

EDUCATION OF SCIENTISTS AND TECHNOLOGISTS FOR THE NEW AGE

IN his presidential address to the Science Masters' Association in Manchester on January 2, Dr. B. V. Bowden, pointing out that Britain is already spending more than £800 million a year on education, or 4 per cent of the gross national product, questioned whether all this money was being spent properly, efficiently and on the right things, and whether enough or too much was being spent. In this context, he challenged strongly the meagre expenditure of about £20,000 in 1962 by the Ministry of Education to investigate the efficiency of educational progress. Even making the most generous allowance for expenditure by university departments of education, he doubted whether Britain's expenditure on educational research reached £250,000 a year, and while he valued the impetus from the United States and the initiative and generosity of the Nuffield Foundation, most of the research into new syllabuses and text-books had still to be done. Education was, he thought, as profitable an investment as was open to any nation to-day, and this was especially true in respect of education in the under-developed countries.

Challenging next the belief of many schoolmasters that the universities provide courses in technology for boys

who have no aptitude for science, Dr. Bowden, noting that science began in an attempt to solve practical problems and paying tribute to Sanderson's work at Oundle, insisted that science was much more than a body of knowledge; it was a way of life, a way of thought, and at its best only understood by active practitioners. He was concerned that so many of Britain's ablest schoolboys were interested in science but not in technology and engineering. While a successful engineer or technologist must know his science and be able to work with people, even to lead them, it was vital that schoolmasters should strive to persuade more of their pupils to take up the life of the creative technologist rather than that of the scientist. Few boys, in fact, even understood that technologists could be trained at a university. Finally, he thought there was room for a huge programme of research into methods of teaching and the possible effect of new techniques based on modern technology, including the study of the processes of learning and the use of television and films.

The full text of Dr. Bowden's address will be published in the March issue of *The School Science Review*, published by the Science Masters' Association.

RHEOLOGY OF MOTOR OILS

AT the meeting of the Cambridge Rheology Club held on October 29, Mr. J. F. Hutton ('Shell' Research, Ltd.) spoke on "The Rheology of Motor Oils". He started by describing briefly the manufacture of lubricating oils from crude petroleum, continued with a discussion of lubricating oils as Newtonian liquids, and ended with a description of experimental work which has shown that lubricating oils, which are generally regarded as Newtonian liquids, can exhibit non-Newtonian effects and behave as visco-elastic liquids at very high rates of shear.

The most important property of a lubricating oil is its viscosity and the temperature of the oil is the external factor which has the greatest influence on viscosity. A rise in temperature of 1 deg. C causes a decrease in viscosity of the order of 5 per cent. It is desirable that the dependence of the viscosity of an engine lubricating oil on temperature should be reduced and this is achieved primarily by suitable refining. An additional reduction is obtained by dissolving in the oil about 1-3 per cent of a polymer having a weight-average molecular weight of $1-5 \times 10^5$. The most effective type of polymer is a copolymer made from oil soluble and oil insoluble monomers and so designed that its intrinsic viscosity, or thickening effect, increases as the temperature increases.

Addition of a polymer to an oil introduces non-Newtonian properties which, being of importance in lubrication, have been studied by many workers. However, in

the short time available, Mr. Hutton chose to talk about the more interesting problem, from the point of view of liquid structure, of non-Newtonian effects in lubricating oils not containing polymers. The detection and measurement of such effects in capillary or Couette viscometers is a most difficult undertaking. Rates of shear greater than 10^5 sec^{-1} are necessary, and in this range it is difficult to separate true shear rate thinning from a fall in viscosity due to viscous heating. A different approach to the problem has been made, notably by J. Lamb and A. J. Barlow, who, from measurements of the propagation of ultra-sonic shear waves through the oils have calculated their relaxation spectra. The results clearly demonstrate the visco-elastic nature of lubricating oils and indicate that the peaks in the spectra are characteristic of the types of molecule present.

In the discussion the comments and questions ranged widely from technological ones concerning the best oil to use in a motor-car to more fundamental ones concerning heating effects in viscometry and the relation between experiments carried out in continuous shear and experiments carried out in oscillatory shear.

The next meeting of the club will be held on March 4 at the Technological Research Station, Spillers, Ltd., Station Road, Cambridge, when Mr. G. G. Zahler and Mr. G. R. Murfit (Instron, Ltd.) will speak on "The Instron High Shear Capillary Rheometer". H. G. MULLER

THE FISHERIES BIOCHEMICAL RESEARCH UNIT

FOR some years the U.K. Development Commission has sponsored a Unit for Biochemical Research bearing on the problems of fisheries, and at present located within the National Institute for Research in Dairying, Reading. In view of the retirement of the honorary director, Dr. S. K. Kon, within the next few years, the Development Commission has decided that it should be transferred to Aberdeen. The advantages of this new

location are that the reconstituted Unit will be in close contact with the fishing industry, the University and the existing marine research institutes in Aberdeen. These are the Scottish Department of Agriculture and Fisheries Marine Laboratory and the Torry Research Station of the Department of Scientific and Industrial Research.

After consultation between the Development Commission and the University of Aberdeen, it was agreed