

million). Notable increases have been effected in the production and export of tea and wattle-bark from Kenya; sisal, coffee and cotton lint from Tanganyika; cotton (due mainly to the Abyan irrigation scheme in the Western Protectorate) from Aden; and sugar from Mauritius. In the last-named Colony attempts to broaden the basis of the economy have met with little success, sugar production having reached a new peak of 515,000 tons in 1952 compared with the pre-war peak of 320,000 tons in 1938. Industrial development in East Africa has continued to expand for the dual purpose of supplying the home market with consumer goods (capital and producer's goods accounted for more than half the retained imports in 1951) and for social ends—to absorb some of the surplus labour created by the continued drift into the towns. Other developments await improvement of communications. The production of copper at Kilembe in south-west Uganda is due to commence this year, but large-scale output cannot be expected until the 215-mile railway extension from Kampala, already proceeding west of Mityana, has been completed. The importance attached to development of communications may be gauged from the fact that the East African Railways and Harbours Administration ranks as the largest industrial undertaking in the High Commission area, with a staff of more than 32,000, of whom 857 are Europeans.

In the survey as a whole, comparatively little reference has been made to pre-war figures which would have made it easier to review post-war progress in comparative terms. On the other hand, the appendix contains a useful supplement on trade in which an attempt has been made to compare conditions before and after 1949 when trade statistics for the High Commission Territories were placed on a common basis. This includes a detailed analysis of the direction of trade in leading commodities for the three countries, similar to those given for Aden, Zanzibar and Mauritius earlier in the survey.

It would be futile to attempt to summarize the findings of a report of this scope in the brief space of a review. There can be no question that it is a highly competent and valuable basic document for all who are concerned with East African affairs. Such deficiencies as there are mainly arise from the inadequacy of statistical data relating to the activities of 90 per cent of the inhabitants. It seems likely, for example, that the annual rate of natural increase of the African population of Kenya ( $1\frac{1}{2}$ –2 per cent), Uganda ( $1$ – $1\frac{1}{2}$  per cent) and Tanganyika ( $1$ –2 per cent) may be under-estimated. According to the present survey and the survey for 1936 (Col. No. 149), the total population of the three territories increased from some twelve million to nearly eighteen million during the twelve-year period 1937–48, corresponding to a natural increase of nearly 5 per cent a year. Allowing for immigration, which at the peak of the post-war influx into Kenya reached 59,000 in 1951, and a higher than average figure for the Indian minority, the overall rate of natural increase among the African population prior to the 1948 census must have been well in excess of 2 per cent. In any event, at least a temporary acceleration rather than a decline in the rate of increase must be expected as current expenditure on the development of medical services takes effect. Without attaching undue importance to figures which can be no more than rough approximations and which are stated in the survey in carefully guarded terms, one hopes that the magnitude of the population problem has not

been under-estimated. The next census will no doubt shed more light on the subject. At present large sums are being spent on what may be termed basic development (hydrological and other surveys, research, training and education), as distinct from more publicized industrial ventures like the Owen Falls scheme, with consequences that remain to be foreseen. Meanwhile, here are food for thought and data for research in abundance.

A. J. HUNT

## UNESCO ADVISORY COMMITTEE ON ARID ZONE RESEARCH

THE Advisory Committee on Arid Zone Research of the United Nations Educational, Scientific and Cultural Organization (Unesco) held its seventh session during May 4–7 in Paris. The meeting was attended by members from Australia, India, Italy, Mexico, Syria, Turkey, the United Kingdom and the United States and, as on previous occasions, by representatives from various Specialized Agencies of the United Nations Organization and from international scientific and engineering bodies, and by French members of the Arid Zone Panel of Honorary Consultants. The principal recommendations made by the Committee were as follows.

*Symposia and reports.* It was proposed that the secretariat should explore the possibility of holding a small symposium in 1955 on human and animal ecology in arid zones, which would enable the proceedings of such a symposium to be published in conjunction with reports on this subject that are being obtained. With regard to the symposium on problems related to arid zone research, sponsored by the American Association for the Advancement of Science, which is to be held in New Mexico during April 27–28, 1955, it was proposed that Unesco should make a grant to assist travel of scientists attending the symposium and also that the Arid Zone Research Committee should hold its ninth session in New Mexico in conjunction with this symposium. It was recommended that review reports should be obtained in 1956 on the formation and erosion of soils in arid zones as affected by climatic factors; these reports could then be published with the proceedings of a symposium on the same subject that is due to be held in the same year.

*Travelling fellowships for senior scientists.* Fellowships should be given to enable senior scientists to visit institutions outside their own country and, when these are given, the recipients should be allowed as much latitude as possible with regard to travel within the country visited.

*Handbook and survey.* At previous meetings it was decided to recommend the production of a handbook to guide in the collection of basic data that would be required when making plans for the development of an arid area, and preparations for writing this handbook are well under way. The Committee considered the advisability of instigating an integrated survey of one or more restricted areas on the lines proposed in such a handbook. It recommended that Dr. B. T. Dickson, who is editor of the handbook, should assemble information on such survey work that has been carried out in Australia and elsewhere, and that the Committee should consider the proposal at its next meeting.

