

RADIOISOTOPES IN SCIENTIFIC RESEARCH

UNESCO CONFERENCE

AN International Conference on Radioisotopes in Scientific Research arranged by Unesco was held in Paris during September 9–20. Some 1,200 scientists from sixty-one countries assembled in the Faculty of Medicine. This was the largest conference on isotopes ever held, and was very considerably bigger than the previous Isotope Conferences at Oxford in 1951 and 1954.

The impressive opening of the Conference took place at the nearby Sorbonne, where the president, Sir John Cockcroft, gave a short speech in which he stressed the importance of isotopes and said that, "What has been established already has shown the importance of radioisotope techniques in such wide and diverse fields that they rival nuclear power itself for their benefits to humanity". After the opening, except for two plenary sessions, all meetings were divided between the physical and biological sciences.

Physical Sciences Sessions

More than a hundred papers were read and discussed. They gave an astounding mass of information and showed the great progress which has been made since the last Geneva Conference two years ago.

In the sessions on production of isotopes, a paper was discussed dealing with the long-lived radioisotope aluminium-26, and its properties; a Russian paper dealt with new methods of depositing alpha-, beta-, and gamma-sources; French and British papers gave details of the extraction of the fission product caesium-137, an isotope which will be used in the future for irradiation sources.

The session on the physics of metals dealt with diffusion problems, metal structure and grain-boundary diffusion. Radioisotopes have shown themselves to be the outstanding tool for development in this field. Research in industrial applications was represented by a theoretical paper on the measurement of fluid density, and by another in which outstanding results on flotation studies were presented.

Solid-state physics and physical chemistry in general were represented by many papers. Perhaps the most interesting were those describing research on structural defects in germanium monocrystals and the elegant emanation method used to give insight into the uranium oxide-zinc oxide and uranium oxide-titanium oxide systems. A number of papers dealt with exchange reactions of ions and complexes, and determination of the heat of sublimation and the diffusion of aqueous vapour. Radioactive gases were used for solid-surface measurements.

A number of interesting papers dealt with organic chemistry. One Russian paper threw new light on the mechanism of catalysis and a German paper dealt with the study of the Hoffmann degradation using tritium. An interesting session dealt with recoil chemistry; and the more general applications of Szilard-Chalmers reactions were described. A most interesting report was by Wolf (United States) on the use of recoiling carbon-14 in a new technique for labelling organic compounds. This technique recently developed may have big future applications

in organic synthesis of carbon-14 compounds. Another American paper dealt with the recoil of tritium atoms on organic compounds, a process which also seems to have good preparative prospects.

In analytical chemistry emphasis was on gamma-ray spectrometry, a development which seems to have gone so far that in certain circumstances it can be relied upon entirely to the exclusion of chemical separations.

Two plenary sessions dealt with methods and techniques. A number of papers described progress in scintillation counting and counting methods. Two interesting British contributions were on the measurement of chromatograms, and on a technique for the simultaneous recording of the instantaneous counting rates of phosphorus-32 and iodine-131 in blood. An amusing application dealt with the use of oxygen-15, which has a half-life of 2.1 minutes, in relation to the tension in neoplasms. A number of papers dealt with improved methods of autoradiography, including a Russian contribution on an autoradiographical technique in which high pressure is applied to radioactive leaves which are between layers of filter paper.

Of outstanding interest were the two sessions on geophysics. The Japanese have studied antique relics by back-scattering methods. The sulphur-32-sulphur-34 ratio in meteorites has been investigated as well as the radioactivity induced by cosmic rays in meteorites and tektites. Dr. Libby read a paper which drew conclusions about the continental water-balance by measuring man-made tritium resulting from atomic bombs. This calculation, which was based on a number of assumptions, was nevertheless interesting in so far as it was possible for the first time to make any estimate at all of the continental water reservoir, especially in the Mississippi valley. It also gave estimates of the general rates of turnover of water.

The last day was devoted to isotope research in connexion with parity in physics, and a number of specialists, including Miss C. S. Wu, Dr. M. Deutsch and Dr. H. Halban, spoke on this problem.

A number of interesting films, including some from the United States, the U.S.S.R., Britain and France, were shown during the lunch intervals. They dealt with atomic reactors, isotope production and applications. Two private symposia were held, on the production of isotopes and on residual radioactivity in finished products. They were of great benefit as they allowed a free exchange of international opinion around a small conference table.

All the sessions on physics and chemistry had a very numerous and interested audience; this shows that chemists and physicists at least are not yet so specialized that they cannot follow scientific subjects other than their own with interest. It is to be hoped that such conferences will be repeated at two or three yearly intervals, for while they give an opportunity for people working in similar fields to meet, at the same time they may help to counteract the threat of over-specialization among scientists.

