

the distance of the occulting screen, and obtains the distance 140 parsecs, which is about four times that estimated for the Hyades. Since the angular extent is 30° , this implies a real length of 70 parsecs, and gives a vivid idea of its gigantic dimensions.

Dr. Pannekoek next proceeds to make an estimate of the mass of the nebula; he first works on the assumption that it is composed of hydrogen. The star-counts indicate an absorption of two magnitudes. Using Dr. Abbot's absorption coefficient for atmospheric air, and taking the thickness of the stratum as 10 parsecs, he finds 10^{-15} for the density of the gas-cloud. The mass is independent of the thickness assumed, and comes out twenty thousand million times that of the sun. This is greater than many estimates of the combined mass of the whole sidereal system, and at once suggests the probability that the larger portion of that mass is not condensed into stars, but distributed in cosmic clouds. Some striking consequences of the presence of such a great mass at a comparatively moderate distance are drawn by

Dr. Pannekoek. The sun would travel round it in a very eccentric ellipse in a period of some two million years, being now near apocentron.

While so large a mass of the universe as a whole would render it easier to account for the numerous cases of high velocity among the stars, it would make the moderate velocities of the bulk of the stars difficult to explain. The author notes a suggestion by Prof. De Sitter that the necessary mass of the occulting clouds may be greatly reduced if we postulate that they consist of dust instead of gas. It has already been pointed out that the aspect of the dark marking near ζ Orionis accords with the hypothesis of solid matter. However, even in this case the necessary mass is enormous, since it is *a priori* improbable that the thickness of the stratum should in all cases be a very small fraction of its visible dimensions.

The demonstration of the existence of these immensely massive cosmic clouds seems to make it desirable to rediscuss the dynamics of the stellar system.

Obituary.

PROF. E. B. ROSA.

THE death, on May 17, of Prof. Edward Bennett Rosa, of the Bureau of Standards at Washington, at the age of sixty years, is a serious blow to electrical science. Born in 1861, Prof. Rosa gained distinction as a student in the Johns Hopkins University under Rowland, and after some experience in professorial work in the Wesleyan university where his early undergraduate days had been passed was in 1901 appointed to the staff of the Bureau of Standards as a physicist. There his main work was done. In 1910 he became chief physicist, and as head of the electrical department was responsible for many of the valuable researches which have been carried out at the bureau.

Among the earliest of these was his determination, in collaboration with Dr. Dorey, of "v," the ratio of the electrical units, and most of them turn on questions relating to the measurement of the fundamental units, the ohm, the ampere, and the volt. He combined in a marked degree the insight required to design and carry through to a successful result a difficult experiment and the mathematical skill needed to develop to a high degree of accuracy the theory on which the experiment is based.

Prof. Rosa's papers on the calculation of coefficients of self- and mutual induction, and on the theory of the instruments employed in absolute measurements, will always be standard; while his own experimental determinations of some of the fundamental quantities are among the best which have been made. He realised the need for accuracy and exactness in the processes of measurement, whether applied to scientific work or to industry, and he organised the electrical section

of the bureau in a manner which fitted it to respond to the requirements both of scientific and industrial research. The list of his papers covers a wide range, and in all of them he added to our knowledge in a substantial manner.

Prof. Rosa visited England in 1908, acting, along with Dr. Stratton and Prof. Carhart, as one of the American representatives to the International Electrical Conference, held in London under the presidency of the late Lord Rayleigh. At that conference a formal distinction was drawn between the absolute and the international units of measurement: between the ohm (10^7 absolute C.G.S. units) and the international ohm—the resistance at 0° C. of a uniform column of mercury weighing 14.521 grams, and 106.300 centimetres in length; or the ampere (10^{-1} absolute C.G.S. units) and the international ampere—the current which under certain carefully defined conditions deposits from a solution of nitrate of silver a mass of 1.11800 milligrams of silver per second.

Prof. Rosa would probably have preferred to retain as standards for legal purposes the absolute magnitudes 10^7 C.G.S. units for resistance and 10^{-1} C.G.S. units for current, but he accepted the views of the majority of the conference, and at a later date lent his valuable assistance in defining accurately the conditions necessary for the realisation of the international ohm, ampere, and volt. As the outcome of the work of the conference, a committee, known as Lord Rayleigh's Committee, was appointed to define these conditions, and representatives of England, France, and Germany met at Washington and carried out a series of experiments, the results of which have determined the practice of all National Standardising Laboratories. Of the

committee engaged in this work. Prof. Rosa was the active head, and its successful issue was due in no small degree to his skill in overcoming the technical difficulties of the task and to his tact in dealing with the varied views of those engaged in the research.

