nificent, lending themselves admirably to representation by the modeller. The exhibits on enzymes are introduced curiously—first by a film-strip of a rugby footballer which is quite irrelevant unless it is intended as a miming for the word 'conversion' (though it is a penalty kick), and then by a model of a dancing class which could not be interpreted; but the exhibits themselves are clear enough.

Associated with the chemical section are a number of poorly adjusted ripple-tank experiments, which do not do justice to a well-known make of apparatus, and which are intended to lead up to the idea of X-ray diffraction by crystals. In this section also is shown the *EM*3 electron microscope. The catalogue says this uses four magnetic lenses; as exhibited, it uses one electric lamp underneath one lantern slide, but nevertheless admonishes the public not to tamper with the controls. Is not a leading make of British electron microscope something to show proudly, in working order, on such an occasion ?

In the biological exhibits the emphasis is rather on living matter than on the organism as a whole; here again the modeller has had full scope and has done magnificently.

In the "Stop Press" section, pride of place must go to the exhibit on cosmic rays. This is fully documented, and tells the whole story from the first unaccountable electroscope leak to the most recent photographic plate work. It was worth the visit to see this exhibit alone, and to watch a counter-controlled chamber in action. Less impressive, but none the less excellent, is the smaller section on electrons in crystals, which explains the behaviour of luminescent materials clearly and effectively. Nimrod, the Ferranti electronic computer, is a good demonstration; the game it plays is simple, and any opponent who knows the rules has a good chance of success. The operator says it has a temper; but its face lights up after every move, whether advantageous or otherwise.

Nimrod, in fact, sets a standard by which many of the other 'working' exhibits might be judged. It really is in full working order, and it has someone in charge to explain what it is doing. Further, there is an excellent pamphlet published by Messrs. Ferranti, Ltd.*, which describes how it is constructed and how it works, and gives a little of the mathematical theory of digital computers. This pamphlet did not, however, seem to be available within the exhibition itself, which is a pity. There is a bookstall, at which expensive-looking commemorative jig-saw puzzles and scientific books quite unrelated to the exhibition are displayed; how much it could have contributed to the purpose of the whole if an explanatory pamphlet setting out details of some of the more striking individual exhibits (and moderately priced) had been on sale there! For the official guide-catalogue, useful as it is in explaining the exhibition as a whole, does not say very much that is helpful about individual items and is even confusing in places; in view of the fact that many items are neither clearly numbered nor effectively provided with displayed descriptive matter, this is a little disheartening. It says a great deal for the real quality of what there is on show that this criticism, which must be made, does not diminish one's admiration for the whole.

The writer was one of a small company of appreciative visitors who seemed to be pretty well outnumbered by the attendants. By all accounts, the exhibition has not so far touched the popular imagination, and there may be several reasons for this. It is the academic conversazione on the grand scale, with the exhibits clearly linked by one central idea, the structure of matter. Perhaps this is the reason, for people will pay to be entertained or impressed, but not to be instructed. Its very success in achieving its aims may well limit its popular appeal. Or it may be that an enterprise of this kind takes a long time to become widely known and appreciated, or even found. It is quite possible to emerge from the South Kensington subway, and be inside the exhibition on the history of the Science Museum itself, before realizing that it is not what you were seeking; though, of course, there is some discreet short-range guidance for the reasonably observant.

One feels that there is something of permanent educational value here, and a pleasing creation which would be worth a visit if only to see a scientific exhibition dressed in a Festival gaiety.

G. R. NOAKES

* Faster than Thought: the Ferranti Nimrod Digital Computer. Pp. 40. (Hollinwood: Ferranti, Ltd., 1951.) 1*s.* 6*d.*

GERMAN SOCIETY FOR ELECTRON MICROSCOPY

THIRD ANNUAL CONFERENCE

THE German Society for Electron Microscopy held its third annual meeting in Hamburg during May 18–20. Although the meeting was convened as a national conference, invitations had been accepted by many foreign men of science, so that the conference took on a certain international flavour. Its success was due not only to the high quality of many of the contributions by German and foreign scientific workers, but just as much to the opportunities it offered to make, or renew, contacts between men and women of many countries.

The work of the conference was opened by H. Ruska with a general lecture on the more recent results of electron microscopy, mainly illustrated by examples taken from the biological and medical field. Stress was laid on combining results obtained by electron microscopy with those obtained by other means.

Only some of the large number of papers read (about seventy) can be mentioned here. Mathematical investigations into the properties of certain magnetic electron lenses were presented by Lenz and by Glaser, and experimental methods for the field determination in magnetic lenses were described by Lenz and by Wolff. A very simple 'electron-optical' bench arrangement, to facilitate experimentation, was shown by Boersch.

Instrument design has been pursued steadily during the last year, and Möllenstedt described a simple way of increasing the specimen penetration in the electrostatic instrument by placing the specimen into a chamber kept at +50 kV. with respect to earth, the gun operating at −50 kV.; a direct switch-over from 50 to 100 kV. can be made. The use of the electron microscope in electron diffraction studies has been extended through the development by Heise of an adaptor for glancing incidence work with the AEG–Zeiss instrument. The design of a small magnetic microscope built at the University of Munich was described by Kinder; this instrument is very similar to the RCA desk-model. An instrument of unconventional design was described briefly by von Borries. This instrument uses a single permanent magnet with two gaps in the iron circuit, one exciting the objective lens, the other the projector lens, the final image being free of image rotation; the magnification of the projector lens can be varied continuously by an axial movement of the pole piece insert. Further experiments with Boersch's filter method, in which the majority of the inelastically scattered electrons which reduce the image contrast in electron microscopy and in electron diffraction are eliminated, were described by Rang, who used an electrostatic lens to obtain the required critical deceleration.

