

BOOK REVIEWS

Human Performance

Decision and Stress. By D. E. Broadbent. Pp. xiv + 522. (Academic: London and New York, March 1971.) £7.25.

THIS important book started as the first Paul M. Fitts Memorial Lectures, delivered to the University of Michigan in 1969. In book form it is far from the spoken word; it is a lengthy, technical and closely reasoned treatment of human performance and ability, in conditions chosen to illuminate theoretical issues.

The author covered some of the same ground in his earlier *Perception and Communication* (1958). The present book, *Decision and Stress*, takes the earlier as its starting point, discussing new experiments and examining the development of ideas on selective attention, stress, arousal and vigilance over the last 1.2 decades since the earlier book appeared. These topics might be discussed from several points of view; the chosen view is that of the experimental psychologist, concerned not so much with neurological accounts, or how information is physically stored and handled by brains but rather with "systems" types of description. In engineering terms, this corresponds to "block diagrams", without reference to specific components or circuits. Such engineering terms are employed as filter, retrieval, filtering, gating, parallel and serial processing, switching time, and many more. Engineering terms and concepts are used to describe psychological and behavioural phenomena—such as vigilance, arousal, decision and stress—although we may not see these at any rate in human form in machines. Some psychologists object to this approach, arguing that man is "reduced" to systems essentially non-human. Others, however, hold that pertinent experiments can be conceived and formulated in these terms, and that they give measures meaningful to man.

Some of the difficulties of providing an adequate theory of human behaviour are brought out with Broadbent's list (page 440) of "weaknesses" of his earlier position.

(i) Both noise and sleeplessness have their greatest harmful effect late in the work-period, and are thus similar in this respect. On the other hand, they tend to cancel each other out if applied together, and are thus opposite in that respect.

(ii) The personality dimension of extraversion interacts fairly consistently with time of day, as if it corresponds to a state of low arousal. On the other

hand, it does not behave consistently in relation to noise or sleeplessness.

(iii) Alcohol interacts with incentive in the way one might expect if it produced high arousal, rather than being a depressant.

These are important statements about skill, which cannot be discussed in the general terms of an engineering or computer model of behaviour without adding a great deal about the special characteristics of people and differences between people.

Some of the experiments described here are elegant, especially where selection of speech information is studied as a function of selective switching between the ears, between voices, languages, or message content. The author is a pioneer of much of this, and he is generous to those (Triesman, Moray) who have modified his earlier views by later experiment and argument. Psychology is still largely a matter of fashionable opinions, but here we find, perhaps for the first time, what appears to be a neutral and objective treatment. The author's work receives no more emphasis and is defended with no more fervour than the views of his disciples/critics. But we are so used to "goodies" and "baddies" in psychological discussion that it is a formidable task to assimilate these arguments. Or is this because psychology lacks accepted "paradigms" (in Kuhn's sense) for making sense of experiment and observation through generally held assumptions?

It is clear that theories adequate for even "simple" skills will have to involve far more than transfer-function statements between input (stimuli) and output (behaviour). This suggests the need for psychological measures in many psychological experiments, and a far greater insight into the brain's logical operations. One is led to questioning how adequate are the conceptual and experimental tools of psychology; but in any case, this book uses the limited tools to maximum effect and our understanding is considerably increased.

R. L. GREGORY

Mathematical Fantasia

Mathematics Made Difficult. By Carl E. Linderholm. Pp. 207. (Wolfe: London, October 1971.) £2.75.

DR LINDERHOLM's book is far removed from the run-of-the-mill mathematics text. That it is confusing and lacking in structure does not, unfortunately, set it apart from all others; that its author

deliberately tries to confuse, and joyfully acknowledges this in his introduction, does. The book aims, then, not to expound, but to mystify, interest and amuse.

As the book claims, the reader is "coaxed deeper into the eerie landscape of central mathematics. Forgetful functors stare back at you between wild trees; arrows fly in all directions; your feet become entangled in an undergrowth of morphisms; your eyes behold the universally repelling object". In the cause of greater confusion, the reader is assumed to know what categories, functors, monoids, and so on, are, or to be sufficiently intrigued by what the author reveals about them to seek elucidation elsewhere. That mystification and interest can profitably precede enlightenment is well known to teachers, but is often forgotten by authors. So, too, is Dr Linderholm's method of asking a question and then disposing of various fallacious replies before revealing the answer.

To take this book as the excuse for a sermon on pedagogy would, however, be wrong. It is a *jeu d'esprit* that should be treated as such. True, it contains much involved and deep mathematics that demonstrate, in particular, how pure mathematicians now concentrate their attention on mappings rather than on the things on which they are defined. Thus a "modern" view is that "a group is a category with one object in which every morphism is an isomorphism".

Not all the book, though, is on this level. Quadratic and cubic equations, for example, are studied through a "real-life" example based on the tribulations of the baker of Beaulieu Derrière. There is an amusing section on the sex life of brackets, and the African travels of that famous journalist and explorer, Dr L. I. Presume (Livingstone to his friends), serve to introduce some topological notions.

The dust jacket compares this book with *Alice in Wonderland*. It is not a particularly apt comparison, for this work is far more mathematical. Indeed, comparison with this book and, say, Carroll's *A Tangled Tale* only emphasizes the gulf that now exists between the mathematics of the educated man-in-the-street and that of the professional. Can one expect the former to grapple with this book, to enjoy its in-jokes and in-puns? I fear not.

For the mathematician, and others prepared to follow some of the trails laid by Dr Linderholm, the book has much to offer. Friends who have seen it have all found something in it to amuse them—although their mathe-