similar activities and aims. Another wish was formally expressed that substantial financial aid be sought from international foundations for scientific establishments of the Union, in particular for the two centres of systematics and of experimentation which have been created by the Commission of the Union for Research on the Biological Control of the Pests of Plants.

The Union organizes annually a limited number of discussion symposia. In 1951 three were held on, respectively, cytochemistry, symbiosis in insects, and biometry in relation to plant growth. This year four are to be held: on the bacteriophage, at Royaumont near Paris; on cytodifferentiation and histodifferentiation, in Stockholm; on the scientific organization of botanic gardens, in London; and on the biochemical and structural bases of morphology, in Utrecht.

The International Union of Biological Sciences, which has been in existence since 1919, is a member Union of the International Council of Scientific Unions, and from time to time, as the need for them arises, joint commissions which last a few years are established between it and other Unions of the Council; for example, a new Joint Commission on Electron Microscopy with the International Union of Pure and Applied Physics has just been set up. The International Union of Biological Sciences possesses limited funds furnished by the subscriptions of its thirty-one member countries, and it acts in an advisory capacity to Unesco for expenditure by that body on biological sciences. Further information can be obtained from the general secretary of the Union, Prof. P. Vayssière, 57 Rue Cuvier, Paris.

BRITISH GELATINE AND GLUE RESEARCH ASSOCIATION

FIFTH RESEARCH PANEL MEETING

THE fifth research panel meeting of the British Gelatine and Glue Research Association was held at Beale's Restaurant, Holloway Road, London, N.7, on Tuesday, April 29, at which the total attendance of about seventy included staff of member firms, and of other research associations and government departments. The chair was taken by Mr. S. G. Hudson, chairman of the Association.

The first paper was given by Dr. J. T. Edsall, professor of biological chemistry in Harvard University and Fulbright visiting lecturer in the University of Cambridge. In his paper, entitled "The Conversion of Fibrinogen to Fibrin", Prof. Edsall commenced by underlining the striking character of the gel-forming process in blood clotting, shown all the more clearly when the purified protein constituents, thrombin and fibrinogen, are mixed in solution and a firm rigid gel is formed in a short period of time. The gel-forming ability is so great that Dr. J. D. Ferry has obtained fibrin gels at a concentration of 0·004 per cent. The two main stages in blood clotting are the formation of thrombin from prothrombin and, secondly, the thrombin–fibrinogen interaction which leads to clotting. It has proved possible to obtain purified prothrombin from which thrombin can be prepared for studies of its action on fibrinogen. Thrombin clearly acts catalytically, since the amount required to convert a substantial quantity of fibrinogen into fibrin is very small (1 part per million of fibrin). Quantitative studies of its enzyme action are, however, difficult to perform owing to adsorption of thrombin on the fibrin formed. Fibrinogen represents some 4 per cent of human plasma proteins and up to 10 per cent in beef plasma and the plasma of other animals. It has been separated by salting out or by low-temperature alcohol precipitation.

Flow birefringence, ultracentrifuge studies, diffusion and light-scattering give evidence of a molecular weight for fibrinogen of 400,000–500,000, the molecule being markedly elongated. Approximate dimensions are, for a rod-like shape, length 700 A. and diameter 38 A. Electron microscope studies by C. Hall, while confirming these figures in the main, show a considerable variation in length from molecule to molecule, and the structure appears bead-like along the length of the molecule. The sub-units may be related to observations of the action of urea in breaking down the molecule to give units of molecular weight in the region of 100,000. The molecular weight of thrombin is not known definitely, but is probably less than 100,000.

The early stages of the action of thrombin on fibrinogen have been shown by Lorand, Bailey and co-workers to involve the release of end-groups which can be estimated by Sanger's fluoro dinitrobenzene technique, giving a frequency of roughly one group per 100,000 molecular weight. In addition, 3–4 per cent of the protein weight is split off as a peptide, the composition of which is being studied. At *p*H 5 there is no evidence of clot formation when fibrinogen and thrombin are mixed. It is clear that some action occurs even in these conditions, since on raising the *p*H instantaneous clotting occurs, whereas in a mixture freshly made at the higher *p*H there is a time delay before clotting. Light-scattering indicates the formation of intermediate aggregates 2500–4000 A. long prior to setting. These aggregates are formed by the modified fibrinogen after loss of the peptide.

By appropriate choice of conditions (*p*H, salt content) the type of clot obtained can vary from a clear transparent stable gel to a doughy opaque mass easily giving rise to syneresis. The difference depends on the size of the fibrillar units, as has been confirmed by electron microscopy. The coarse clots are the basis of the fibrin films developed by J. D. Ferry and P. R. Morrison for use in neuro-surgery. The effects of *p*H, salt concentration, urea, guanidine hydrochloride, etc., on rate of clot formation have all been studied.

Electron microscope studies of the fibrils in the coarse type of clot show a periodic structure with a spacing of 230 A. reminiscent of the collagen structure. There is no ready explanation of this periodicity. The type of bonding appears to vary according to whether calcium, and a plasma component, are present or not. In the absence of these two, urea suffices to cause dispersal of the clot, but with both present it appears likely that more permanent links involving —SH groups are formed.