The usefulness of stereoscopy in the interpretation of complicated structures was demonstrated by Helmcke, who also applied the methods of photogrammetry to a quantitative evaluation of stereograms, and by Grasenick.

The problem of the 'tolerance dose' without specimen destruction was discussed from various aspects. Boersch estimated that hydrogen atoms will always remain invisible; but that carbon atoms might possibly be made visible if the resolving power could be increased sufficiently far. Experimental investigations by König gave a much more pessimistic picture; specific loads of 10^4 to 10^5 Wsec./cm.^{2} at the specimen already lead to a partial breakdown of the more complicated materials. Rang showed that by correct choice of the observation screens optimum conditions regarding specimen load during focusing can be maintained.

Interesting details were given by König of the 'carbon skin' method of obtaining three-dimensional 'replicas' of substances which do not stand the high beam intensities often required in their imaging. The specimen to be coated is placed on the aluminium anode of a glow discharge maintained in benzene vapour of about 1 mm. pressure. The carbon coating formed is later 'hardened' either by subjecting the coated specimen in the electron microscope itself to a high beam current, or by keeping it for some time in a vacuum oven at 400° C. The original specimen can then be dissolved, or evaporated out, leaving the carbon skin intact; this gives a faithful representation of the original, as was proved by stereograms of diatom replicas shown by Helmcke.

Surface structure, phase changes and crystal growth phenomena at elevated temperatures in steel and iron–nickel alloys were demonstrated convincingly by Rathenau, using the emission electron microscope; other applications of electron microscopy to metallurgical problems were discussed by several authors. Grasenick has studied crystal growth in magnesium oxide, and Helwig the formation of zinc and cadmium oxides. Several papers described the structures of activated aluminium oxides. Rang and Schluge, as well as Bernard, and Möllenstedt, showed how the Bragg diffraction lines appearing in many electron micrograms of crystalline materials can be co-ordinated with certain lattice positions.

A number of papers dealt with the methods of preparation of biological material; Kellenberger described a critical study of various methods of preparing *B. coli* for the electron microscope, and Winkler an investigation into the method of fixation which gave closest agreement with the light optical picture. The varying success of the 'freeze-drying' method was discussed by Studer and others. Contributions to the study of collagen and reticulin fibrils were presented. Further papers dealt with the reaction of bacteria to certain treatments (for example, of T.B. bacilli to streptomycin) and other cytological questions, and with the first electron microscopical representations of new material.

Progress in the preparation of thin sections of tissues was reported by several workers. Kellenberger described the design of a new microtome (made by Trüb-Täuber, Zurich), cutting reproducibly to 0·05 micron, and illustrated this by slides of thin sections through nerve fibres of frogs and neuro fibrils. Bretschneider uses a modified C.I.C. microtome; he considers that the problem of thin sectioning is no longer one of microtomes but of the technique of fixation; this he described in detail. (Of eighteen mixtures investigated, a composition of paraffin wax, beeswax and carnauba wax was found most successful.) This talk, too, was illustrated by interesting slides. Bernhard discussed investigations on cancer cells using the thin-sectioning technique; the interpretation of earlier American results, showing virus particles in cancer cells, could not be confirmed, as most virulent cancer cells investigated were free of these bodies. Hence, normal cells were studied, in which several new features were discovered, the function of which is still unexplained. Mölbert and Beyersdorfer also described a new microtome (made by Jung, Heidelberg), and discussed the technique of its use. They found that an after-treatment of the thin sections by an electrical discharge in air of 0·05 mm. mercury pressure made them more resistant to the electron beam.

Many other subjects were discussed, for example, polymerizing methyl methacrylate replicas, investigations on textile fibres, rubbers and plant cells, size measurements of sub-microscopical crystals, fine-grain photographic emulsions and studies of surface contamination phenomena with Müller's point projector microscope.

An exhibition of photographs and of new instruments was held in conjunction with the conference. Besides microscopes, microtomes and vacuum accessories, four electron microscopes were on show. All these instruments were distinguished by a high standard of craftsmanship employed in their manufacture, but they were expensive by our standards. The Philips electron microscope has been exhibited in Great Britain on several recent occasions, and does not, therefore, require any further description; but the AEG–Zeiss electrostatic instrument will not be known to many workers here. This machine uses electrostatic lenses throughout. The need for frequent cleaning of the lenses has been greatly reduced through a built-in 'stigmator', which compensates the astigmatism caused by dirt particles getting into the lenses. Three magnifications can be selected by using the two fixed projector lenses singly or in combination; an additional diffraction lens is provided. Siemens demonstrated two instruments, their standard three-lens type for 100 kV., and a new simplified type for 60 kV. Both types are post-war developments of the original Siemens instrument. Both new instruments employ a revolving projector lens head, which allows any of four projector lenses to be brought quickly into operation. Many other improvements over the old type are incorporated, for example, grease vacuum joints are replaced by rubber seals.

G. LIEBMANN