

focusing, it has been found possible to produce a source less than one micron square on an air-cooled foil transmission target which can be loaded to a power of one watt. Thus the brightness is about 1,000 kW./mm.², as compared with an effective brightness of about 1 kW./mm.² in a normal foreshortened diffraction X-ray tube focus. The new point source has been employed principally in shadow microscopy, when a resolution of about 1000 Å. has been obtained; applications in microbeam diffraction are being studied. Dr. J. W. Jeffrey analysed modern practice in intensity estimation where insufficient attention is often paid to experimental accuracy. He described methods of grinding specimens to a spherical shape to facilitate absorption corrections; the use of some form of integrating mechanism on moving-film cameras permits the employment of a very simple densitometer. Dr. U. W. Arndt reported only moderate success in the use of radiiodine for silver estimation in photographic images; the method gives a measure of the integrated intensities of single crystal spots. In spite of a number of ingenious suggestions to obviate this, it is generally necessary to punch out each spot individually before measuring the activity. The use of emulsions considerably thicker than normal increases the sensitivity to X-rays and the reproducibility of measured intensities at the expense of much more elaborate processing requirements. Dr. R. L. Gordon discussed methods of making 'lost counts' corrections in monitored Geiger-Müller counter systems and described a direct way of measuring the form factor for a self-rectifying X-ray tube. Dr. G. S. Parry and Dr. S. C. Abrahams gave brief descriptions of the General Electric and Norelco counter diffractometers, respectively.

Dr. R. W. Cahn had used the Buerger precession camera for metallurgical problems where the orientations of very small regions had to be verified, such as in the examination of mechanical twins in molybdenum. The very low background scattering allows very weak reflexions to stand out. Mr. H. J. Goldschmidt commented on some of the problems in high-temperature powder photography: his new camera, which was sponsored by the X-Ray Analysis Group of the Institute of Physics, provides the most satisfactory solutions to date. The greatest difficulties are those of specimen mounting and of evaporation of furnace windings; periodic calibration of thermocouples is always necessary owing to vapour contamination. Dr. R. Witty reported on his studies of X-ray tube characteristics. He pointed out the advantages of d.c. operation which, for the type of stationary anode design common in demountable X-ray tubes, permits a doubling of the target loading as compared with self-rectifying operation. Similar gains are possible with rotating anodes. He gave focal spot and saturation current characteristics as a function of bias voltage. This bias is most conveniently provided from a separate bias supply as distinct from a bias resistance. Mr. P. Holroyd and Dr. D. L. Smare had studied similar phenomena in micro-focus tubes. For fixed bias resistance the anode current rises exponentially, and the focal spot diameter falls exponentially, with decrease in anode-cathode separation. Dr. A. L. MacKay described a miniature Weissenberg camera and a miniature retigraph designed to take full advantage of the properties of a micro-focus X-ray tube in the examination of very small crystals. A number of novel features are incorporated, particularly in the design of the goniometer heads.

U. W. ARNDT

SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES

ANNUAL CONGRESS

THE South-Eastern Union of Scientific Societies held its sixtieth annual congress in Folkestone during April 14-17, under the presidency of Dr. Russell J. Reynolds. Throughout the congress an exhibition of geological, archaeological, botanical, zoological and general interest was on display at the Leas Cliff Hall, and the programme included a young naturalists' evening, when questions from children were answered by a panel of experts, and a lecture by Maxwell Knight on the habits of the cuckoo, illustrated by a film.

Dr. Russell Reynolds's presidential address to the Union was on "Cineradiography". He commenced by outlining the technique and application of his subject. Röntgen made his discovery in November 1895, and Dr. Reynolds still has a plate taken by himself by X-ray photography in 1896. Two years afterwards John Macintyre produced an X-ray cinematograph film by re-photographing on an ordinary cinematograph film a series of radiographs of a frog's leg which had been slightly moved between the exposures. Gradually the apparatus improved, tubes were more reliable and fluorescent screens gave greater luminosity. Sensitivity of film emulsion increased, and lenses of wide aperture were made. Two methods of making cineradiograph films became possible—the direct and indirect. The first utilizes the power X-rays have of affecting a sensitized photographic emulsion; in the second the rays passing through the subject strike a fluorescent screen, and the shadow cast is photographed. X-rays cannot be focused, and this limits the direct method. Difficulties with the indirect method include the weakness of the intensity of light emitted by the fluorescent screen; when this is increased, the exposure risk to the subject is also increased. Dr. Reynolds said that he began his cineradiographic experiments in 1921 using the indirect method. Later he introduced a switch which synchronized the excitation of the tube with the opening of the camera shutter, thus reducing both the exposure of the patient to risk and the strain on the tube by half. Improvements continued, and at the present time the method used is reliable and safe. The cost has been reduced and does not exceed that of a complete X-ray examination in the usual way. Modern apparatus has a specially designed transformer unit, and the X-ray tube has a double-focus cathode. The camera lenses have a wide field, the apertures being $f/0.7$ and $f/1.5$; the speed of the camera can be adjusted at will from 3 to 100 frames per second. The technique in making cineradiographic film differs little from that employed in normal radiography. Dr. Reynolds stressed the importance of the use of short coils of film that can be projected continuously, not only for the purpose of medical diagnosis, but also for training students.

