metals in contact with one another produces an electric current which may be measured with a delicate galvanometer; others make use of the change of resistance of fine platinum wire with temperature, so that the amount of current flowing through it is modified by the application of heat; in still others, a delicate radiometer vane is suspended by a fine quartz fiber, and the reaction of the molecules of gas in contact with the vane when it is warmed turn it about its axis away from the direction of the radiant source. All of these types of instruments have been used in recent years with great success by astronomers, especially at the Lowell and Mount Wilson observatories, and the amount of radiated heat has been measured for nearly 150 individual stars. These results are of fundamental importance to all theories of stellar constitution and radiation.

The contribution of the 200-inch telescope to progress in this field will undoubtedly be very great. The surface of the large mirror, nearly 240 square feet in area, will collect and bring within the range of measurement stars at least five to ten times fainter than can be studied at present, and so will multiply the total number many times. It will also make it possible in the case of the brighter stars to extend and make more accurate the skilful work of Abbot in measuring the radiation throughout all parts of the spectrum. Finally, it should enable us to gain a very accurate knowledge of the temperatures of different parts of the lunar and planetary surfaces, and the rate of change of temperature during the planet's day and night. In Russell's phrase, the 200-inch telescope should provide us with a "weather map of Mars," and it is probably on such records rather than on direct observations that speculations regarding the possibility of life on the planets must find a logical basis for discussion.

With all the far-reaching and definite advances in knowledge which we can foresee for this great instrument, the appeal which it makes to the imagination is still one of its most valuable indirect contributions. A few weeks ago a small spiral nebula near one of the poles of the Milky Way was observed with the 100-inch reflector on Mount Wilson. It is very faint and probably one of the most distant objects within the range of present telescopes. It was found to be moving away from the earth at the amazing rate of nearly 2,500 miles a second, nearly double the velocity of any cosmical object so far observed. The possibilities of what the new telescope may discover in these inconceivably remote regions of space, under what strange forms matter may exist in some of the stars it will reveal to us, what it will tell us of the development and motions of the outer universes, and of space and time and gravitation, are all speculations for the future. But they can not fail to stir the mind and imagination, and it is to the trained imagination of scientific men in every generation that science has owed her greatest advances.

WALTER S. ADAMS
MOUNT WILSON OBSERVATORY

SCIENTIFIC EVENTS

MEDALLISTS OF THE ROYAL SOCIETY

AT the anniversary meeting of the Royal Society on November 30, the medals were presented. There is here abridged from *Nature* the descriptions of the work of the medallists, as stated when the medals were conferred by the president of the society, Sir Ernest Rutherford.

THE COPLEY MEDAL TO SIR CHARLES PARSONS

In the world of mechanical engineering the genius of Charles Parsons has opened up a new era. He has originated and developed a new type of thermal engine entirely flexible and adaptable, and capable of high efficiency combined with concentration of power never even imagined before. By continuous practical effort for the past forty-five years, aided by remarkable mathematical insight acquired in his university days, he has perfected the parallel-flow compound steam turbine, and has applied it successfully to electric generation and to marine propulsion, both attaining to an unprecedented scale. While the utilization of heat in the best triple-expansion reciprocating steam engine amounts to 17 per cent. of the whole, the Parsons' large central station turbines now convert 25 per cent. into mechanical power, and in still larger turbines 28 per cent. is anticipated. The first steam turbine of 4 kilowatts was used in 1885 for electric lighting; at present, turbines of 20,000 and 30,000 kilowatts are in operation. The application to marine propulsion was signalized in 1897 by the appearance of the *Turbinia*, a small experimental craft developing the extraordinary speed of 33 knots. Large turbine-driven destroyers for the Navy rapidly followed, and now all large high-speed liners are turbine driven.

THE RUMFORD MEDAL TO PROFESSOR FRIEDRICH PASCHEN

Professor Paschen is especially distinguished for his practical and theoretical contributions to spectroscopy. He early acquired remarkable skill in the investigation of infra-red radiation and made valuable determinations of the distribution of energy in the spectrum of a black body, giving the first experimental proof of the law that the frequency of maximum energy is proportional to the absolute temperature. He afterwards made numerous observations of the infra-red emission spectra of various elements, which were of fundamental importance for the development of our knowledge of series in spectra, and afterwards for the theory of spectra in relation to atomic structure. He has also contributed in a notable degree to the precise measurement and series classification of spectrum lines in general; he has long been one of the foremost workers on the Zeeman effect, and the results which he has obtained, including the discovery of the

well-known Paschen-Back effect, have been invaluable for theoretical discussions.

