ELECTRON MICROSCOPY GROUP OF THE INSTITUTE OF PHYSICS

ANNUAL CONFERENCE

THE annual conference of the Electron Microscopy Group of the Institute of Physics was held in Birkbeck College, University of London, during November 10–11. The Group held its meetings in the lecture theatre of the Physics Department, and was welcomed by Prof. J. D. Bernal, head of the Department.

Papers covering the electron microscope and a wide range of its applications were read. The first paper of the conference was presented by M. E. Haine and T. Mulvey (Associated Electrical Industries, Aldermaston) on the correction of astigmatism in electron lenses. They have analysed the edge diffraction test of Hillier and Ramberg[1], showing that it is sufficiently sensitive to allow adequate correction to obtain 10 A. resolution, and they described the design and application of a four-pole cylindrical stigmator lens.

Several papers were presented covering chemical applications of electron microscopy, one of which, by E. Crampsey, Dr. M. Gordon and J. W. Sharpe (Royal Technical College, Glasgow), described an electron microscope study of the hydrochlorination of natural and synthetic polyisoprene. Miss K. Little (Medical Research Council Radiobiological Research Unit, Harwell) described how the electron beam energy could manifest itself as heat and as a source of ionizing radiation, and she showed some changes in appearance of plastics which had been bombarded by electrons from a Van de Graaff generator. Miss J. M. Peskett then described a method used in the Mechanical Engineering Research Laboratory, East Kilbride, for specimen preparation of soap fibres present in alkali base greases, whereby oil is vaporized *in vacuo* to leave the soap fibres unchanged in size, shape and arrangement for viewing in the electron microscope; the specimens are used in research into the function of the structure of a grease in the lubrication of roller bearings.

Reports of work done with the reflexion electron microscope were presented by the Laboratory of Physics and Chemistry of Surfaces, University of Cambridge, and the Research Laboratories of the Associated Electrical Industries, Aldermaston. Dr. J. W. Menter and his colleagues at Cambridge described work on synthetic and other fibres, electrodeposits and the polish on diamonds, while Dr. J. F. Halliday (Aldermaston) examined the finish of surfaces prepared by typical engineering methods, such as grinding, polishing, lapping, etc., and also worn surfaces. Some advantages of the technique are that asperities making an angle of $\frac{1}{2}°$ or less with the horizontal can be observed, and also the surface structures (such as electrodeposits) are more easily identifiable than by replica or light microscopical techniques.

A short note on some recent results of X-ray microscopy in the United States was presented by Dr. S. P. Newberry (General Electric Co., Schenectady, N.Y.) and Dr. W. C. Nixon (Cavendish Laboratory, Cambridge). Resolution using magnetic electron-beam focusing lenses was up to twenty times better than for electrostatic lenses. Micrographs obtained with magnetic focusing showed resolution of the order of 1 μ. Among the metallurgical results an aluminium–tin alloy (5 per cent tin) 0·020 in. thick showed the deposition of tin to be along the aluminium grain-boundaries.

Dr. V. E. Cosslett (chairman of the Electron Microscopy Group) and M. E. Haine (Associated Electrical Industries, Aldermaston) gave a report of the electron microscopy conference held in Innsbruck during September 16–19, 1953. This was followed by a comprehensive report by D. E. Bradley (Associated Electrical Industries, Aldermaston) on the development of a new technique for producing strong specimen-supporting membranes and also replicas of high resolution. To make the supporting films, carbon is evaporated *in vacuo* by passing a high current between two pointed carbon rods mounted so that the points are lightly held together. The evaporated carbon is allowed to fall on to the surface of glass, from which it may be stripped and mounted on specimen grids in the usual way. It may also be evaporated on to the surface of glycerol or plastic. In the latter case the plastic is dissolved away after the composite film is on the grid. To make the replicas two methods have been developed. For examining photographic grain, carbon is evaporated directly on to the emulsion, floated free on the surface of water, and mounted for the electron microscope. For metal surfaces, a plastic replica is made in the accepted manner, carbon deposited on the replicating surface, the composite replica mounted on a grid, and finally the plastic dissolved away. The carbon replica may be shadowed if desired. The carbon films produced in this way withstand the electron beam better than plastic and are more transparent to the beam. Some research done with this method was presented by J. F. Nankivell (Cavendish Laboratory, Cambridge) and E. Smith and Dr. J. Nutting (Metallurgy Laboratory, Cambridge) which supported Mr. Bradley's claim of high resolution. Dr. C. E. Challice (Wright–Fleming Institute of Microbiology, London) described how he had used the method for backing thin biological sections.

Unexpected aspects of the polystyrene – silica replica technique experienced at the Shirley Institute, Manchester, were described by S. F. Ward and Dr. D. G. Drummond. They showed that although silica, when evaporated on to the polystyrene, covers the whole surface, it remains thinner in the lee of a projection than elsewhere, producing a 'self-shadowing' effect. This effect was also shown by Mr. Bradley in his carbon replicas. A method for examining selected areas of surfaces using wet-stripped replicas was described by G. R. Booker (Metropolitan-Vickers Electrical Co., Ltd., Manchester). The selected area of surface is identified by fine scratches in the immediate vicinity, and the corresponding portion of the replica is mounted over a hole 0·015 in. in diameter in a copper disk. It is viewed in the electron microscope using a specimen screening aperture. Application of the anodic replica technique to the study of the structure of cast aluminium–manganese alloys was described by Miss M. K. B. Day (British Aluminium Co., Ltd.).

