

a chemical sense, the discussion gave the impression that it is not yet possible to link up the physical and chemical evidence on cell-wall structure.

In Session 3, which, under the chairmanship of Dr. H. F. Rance, dealt with bonded-fibre assemblages, the contributions took a more practical form in that they dealt with paper as distinct from fibres. Prof. B. Steenberg (Sweden) presented a critical review of the relationship between beating and the mechanical properties of paper. He indicated that the ultimate strength properties are determined essentially by the less-damaged fibres and the contacts they make with one another. Prof. W. Brecht (German Federal Republic) dealt with the effect of beating on the important practical property of hygrostability of paper, and the influence of paper composition, thickness and density. It was concluded that inter-fibre shrinking, which is a consequence of surface tension effects between individual structural elements, is promoted by beating since this produces suppleness. Single fibre shrinkage, on the other hand, is practically independent of beating, but its effect is transferred to the final sheet to a degree which depends on the extent to which the fibres are in contact.

A paper by Dr. H. Corte (German Federal Republic) dealt with the measurement of the porous structure of paper and its modification by beating; and L. Nordman (Finland) discussed strength of bonding in paper in terms of the energy required to break the bonds in an area of unit size. For such measurements the optical method based on the theory of Kubelka and Monk is preferred, the bond-strength being determined from the slope of the line relating the increase in scattering coefficient and the irrecoverable energy loss in a straining/destraining cycle. The results are similar to those deduced from the work of Nissan on strained hydrogen-bonded materials.

The stepwise pattern of Nordman's curves relating increase in reflectance and strain was related by C. R. G. Maynard, during the discussion, to the formation of opaque patches made up of criss-cross lines when transparent paper is subjected to strain.

Session 4, on the process of beating (chairman, Prof. B. Steenberg), comprised six papers which were intended, so far as possible, to collate the conclusions of the preceding sessions. Dr. W. Gallay (Canada) introduced it with a review of aspects of the theory of beating, and Emerton provided a short sequel to his paper in Session 1 when dealing with the significance for paper-making of the outer secondary wall (or primary wall as a number of speakers felt it should now be called). Prof. H. W. Giertz (Norway), in a study of the effects of beating on individual fibres, dealt primarily with swelling and fibrillation phenomena. Although it is difficult to measure the degree of swelling, it has been shown that it increases with beating. While, therefore, swelling is a necessary condition to obtain paper strength, it has not been possible to correlate these two properties. In general, similar conclusions apply to external fibrillation. A combined swelling and staining technique was used to render the primary wall visible, and thence to show that removal of the primary wall has a drastic influence on the bonding capacity of the fibre.

Prof. G. Centola and Dr. D. Borruso (Italy) then discussed the influence on beating of certain electrolytes and substantive azo-dyes. As a rule, electro-

lytes reduce the beating rate (as compared with distilled water). On the other hand, benzidine type azo-dyes greatly accelerate beating and the development of mechanical properties, and when added to the beaten pulp produce an increase in wetness without appreciable change in strength. Extraction of the dye from the beaten pulp reduces the wetness.

Dr. J. A. Van den Akker (United States) applied energy considerations to the beating process under idealized conditions. He found an energy requirement of 0.01 kWh. per ton of pulp for the production of 'sub-microscopic fuzz' (fibrillation), that is, only 0.0025 per cent of the total energy expended in a typical beater or refiner. For the loosening of the internal structure of the fibres (swelling) and for cutting, the respective energy requirements are only 0.4 and  $2.7 \times 10^{-5}$  kWh. per ton. The wastage of energy in the form of heat during beating has always been regarded as inevitable; these figures should, however, shake the complacency with which it has been accepted.

The concluding paper, by O. L. Forgass, A. A. Robertson and Dr. S. G. Mason, read by Dr. S. G. Mason (Canada), dealt in a masterly way with the hydrodynamic behaviour of paper-making fibres, under the headings of flow of pulp suspensions, coherent fibre networks, and the flexibility of single fibres. The study of flexibility is of particular interest because of its relationship to fibre entanglement and wet-web properties. The method of measurement adopted makes use of the characteristic rotational orbits described by fibres suspended in a liquid subjected to laminar shear. The flexibility was found to increase as the lignin was removed; with increase in the length of fibre; and on beating.

A point raised in the discussion (which indeed is applicable to the whole of the symposium) is the importance of making clear when the term 'fibre' is used in a general sense—and when used for describing wood fibres only, as was usually the case. It was pointed out, for example, that the conclusions regarding the relative unimportance of external fibrillation in producing strength is most unlikely to apply to well-fibrillated rag fibres.

A brief summing-up by Dr. H. F. Rance brought this highly successful event to a close.

JULIUS GRANT

## THE BRITISH SCIENTIFIC INSTRUMENT RESEARCH ASSOCIATION

THE Association opened its doors to eight hundred visitors from member-firms, academic and government agencies, and non-member organizations during the week beginning October 7. Each day a distinguished scientist gave a lecture to the visitors after luncheon in a marquee on the lawn. Fortunately for all concerned, the weather remained uniformly good over the period. The chairman of the Association, Mr. J. E. C. Bailey, entertained the speakers and other distinguished guests at a dinner held in London on the evening of October 9.

