism in the world will not avail. One can glimpse the same process at work in Amarel's analysis of problem formulation, and in a number of contributions in the area of programming theory and language design. Here the philosophic mantles of prophets absent from this collection, notably, J.McCarthy, C.Strachey, and P.Landin, are conspicuously in evidence. If one had to sum up the language trend one might say that it is directed towards a future in which *if a passage of text is respectable mathematics in a generally accepted notation, then it will compile.*

This volume comprises the papers delivered at the third Annual Machine Intelligence Workshop held in Edinburgh, 11–16 September 1967. Gratitude is

owed to the University of Edinburgh for hospitality, and to its Principal, Professor M. M. Swann, FRS, who delivered a memorable luncheon address to the participants. We also owe particular thanks this year to the Science Research Council, who defrayed the Workshop's costs, and to the Edinburgh University Press, who have taken over responsibility for publishing the series.

DONALD MICHIE
February 1968