of biotite increases with grinding for twenty-four hours, and the lines in the X-ray patterns tend to become diffuse; peculiarities observed with vermiculite cannot yet be explained. In the discussion, R. W. Nurse (Building Research Station) pointed out the severe nature of dry grinding, while Dr. Gregg and Dr. G. W. Brindley (Leeds) both described work on the grinding of kaolinite and halloysite.

In the section devoted to general papers there were three contributions from Rothamsted. The technique employed there by H. L. Nixon and Dr. A. Muir for obtaining electron micrographs of clays was described and a number of excellent electron micrographs shown. In reply to Dr. G. Nagelschmidt (Sheffield), Dr. Muir confirmed that the hexagonal crystals in some of the micrographs are metahalloysite, this having been checked by X-rays. The theory of X-ray diffraction and absorption by oriented flakes and rolled specimens was discussed by K. Norrish and Dr. MacEwan. Equations giving the angular distribution of any particular crystal plane in terms of the distribution of particles have been derived, and the effect of orientation and flake shape on intensities calculated. The calculations give a method of determining the distribution of particles from the variation of intensity of a particular line at different settings of the specimen. Dr. Nagelschmidt and Dr. Brindley both stressed the importance of this theory in quantitative analysis and in structure determinations, and Dr. Brindley explained that, in certain cases, the distribution of particles is obtainable from one photograph. In the third paper, Dr. MacEwan presented a detailed table in which clay mineral types are classified on structural grounds⁸. Use is made chiefly of an extension of the significance of existing names; for example, there are three groups, depending on the number of O, OH layers in the structure, and these are divided into thirty-three sub-divisions through the major divisions: kaolinoids (or kaolin minerals), micas, montmorillonoids, vermiculites and chlorites. This classification was compared with other attempted classifications. In the discussion, Dr. Brindley spoke of the necessity of consideration of such schemes in reaching any definite ruling on nomenclature.

Adsorption isotherms of carbon tetrachloride, water and oxygen, as well as density in carbon tetrachloride, have been used by Dr. Marjorie J. Brown (Exeter) and Dr. Gregg to investigate changes induced in kaolinite on heating. In the region where the water-loss becomes largely irreversible (400–490° C.), the morphology of the grains cannot be greatly changed, since the surface area increases only slightly. A slight decrease in area is observed at about 720° C.; but even at 1,000° C. both area and sorption are still appreciable. H. R. Samson gave some optical evidence supporting the small area change in the 400–500° C. region. Dr. Brown, in reply to Dr. G. Nagelschmidt, indicated that this work is to be extended to montmorillonites saturated with various cations.

Although cold-precipitated hydrated ferric oxide appears to be widespread in soils and clays⁹, the conditions necessary for its formation have not yet been determined. The conditions under which it can be formed and is stable in the laboratory were described by Dr. Mackenzie. The changes occurring in the mineral with changes in the mode of preparation have been studied by X-ray, electron diffraction and other methods, and some suggestions were made as to possible modes of origin in Nature. Dr.

Neumann reported that similar changes can be obtained with hydrated aluminium oxides, the *endothermic* peak temperature increasing as the precipitation temperature is raised.

The discussion both on the special subject and on the general papers was very valuable and stimulating, but it was obvious that at present no definite agreement as to the correctness of either the Hofmann–Endell–Wilm or the Edelman–Favejee structure can be arrived at. Prof. McConnell's hypothesis has attractive features as a compromise; but at present it is apparently open to some objections, and only if these are overcome can it be accepted.

R. C. MACKENZIE

¹ Hofmann, Endell and Wilm, *Z. Krist.*, A, **36**, 340 (1933). Maegdefrau and Hofmann, *ibid.*, A, **38**, 299 (1937).

² Edelman and Favejee, *Z. Krist.*, A, **102**, 417 (1940). Edelman, *Verres et Silicates Ind.*, **12** (Suppl.), 3 (1947).

³ Berger, *Chem. Weekblad*, **38**, 42 (1941).

⁴ Méring, *Trans. Farad. Soc.*, **42B**, 205 (1946).

⁵ Forslind, *Trans. IV Int. Congr. Soil Sci.*, Amsterdam, **1**, 110 (1950). Mackenzie, *Clay. Min. Bull.*, No. 4, 115 (1950).

⁶ Walker and Milne, *Trans. IV Int. Congr. Soil Sci.*, Amsterdam, **2**, 62 (1950).

⁷ McConnell, *Amer. Min.*, **35**, 16 (1950).

⁸ MacEwan, *Anal. de Edafologia*, **8**, 645 (1949).

⁹ Mackenzie, *Nature*, **164**, 244 (1949).

NEW DEVELOPMENTS IN VISCOMETRY

COLLOQUIUM AT BIRMINGHAM

A COLLOQUIUM on "New Developments in Viscometry" was held by the British Society of Rheology on May 11 in the Department of Chemical Engineering, University of Birmingham. The discussion was introduced with a paper by Dr. R. S. Higginbotham (Shirley Institute, Manchester) and J. J. Benbow (Dunlop, Ltd.) entitled "Some Novel Viscometers for Rapid Measurements under Defined Conditions". Dr. Higginbotham spoke at first on the historical development of rotatory viscometers, including the cone and plate types, mentioning their limitations and discussing procedures for obtaining rheological constants of starch pastes, thick suspensions and soft solids in general over a wide range of shearing stress. A precise knowledge of these constants, including the extent of changes due to thixotropy and dilatancy, is of great importance in selecting and controlling the manufacture of materials in textile printing. Electrical viscometers of the cone and plate types, robust in design and of simple operation, have been designed and found useful for control purposes.

