

Annual Exhibition of the Physical and Optical Societies.

THE seventeenth annual exhibition of the Physical and Optical Societies was held on Jan. 4, 5, and 6 at the Imperial College of Science, London, and covered a wide range of electrical, optical, and other physical apparatus. This exhibition has rightly come to be regarded as an opportune occasion for the various manufacturing firms to bring to notice their latest improvements, and this year's exhibition reflects great credit on the ingenuity and originality in design and excellence of workmanship of the apparatus shown. There is an atmosphere of courtesy and entertaining informality in these annual events which cannot fail to enhance the interest of the visitors and evoke their admiration. Prof. A. O. Rankine, as secretary, is to be heartily congratulated on his success.

Seventy-four firms exhibited apparatus, and it is regretted that the limited space available in this journal does not permit mention of all the instruments. Reference may be made to the illustrated catalogue of the exhibition for fuller details, and some exhibits embodying new features are noted below.

The attractive lectures in the evenings, and subsections devoted respectively to recent results in physical research, lecture experiments in physics of special interest to teachers, and famous historical physical experiments again appeared in the programme.

The lecture on the first evening was by Prof. E. N. da C. Andrade on light and electricity as it might have been given in 1709 with the apparatus of the time, and, it may be added, under conditions which were dramatically realistic and were greatly appreciated by the audience. The lecturer, who impersonated Francis Hauksbee, and his assistant Mr. Paul, appeared in the picturesque costume of the period, and the hall was appropriately illuminated by candles, which were lighted by flint-and-steel and tinder box. All the experiments were repetitions of those actually performed by Francis Hauksbee, a contemporary of Newton, and were selected as having particular relation to present-day concepts of the electrical constitution of matter. The electric glow accompanying ionisation when matter is finely subdivided *in vacuo* was demonstrated with such simple apparatus as vessels containing oil or mercury and partially evacuated, and then shaken; a mercury jet *in vacuo*; and a rotating glass globe rubbed by the hands. By courtesy of the Royal Society, the actual air pump made and used by Hauksbee was employed in the lecture. This treasured veteran of pioneer apparatus, quaint in design and portraying the combined efforts of wood-turner, joiner, and engineer, was successfully coaxed by Mr. Paul to resume duty after more than two centuries, to the accompaniment of a few merry clanks due to the hand-cut gears, with perfect results.

On the second evening a discourse was given by Dr. C. V. Drysdale on "Progress in Electrical Instrument Design and Construction." Reference was made to the many improvements introduced by Profs. Ayrton and Perry some forty years ago, the more modern improvements being due to the utilisation of new materials possessing properties valuable in instrument design, for example, synthetic resins, chromium gels, and magnetic alloys of the chromium-steel and nickel-iron class. A demonstration was given of the effective magnetic screening afforded by mumetal, and reference was made to the use of this alloy in transformer design on account of its high permeability and low hysteresis. The necessity of studying the bearing of basic formulæ in instrument design was emphasised in the application to d.c. and a.c. instruments and machines, conductors, etc.

The lecture on the third evening was delivered by Mr. J. L. Baird on "Television." The development of this difficult branch of physics was traced from its inception in the early part of the present century down to work done barely twelve months ago. One of the first attempts was a model of the eye comprising sixty-four selenium cells and made in 1906. Later came the single cell in conjunction with an exploring beam produced by vibrating mirrors, then the photoelectric cell replacing the selenium cell; still later the cathode-ray tube was added to the combination of mirrors and cell, and then the rotating prismatic disc replacing the mirrors. A résumé of the lecturer's own research then followed. His apparatus comprises direct current and alternating current motors, lenses spirally arranged on a rotating disc coacting with a slotted disc, and a photo-electric cell, the current variation of which is utilised in the wireless transmission of the image. Reception is effected by similar means. A model of the transmitting portion of the lecturer's original apparatus used in 1925 was on exhibition, and no doubt the bulkiness of the complete plant precluded an actual demonstration. The discourse was repeated the same evening, but one item not referred to in the lecture should be recorded, namely, that Mr. Baird successfully effected the transmission of moving images of human faces at the Royal Institution on Jan. 27, 1926.