H. SELIGMAN

Biological Sciences Sessions

THE Biological Sciences Sessions at the Unesco Conference on Radioisotopes in Scientific Research were planned on an ambitious scale to embrace all major fields of biological study in which isotopes are used, excepting only clinical diagnosis and the biological effects of radiation. More than a hundred papers were read at seventeen sessions embracing pharmacology; thyroid metabolism; lipid metabolism, blood and blood proteins; nucleic acids; protein and amino-acid metabolism; metabolism in brain and nervous system; carbohydrate metabolism; metabolism of fission products in soils, plants and mammals; nutrient assimilation in plants; translocation in plants; photosynthesis; plant biosynthesis; plant metabolism; and productivity of oceans and lakes. In addition, plenary sessions attended by both physical scientists and biologists were devoted to questions of technique, and a number of evening lectures of a more general nature were provided. Speakers from eighteen countries appeared on the programme. France, the host country, was the major contributor, but Belgium, the United Kingdom, the United States and the U.S.S.R. each provided ten or more papers. Other contributors came from Canada, Denmark, Germany, Ghana, India, Israel, Italy, Japan, the Netherlands, Poland, Roumania, Sweden and Yugoslavia.

The preparation of this programme was clearly a considerable task for the small panel of scientific consultants. Only a limited time was available for organizing the Conference, and it was necessary for them to consider not only the scientific quality of contributions but also the adequacy of the coverage of the subjects chosen, and the appropriate representation of different countries.

In terms of breadth of scope and international participation, Unesco achieved its objective. However, these requirements are difficult to reconcile with a uniformly high standard of scientific presentation. Moreover, the serious exchange of scientific ideas is easier when the subject of a conference is narrower and the interests of its participants are correspondingly closer. In the present Conference a further difficulty in the biological sessions was that, even at the best-attended lectures, the audience was lost in the spacious, it may be said magnificent, surroundings of the Grand Amphitheatre of the new Faculty of Medicine of the University of Paris. It is natural, therefore, that much of the most useful scientific discussion occurred in private. None the less, some sessions gave rise to most interesting discussions on the floor of the hall.

Abstracts of all papers presented have already been published (*International Journal of Applied Radiation and Isotopes*, 2, 175-264; 1957) and the Proceedings of the Conference are now in preparation; a detailed review is therefore inappropriate here and reference will be confined to general aspects.

A discussion in the session on lipid metabolism illustrated clearly the advantage which can occur when workers from widely differing fields are brought together. In a paper reporting work on lipids in the blood and milk of cows, reference was made to an as yet unidentified component in blood which had aroused interest by virtue of the high specific activity it rapidly attained in tracer studies. During subsequent discussion the possibility emerged that this component might well be diglycerophosphate, which

had lately proved to be an important, though hitherto unidentified, metabolic intermediate in algae. It was most unfortunate that the division of the programme into 'animal' and 'plant' sessions caused the presentation of the paper on lipid synthesis in algae which dealt with this question to be deferred to a later session. Such examples of biochemical studies in plants providing interpretations of results obtained in animals are rare; new concepts developed in investigations with animals have more frequently aided the elucidation of biochemical problems arising in connexion with plants.

To many British and American representatives at the Conference the presence of a strong delegation from the U.S.S.R. was of particular interest. Russian contributions occupied the greater part of the session on the metabolism of the brain and the nervous system; the turnover of proteins and nucleoproteins, and the metabolism of glycogen were here major questions of interest. Russian contributions were also numerous in the session on plant biochemistry and photosynthesis.

One session was devoted to the metabolism of fission products in soils, plants and mammals. The major focus of interest was the relative behaviour of strontium and calcium throughout the biosphere. This question was discussed in relation both to the upward passage of the two ions from the roots to the shoots of plants and to their subsequent metabolism in the animal body. The extent to which strontium, and also iodine, are transferred to milk was also discussed.

A day was devoted to the assimilation and translocation of nutrients in plants. In contrast with contributions at many earlier conferences on the application of tracer methods to this field, the majority of the papers were concerned with detailed physiological questions, such as the factors controlling translocation and the nature of the flux of ions across the cytoplasm of cells. Large-scale field experiments with labelled fertilizers, which were at one time widely believed to hold considerable promise, received little consideration.

In several evening lectures the importance of the industrial applications of radioisotopes was emphasized. Spectacular achievements were reported in the reduction of production costs by the use of radioactive thickness gauges and other procedures. It was estimated that in the United States industry is already saving more than 300 million dollars a year. Agriculture, the world's greatest 'biological' industry, promises no comparable rapid economic gain. The opportunity, which radiation provides, of producing new varieties of plants by mutation was referred to on a number of occasions. However, the probable value of this procedure can easily be overrated. As a representative of the Food and Agriculture Organization of the United Nations stated: "One word of warning, however, is needed in this connexion. It should be remembered that few countries, developed or underdeveloped, have adequately exploited, in their plant breeding programmes, the breeding material already present in their native crops or in material that could easily be introduced from other parts of the world. It is important, therefore, especially in countries with a limited number of scientists, that plans for the use of radiation in plant breeding should not be at the expense of money and trained manpower needed for

the basic fundamentals of an effective plant breeding programme conducted on a conventional basis." However, if the Conference held out no prospects of isotope procedures leading to immediate economic gain in the biological sphere comparable to that which may result from their application to the physical processes of industry, there was ample evidence that the eventual gain through research applied both to medical and agricultural questions may be at least as great.

