

Milne's original kinematic model of the universe, this outward increase in density is just what would be expected from the fact that we do not have, as it were, an instantaneous view of the universe, but are seeing the more distant nebulae as they were some five hundred million years ago. When the observed density distribution is corrected to the instantaneous view, the resulting spatial distribution turns out to be uniform; since on the kinematic model, however, uniform density distribution can only occur once, Hubble finds it nearly as unsatisfactory to suppose that we are just happening to observe the universe at a special instant in time, as if we were observing from a specially favoured point in space.

Still assuming that the observed red displacement is due to a velocity of recession, and that therefore the apparent spatial distribution of nebulae increases radially outwards, Hubble next examined the apparent distribution of nebulae predicted by the homogeneous expanding models of general relativity, a special case of which also includes in many of its aspects Milne's kinematic model. Tolman has shown that the nebular counts predicted by these models take the form

$$\log N(m) = 0.6 \{m - \Delta m_1 - \Delta m_2 + F(R)\}$$

where  $R$  is the radius of space curvature. At the very outset an almost insuperable difficulty is encountered in that the observed counts do not obey a relation of this form. If, however, it be assumed that the observed counts are subject to almost impossibly large systematic errors, the relation and the observations may be used to calculate a value of  $R$ . The resulting value is of

the order of five hundred million light years, rather less than the penetrating power of the 100-in. telescope, and since there is a relation between  $R$  and the density of matter in space, the density must be  $10^{-26}$  gm. cm.<sup>-3</sup>, which is many times greater than the mean density produced by the nebulae alone. To account for this density we must postulate that inter-nebular space is filled with matter the mass of which is greatly in excess of the total mass of the nebulae, and which is distributed in such a form as to produce no absorption of light in space, since any absorption would demand a still smaller radius of curvature and larger mean density.

If no recession is assumed, the observed nebular counts are satisfactorily described by supposing that we are observing a finite portion of a much larger universe of nebulae, but a universe in which the frequency of light varies uniformly with the distance. If, on the other hand, recession is assumed, the observed nebular counts are not satisfactorily described by any of the homogeneous expanding models of general relativity, but if forced to fit require that the universe be closed, that we have already explored it to its outmost bounds with the 100-in. telescope, and that it is a universe dominantly filled with non-luminous matter distributed in such a way as to absorb or scatter negligibly small amounts of light.

The large and appreciative audiences who followed the three lectures, each a model of exposition and clarity, had little difficulty in agreeing with Dr. Hubble that the consequences of assuming no recession were the less difficult to accept.

H. H. P.

## News and Views

Prof. A. N. Talbot

PROF. ARTHUR N. TALBOT, emeritus professor of engineering in the University of Illinois, has been awarded the John Fritz Gold Medal, the highest of American engineering honours. Prof. Talbot, who is seventy-nine years of age, was cited as "moulder of men, eminent consultant on engineering projects, leader of research, and outstanding educator in civil engineering". The award is made annually by a board composed of sixteen past-presidents of the four national societies of civil, mining and metallurgical, mechanical and electrical engineers. Prof. Talbot was born in Cortland, Ill., on October 21, 1857. He has been engaged in engineering work since 1881, his activities embracing railroads, roads, bridges, buildings and municipal public works. Prof. Talbot aided in the development of the testing laboratories and the College of Engineering of the

University of Illinois. He has been active in the formation and development of the Illinois Engineering Experiment Station, in connexion with which he has made numerous investigations in the properties of steel, brick, concrete and reinforced concrete, and in water purification, sewage treatment and hydraulics. Among previous recipients of the John Fritz Gold Medal have been Lord Kelvin, Thomas Edison, Guglielmo Marconi, Elihu Thomson and Sir Robert Hadfield.

Sir Robert Mond

SIR ROBERT MOND has been elected an associate foreign member of the Académie des Inscriptions et Belles Lettres in Paris, in succession to the late King Fuad of Egypt. Sir Robert Mond's wide interests are illustrated by the fact that he is honorary secretary of the Davy Faraday Research Laboratory at the

Royal Institution, chairman of the Norman Lockyer Observatory Corporation, and also president of the Egypt Exploration Society; he is a Messel medallist of the Society of Chemical Industry, a past president of the French Society of Chemical Industry, and he has carried out noteworthy archaeological excavations at Thebes, in Palestine, and in Brittany. The museum at St. Germain has been much enriched as a result of his excavations in Brittany. The Académie des Inscriptions, by its election of Sir Robert as a foreign associate member, has attracted to its service one whose knowledge in many fields can scarcely fail to promote its activities and influence.

