Similar results using 10-cm. radar, with a pulse integrator device which gives automatically the average signal intensity over an area, were reported by Austin and Richardson (Massachusetts Institute of Technology).

Mr. G. E. Stout (Illinois State Water Survey) presided over Session E, which was devoted to "Instruments". As well as the radars of short wavelength already referred to, which it is hoped to use as indicators of cloud base and top, instruments were described which are designed to measure rain-drop sizes and distributions from aircraft and on the ground. A knowledge of liquid water content and drop-size distribution is of importance in assessing quantitatively the radar signal received from a volume of cloud.

Dr. R. A. Smith (Telecommunications Research Establishment, Malvern) was chairman of Session F. when "Scattering in the Atmosphere" was discussed. Gunn and East (McGill) and Labrum (Radiophysics Laboratory, Sydney), working independently, have put on a firm quantitative basis the theory of backscattering of radio energy from ice spheres coated thinly with water and from water spheroids. They have proved (what up to now has been assumed) that a small ice sphere with a thin water coating, as, for example, in the first stage of melting, will scatter nearly as well as a water sphere of the same volume and may absorb better. A water-coated ice spheroid may scatter and absorb very much more strongly than the spherical water drop into which it melts, giving an explanation of the well-known 'bright band' effect of enhanced echo at the freezing-level in conditions of continuous rain.

Gerhardt (University of Texas) said that his refractometer measurements indicated that in subsidence and frontal inversions the refractive index gradient over short distances may be several orders of magnitude greater than the normal, and that isolated patches exist with variations of refractive index adequate to explain 'angel' echoes (radar echoes received from a clear sky). Gordon (Cornell University) explained how scattering from turbulent patches in the atmosphere may increase the field strength beyond the horizon above the theoretical value at frequencies greater than 30 Mc./s., as has often been observed. There was some discussion on 'angel' echoes, which were reported by W. B. Gould (Signal Corps Engineering Laboratory) to have been observed in great numbers using a vertically-looking radar of wave-length 1.25 cm. These echoes are also observed in Britain using wave-lengths of 3 cm. and 10 cm. and are almost certainly associated with inhomogeneities in the atmosphere of the kind described by Gerhardt.

The final session, under the chairmanship of Dr. Gould, discussed "Fluctuating Signals", the object of this topic being to deduce some of the properties of the scattering particles by measurement of the fluctuations from pulse to pulse of a radar signal. In particular, it is hoped that the measurements may yield information on the turbulence within a cloud for example, the size and duration of turbulent eddies. The subject is clearly complicated by the large distribution of drop sizes within a precipitating cloud and also by the inherent variabilities in the performance of radar sets.

Before finally dispersing, the Conference decided to accept an invitation to hold its fourth meeting during November 1953 in the University of Texas. R. F. JONES

## INTERNATIONAL SCIENTIFIC FILM ASSOCIATION

## SIXTH ANNUAL CONGRESS

THE growing strength of the international scientific film movement was well in evidence at the annual congress of the International Scientific Film Association, held in the Maison de la Chimie, Paris, during September 23–October 1. During the congress, the acceptance of three countries as new members was announced—Cuba, East Germany and West Germany—and the reports from all countries showed steady progress and development in the use of the film for scientific education, for research and for popularizing science.

Seventy-two delegates and observers, representing twenty-one countries, the United Nations Educational, Scientific and Cultural Organization, the Federation Internationale des Archives du Film and the Federation Internationale des Ciné-Clubs, attended the congress. During the meeting, a hundred and seventeen films were shown to public and specialized audiences and, of these, the largest number from any one country was from Great Britain, no fewer than twenty-seven British films being shown; among them may be particularly mentioned "Atoms at Work", the Crown Film Unit's ten-minute documentary on Harwell, which attracted wide interest and resulted in a unanimous resolution by the congress urging other countries to give it the widest showing and to make similar films depicting their own development of atomic energy for peaceful ends.

Other films shown included a West German film illustrating, by means of infra-red photography, the remarkable fact that mice will fight savagely in the dark but never in the light; a French film showing the film work by the late Bernard Lyot on astronomy; a quite outstandingly beautiful Hungarian colour film of bird and insect life on the great lakes; an Icelandic film made by Mr. Tutte Lemco on the eruption of Mount Hecla, the dramatic shots of which provoked several bursts of spontaneous applause; and an equally striking Italian colour film of the courtship of the praying mantis.

The Research Section of the Association held several sessions, at one of which there was a demonstration of magnetic strip recording by M. André Didier, which was of particular interest to the British members present in view of its introduction at the present time into Britain. There were also two demonstrations of stereoscopic techniques. The first, by Dr. François Savoye (Paris), dispenses with 'Polaroid' glasses and relies on a synchronized rotating 'grill' in front of the screen to alternate the right- and lefteye images. It was effective, but suffered from the fact that the viewer's head has to be held very still in order to avoid a shifting of the images-a drawback that may possibly be due to the fact that both screen and grill were rather small. The other stereoscopic system was demonstrated by H. Dewhurst, of the Telecommunications Research Establishment, Malvern, using 'Polaroid' glasses and a beam-splitting equipment which is within the scope even of the amateur film-maker. The demonstration was mainly with an amateur colour film, and the results were excellent, although again handicapped perhaps by a small screen.