The second paper was given by Mr. E. Bradbury, of the British Cotton Industry Research Association, Shirley Institute, Manchester, and bore the title "The Effect of the Temperature of Preparation on the Mechanical Properties and Structure of Gelatine Films". Mr. Bradbury explained the significance of this work as fundamental to the study of the use of gelatine for rayon sizing. Gelatine films prepared by

drying at 20° C., 70 per cent relative humidity, and at 60° C., 70 per cent relative humidity, differ appreciably in their properties. Tensile tests on the films after subsequent conditioning at different relative humidities showed that those prepared at 20° C. were stronger than those prepared at 60° C. At low humidities they were also rather more extensible before rupture occurred, but at high relative humidities the 60° C. films became very extensible. At 85 per cent relative humidity their extension at rupture was 129 per cent compared with 23·8 per cent for the 20° C. films. Further experiments showed rate of drying, and the moisture content left in the film at the conclusion of drying, to be of minor importance compared with the temperature of drying. With the guidance of X-ray diffraction results, a theory has been put forward attributing the differences to differing degrees of crystallinity in the films.

The discussion on Mr. Bradbury's paper was opened by Dr. Conmar Robinson, who made use of results on optical rotation and diffusion to put forward an alternative explanation based on two configurations of the gelatin chain. The high-temperature form is presumed folded, with internal hydrogen bonding, whereas in the low-temperature form intermolecular hydrogen bonds occur. Mr. A. G. Ward described results of dilute-solution viscosity measurements on gelatin solutions at 25° C. and 10° C. There appears to be no change in shape in the isolated molecules with temperature, although a slow aggregation occurs.

The final paper was given by Mr. R. A. G. Knight, of the Forest Products Research Laboratory, Princes Risborough, with the subject "Glue Testing at Risborough". Mr. Knight outlined the development of testing procedure and made clear the basic principle of choosing test conditions related to those which the glued joints or plywood are required to withstand in practice. The importance of both plywood and glued joints for the aircraft industry during the Second World War placed great emphasis on behaviour under full exposure to the weather, since aircraft were often parked for months on end in the open. The way in which the Forest Products Research Laboratory drew on the experience of the glue-manufacturing and wood-working and -using industries was described.

MAKERERE COLLEGE: THE UNIVERSITY COLLEGE OF EAST AFRICA

IN 1922, the Uganda Government opened a technical college at Makerere, one of the royal hills of the Kabakas of Buganda just outside Kampala. In 1924 a Government medical school and teachers' training course were also started at Makerere. Gradually all trades courses at the technical college were passed over to a neighbouring institution, and agricultural and veterinary courses took their place; a school certificate course was also developed. By 1937 the College had developed a corporate life of its own and, in that year, the De la Warr Commission recommended that Makerere should develop into a centre of higher education for East Africa; this had long been the wish of the founders of Makerere. From this time the College was to cease to be a Government institution and was to possess an independent Council composed of representatives from all the East African Territories whose Governments jointly made themselves responsible for its finances*.

As secondary schools developed in other parts of East Africa, the academic standards at Makerere quickly rose and, in 1945, the Asquith Commission on Higher Education in the Colonies confirmed that the College should press forward towards university college status. In 1949 it was announced that the College had entered into special relationship with the University of London, and the way was therefore opened for degree courses at Makerere.

The path was now clear for a programme of rapid expansion. On the recommendation of the Inter-University Council for Higher Education in the Colonies, early in 1950 the British Government promised the College £1,100,000 from the Colonial Development and Welfare Fund towards a programme of building development, and the East African Governments quickly responded by guaranteeing annual grants for a five-years development scheme totalling annually approximately four times their previous contributions. The programme already embarked on aims at raising numbers in steps from the present 240 students to 630 students and some 85 members of staff by 1955. The new medical school buildings, opened by the Secretary of State for the Colonies in May 1951, are already in use. The first of the new men's halls of residence, providing accommodation for 180 students, is now complete and was occupied at the opening of the new session in March 1952. An arts faculty building and a new physics laboratory building is also about to be brought into use. A start has been made on the first new women's hall of residence, further staff houses and a science workshop. Other buildings now at the drawing or planning stage include a new chemistry laboratory building, an agriculture block, a second men's hall of residence, a library which it is hoped will provide for the eventual needs of a university of some 2,000 students, and the adaptation of a number of existing buildings to provide further accommodation for biology and satisfactory premises for an enlarged school of art.

Makerere was started for Africans, and by force of numbers it will inevitably and rightly always remain predominantly an African college. The College's Charter, however, laid it down that it was to be open to all the peoples of East Africa. In 1951 the College Council determined that with the opening of new accommodation a start should be made in this direction. It was decided that, for the coming year's entry, six places should be reserved for qualified non-Africans; in fact, an English candidate has already been offered a place for the coming year, and there are a number of Indian candidates. The one stipulation made in admitting members of all races as well as of all religious persuasions is that all should share the common residential life.

The qualification demanded for consideration for admission is the possession of the Cambridge School Certificate (Overseas) with three credits. In practice there are already many more qualified candidates for admission than can be taken. As schools develop in number and quality the matriculation standard will be raised.

The admission problem for girls is far harder than that for boys. Though Uganda and Zanzibar have full girls' secondary schools, neither the first girls'

* *Universities Review*, **24**, No. 2.