the hardness of the pin, a very large increase in the wear is observed, due to the overlapping of the plastic regions around each junction.

In the discussion which followed, Prof. F. E. Simon (Oxford) raised some interesting points on the energetics of the frictional process, and in particular asked for a fundamental mechanism to explain the conversion of friction into heat. Mr. A. W. Crook (Associated Electrical Industries, Ltd., Aldermaston) pointed out that impact experiments on indium indicate that metallic junctions take a finite time to reach their full strength. Mr. P. P. Love (Glacier Metal Co., London) quoted some experimental results on bearing metals impregnated with polytetrafluoroethylene which ran without lubrication under conditions where conventional bearings completely failed.

Friction of Non-metals. In this section some recent experiments on the friction of diamond, graphite and carbon were described in a paper by Dr. F. P. Bowden, J. E. Young and G. W. Rowe (Cambridge). Experiments with surfaces outgassed *in vacuo* again showed a large increase in friction when the surface films were removed, but the gross seizure observed with metals under comparable conditions did not occur owing to the limited deformation at the regions of contact. Dr. K. V. Shooter (Cambridge) described a study of the frictional properties of plastics. With these materials there is a deviation from Amontons' law at low loads. Apart from this, however, the frictional properties can be explained in terms of adhesion and shearing at the interface exactly as for metals. An important exception is polytetrafluoroethylene, which on account of its molecular structure has an exceptionally low coefficient of friction. In the last paper, Prof. N. Gralén (Gothenburg) described some ingenious experiments for determining the friction between single fibres. His investigations show that, as for plastics, the coefficient of friction tends to increase at very small loads. The importance of this work in textile research was emphasized by Mrs. K. R. Makinson (Commonwealth Scientific and Industrial Research Organization, Australia).

Boundary and Extreme-Pressure Lubrication. This section opened with a survey by Dr. D. Tabor (Cambridge) of the mechanism of boundary lubrication. He showed that, although boundary lubricants enormously reduce the amount of metallic interaction, they do not eliminate it entirely. The most effective lubrication is obtained when the lubricant film is solid and possesses a close-packed structure. When the film melts, a marked increase in friction and metallic interaction occurs. For this reason fatty acids are generally more effective than hydrocarbons or paraffins, since they can react with the metal surface to form metallic soaps of relatively high melting points. These observations have been confirmed in some recent experiments using radioactive metals to detect the amount of metal transferred from one surface to the other as sliding proceeds. A new observation is that, at temperatures above the melting point of the lubricant film, a further deterioration occurs due to the desorption of the lubricant film. At this stage, although the surfaces are flooded with lubricant, the friction and surface damage are comparable with those observed with unlubricated surfaces. These changes, which are reversible on cooling, correspond to changes in state of the lubricant film. Similar changes are observed in electron diffraction studies of the structure and orientation of boundary films.

Dr. J. S. Courtney-Pratt (Cambridge) described an optical method of measuring the thickness of adsorbed layers using the Tolansky multiple-reflexion interferometric technique. The investigation showed directly that molecules of fatty acid, spread by retraction, are adsorbed on the surface as a uniform monomolecular layer. Dr. F. T. Barwell (Mechanical Engineering Research Organization, East Kilbride) discussed the effect of surface structure on the friction of metals sliding under boundary conditions. Surface roughness appears to play a small part; but work-hardening of the surface layers may produce an appreciable increase in the friction. The type of oxide film formed under various conditions may also have a marked effect. Finally, Dr. C. G. Williams (Thornton Research Centre, Chester) spoke on the action of extreme-pressure lubricants. The underlying principle is to use additives which can react with the metal surfaces to form protective films. In general, the additives are inert under less severe conditions of sliding, but at the high temperatures developed at incipient seizure rapid reaction occurs. Metal chloride and metal sulphide films are particularly effective as protective films, and for this reason a large number of extreme-pressure additives contain labile sulphur or chlorine.

In the discussion which followed, Dr. W. Hirst, M. Kerridge and J. K. Lancaster (Associated Electrical Industries, Ltd., Aldermaston) described an investigation of the thickness of the lubricant film necessary for effective boundary lubrication. Using radioactive tracer techniques they have shown that at small loads a single monolayer is sufficient, but at higher loads, where appreciable deformation of the surfaces occurs, considerably thicker films are necessary.

The full discussion will be published in the *Proceedings of the Royal Society*.

D. Tabor

OBITUARIES

Dr. J. C. E. Simpson

James Charles Edward Simpson was educated at St. Edward's School, Oxford, and the University of Liverpool. He graduated in 1929, was awarded the Leverhulme Chemistry Prize and the Campbell Brown Fellowship, and began research under Prof. (now Sir Ian) Heilbron on the chemistry of ergosterol. In 1933 the award of a Commonwealth Fund Fellowship took him to the Rockefeller Institute, New York, where he studied steroid sapogenins with Dr. W. A. Jacobs. He returned to England in 1935 and became an assistant lecturer at King's College, London, where for four years his work was mainly in the triterpene field, with particular reference to β-boswellic acid and β-amyrin.