The research and experimental section inaugurated at the annual exhibition last year again proved instructive and of special interest in indicating the trend of progress in the application of modern physics to the arts and manufactures. The Research Association of British Rubber and Tyre Manufacturers exhibited a sieving apparatus for the detection and estimation of grit in fine powders by means of wire gauze and a stream of water. The British Research Association for the Woollen and Worsted Industries included in its section a balance for estimating moisture regained by textile materials in drying ovens, an electrical device for controlling room humidity, and a roller setting gauge. The Admiralty Research Laboratory supplied eight exhibits, comprising phonic signalling apparatus, a camera of the revolving-drum type for use with an oscillograph, and other electrical apparatus used in tests involving sonic frequencies. The development of fog-signalling and sound-locating apparatus was illustrated by the Air Defence Experimental Establishment.

Devices for solving practical difficulties continually arising in specialised technical operations were shown by the following firms and institutions: Mr. Conrad Beck, microscope aberration tests; Dr. G. D. Bengough and Mr. J. M. Stewart, protecting and colouring aluminium; the Brown-Firth Research Laboratories, chromium steels; Prof. W. Cramp, a magnetic balance; Mr. H. Dewhurst, a rapid bolometer in operation; The General Electric Co., Ltd., optical and electrical apparatus; Mr. Hallimond, a magnetic separator; W. T. Henley's Telegraph Works Co., Ltd. (Research Dept.), wire and cable testing and phenomena; Metropolitan-Vickers Electrical Co., Ltd. (Research Dept.), valves, electric furnaces, chromium plating, welding, etc.; The National Institute for the Blind; the National Physical Laboratory; and The British Thomson-Houston Co., Ltd., together contributed an important collection.

The lecture experiments in physics comprised working models designed to illustrate wireless phenomena; synchronous and induction motors; three-phase currents; wave motion; and magnetic fields. Other apparatus demonstrated cloud experiments,

condenser capacity by analogy with models immersed in a solution of copper sulphate, and the rotation of bodies with dielectric surfaces when suspended between the poles of a Wimshurst machine.

In the section devoted to famous historical experiments, Prof. E. V. Appleton exhibited a coil from King's College and used by Joseph Henry in his work on self-induction; Sir Charles Wheatstone's step-by-step telegraph designed in 1840, and a variable resistance box and bridge by the same inventor; and James Clerk Maxwell's model illustrating the induction of currents; while Sir William Bragg exhibited apparatus used by Tyndall in his investigation on so-called spontaneous generation.

Of the almost bewildering assemblage of apparatus, the following exhibits are selected for particular notice: C. Baker, for epidiascopes; The Cambridge Instrument Co., Ltd., an oxygen recorder for boiler feed

water, a carbon dioxide recorder for flue gases, a magnetic bridge permeameter, and a glass electrode potentiometer; Crompton and Co., Ltd., their "S.M.S." hygrometer and new wattmeter; W. Edwards and Co., rotary vacuum pumps; Adam Hilger, Ltd., the Guild trichromatic colorimeter and spectrographic apparatus; H. Hughes and Sons, Ltd., echo-sounding gear; Klaxon, Ltd., the 'Audiwave' machine for relieving deafness; Negretti and Zambra, meteorological and electrical appliances; L. Oertling, Ltd., special physical balance with 22 ft. light beam; Ogilvy and Co., dark ground condenser, 1.20 N.A., objectives, and colorimeter; H. Tinsley and Co., electrical and stroboscopic apparatus; and Carl Zeiss (London), Ltd., the "Bitukni" binocular microscope attachment, microscope stand G, Nordenson photographic ophthalmoscope, and direct vision monochromator with wavelength scale. H. W. H.

The Science Masters' Association.