The main research programme of the Association, as approved by the Research Advisory Committee, was exemplified by exhibits of the investigation of

the structure and control of thin films, ultrasonic and electromagnetic flowmeters, applications of semi-conductors, and the design of a specific microscope objective. These formed but a part of the seventy-seven exhibits, covering many aspects of the Association's work. Of particular interest, as indicating the importance of giving as much freedom as possible to the individual scientist, was the demonstration of a chemical balance which used flexure pivots in place of knife-edges. This development had no place in the research programme, but although the investigation is still in its early stages, a promising degree of robustness and sensitivity has been achieved. Another exhibit of potential value was the moisture-sensitive ceramic element. This was demonstrated, measuring humidities in the 0-1 per cent region to about 0.02 per cent. The instrumental applications of gratiules, devices which started as scales and now form an essential part of certain automatic control processes, are becoming more numerous every day. The exhibits concerned with gratiules covered the whole field of their manufacture and application. British thermometer manufacturers now have at their command a method of making permanent markings on many of their products. The process for doing this, developed by the Association, was the subject of another exhibit. Pneumatic gauging, as developed by the Mechanical Department, excited considerable interest.

The extent of the services provided by the Information Department came as a surprise to many visitors, particularly the range of technical inquiries handled by the scientific staff of the Department. Working models of flexure pivots, illustrating devices described in one of the Department's publications, aroused much interest.

The speaker on October 7, Dr. T. E. Allibone, took as his subject "Black and White Elephants at Aldermaston". In the course of his lecture he described many discoveries and inventions made in his own laboratories which were apparently of little use, but had afterwards turned out to have considerable value. On October 8, Sir John Cockcroft spoke about "Nuclear Instrumentation" and directed attention to the enormous field for instruments which was being created by the planned reactor programme. On October 9, Prof. Casimir, from Holland, gave his audience a peep into the future by discussing "Atoms as Units", describing how atomic properties could be used as standards of length, time, electric charge and magnetic induction. Dr. Ponte, of Paris, gave a more detailed account of a particular branch of instrumentation on October 10. His subject, "Quartz Oscillators and their Limitations", was illustrated by slides of modern time-measuring equipment. He showed that an accuracy of 1 part in  $10^8$  was now feasible with small, robust equipment. On October 11, Prof. S. Tolansky demonstrated the power of phase-contrast microscopy by means of many photographs of the detail of crystal structure in metals, convincingly illustrating that for the detection and measurement of the contours of a surface the optical method is comparable with the electron microscope.

A noteworthy feature of the open days was the exhibition of members' products to which the Research Association had made some contribution. It was a kind gesture on the part of the members and one which is bound to have a good effect on the morale of the staff thus to acknowledge some of the benefits which have accrued as a result of the Association's work.

## CONTROL OF ADMINISTRATIVE TRIBUNALS

IN opening a debate in the House of Commons on October 31, in which the House took note of the report of the Franks Committee on Administrative Tribunals and Enquiries, Mr. R. A. Butler said that the Government is concerned to accept as many of the recommendations of the report as possible. Nevertheless, it wishes to obtain the views of members on certain of the findings and particularly in the light of the three guiding principles of openness, fairness and impartiality. The Government believes it would be possible to accept wholly or substantially the majority of the detailed recommendations, while striking a just balance between the rights of the citizen and the efficient discharge of the country's business. The Government proposes to set up a single Council on Tribunals which will be appointed jointly by the Lord Chancellor and by the Secretary of State for Scotland, with a special committee or panel of the Council to deal with matters of special concern to Scotland. The Council would be consulted before establishing any new tribunal and the Government would refer to the Council various recommendations made by the Franks Committee.

It is also proposed that, in general, chairmen should be appointed by the Lord Chancellor in England and Wales, and by the Lord President of the Court of Session in Scotland, and the Government agrees that for the most part it is desirable that chairmen of tribunals should have legal qualifications. The opinion of the House of Commons is to be obtained regarding the proposal to entrust adjudicating functions of county agricultural executive committees to new independent tribunals, with appeal to the Land Tribunal or to the Scottish Land Court. In future, it is proposed to appoint inspectors only after consultation with the Lord Chancellor, and the Minister would be free to dismiss chairmen only with the Lord Chancellor's consent. Mr. Butler said that the Government is also prepared to arrange for publication of inspector's reports and promised that in future responsible Ministers would ensure that more is done to make the policies for which they are responsible more widely understood, that people are told where they can find the information which may help them, and that authorities will be required in future to see that their case is properly set out before an inquiry opens. The statement was generally welcomed, and in replying on the debate the Attorney-General stressed the advisory functions of the proposed Council.

## EFFECT OF RADIATION ON HUMAN HEREDITY

A STUDY group, set up by the World Health Organization in Geneva to consider the effect of radiation on human heredity, has presented its report to the United Nations Scientific Committee on Atomic Radiation; in shortened form, the report has been prepared as a special feature of the *Chronicle of the World Health Organization* (11, No. 8; August 1957).

Each member of the group was acutely aware of the existing gaps in knowledge and drew up an inventory of problems which will need to be investigated by geneticists, nationally or internationally.