

useful book, in which the subject-matter has been well planned and ably presented.

Shea's book covers most kinds of transistor circuits, and is in many respects an enlarged and more advanced version of another book which he edited a few years ago. Written by a team of specialists, it naturally contains a wealth of practical information. However, it is not always up to date, a weakness that is inherent in a reference book that covers a rapidly developing subject. Nevertheless, it will be welcomed by many practising engineers, particularly by those whose work covers the design of a wide range of circuits. In addition to detailed studies of circuits, it contains a chapter describing how some of these can be fitted together to produce a practical equipment.

Without doubt each book fulfils a need and helps to bring a fascinating subject within closer reach of electrical engineers.

D. D. JONES

DETACHMENT RELINQUISHED

Personal Knowledge

Towards a Post-Critical Philosophy. By Prof. Michael Polanyi. Pp. xiv + 428. (London: Routledge and Kegan Paul, Ltd., 1958.) 42s. net.

A CHARACTERISTIC feature of the contemporary approach to science is that, both as a discipline and as a substantial part of knowledge, it is objective, and basically impersonal. These features are commonly considered to be virtues. For some time, and in several quarters, doubts have been cast upon this view: now in this monumental work Prof. M. Polanyi adopts a position completely rejecting the whole ideal of scientific detachment. There must be such a thing as the conception of knowing, and it is just this which he sets out to modify. Indeed, his title, "Personal Knowledge", demands some reconciliation, otherwise the two words appear contradictory. For his machinery, the author turns to *Gestalt* psychology. It is true, as he says, that scientists have shied at the philosophical implications of the theory: for himself he embraces them, prepared for the consequences. Naturally, these are likely to be more far-reaching in the biological sciences than in the domain of physics and mathematics. Otherwise expressed, the urge to detachment has done more harm in the former sphere: in the latter, at any event in recent years, formal impersonality has become somewhat disregarded. The late E. S. Russell (whose name, by the way, does not figure in the excellent index) was something of a pioneer in his "Directiveness of Organic Activities", and reached much the same conclusion, but by rather different paths.

This use of the *Gestalt* concept is vital, for, as is common knowledge, its outstanding principle is that of integration. Otherwise, Prof. Polanyi would have found himself inhibited from achieving what is perhaps the summit of his endeavour, namely, to link all purposive awareness to value. Axiological frustration may well be one of the deepest ills of our epoch; here at least is a system of methodology capable of resolving the paradox of increasing power with diminishing faith. The fact is that nobody but the author could possibly have written this book, or anything like it. The passionate element in the

very act of knowing is not something subordinate: it is of the essence of creative ability. With it goes the coupling—more and more demanded as our mental process deepens—between the sciences and the humanities, if man is not to flounder in a bog, largely of his own making. Meanwhile, it is perhaps as well to face the essential difference between science and technology. Both need originality, which is therefore not a discriminant. What the scientist does is to probe more deeply into the nature of things than other people: the technologist, however, is quick to see how phenomena can be turned to practical ends, which involves the assessment of a host of factors entirely irrelevant to the scholar as such.

Under the general heading of "Commitment", several matters are discussed which reveal the quality of the author's mind, and the grasp which he has obtained over his subject. In particular, one may note the high state of stress which accompanies the solution of a major problem. It is only possible to experience this if one believes that the question has an answer: in the event of success, there is rejoicing in discovery and more rejoicing in accepting it as true. This state of affairs is akin to the late Prof. E. A. Milne's "logical pressure", which he described as a kind of pre-condition for great discovery. (The immediate condition is slightly different, and contains certain historical and personal elements which together may produce simultaneous effects, or a near-miss, as the case may be.)

Over and above all this comes the struggle to gain agreement that something fundamentally new is both valid and intellectually coercive. An example would be the non-Euclidian geometries of Bolyai, Lobatshevski and Riemann. Again (pp. 308–9), we are reminded how great are the responsibilities of commitment when a judge decides a novel case within the framework of the existing law. Perhaps it is not wholly an accident that several high wranglers have achieved distinction on the Bench: men who have been through the rigours of mathematical manipulation, but who have not lost sight of the artistry of logical processes.

The relation between the axioms discovered by Gödel and logical inference machines has a direct bearing upon the current problems of automation in general. The crux of the matter would appear to be the extent to which the rules of any art can be specified. But any skill or connoisseurship, which is unspecifiable, cannot be fed into a machine. It looks as if it is just this class of human properties which forms the entire basis of Prof. Polanyi's thesis, namely those generated by the mind in its passionate search for truth. It is in this sense that "the powers of the mind exceed those of a logical inference machine".

Towards the end, the author introduces his concept of a heuristic field, with its analogues of lines of force, which "should stand for an access to an opportunity. . . ." It is significant that the greatest artists of the Italian renaissance recognized this almost intuitively, when (as X-radiography has revealed) they made tentative outlines, perhaps with a blunt instrument, to the limbs of their figures before committing themselves to the final form. In the same way, Prof. Polanyi has spent some nine years in his majestic 'groping' for the ultimate verities, and thus shares in the wisdom of the ages "as one that traceth".

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