AT the kind invitation of the Vice-Chancellor of the University, the annual meeting of the Science Masters' Association was held at Oxford on Jan. 4-7. The membership of the Association has grown rapidly in the last few years, and at this, the twenty-seventh, annual meeting, some 450 members were present out of a total of 1200. Formal proceedings opened on Tuesday evening, when Brig-General H. Hartley delivered his presidential address in the large hall of the City of Oxford School. Choosing as his subject the rise and development of the ionic theory, the president gave a masterly survey of both the fundamental work and recent advances, pointing out the way in which the difficulties presented by strong electrolytes are being overcome. To the evident relief of his audience, General Hartley said that practically no change was necessary in the method of teaching elementary work on the theory. On the motion of Sir Richard Gregory, seconded by Mr. H. A. Wootton, a hearty vote of thanks was accorded the president for his address, but much to the disappointment of the Association Prof. H. E. Armstrong, who was present, could not be prevailed upon to speak.

On succeeding days, lectures on various scientific subjects were given by members of the University of Oxford and others, two of the most attractive being that of Prof. E. B. Poulton upon "Protective Mimicry in Insects" and that of Prof. H. H. Turner upon "Eclipses" with special reference to the forthcoming total solar eclipse visible in England. Prof. Poulton's lecture, to judge from the applause it evoked, met with warm appreciation. It was admirably conceived and delivered, and was illustrated with a large number of exquisite lantern slides. We believe it should have been of the greatest value to science teachers, in that it showed how natural history may be made to afford a sound training in scientific method in an extremely attractive way.

The Association was fortunate in securing Prof. Turner's lecture on the total eclipse, not merely on account of the intrinsic value and interest of the lecture, but also because Prof. Turner demonstrated in an inimitable way how difficult astronomical conceptions could be made clear to boys and girls. He captured his audience at once with his small spheres for the earth and moon, indiarubber balloon for Jupiter, and large carriage-umbrella for the sun. After a very lucid description of the causes of eclipses in general, he related the story of several famous examples of the phenomenon, winding up with a graphic account of the Einstein eclipse of 1919. He then described the course of the total eclipse of June next, and urged upon teachers the importance of making arrangements to allow as many of their

pupils as possible to see this event, which is likely to prove unique to most Englishmen now alive. Prof. Turner suggested that camps should be formed in suitable spots along the course to accommodate children for the preceding night, and said that he had been in communication with the Board of Education and with the authorities of the Boy Scouts' Association. It is desirable that arrangements should be made some time in advance, and science teachers would do well to lay the matter before their respective headmasters and headmistresses at the earliest opportunity. Fortunately, the date of the eclipse (June 29) does not clash with matriculation, school certificate, or higher certificate examinations, and we therefore hope that the school authorities will view with leniency any alterations in routine which may be necessary.

Through the efforts of the president and of the local secretary, Mr. H. R. Raikes of Exeter College, visits were made to the various colleges, the Bodleian Library, the Clarendon Press, the Morris Works at Cowley, and other places of interest. The wonderful collection of historic scientific instruments at the Old Ashmolean proved very popular, and one heard on every hand the wish expressed that some one would do for Cambridge what Dr. Gunther has done so excellently for Oxford. The collection is rendered additionally valuable by the series of "Old Ashmolean Reprints" now in course of publication, and by Dr. Gunther's small but delightful handbook.

In the Clarendon, electrical, and other laboratories, demonstrations and exhibits had been prepared by members of the University. This feature, which entails a great deal of work on the part of the demonstrators and exhibitors, is always warmly appreciated by members of the Association, who find it of the greatest value as a concentrated refresher course and as a source of new ideas with which to infuse their school lessons.

As in previous years, there was an exhibition of scientific books and apparatus. On the table reserved for books written by members of the Association there were no less than forty-nine exhibits, a number which says much for the enthusiasm and literary energy of our teachers of science. It was pleasing to note that these books were by no means all textbooks; some dealt with the history of science, some with science in its more general aspects, and one at least—Dr. I. B. Hart's well-known book on the mechanical investigations of Leonardo da Vinci—was evidence of sound and exacting original research.

The large size of the publishers' exhibit was an unmistakable sign of the importance they attach to this annual meeting. In spite of many counter-attractions,