Dr. P. S. Williams (Paints Division, Imperial Chemical Industries, Ltd.) described a new design of co-axial cylinder viscometer with the torsion wire replaced by a strain-gauge assembly holding the inner cylinder. Intended for research purposes with high-concentration suspensions, it has been built to a simple and robust design with a self-centring journal bearing. Results obtained with fine suspensions and gels of silica spheres were discussed with reference to thixotropic changes after different periods of shearing.

Dr. G. F. Eveson and G. H. Higginbotham, of Prof. S. G. Ward's laboratory, Mining Department, Birmingham, discussed results obtained with fine dispersions of spheres in a lead acetate–glycerol medium using different kinds of viscometers, with special reference to the sigma phenomenon which appears to be absent when some types of viscometers

are used, due presumably to the kind of flow prevailing. Experiments have been carried out using different gaps between rotating cylinders, allowing for a wide range in the ratio of particle size to length of annular gap. Similar results for slip at the cylinder walls have been obtained under the various conditions. Special research viscometers for dealing with settling suspensions and methods of analysing the results obtained were next described. Following further discussion by the meeting, under the chairmanship of S. F. Freeman (Mars, Ltd.), of proposed new viscometers, visits were made to the laboratories of the University where rheological work was proceeding.

E. W. J. MARDLES

UNIVERSITIES' FEDERATION FOR ANIMAL WELFARE

SILVER JUBILEE

By PROF. A. N. WORDEN

THE British Science Guild, which derived from the British Association for the Advancement of Science, was formed for the purpose of promoting the application of scientific methods and results to public affairs. In 1926 its honorary secretary was C. W. Hume and its most active member Sir Richard Gregory, then editor of *Nature*. The Guild has since been re-absorbed into the British Association; but one of its unofficial offspring, the University of London Animal Welfare Society, or ULAWS (now expanded into the Universities' Federation for Animal Welfare, or UFAW) is still very much alive and has recently celebrated its jubilee by a dinner held in London. It was Major Hume's thesis that the right relations between man and his fellow creatures were a proper study for the attention of university people as such. His first aim in founding the University of London Animal Welfare Society was to secure the support of veterinarians and zoologists; but the veterinary profession was at that time largely at variance with animal welfare movements. A contemporary vivisection controversy found the Society attacked by the anti-vivisection societies and suspected by experimentalists of harbouring in its ranks those of the category since dubbed 'crypto-antivivs'.

Major Hume's refusal to bow before these attacks, or to be discouraged by the initial apathy of the majority of those whose support he solicited, was steadfast. By 1939 hundreds of members and thousands of subscribers had been enrolled, funds from legacies and broadcast appeals had accrued, and the movement had been extended to other universities. In the same year it was decided that the now extensive educational efforts should be backed by original work, and a Scientific Investigations Committee was accordingly formed. Small grants were made for work on rabbit ecology, at the Bureau of Animal Population, Oxford, and for some studies on euthanasia in dogs in the Department of Pharmacology at the same University.

War, the early demise of the Federation's secretary and the destruction of its offices by enemy action naturally hampered many projects. On one enterprise, however, work was continued, and by 1943 it was possible to begin the preparation for publication

of a standard text-book upon the care and management of laboratory animals. The support of research workers for such a work was world-wide. Literally hundreds of scientific workers offered their support and the subsequent book, published some four years later, obviously filled a very real need. Only the anti-vivisectionist Press failed to accord it a most favourable reception.

Shortly after the conclusion of hostilities, the Federation made a substantial grant for research on rabbit ecology and control by the Department of Animal Health, University College of Wales, Aberystwyth. It had long been felt that trapping, while a barbarous procedure, was probably an unsound practice from the agricultural point of view, but scientific proof was wanting. These studies continued for more than four years, and attracted the interest and collaboration of official bodies. One of the county agricultural executive committees initiated a widespread attempt at rabbit control based upon methods investigated by the workers in the Department of Animal Health. The reports of the extensive investigations upon control measures, and upon the damage to pastures inflicted by rabbits, are at present being prepared for full publication. The information available by 1950 was placed before the Home Office Committee on Cruelty to Wild Animals. It is evident from its report (Cmd. 8266) that the Committee was duly impressed by the evidence given. The objective presentation to a departmental committee by an animal welfare organization of factual scientific material must have been something of a novelty; but it is, of course, this very combination of humanitarian outlook and scientific approach that characterizes the Universities' Federation for Animal Welfare and places it in the category of a scientific society.

Substantial support has more recently been given to investigations relating to the electrocution and electro-anæsthesia of animals. At present these studies are being undertaken by a veterinary physiologist attached to the Neuropsychiatric Research Centre, Whitchurch Hospital, Cardiff, in the hope of yielding much-needed information on the painlessness or otherwise of electrocution and electro-stunning apparatus now in use, and upon the future possibilities of electroplectic anæsthesia.

Yet another problem supported by the Federation is that of the humane destruction of whales. Here much of practical value has already been achieved in work undertaken at sea by one of the British whaling companies, but the full results are not yet available for study.

These original investigations, while forming a heavy burden upon the slender funds of any charitable organization, have not been pursued to the detriment of educational work at home or abroad. The *UFAW Courier* is widely read, and a great deal of lecturing is carried out by members of the staff and by co-operating men of science. Before the War, membership was extended so as to include not only university men and women but also those members of the learned professions who were not university graduates.

From the first twenty-five years there is therefore much of which the Federation has cause to be proud. Its officials feel, however, that it is still extremely young. They note with satisfaction the birth of kindred ideas elsewhere. The recent formation in the United States of an Animal Care Panel, by veterinarians and scientific workers engaged in animal