The biological session was opened by Dr. G. Eaves (School of Medicine, Leeds), who made some remarks

on the attainment of high resolution from thin tissue sections, and suggested that, to attain a resolution of 10 A., the section must be 100 A. or less in thickness. A short discussion followed in which Mr. Haine (Associated Electrical Industries, Aldermaston) stated that, to avoid graininess in the final photographic print due to random fluctuations in the electron beam, a 10-A. resolution micrograph must be recorded on the photographic plate at a magnification of not less than × 50,000. R. C. Valentine and Dr. J. R. G. Bradfield (University of Cambridge) then presented two papers, in the first of which they described how, by draining the suspending fluid from a drop of suspension on a collodion-covered grid, damage to bacterial cells can be minimized. In their second paper they described preliminary observations on 0·035-μ sections of *Staphylococcus aureus* and *Paracolon bacillus*. Bodies described as resembling chromosomes were shown in the nucleus, which was demonstrated to contain deoxyribonucleic acid by use of a modified Feulgen stain.

Dr. T. H. Flewett and Dr. G. Eaves (School of Medicine, Leeds) showed sections of egg membranes infected with vaccinia virus, ultra-thin sections of the vaccinia virus being demonstrated. Dr. E. M. Brieger and Dr. A. M. Glauert (Strangeways Laboratory, Cambridge) showed some sections of lung and spleen of mice infected with bovine tubercle bacillus.

Mrs. B. E. Williams reported that the National Physical Laboratory, Teddington, has developed a cheap method of producing gelatin copies of diffraction gratings, from which it is possible to make 'Formvar' replicas for the electron microscope for use in magnification calibration. The Laboratory is prepared to supply these copies at a nominal charge to cover postage and packing. C. E. CHALLICE

[1] Hillier, J., and Ramberg, E. G., *J. App. Phys.*, 18, 48 (1947).

NORTHERN SECTION OF THE PHILOSOPHY OF SCIENCE GROUP

INAUGURAL MEETING

AN inaugural meeting to constitute the Northern Section of the Philosophy of Science Group of the British Society for the History of Science was held in the Staff House, University of Manchester, on January 30, at 2.30 p.m. Despite the cold weather, which made travel difficult, it was attended by representatives from the Universities of Leeds and Liverpool and the University College of North Staffordshire. Of those from the University of Manchester, eleven departments were concerned—botany, child health, classics, chemistry, extra-mural, mathematics, philosophy, psychology, radio astronomy, theoretical physics and zoology. From Leeds the departments represented were mathematics, medical physics and philosophy; from Liverpool, philosophy and zoology; and from North Staffordshire, philosophy and physics.

After Prof. L. Rosenfeld (professor of theoretical physics, University of Manchester) had been elected chairman of the business meeting, Dr. W. Mays (University of Manchester) gave an account of how the proposal for a Northern Section arose. He pointed out that for a number of years it had been felt by some members of the Philosophy of Science Group who were living in the North of England that they were missing a good deal by not being able to attend its meetings, and it was therefore considered appropriate to have a Section of the Group in their part of the country. Such a Section would help to bring together people interested in the philosophy of science and encourage discussion and research. Inquiries made at Leeds, Liverpool, Sheffield and North Staffordshire as well as Manchester showed that there was considerable interest in the proposal. The members promoting the scheme therefore decided to ask the Philosophy of Science Group for permission to form a Northern Section, and this was readily granted. As far as future activities are concerned, it is hoped to hold meetings at regular intervals at the various university centres taking part in the scheme. There will obviously have to be a good deal of flexibility and decentralization, and, wherever possible, local centres will be encouraged to organize their own activities.

The resolution to form the Section was then put to the meeting and carried, and it was decided to elect a provisional committee to take charge of affairs until October, when there will be a general meeting and officers will be elected for the year 1954–55. Prof. D. M. Emmet (professor of philosophy, University of Manchester) was elected provisional chairman of the Section, and Dr. Mays provisional honorary secretary and treasurer. It was resolved that the committee be composed of two representatives from each University, and that members should be elected by the Philosophy of Science Group on the recommendation of the Section. Twenty-eight applications for membership were made at the meeting.

Prof. L. Rosenfeld then gave a lecture on "Rationalism in Antiquity". The topic, he said, has philosophical as well as scientific implications. If one examines the atomic theory of Democritus, one is struck by the modernness of his approach as he seriously attempts to give a rational explanation of the universe devoid of theological or mythological content. The view has been advocated that the growth of rational thinking in Ancient Greece, which led to the birth of Ionian natural philosophy, was to some extent conditioned by the social and economic changes occurring at the time. During the Pre-Socratic period the Greeks had the East opened up to them for trading purposes. In some ways one is reminded of the growth of scientific ideas during the sixteenth century as a result of navigational discoveries.

With the breakdown of Athenian democracy and its subsequent domination by Alexander, Greek philosophy lost its flexibility and became rapidly systematized. A new type of literature developed, the writing of Utopias with their veiled criticism of the authorities. The seeds sown by free discussion among the earlier Greek thinkers became, in Alexandrian times, Stoicism and Epicurianism; but whereas Democritus represented an optimistic and constructive philosophy, Epicurus and Lucretius represented a philosophy of pessimism fighting against a decaying civilization.

But the ideas of the Milesian thinkers were not entirely original. The first international carriers and merchants were the Phœnicians. If the philosophical thought of the Phœnicians was purely mythological in character, the hypothesis that there is a relationship between rationalism and commercial adventure becomes considerably weakened. The little that is