*Research projects.* As a result of recommendations made by the Committee at previous meetings, Unesco has given grants for research on the following subjects: the geographical potentialities of coastal deserts; a survey of wind energy and of energy requirements in a typical arid area (Somaliland); the flow of underground water in calcareous mountains; the sulphate- and nitrate-rich soils of Algeria; changes in climate during the Quaternary Period in Israel, as evidenced by pollen analysis; the role of dew in plant growth in arid regions; plant ecological studies in French North Africa; the role of vertebrates in spreading desert conditions in India; and the physiology of the camel. At the meeting in Paris, reports on these investigations were received by the Committee, and grants were recommended for the development and testing of apparatus for the measurement of dew and for the study of plant distribution and ecology in the Rajistan desert in India.

*Future meeting.* The Committee will hold its next session in New Delhi during October this year in conjunction with the symposium on wind and solar energy that has been arranged at the invitation, and with the help, of the Government of India.

## CHEMISTRY AND PHYSICS OF SYNTHETIC FIBRES

ALTHOUGH the subject of 'man-made' fibres is well to the fore in the world of polymer technology and names of new fibres such as 'Terylene' and 'Orlon' are beginning to compete in the housewife's mind with nylon, major discussions in Britain on chemical aspects of this topic have been few. The three-day symposium held during March 24-26 by the Plastics and Polymer Group of the Society of Chemical Industry on the subject of "The Chemistry and Physics of Synthetic Fibres", at the Institution of Electrical Engineers, Savoy Place, London, was therefore timely. More than three hundred participants, including a number from overseas, attended, and some interesting papers were read and discussed. During the first session, Mr. J. R. Whinfield (Terylene Council, Imperial Chemical Industries, Ltd.), chairman of the Group, presided.

Dr. R. Hill (Terylene Council, Imperial Chemical Industries, Ltd.), in an introductory paper on "Chemical Aspects of Fibres", discussed the structural features in polymers which have led to the mechanical behaviour characterizing rubbers, plastics and fibres; for the development of fibre properties a macromolecule needs to possess a regular, crystallizable structure and high interchain forces. In materials such as polyamides, polyurethanes and polyesters, these features are present, but fibre properties can be seriously affected if any branching or cross-linking occurs during condensation owing to the presence of impurities. In the vinyl polymer field, Dr. Hill referred to grafting, a new method by which the properties of a given polymer can be modified. It seems unlikely, partly for economic reasons, that any completely new fibre-forming polymers will be commercialized in the near future, but possible developments in such materials as polyvinylidene cyanide and polymers obtained by ring-opening of oxacyclobutane derivatives and N-carboxy-amino-acid anhydrides were mentioned.

Among the new materials which have aroused interest in recent years are the polyaminotriazoles, which may be obtained by the reaction of dibasic acids with rather more than two moles of hydrazine; the recurring polar linkage in these polymers is a 4-amino-1:2:4-triazole ring. Mr. J. W. Fisher (British Celanese, Ltd.) gave an account of the chemistry and use of "Polyaminotriazoles as Fibre-forming Materials". A typical polyaminotriazole, that based on sebacic acid, has a melting point of 256° C. and can be melt-spun and cold-drawn to give yarns with mechanical properties generally similar to those of nylon or 'Terylene' and which can readily be dyed with dispersed acetate and wool colours. A structure of the polymer, as shown by X-ray examination, was proposed, involving a planar chain in which the octamethylene segments zig-zag at an angle of 20° on either side of the general fibre axis, and a resonant triazole ring; hydrogen-bonding between exocyclic amino-groups and nitrogen atoms in another ring is thought to be responsible for the high melting point of the polymer.

Turning to a subject related to the production of synthetic fibres from a natural material, Dr. W. E. F. Naismith (Nobel Division, Imperial Chemical Industries, Ltd.) discussed the "Chemical Denaturation of Groundnut Protein and Fibre-Formation". The globular proteins of groundnut must first be converted to an unfolded configuration (denaturation) before they can be spun: the denaturation by urea, guanidine salts and a series of organic bases has been investigated by measurement of the rise in viscosity increments of the solutions, and interpreted in terms of an increase in asymmetry of the protein molecules, using Simha's equation to calculate axial ratios. A definite relationship has been found between the ability of a base to cause rise in viscosity increment, and its ability to give spinnable solutions.

Few fundamental studies have been published of the industrially well-established processes for preparing polyamides from compounds containing carboxylic acid and amino-groups or by opening lactam rings. Dr. A. B. Meggy (University of Leeds) outlined a new thermodynamic method of attack in a paper on the "Free Energy of Formation of the Amide Bond in Polyamides". Equations were deduced in the case of the equilibrium between carboxyl, amino and amide groups and water molecules, relating the equilibrium constant  $k'$ , the number-average chain length and the partial pressure of water. The effect of the presence of a cyclic monomer in amount determined by a second equilibrium constant  $k_2$  was discussed, in cases where 5- to 8-membered rings might be formed. From somewhat limited data on the variation of  $k_2$  with temperature  $T$  for  $\epsilon$ -caprolactam, the heat of formation  $\Delta H$ , entropy  $\Delta S$  and free energy  $\Delta F$  of the polyamide bond in polyaminocaproic acid have been calculated; the value of  $\Delta H$  obtained agrees well with the experimental value. In the subsequent discussion, Dr. J. Saunders referred to other data on  $k_2$  versus  $T$  which give a  $\Delta H$  value according to Dr. Meggy's method which is considerably too high.

During the second session, Prof. J. B. Speakman (University of Leeds) assumed the chair. Dr. L. B. Morgan (Dyestuffs Division, Imperial Chemical Industries, Ltd.) discussed "Crystallization Phenomena in Fibre-Forming Polymers", his paper being illustrated by an excellent film showing the crystallization of polyethylene terephthalate from its melt,