From 1939 Dr. Simpson was a temporary lecturer in the Durham Division of the University of Durham. There he became interested in the chemistry of cinnoline, and this system was studied together with related antimalarial agents. In 1945, he was awarded the D.Sc. degree of the University of Liverpool and at the beginning of that year went as I.C.I. Fellow to the Chemotherapy Department of the Liverpool School of Tropical Medicine. Collaboration with the director, Dr. E. M. Lourie, on the chemotherapy of trypanosomiasis was continued after 1946, when Dr. Simpson was appointed to the scientific staff of the Medical Research Council. A comparative study of

a group of related heterocyclic compounds formed an integral part of this work, which was pursued after he became director of the Council's Group for Research on Chemotherapy in the Chemistry Department at Manchester. His untimely death on February 7, at the age of forty-three, came when he was starting a new programme in which his experience of natural products and synthetic work would have proved invaluable.

Besides research communications, Dr. Simpson's writings included a book on "Cinnolines, Phthalazines and Quinoxalines", an article on pterins for "Thorpe's Dictionary" and the Heterocyclic Section of the "Annual Reports" (1946); he had previously done editorial work for the Bureau of Abstracts.

Simpson was possessed of boundless intellectual and physical energy, which in research was expended without reservation on the problems in hand. Characteristically, his leisure was spent in an energetic way, fell-walking and playing tennis or badminton; he was a life-long campanologist and an active member of choral societies. His travels in connexion with these pastimes revealed a latent ability as a racing motorist. The intensive use which he made of his own time often made his conversation appear abrupt to those who were not well acquainted with his manner, but in fact he was always ready to cease work to offer help on problems in which he need have taken no interest. He will be remembered always as a loyal and generous colleague, a man of the highest calibre.

C. M. ATKINSON

WE regret to announce the following deaths:

Dr. A. E. Cameron, recently reader in entomology in the University of Edinburgh and formerly professor of zoology, University of Saskatchewan, on February 27, aged sixty-four.

Sir Roger Hetherington, C.B., O.B.E., chief engineering inspector, Ministry of Health, during 1930–44, and president in 1947–48 of the Institution of Civil Engineers, on February 24, aged seventy-six.

Sir Charles Sherrington, O.M., G.B.E., F.R.S., past president of the Royal Society, aged ninety-four.

Colonel E. Bright Vedder, sometime senior member of the U.S. Army Board of Research, and later professor of pathology and experimental medicine in George Washington University, known for his work on beriberi and clinical scurvy, on January 30, aged seventy-three.

NEWS and VIEWS

Chairmanship of the Advisory Council on Scientific Policy: Sir Henry Tizard, G.C.B., F.R.S.

SIR HENRY TIZARD will be retiring at the end of March from the Advisory Council on Scientific Policy. The Council was founded in January 1947 as a result of a recommendation of the Barlow Committee, and Sir Henry became its first chairman, a post which he filled concurrently with that of chairman of the Defence Research Policy Committee. To undertake these two tasks Sir Henry resigned from the presidency of Magdalen College, Oxford, an office which he had taken up in 1942. He brought to both posts a considerable knowledge of scientific affairs in government. From the time of the First World War he had been closely connected with the development of the scientific services of the Royal Air Force. He was chairman of the Aeronautical Research Committee during 1933–43, and a member of the Air Council itself in the earlier part of the Second World War. As permanent secretary of the Department of Scientific and Industrial Research during 1927–29, he also had a first-hand knowledge of the civil side of government science. It fell to him to establish the Advisory Council as a common meeting ground where advice to the Government on current and prospective demands for scientific workers, on the organization of government science, and on the broad allocation of our scientific resources could be formulated with the participation of the secretaries of the Research Councils, one or two scientific advisers to Ministers, and independent members drawn from among the officers of the Royal Society, the universities, and scientific men in industry. It was necessary to the Advisory Council's success that it should deal with matters of policy which could not be effectively handled by other bodies, while refraining from intervention in the numerous and important problems with which existing bodies could more appropriately deal. Sir Henry Tizard's rare capacities and experience proved equal to the task, and Prof. A. R. Todd, who follows him, will succeed to the chairmanship of a going concern with a record of achievement and with a high prestige in Whitehall. Sir Henry has now become a director of the National Research Development Corporation, and fortunately is not disappearing entirely from public life.

Prof. A. R. Todd, F.R.S.

PROF. A. R. TODD, who has been appointed to succeed Sir Henry Tizard as chairman of the Advisory Council on Scientific Policy, has been professor of organic chemistry in the University of Cambridge since 1944, an appointment to which he moved after occupying the Samuel Hall chair of chemistry in the University of Manchester during 1938–44. Prof. Todd is an organic chemist of great distinction. He has made outstanding contributions to the chemistry of complex molecules of great current interest in biology. Among his many achievements are the synthesis of vitamin B_1, and the determination of the structure and the synthesis of vitamin E. He has also made very important strides in determining the structure of such degradation products of nucleic acids as purines, pyrimidines, nucleosides and nucleotides. More recently he has turned his attention to the chemistry of the adrenocorticotrophic hormone (A.C.T.H.). Prof. Todd returns to the Advisory Council on Scientific Policy after a gap of a year, having been one of the original members appointed in 1947. Unlike his predecessor, Sir Henry Tizard, he will not leave his University but will continue to give full-time direction to his Department in Cambridge. He will be enabled to do this partly by resigning from certain other official committees and partly as a result of recent developments which have led to much of the detailed work of the Advisory Council being done by its committees under the general supervision of the whole body. Prof. Todd will also be free of the heavy responsibilities of the chairmanship of the Defence Research Policy Committee,