

3. Elementary functions with polynomial arguments. The polynomials having numerical coefficients. 17 Blocks (4)
4. Tensor manipulator with polynomial elements. 14 Blocks
5. Tensor manipulator with elementary functions as elements. 24 Blocks

Further details of the systems numbered 2 and 3 above may be obtained from Barton, Bourne and Burgess (1968) and Barton, Bourne and Fitch (1969).

Assuming that an average user program occupies 2 Blocks we have only 26 Blocks allocated to the program using even the most complicated combination of runtime systems available, namely 5, while the program to manipulate polynomials will occupy just 9 Blocks. In practice both of these figures are reduced by two blocks

since the service routines are overlaid. During initialisation it is necessary to have one block of service routines in store. These are over-written by more service routines for use during the actual running of the algebra program and finally the post mortem part of the service routines overwrites this latter set of routines in the event of a failure in the user's program. The above estimates of space do not of course include that required by the data structures that may extend to the capacity of the machine if necessary.

In conclusion it is once again a pleasure to express our thanks to the Director and Staff of the Mathematical Laboratory for their continued interest in this project and for extensive use of the computing facilities available in Cambridge. Our thanks are also due to Mr. J. P. Fitch for his assistance throughout the development of the system.

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## Book Review

*Memory and Attention*, by Donald A. Norman, 1969; 201 pages (London: John Wiley & Sons Ltd., £4.20. cloth, £2.20 paper)

This book is divided up into nine chapters which start with a statement of the problem and finish with the conclusions. In between we consider a number of important and related topics which are built up, in seminar fashion, around the writings of various scientists. In a sense this is a book with a difference, since it does not collect papers written by other people but rather abstracts them and suggests them as a text and then with references and sections on suggested reading, builds up a picture of each of the many central features of what is connected to human information processing. It should be noted that the sub-title of the book is 'An introduction to human information processing'. Let us say right away that the book is an extremely readable one and is very well produced physically, and that it is insightful in its analysis of some of the thornier problems involved in human information processing. In fact, the problems considered are central to the whole issue, since they include such major subjects as attention, recognition, particularly pattern recognition, memory and the computer simulation of these various cognitive features.

The author divides memory into primary and secondary components, and in so doing is well in step with later views on this subject. He presents a number of models which purport to provide some picture of the memory process. This includes well-known models such as those of Miller, Galanter and Pribram who worked on plans and totes. Less familiar models such as that of mnemonics in the context of the 'Greek art of memory' are also included. One of the points that is

brought out quite clearly here is the fact that much of what we now understand about memory was understood a very long time ago. However, the computer simulation of many of these processes holds out high hopes for considerable future development in the field.

One of the most important issues raised by Dr. Norman is that between the 'active' and 'passive' theories of pattern recognition. In the first place he draws attention to the vital importance of attention. Attention is the process which is clearly linked to perception, conception, discrimination, and remembering. This process of extracting he compares, in Broadbent's writing, to that of having an active filter. This is also a process of selecting, and Dr. Norman sees that the sort of stimulus analysing mechanism suggested by Sutherland is appropriate to the process. The main point he is making here is that the process of remembering and pattern recognition are active reconstructive processes rather than passive acceptance processes. This distinction between active and passive cognitive processes, and Dr. Norman like most other people in the field at the moment accepts that both are probably available to the human processing systems, is reminiscent of the difference between merely looking up, say, log tables in a book, as opposed to generating log tables as they are needed.

By and large, most people will accept the broad sweep and philosophy of this book and would accept it as yet another link in a chain which is gradually building up showing fairly clearly and explicitly how the cognitive processes operate. I would regard the book as thoroughly worthwhile. Certainly it is very readable and I think it is fair to encourage all people interested in the central cognitive activities to buy a copy.

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