The presidential address to the Archaeological Section was given by Major H. M. Rand, who spoke on "The Saxon Shore Forts of Kent". He said that historical evidence, often not contemporaneous, can be misleading and that muddy boots are sometimes better than documents. The archaeological approach is the correct one, and excavation may solve the problem of the 'lost centuries'. There is an absence

of uniformity in the forts: some are rectangular (Reculver), others oval (Pevensey), and the areas vary from five to nine acres. Occupation in some commenced in the first century and continued until the fifth; in others there is evidence of two separate periods in the second and fourth centuries. The coastline differs considerably from that of the present day, erosion and silting up, particularly of the Wansunt Channel, making the location of the forts problematical. The Kent Archaeological Society commenced excavation at Richborough in 1922, and the fifth report is now in the press. The cruciform platform is unique, and may have supported a monument to commemorate a triumph during the third century; triple defensive ditches were raised about the same time.

Dr. Maurice Burton gave the presidential address to the Zoological Section, his subject being "Art in Animals". He said that he differs from some of his colleagues in the line drawn between man and the other animals, for we may tend to trust our reason too much. There is opportunity for us all to study the difference between human and animal behaviour. The love behaviour is much the same, that of male and female sticklebacks being a case in point. Maybe, he said, the difference is one of quantity rather than of quality. Dr. Burton spoke of the beauty, to our eyes, of the shells of single-cell animals, the Foraminifera, and of the sponge called the Venus flower basket. He mentioned the ability of lower life forms to take material from outside their bodies to construct beautiful homes—the tube-making worms, caddis fly larvæ and the nests of fishes and birds; the web of a spider compares favourably with the efforts of a civil engineer. The difference between man and the animals is that aesthetic appreciation has evolved man's consciousness of his art. In animals mechanical skill is highly developed. Dr. Burton then dealt with the evolution of the eye from the light-sensitive cell of the lowest organisms. The bower birds have especial skill in the construction of their elaborate houses, for they use natural pigments for colouring sticks, selecting favoured ones and burying those considered distasteful. Colour should be related to the development of the eye, and while at times its value is protective, at others it has a physiological value: it has signal values with the birds and fishes and arouses emotions. The appreciation of sounds by animals when they have no other apparent value than aesthetic was briefly mentioned by Dr. Burton, and also the question of taste.

Dr. Francis Rose, as president of the Botanical Section, spoke on "The Flora of Kent", saying that the earliest plant records are those of Turner, in 1549, dealing largely with the plants of the Dover area; the inaccessibility of the Weald prevented recording from there. The Elizabethan records were from the point of view of the herbalist; Gerard, in 1597, recorded plants still thriving in the same localities. Even during the nineteenth century transport was difficult in the Weald, thus accounting for some of the missing species in the work of Hanbury and Marshall. Dr. Rose commenced his work upon "The Flora of Kent" in 1942, and it will be published during the autumn of this year. Its sections deal with the distribution of species, the ecology, plant distribution as a whole and floral statistics. C. W. Wright chose for the presidential address to the Geological Section the subject of "Unsolved Problems in Cretaceous Stratigraphy and Palaeontology" and commenced by saying that Folkestone can be regarded as the centre of English

geology. Much work is left to be done in spite of the intensive work of Rowe, Jukes-Browne, Whitaker and the Weald Research Committee of the Geologists' Association. There are many surprises around the corner, said Mr. Wright. The beds at the base of the Albian, thought to be allied to the Lower Greensand, may be more closely related to the Gault. Although each ammonite carries its evolutionary life-history, species evolved and disappeared in such relatively short times that the gaps between the species now found causes problems which may never be solved owing to the vast amount of material denuded, so removing the required evidence. Lithographical similarity in various districts can be misleading as regards zoning, as palaeontological evidence has proved a sub-zone difference in some cases. World-wide correlation is exceedingly difficult owing to the lack of evidence, and Mr. Wright emphasized that ammonite material, however fragmentary, is needed to aid the solution of the problems.

During the congress favourable weather conditions enabled the full programme of excursions to be carried out. The archaeologists visited Wye College and Church, ancient occupation sites on the Downs, Studfall Castle, the Roman fort of the Saxon shore and a fortified Manor House at Westhanger. The botanists and zoologists went to Westwell, Hothfield, Little Chart, Saltwood, Romney Warren, Dungeness Bird Observatory and the Folkestone Corporation greenhouses. The geologists made excursions to the Warren Defence Works, the Stour Valley near Ashford, Great Chart, Kennington, Wye and Brabourne.

The sixty-first annual congress of the Union will be held next year in Tunbridge Wells during May.

CARNEGIE UNITED KINGDOM TRUST

REPORT FOR 1954

THE forty-first annual report of the Carnegie United Kingdom Trust*, to which are appended the accounts for the year ended December 31, 1954, covers the fourth year of the present quinquennium and is concerned chiefly with the development and direction of existing schemes. Such good progress has been made with the programme for the development of local museum services that during the year the allocation of £40,000 for the five years was increased to £50,000, most of the fund being earmarked for direct grants to enable museums to improve their standards of display. In this field, the most important event of the year was the reopening of the Taunton Castle Museum after its complete re-organization. The Trust notes that the service of expert reports has continued to be of much value to the museums movement, but that a major difficulty in re-organization has been that the schemes involve the exercise of technical skill beyond the resources of the museums concerned. Grants for reorganizing displays were made during the year to the Banff Museum, Hove Museum of Art, Museum of Leathercraft, London, Torquay Natural History Society Museum, Truro Museum and the Worthing Museum and Art Gallery. During the year, five village hall

* Carnegie United Kingdom Trust. Forty-first Annual Report, 1954. Pp. viii + 43. (Dunfermline: Carnegie United Kingdom Trust, 1955.)