This Conference may in some ways be regarded as the successor, though on a larger scale, to other isotope conferences, for example, those which the United Kingdom Atomic Energy Authority held at Oxford in 1951 and 1954. Apart from the lavish hospitality which the French Government and several embassies provided, the most striking aspect in which the Paris Conference differed from its predecessors was in a shift of emphasis from techniques to results. It is true that the sessions devoted to techniques were of considerable interest, particularly from the point of view of scintillation counting, very rapid sampling procedures in biological work, and autoradiograph procedures. Much information on these questions is, however, now readily available, and facilities for tracer work have become as much part of the normal equipment of many biological laboratories as the microscope. Past conferences on radioisotopes in research have greatly aided this development and the value of the Paris Conference is beyond doubt. However, it can legitimately be asked whether such gatherings have, by their success, made their continuation largely unnecessary for the experimental biologist. The majority of scientific conferences concerned with experimental biology to-day embrace some aspects of radioisotope research; in the future it will be increasingly so, and the successful use of tracer methods may in future be better stimulated by conferences convened to discuss more limited fields.

R. SCOTT RUSSELL

STATISTICS IN THE UNIVERSITY OF ABERDEEN

THE University of Aberdeen was among the first of British universities to provide for the teaching of statistics: in 1906, the Senatus recommended "the institution of a short course of lectures in the University on Statistical Methods which, in the opinion of the Senatus, is required for the equipment of advanced students in various branches of Science". In consequence of this recommendation, Mr. W. R. Macdonnell was "asked to act as lecturer, as he has given much attention to the subject and is competent to impart instruction in it". Macdonnell, who had been closely associated with Prof. Karl Pearson of University College, London, laid a firm foundation on which his successor, Dr. J. F. Tocher, was able to build more ambitiously. Tocher was one of the pioneers in the teaching of statistical methods and in the practice of statistical science; a well-known Aberdeen personality, about whom anecdotes are still current, he was lecturer during 1910-39. The University Calendar for 1920 shows that, even at this early date, Tocher was providing, single-handed, a breadth of statistical instruction that would not shame any university to-day: his lectures ranged over biometry, anthropometry, medical and

vital statistics, eugenics and economic statistics, with strong emphasis on computing and practical work.

In 1954, the appointment of Dr. D. J. Finney as reader in statistics and the simultaneous establishment, within the Department, of the Agricultural Research Council's Unit of Statistics began a new phase of development. The resultant rapid increase in staff caused a degree of overcrowding that seriously impeded work. This period of discomfort has now ended: on October 7 Lord Cameron, chairman of the Carnegie Trust, inaugurated the new building that the Department now occupies. The building is a four-floor extension to the Chemistry Building in Old Aberdeen, Messrs. Pite, Son and Fairweather being the architects for both. The total cost, £32,000, has been met by generous assistance from the Carnegie Trust and the University Grants Committee and a deeply appreciated gift of £10,000 from the Rockefeller Foundation.

At present, the Department of Statistics has two floors of this building, giving an area of nearly five thousand square feet. There are individual rooms for each member of the teaching and research staff, two large rooms for a team of ten or twelve computers, two rooms for graduate students, and a classroom that accommodates up to twenty-four for practical work or more for lectures. The Department does not yet possess any large-scale computing machinery, but a room has been set aside for the eventual acquisition of electronic equipment. The accommodation must compare very favourably with that of any other university department of statistics in Britain.

The Department now has four lecturers and assistants, and the Unit of Statistics a further five graduate statisticians. A broad programme of elementary lectures enables undergraduate students in many different fields to obtain some knowledge of statistical principles; a particular feature of Aberdeen practice is the inclusion of about twenty hours of instruction in statistical science for medical students. Students of mathematics or economics can take statistics as a special subject for final honours. Aberdeen has followed several other British universities in instituting a diploma in statistics, based on postgraduate instruction, as a measure to combat the acute shortage of trained statisticians that most countries have experienced since 1945; teaching of the first students, a group of three from as far apart as Pakistan, South Africa and Wales, has just begun. In addition, there are facilities for Ph.D. students and, of particular value for those from overseas, a few students can be taken who have no degree or diploma in view but who wish to attend lectures and to gain experience of special types of statistical work.

For many years, the connexion of the Department with agricultural research has been close. The statistical sections of the Rowett Research Institute and the Macaulay Institute for Soil Research began as offshoots from the University Department; the North of Scotland College of Agriculture, situated in Aberdeen and closely associated with the University Department of Agriculture, has frequently sought assistance in the planning of field experiments and in the analysis of results. The new Unit of Statistics is intended to make a similar service available to agricultural research throughout Scotland. The aim is that any member of the staff of an agricultural