and analogical argument can lead not only to the conjectural theorem but also, often enough, to the lines on which a deductive proof may be founded. Take, as an example, Carleman's theorem, that if each a_n is positive:

$$\Sigma(a_1 a_2 \ldots a_n)^{1/n} < e\, \Sigma a_n$$

where, on the right, e is the best possible constant. Pólya's proof of this in the *Proc. London Math. Soc.* (24; 1926) may strike the casual reader as a *tour de force*; but the author's own dissection of his proof shows how naturally the argument flows from a plausible line of approach. Much of the work is within the limits of a good school course, and teachers who make use of his ideas need no longer fear that reluctant intellectual assent ('You've proved it, but I still don't believe it'), which is so often their meagre reward. Pólya has shown us how to convince our students that mathematics is as exciting, as imaginative, as æsthetically satisfying as any other field of intelligent enquiry. Britain needs more mathematicians; it will not get them by stressing utilitarian values, but it may get them by presenting Pólya's view of mathematics as a superb intellectual adventure.

the reason why there has been no significant contribution to modern algebraic geometry in the U.S.S.R. is that the subject is self-contained and has no direct influence on applications to applied problems.

This appraisal gives the impression that the Russians have solved the problem of combining breadth of view with sharpness of specialist penetration in a mode which is no longer common in the United States or in Britain. How has this been done ? Is Britain's examination system partly to blame ? The old Tripos, with its many defects, at least knew no distinction between pure and applied mathematics: J. J.'s first paper was on the theory of numbers, A. R. Forsyth's on hydrodynamics. One thing seems certain: it is not enough for academics, industrialists or politicians in Britain to talk glibly about the need for more mathematicians, it is necessary to look to the kind of mathematicians that are wanted. Britain must have expert pure mathematicians who nevertheless do not despise the stimulus of application, and applied mathematicians who can exploit the most abstract and general theories of the pure mathematician.

T. A. A. BROADBENT

MATHEMATICS IN THE U.S.S.R.

Recent Soviet Contributions to Mathematics
Edited by Dr. J. P. LaSalle and Dr. S. Lefschetz. Pp. viii + 324. (New York and London: The Macmillan Company, a Division of the Crowell-Collier Publishing Company, 1962.) 8.75 dollars; 66s.

THOSE who cannot make a direct study of Russian mathematics, because of linguistic deficiency, may find difficulty in assessing the true worth of its immense productivity. To help them, a panel of well-known American mathematicians has devoted a year to an intensive survey of Russian mathematical output, principally for the period 1957–60, and has now reported on some major topics in pure mathematics. The main headings are: algebra, control and stability, functional analysis, numerical analysis, ordinary and partial differential equations, probability and information theory, and topology.

The editors have themselves added to the special reports a 'general appraisal'. The conclusions they draw are well worth consideration. While they regard the United States and the U.S.S.R. as world leaders of about equal strength, they believe that the U.S.S.R. can move more rapidly than the United States in the practical applications of mathematical theory, and may possibly surpass the United States in such matters as control theory, numerical analysis, and differential equations, perhaps because of the intense drive by the U.S.S.R. towards automation in industrial production. They emphasize that while the gap in the United States between mathematics and its applications is widening, mathematicians in the U.S.S.R. are not neatly segregated into the 'pure' and 'applied' categories; there, mathematicians, scientists and engineers work closely together, so that, for example, there are many engineers who understand and exploit the most recent of advanced mathematical techniques. Mathematicians themselves enjoy a high prestige and status. Excellent books are available at very low prices; the large number of mathematical periodicals means that room can be found for long expository articles as well as for the highly condensed specialist-to-specialist research memoirs. It is this breadth of view, coupled with motivated specialization, which accounts for the fact that in control theory the quality of work is as good as that in the United States while the quantity and number of participants is much greater, and that in the field of differential equations the lead is now indisputably with U.S.S.R. On the other hand, this may explain why certain topics are under-developed; Lefschetz, in his own report on topology, suggests that

ATTITUDES IN INDUSTRY

Industrial Participation
Theory and Practice—a Case Study. By J. A. Banks. (Social Research Series.) Pp. 150. (Liverpool: The University Press, 1963.) 25s. net.

THE problem of getting employees at all levels in a business organization to participate in its smooth running is one which is frequently posed and seldom solved. In a case study of a factory employing some 500 male manual workers, J. A. Banks has attempted to discover the forces which influence participation in different departments of the factory, among employees with varying periods of service in the particular company, and on different shifts. As a measure of participation he uses the desire to seek promotion to the rank of supervisor, the willingness to seek responsibility by serving as a shop steward, and the extent to which employees were not only prepared but also actually participated in the company's formal joint consultation machinery.

The conclusions are not unexpected and confirm earlier studies of a similar nature. What matters most in influencing the degree to which employees are prepared to contribute to an organization's well-being is not the mechanics of joint consultation, not its technical efficiency, and not necessarily its social groupings. It is, quite simply, the inter-personal factors which continue to make an employee feel he is or is not wanted.

This is the essence of a study which takes a long time in the telling and which, throughout, bears an air of unreality. This is mainly because the statistical analyses are too small to command anything like the general import which Banks indicates and because of his excessive preoccupation with them. The author's lack of awareness of what is happening in industry is indicated in a reference to promotion. "Although there are signs," he writes, "that at the management level recruitment from outside is gradually replacing promotion from within, at the supervisory grade we still largely expect to recruit by promotion from the shop floor". This reads more like a lament from a charge-hand than an observation by a skilled industrial investigator. Does it need Lord Robbins, or the report of the Committee on Higher Education of which he was chairman, to persuade the author that the graduate recruit differs only from the secondary modern recruit in that his period of formal education lasts longer and that, until they start work, both must be considered as outsiders? Moreover, that, increasingly, supervisory jobs are being filled by graduates and their equivalents as part of their development on the way up ?

T. H. HAWKINS