

inadequate, and misprints copious. More dismaying, there is little sign that the authors know what has been done on heuristic search since GPS.

Where is the wave of the future? Why cannot even the best and brightest heuristic search algorithms, let alone GPS, make an intelligent response to problems such as the Bridges of Königsberg? The tail end of a review is no place to plunge in deeply. But the question is a salutary one on which to end. It points to the gap between what one can expect heuristic search methods to accomplish, and what cannot ever be accomplished by such methods alone. Heuristic search can no more expect from its own resources to solve the big problems of machine intelligence than numerical analysis can expect to solve the big problems of physics. GPS, the Graph Traverser⁵, Quinlan and Hunt's FORTRAN Deductive System⁶, Pohl's VGHA⁷, and Sandewall's PPS⁸ are all prisoners of the manner in which the problem is mapped into graph form. The human solver sinks only a certain amount of labour searching within the limitations of a weak representation. Then he scraps it, to construct a better one in which what was formerly laborious is felicitously trivialized. This is the creative step, the prize which has so far evaded all the mechanizers. A growing number of workers are now converging on the "representation problem" along different avenues. But that is a different story.

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¹ Newell, A., Shaw, J. C., and Simon, H. A., *Proc. West. Joint Computer Conference*, 218 (1957); reprinted in *Computers and Thought* (edit. by Feigenbaum, E. A., and Feldman, J.) (McGraw-Hill, New York, 1963).

² Von Neumann, J., and Morgenstern, O., *Theory of Games and Economic Behaviour* (second ed.) (Princeton University Press, 1947).

³ Turing, A. M., in *Faster than Thought* (edit. by Bowden, B. V.), 286 (Pitmans, London, 1953).

⁴ Shannon, C. E., *Phil. Mag.*, **41**, 256 (1950).

⁵ Doran, J. E., and Michie, D., *Proc. Roy. Soc., A*, **294**, 235 (1966).

⁶ Quinlan, J. R., and Hunt, E. B., *J. Assoc. Comput. Machinery*, **15**, 625 (1968).

⁷ Pohl, I., in *Machine Intelligence*, 5 (edit. by Meltzer, B., and Michie, D.) (Edinburgh Univ. Press, in the press).

⁸ Sandewall, E. J., *J. Assoc. Comput. Machinery*, **16**, 364 (1969).

REGULATING THE PAYMENTS

Steering the Economy

The Role of the Treasury. By Samuel Brittan. Pp. xix + 342. (Secker and Warburg: London, July 1969.) 100s.

MR BRITAN has written a very readable account of official attempts to manage the economy. A useful discussion of the machinery of economic management is followed by a blow-by-blow account of policy since the war, while the final section of the book attempts to assess the results and offers some policy prescriptions. Readers familiar with his earlier work (*The Treasury under the Tories 1951-1964*) will recognize substantial chunks in the present volume which have been incorporated only in a slightly disguised form. The chief new additions are the account of the present Labour Government and the revised conclusions.

The study lacks the depth of some recent contributions on the British economy, but for those interested in acquiring a good working knowledge of the economy's performance and the role of policy it provides an ideal starter. The general conclusion, as one might expect, is that the management of the economy has not been particularly successful, either from the point of view of stabilizing fluctuations or that of promoting long-term growth. The chief constraint has been the problem of the balance of payments and the priority of policy treatment accorded to it. In the circumstances of the post-war period this was more or less inevitable, but the chief difficulty has been the absence of effective external regulators—many of the options such as import controls and devaluation being closed for one reason or another. Reliance has therefore had to be placed on internal regulators which

often conflicted with the needs of the domestic economy. The devaluation of 1967 was the ultimate bowing to the inevitable when it was finally recognized that the old prescriptions were no longer sufficient to rectify external imbalance.

Brittan offers no new remedies; indeed, it would be difficult to do so because most of them have been suggested already and many of them have been tried and found wanting. His chief preference seems to be a system of floating exchange rates. It is not altogether clear, however, whether this is a feasible alternative if other countries remain on a fixed system because there would be the danger of the floating currency being forced down by countries whose currencies were undervalued. The point should also be made that it is not so much that existing policy remedies are inadequate but rather that they have been badly applied and badly timed, though to some extent this may have stemmed from the unfortunate timing of the balance of payments crises. There is still scope for improving the practice of management with the existing tools before resorting to a system of floating exchanges or some modification thereof. Anyway, with a bit of luck the devaluation of 1967 may yet work, and, if recent trends are anything to go by, there is still hope for the future.

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GRAND INVENTORY

Alphabetical Index of Patentees of Inventions

From March 2, 1617 (14 James I), to October 1, 1852 (16 Victoriae). By Bennet Woodcroft. With an Introduction and Appendix of additions and corrections compiled in the Patent Office Library. Pp. xv + 647. (Evelyn, Adams and Mackay: London, March 1969. First published in 1854.) 84s.

"THE British suffer from the delusion that they are, and always have been, a highly inventive people, whose ideas are frequently stolen by other nations". So say Jewkes, Sawers and Stillerman in their *Sources of Invention*, and they award first prize for ingenuity to the Germans and Americans. Whichever nation deserves the palm, the extraordinary exuberance of English inventors is on record in the form of a catalogue compiled by the Superintendent of Patents, Bennet Woodcroft, in 1854. The catalogue, now reprinted, lists by alphabetical order of inventor the 14,000 applications for patents made between 1617 and 1852, together with the subject to which the patent refers.

The catalogue is an absorbing record not only of the technical arts but also of fashion, folly and fantasy. Cranks and benefactors of mankind, charlatans and the makers of the industrial revolution are listed impartially side by side. A patent was awarded to a Christopher Pinchbeck in 1768 for his "nocturnal remembrancer", tablets by which people may secure their thoughts in the dark, while James Jackson (1752) and Ann Pike (1760) drew their respective patents on "medicine, called Oleum Anedinum, or British balsam of health" and "Ointment, as an antidote for the itch and all scorbutic humours". Arkwright and Watt grace the list and there are also the lesser inventors such as Edward Budding, who invented the lawn mower (1830), and Joseph Bramah, to whom the flush water closet is due (1778). Some of the applications have a surprisingly modern ring; John Prewett in 1634 patented an "engine for ploughing land without oxen or horses". Certain contrivances, noticeably umbrellas and trusses, attract the attention of numerous patentees, doubtless because existing models left room for improvement. Others seem to be invented twice over—Charles and John Mowate were granted a patent in 1634 for "making woollen-cloth impenetrable to rain", and the same idea occurred to one Charles MacIntosh 199 years later.