#### Prof. A. F. Burstall

DR. AUBREY F. BURSTALL has been elected professor of engineering and dean of the faculty of engineering in the University of Melbourne, Australia. Dr. Burstall is a son of the late Prof. F. W. Burstall, who was professor of mechanical engineering in the University of Birmingham in 1896-1931. Dr. Burstall, who is thirty-four years of age, received his education at King Edward's School (New Street), Birmingham, at the University of Birmingham and at St. John's College, Cambridge. The results of his work on the combustion of various gaseous fuels in the high-speed internal combustion engine were published in a series of papers before the Institution of Automobile Engineers. Dr. Burstall joined in 1925 the staff of Synthetic Ammonia and Nitrates Ltd. at Billingham, which in 1928 became a constituent company of Imperial Chemical Industries Ltd. He held various positions of increasing responsibility on the engineering staff and in 1930 was appointed deputy chief engineer of the Billingham Factory. In 1933 he resigned his position to become technical adviser to the Aluminium Plant and Vessel Company of Wandsworth, London. The Engineering School at the University of Melbourne, to which Dr. Burstall is going, is one of the largest in Australia, the students numbering nearly two hundred. During the last two years of the four year course the undergraduates specialize in either civil, mechanical, mining, electrical or metallurgical engineering before taking their degrees. Dr. Burstall succeeds Prof. Wilfrid Kernot, who is retiring in March at the end of the present academic year.

#### Ernst von Bergmann

ERNST VON BERGMANN, who was one of the most skilful surgeons and commanding personalities in Germany of the last century, was born at Riga on December 16, 1836. He received his medical education at Dorpat, Vienna and Berlin and qualified on November 13, 1860. He commenced his career as assistant in the Dorpat surgical clinic and afterwards served as a medical officer in the Prussian Army in the war with Austria in 1866 and in the Franco-Prussian war in 1870. He was elected professor of surgery at Dorpat in 1871. In 1877, when war broke out between Turkey and Russia, he became consulting surgeon to the Russian Army invading Rumania, and in the treatment of wounds carried out the antiseptic

method just introduced by Lister. His activities as a military surgeon, however, were cut short by a severe attack of dysentery, and in 1878 he was appointed professor of surgery and senior surgeon to the Julius Hospital at Würzburg. He remained there until 1882, when he succeeded Langenbeck in the chair of surgery at Berlin. In 1887 he attended the Emperor Frederick in his last illness, when an unfortunate dispute as to the correct diagnosis and treatment arose between the German surgeon and Morell Mackenzie, the well-known London laryngologist and author of "Frederick the Noble".

VON BERGMANN is best known for his introduction of aseptic surgery, the principles and practice of which he described at the Tenth International Medical Congress held at Berlin in 1890 in conjunction with his assistant C. S. Schimmelbusch, whose work on the subject is a surgical classic. Von Bergmann also made a valuable contribution to the literature of military surgery by his works on injuries to the head and brain and gunshot wounds of the knee-joint. In association with Profs. von Bruns of Tübingen and Mikulicz of Breslau, he edited a handbook of practical surgery, of which the first edition appeared in 1900. He took an active part in the promotion of post-graduate study and was the founder and moving spirit of the Berlin ambulance organization. He was the recipient of many honours both in Germany, where he was given the title of Excellency and made a member of the Prussian House of Lords, and in other countries including England, where he was elected in 1900 an honorary fellow of the Royal College of Surgeons. He died at the age of seventy years on March 25, 1907, and was succeeded in the chair of surgery at Berlin by Prof. August Bier, who celebrated his seventy-fifth birthday on November 24.

#### Alexander Neckham (1157-1227)

IN his Friday evening discourse at the Royal Institution on December 4, Sir Stephen Gaselee discussed "Natural Science in England at the End of the Twelfth Century". It was impossible to survey all the English writers who were treating of natural science about A.D. 1200, but there is fortunately one who was widely read and a good compiler, and at the same time a personal observer of Nature—Alexander Neckham, born in 1157. He was born at St. Albans; afterwards he was headmaster of a school at Dunstable, and also studied in Paris. He later joined the Augustinian Canons at Cirencester, where he spent the rest of his life, becoming their abbot in due course, and died about 1227. He was an author of many and various works: one is called "Of the Natures of Things", and is partly a compilation from Pliny, Solinus and Cassiodorus; but is not without evidence of his own personal investigations. There is continuous moralizing throughout the book; but in natural science he begins with a description of the firmament, the sun, moon and stars; then the four elements; and then starts a survey of the animal world, beginning with