

relationships of the managers themselves, beginning in a no less mundane situation than a recurrent dose of late arrival or failure to turn up at a periodic progress meeting. This gave rise to argument on occasion as to functions and roles, and eventually led to the research team being invited to come to help unravel a tangle of conflicting and confused views about rival or respective authorities. Of all the studies portrayed here, this last is likely to be at once the most popular and the most useful among industrial readers: this is the first time that a 'motion picture' of executives in action has been made. The portrayal is clear and frank, and it is not long before these managers (of long-standing acquaintance in the one organization) are prepared to recognize as part of their difficulties "possible sources of hostility and rejection in their own group . . . having denied the existence of any such feelings just one month before and without now being aware that they had denied it".

Throughout the studies the research team made full use of the consultative committee (works council) system in the Glacier factory, and thus a most valuable by-product is an insight into the how's and why's of typical manager-worker consultation. There are gems here for every taste: the enthusiasts can find support for their unswerving and untainted beliefs in consultative committees; the realistic sceptics can point to the emergence of the view that our trade union arrangements breed leaders who have no skill in co-operation unless it is in the form of 'a fight'. Students of management can find clear evidence of the significance of policy to effective control and of the importance of defined responsibilities. Those familiar with current thought can find the strongest support for the emphasis on the role of the 'social skills' in management.

The depth of treatment in Dr. Jaques's account of the material is too profound to admit of brief summary or review. The book is, indeed, a preliminary treatise on the dynamics of co-operation. In reflexion, one sees what makes co-operation possible and successful, and from the direct view of the cases studied one sees just how co-operation is so often thwarted or hampered, even where its contribution is most essential—hampered not by any malice or perverted intention, but by the very human attitudes of the human beings who are setting out to co-operate. The human process, in other words, becomes entangled in the unrecognized human intricacies of the human situation with which it is unconsciously dealing. In industry or elsewhere, co-operative effort is mostly directed to external objectives—the discussion of a new scheme of wage payment, the modification of the design of a product, the introduction of a new accounting procedure, or many another seemingly factual subject. The Glacier project throws into relief the misleading character of such a description: by the mere act of bringing the persons together to discuss or to deliberate, the complex forces of human emotions are unleashed, and as likely as not the logic of the facts on the agenda will be overpowered by the phantoms of hostility, frustration, power-complex, prejudice from bygone causes, and the other motivations that unconsciously power the behaviour of the human being.

Co-operation is the greatest need of the twentieth century. It is also the field of our greatest ignorance. Gratitude is due to Dr. Jaques and the Glacier Company for this valuable guiding-hand in our blindness.

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LEVELS OF ABSTRACTNESS IN MATHEMATICS

Infinite Matrices and Sequence Spaces

By Dr. Richard G. Cooke. Pp. xiii+347. (London: Macmillan and Co., Ltd., 1950.) 42s. net.

A GIVEN domain of mathematics can usually be treated at several different levels of abstractness. At the lowest level the domain appears to consist of an almost unorganized mass of individual results; as the level rises groups of results become linked to one another by the unifying influence of abstract concepts until, at the highest level, the whole subject may be considered as a concrete realization of some general type of axiomatically defined structure. This process can seldom be carried through without loss; at each level there may be results that do not fit into the abstract structure belonging to the next higher level. We usually find, therefore, that we can mark out certain portions of the subject that can be most naturally treated at a given level; at a lower level the guiding thread is lost or obscured, and at a higher level the results do not fit into the available abstract structures. New developments may, of course, provide more comprehensive abstract structures into which this body of results will fit, and the natural level of treatment may then move up a step or two.

The theory of infinite matrices is to-day generally regarded as belonging to the more abstract theory of linear operators in topological vector spaces, and a considerable portion of its results can be organized in a very natural manner from this point of view. In the book under review Dr. R. G. Cooke has, however, preferred to remain, for the most part, at a lower and more concrete level; for him, infinite matrices are not realizations of linear operators, but objects with their own laws of combination, analogous to those of finite matrices, and worthy of study in their own right. He indicates the difficulties connected with the fact that the associative law of multiplication fails to hold in general; later, he discusses more restricted collections of infinite matrices in which the law does hold.

The main body of the book is devoted to matrix methods for the summation of divergent infinite sequences and series. There is a detailed treatment of the group of results associated with the names of Kojima, Schur, Silverman, Toeplitz, Bosanquet, Hahn and Takenaka, consistency problems and problems concerning the efficiency of summation methods are discussed, and results connected with the notion of the 'core' of a divergent sequence are proved. This part of the book forms a valuable supplement to Hardy's comprehensive work on "Divergent Series". The later chapters, on Hilbert space, and on sequence spaces of the Köthe-Toeplitz type, are less successful, since most of the topics treated in them belong naturally to a higher level of abstraction.

The reader will also find numerous results that have not yet been fitted into a more comprehensive abstract structure; some of these may be useful starting-points for future investigations. Their presence may make up, to some extent, for the omission of a systematic presentation of the part played by more abstract concepts in some parts of the theory; it is to be hoped that the author will take up this aspect of the subject in his promised second volume.

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