Among matters discussed by the general assembly of the congress was a proposal to establish a Section of the Association to deal with veterinary science, a suggestion which was made by the Netherlands delegation and accepted by the assembly. It was also decided to consider the possibility of holding at the 1953 congress a special session on high-speed cinematography.

The officers of the Association elected unanimously for 1952–53 were as follows: President, John Maddison (Great Britain); Vice-Presidents, Jan Korngold (Poland) and Prof. Mario Ponzo (Italy); Honorary Treasurer, J. W. Varossieau (Holland); and Honorary Secretary, Jean Painlevé (France). In addition, Luc Haesearts (Belgium) was re-elected as curator of the International Film Reference Library and Prof. R. V. Talice (Uruguay) was appointed as delegate for Latin America; Dr. G. Wolf (West Germany) was elected chairman of the Research Section, and Prof. Dekking (Holland) chairman of the Medical Section.

Great Britain was represented at the congress by a strong delegation led by Dr. Malcolm Donaldson, which also included Prof. H. Dryerre, representing the Scottish Scientific Film Association. At the end of the final session of the Assembly, it was unanimously agreed to accept the invitation of the British delegation to hold the seventh congress in London during September 1953. J. STEWART COOK

## INSULATION OF ELECTRICAL EQUIPMENT

A VACATION 'school' on the insulation of electrical equipment was held in the Electrical Engineering Department of the Imperial College of Science and Technology, London, during September 15–19. It was attended by some eighty engineers drawn from industry, the British Electricity Authority, research associations, technical colleges and the universities. The purpose of the course was to consider the factors which are limiting insulation design in the main classes of electrical equipment, and the general principles which should govern the approach to the solution of outstanding problems in this field.

An opening address was given by Dr. P. Dunsheath, chairman of convocation of the University of London, in which he commented on the value of postgraduate schools in facilitating and extending the interchange of knowledge and ideas between specialists of long experience and the more junior members of industry and in reducing the time-lag in the use of new information. He then drew on his long experience of cable manufacture in an interesting historical review of early developments in insulating materials and of the difficulties which were encountered and overcome when little was known of the principles underlying their behaviour.

In the first lecture Prof. Willis Jackson, of the Imperial College of Science and Technology, London, discussed the problems facing the insulation engineer, surveyed the historical development of the widely used materials based on natural products and of the more recent synthetic materials, and outlined the progress which has been made towards explaining the electrical, physical and mechanical properties of these materials in terms of their chemical composition and physical structure. He was followed by Dr. L. Hartshorn, of the Electricity Division, National Physical Laboratory, Teddington, who spoke on the phenomena of permittivity and dielectric loss, with particular reference to the effects on them of temperature, humidity and oxidation.

The third lecture, by Dr. S. Whitehead, director of the Electrical Research Association, dealt in a comprehensive manner with existing knowledge of the mechanisms of intrinsic and thermal dielectric breakdown, and of breakdown due to external or internal discharges. Dr. Whitehead also discussed the effect on the electric strength of electrochemical deterioration in service, and the scope for improvement in materials, design and testing. Another member of the Electrical Research Association, Mr. C. G. Garton, then spoke on the structural basis of electrical and mechanical properties, and gave a very illuminating treatment of rate processes in relation to the dependence of these properties on temperature and frequency.

In the fifth lecture Mr. R. Snadow, of the British Thomson-Houston Co., Ltd., reviewed the available insulating materials in terms of the present thermal classification. He emphasized the inadequacy of this classification for some of the new synthetics, and that their application is being retarded by too limited knowledge of their thermal endurance.

The next five lectures were concerned with the applications of insulation in different classes of electrical equipment, and with the design problems involved. In discussing communication components, Mr. I. M. Ross, of the Ministry of Supply, referred to the extremely wide frequency-range with which the communication engineer has to deal, and the severe thermal and mechanical conditions to which military communication equipment, in particular, is subjected. After reviewing the changes in design which the use of new synthetic materials has made possible during recent years, he outlined the directions in which further improvement is required. Dr. L. G. Brazier, of British Insulated Callender's Cables, Ltd., dealt with the development of high-voltage cables and remarked that, in consequence of improvements which have occurred in the qualities of paper and oil and in the methods of cable fabrication, the oil-paper dielectric introduced by Ferranti some fifty years ago remains the only form of dielectric suitable for use at the highest operating voltages. He outlined the outstanding problems and the methods being adopted to resolve them. The design of power capacitors, and the manner in which this might be affected in the near future by the use of the new ceramics based on barium titanate, was then discussed by Dr. R. S. Vincent, of British Dielectrics Research, Ltd.

Mr. E. Jones, of the English Electric Co., Ltd., made a comprehensive review of the insulation problems involved in the design of electrical machines and indicated possible lines of approach to a more efficient use of insulation, and the reasons why, except to meet special requirements, there is no great need for, nor likelihood of, a marked increase in operating temperatures. The subject of transformers was dealt with by Mr. D. McDonald, of the British Thomson-Houston Co., Ltd. After discussing the electrical, mechanical and thermal requirements of transformer insulation design and the problems involved in satisfying them, he illustrated the trends of high-voltage transformer design by consideration of the shielded cylindrical layer-type winding. He brought out the increasing similarities with cable construction and the movement towards the exclusive use at the highest voltages of the oil - paper dielectric. Mr. P. G. Ashley, of the Metropolitan-