The volume giving an account of these experiments, published by the Bureau of Standards in 1912, will form a fitting memorial of one who for the last twenty years devoted himself unweariedly to the advancement of electrical science. During the war he directed the development of a number of instruments of great use to the American forces in France. Among these may be mentioned a sound-ranging device and much radio apparatus suitable specially for aircraft. He was greatly instrumental in establishing the splendid radio laboratory at the bureau. Throughout his life he was keenly interested in the prevention of industrial accidents and in the provision of safety standards for the guidance of public authorities. The national electrical safety code at present in use in the United States owes much to him. His last work, now in the press, was an analysis of the expenditure of the Government Departments, which contains a number of statistics of great importance and interest.

Prof. Rosa was married in 1894, and Mrs. Rosa survives him; she has the deep sympathy of all those on this side of the Atlantic who knew her husband and appreciated his work.

MISS CZAPLICKA'S sudden death on May 20 cuts short a brilliant career. Having studied geography at Libau and Warsaw, she came with a research scholarship to this country in 1910, and soon after joined Somerville College, Oxford. She then turned her attention to anthropology, and, after taking the diploma in that subject, conceived the bold project of an expedition to the almost un-

known part of the Siberian *tundra* lying between the Yenisei and Lena valleys—a project that was carried out with brilliant success in the years 1914–15. It was in keeping with her spirit of thoroughness, however, that by way of preparation she should first review the existing literature, mostly Russian, relating to this region, thus producing "Aboriginal Siberia" (Clarendon Press, 1914), a book not only full of out-of-the-way information, but likewise showing interpretative power of a high order. Her return from an adventurous journey involving great privations was marked by the appearance in 1916 of a popular work, "My Siberian Year"; but the full report by herself and her colleague, Mr. H. Hall, of the University of Pennsylvania, has not yet been published. At Oxford Miss Czaplicka acted as lecturer in ethnology until the end of the war, when she passed on to the University of Bristol to serve in a like capacity under Prof. Fawcett. In the meantime she found time to compose a valuable monograph on "The Turks of Central Asia," as well as to contribute many articles on the Siberian tribes to Hastings's "Dictionary of Religion and Ethics"—articles which might well be reprinted together in book-form. This brief account must suffice of the work of one whose intellectual energy was on a par with her personal charm and lofty spirit of self-devotion. Poland, so prolific of genius, can count her among its best. In Oxford, London, and Bristol alike she was the centre of a circle of admiring friends, whose lasting regret it now is that they did not somehow prevent the too courageous spirit from fatally overtaking the delicate frame.

R. R. M.

WE regret to announce the death, on May 31, of COL. JOHN HERSCHEL, R.E., retired, F.R.S., youngest son of the late Sir J. F. W. Herschel, Bart., in his eighty-fourth year.

Notes.

THE list of honours conferred on the occasion of the King's birthday includes the following names of men known to the world of science:—*Knights*: Prof. Arthur Keith, Hunterian professor and conservator of the Royal College of Surgeons; Dr. T. Lewis, hon. consulting physician since April, 1918, to the Ministry of Pensions; Dr. S. Russell-Wells, Vice-Chancellor of the University of London; Dr. F. Conway Dwyer, ex-president of the College of Surgeons, Ireland; Mr. J. B. Harrison, Director and Government Analyst, Department of Science and Agriculture, British Guiana; and Brig.-Gen. D. J. McGavin, Director-General of Medical Services in New Zealand. *C.B.*: Mr. L. S. Lloyd, Assistant Secretary to the Department of Scientific and Industrial Research. *K.C.I.E.*: Col. W. H. Willcox, late Medical Adviser to the Civil Administration in Mesopotamia. *C.I.E.*: Dr. M. N. Banerjee, Principal of Carmichael Medical College, Belgaichia, Bengal. *Companion Imperial Service Order*: Mr. G. J. Williams, Senior Inspector of Mines, Mines Department.

AN interesting ceremony took place at the Cosmos Club in Washington on Tuesday, May 10, when Mr. Henry S. Wellcome presented Dr. F. B. Power with a gold medal, specially struck to commemorate the latter's tenure of the directorship of the Wellcome Chemical Research Laboratories in London from their foundation in 1896 to 1914, when for family reasons he returned to the United States. During that period more than 170 papers were published from the laboratories, mostly in the Transactions of the Chemical Society. These papers deal chiefly with the constituents of plants, more especially with those plants used in medicine, and they form a notable contribution to our knowledge of the chemistry of drugs of vegetable origin. It will be remembered that in 1913 Dr. Power received the Hanbury medal, which is bestowed periodically by a joint committee of the Chemical, Linnean, and Pharmaceutical Societies in recognition of specially meritorious research on drugs.

A DISCOVERY in the Channel Islands of considerable interest to archæologists is announced in the *Times*