A ROYAL MEDAL TO PROFESSOR ARTHUR STANLEY EDDINGTON

Professor Eddington's contributions to knowledge within the past ten years have been mainly in connection with the internal constitution of stars and with the generalized theory of relativity. He has formulated a complete theory of the internal structure of a star, assumed to be a non-rotating whirl of atoms and electrons, with radiation gradually forcing its way to the surface; further, he pointed out that the masses of stars, which are found by observation not to vary greatly, ranged about the point where radiation pressure balances gravitation. Later, he obtained a theoretical relation between the mass and absolute luminosity of giant stars. In connection with the theory of relativity, he conducted in 1919 one of the two eclipse expeditions which verified the deflection of light rays. He also developed the theory, to a certain extent on the philosophical side, but considerably on the analytical side, especially with regard to the electromagnetic and gravitational fields.

A ROYAL MEDAL TO DR. ROBERT BROOM

During the course of thirty-three years' search in Australia and South Africa, Dr. Broom has made a very large number of important discoveries in vertebrate paleontology, embryology and morphology that shed new light upon the problems of the origin of mammals, lizards, crocodiles, and birds. His researches represent the most significant contribution made by any one investigator to the determination of the relationships of the main groups of vertebrate animals and to the definition and solution of the problems involved in the evolution of the higher groups.

THE DAVY MEDAL TO PROFESSOR FREDERICK GEORGE DONNAN

Professor Donnan is, like his master, van't Hoff, a man of ideas. Early in his scientific career he wrote on the nature of soap emulsions and on the theory of capillarity and colloidal solutions. His theory of membrane equilibrium and membrane potential is an achievement of the first rank, and has been the starting-point of numerous studies not only in the domain of pure chemistry, but more especially in biochemistry, where the conditions for displaying the phenomena he predicted are often encountered. His researches on surface tension and absorption at liquid-liquid interfaces have led to results of the greatest interest, and his verification by means of nonylic acid of the Gibbs' absorption formula is a most brilliant experimental conception.

THE DARWIN MEDAL TO DR. LEONARD COCKAYNE

A true naturalist, Dr. Cockayne has waited patiently upon facts before drawing conclusions. For more than thirty years he has made it his task to deepen and widen our knowledge of New Zealand botany in the broadest sense. He is one of the foremost living students of plant-association; the taxonomic studies rendered necessary by his ecological results have led to those remarkable discoveries of natural hybrids in New Zealand that have won for him a world-wide reputation and have made on modern thought an impression akin to that produced by the results of Darwin's studies of plants under domestication. Dr. Cockayne's researches have had, on silvicultural and agricultural procedure, a practical bearing which has been appreciated by, and has influenced the policy of, New Zealand statesmen.

THE SYLVESTER MEDAL TO PROFESSOR WILLIAM HENRY YOUNG

Dr. W. H. Young has taken a very prominent part in the development of the modern theory of functions of real variables, and in its application to the theory of Fourier's and other series. His earlier work dealt chiefly with the theory of sets of points, and contains important developments on the lines laid down by G. Cantor and Harnack. He soon proceeded to apply this theory in the integral calculus, and he obtained a general definition of the integral which is essentially equivalent to, although somewhat less simple in form, that given about the same time by H. Lebesgue, which latter has become a cornerstone of modern analysis. Much of Dr. Young's work has proved to be a starting-point for further investigations by other mathematicians. By means of his conception of restricted Fourier's series he was enabled to devise a method by which conditions of convergence, summability, etc., known to hold good for Fourier's series, could be carried over to series of Legendre's and Bessel's functions.

THE HUGHES MEDAL TO M. LE DUC DE BROGLIE

Maurice François César, Duc de Broglie, is distinguished especially for his pioneer researches on X-ray spectra and secondary β-rays. He was one of the first to obtain the complete emission spectrum of X-rays and to study X-ray absorption spectra, while his work on the magnetic spectrum of the β-rays, arising from the passage of X-rays through matter, has proved of great importance. He founded in Paris a private laboratory directed by himself, which is devoted to researches on X-rays and allied subjects.

GRANTS IN SUPPORT OF RESEARCH ON THE EFFECTS OF RADIATIONS UPON ORGANISMS

AT the meeting of the Division of Biology and Agriculture of the National Research Council, held in April, 1928, a group of investigators[1] requested approval by this division of an attempt to obtain funds in support of studies on the "Effects of Radiations upon Organisms."

This project was endorsed by the division and a general committee and a sub-committee on solicitation

[1] These individuals were: Edgar Altenburg, H. J. Bagg, A. F. Blakeslee, W. C. Curtis, A. U. Desjardins, C. Stuart Gager, T. H. Goodspeed, Robert F. Hance, F. B. Hanson, E. E. Just, Henry Laurens, C. C. Little, J. W. Mavor, H. J. Muller, Charles Packard, W. J. Robbins, Herman Schneider, George Sperti, L. J. Stadler, Alexander Weinstein, P. H. Whiting.