Rothamsted Experimental Station

ROTHAMSTED must surely have appeared to most of its scientific visitors as the embodiment of stability, and it has come as a great shock to learn that its historic fields are threatened by the builder. When Lawes in 1889 set up the trust that governs the Station, he did not give the classical experimental fields or the land on which the laboratories stand, but only the use of them for a period of years. After his death it was found impossible to work the experiments without taking on the Home Farm from the family trustees, and this was done in 1911; but some of the highly important fields were let to Rothamsted on a six-monthly arrangement only. Even so, the farm remained awkward and difficult to work, being split into three separate pieces, easy access to which was possible only by courtesy of the estate and the tenant. With the encroachment of the builder a new situation has arisen. The family is proposing to give up possession and to put the whole estate into the market. The situation has been closely examined by the Lawes Agricultural Trust Committee in consultation with the staff of the Ministry of Agriculture, and the conclusion has been reached that Rothamsted must own the land on which it is working. An appeal for £30,000 has therefore been issued over the signatures of an influential group including the Duke of Devonshire; the presidents of the Royal Society, the Royal Agricultural Society, and the National Farmers Union; Lord Clinton, the chairman of the Rothamsted Committee; Sir Daniel Hall, the late director and Sir John Russell, the present director of Rothamsted.

IT is greatly to be hoped that the appeal may succeed. The sum required is not large having regard to the area of land involved (515 acres) and to the fact that the purchase includes also Rothamsted Manor House, a Jacobean mansion, without which, it is understood, the land could not be acquired. Rothamsted has a record of more than ninety years to its credit; its first triumph was the discovery of the value to agriculture of artificial fertilisers, and of the way to make them on the large scale; it was on the Rothamsted fields that they were first tried on the large scale, with the result that the fertiliser manufacturing industry in various countries now has an annual output of some 35–40 million tons. It is not, however, because of past triumphs that Rothamsted deserves to survive. With a staff of some sixty scientific workers, it is an active centre of research on agriculture, soils, fertilisers, plant nutrition, statistical methods in biological science, plant pathology, entomology, and bees, while from its laboratories there has gone forth a steady stream of young men and women to take up high posts in practically all the more important agricultural research institutions in the Empire. Further, agricultural experts from all parts of the world go to work in its laboratories, to study its methods and its results. Its essential characteristics are the spirit of co-operation between the various departments which greatly facilitates border-land work, and the close connexion between field and laboratory, which it is now hoped to put on to a permanently secure basis.

Mr. H. Dennis Taylor

THE council of the Physical Society has awarded the eleventh Duddell Medal to Mr. Harold Dennis Taylor. This medal is given "to persons who have contributed to the advancement of knowledge by the invention or design of scientific instruments, or by the discovery of materials used in their construction". Mr. Taylor has lived and worked in a period which must always be regarded as of the first importance in the development of optical instruments. The work of Abbe and Schott may be said to mark the beginning of the modern period in lens construction. At this time, Dennis Taylor was the optical manager of Thomas Cooke and Sons, of York, a firm celebrated for its astronomical and surveying instruments. Large astronomical refractors of that period suffered from a serious defect, the so-called secondary spectrum, a residual defect remaining when the normal conditions for the removal of chromatic aberrations have been satisfied. Taylor removed this defect by employing three glasses, and with rare skill and insight devised an objective in which not only the purely optical problem was solved, but also the important practical problems of giving accuracy of form to large lenses of different shapes, and allowing for their deformation in use. In these first triple apochromats, the colour correction is so good, and is so successfully combined with the other fine corrections needed, that the same instruments may be used both for visual and for photographic work. A number of large telescopes of this type are in regular use, among them two, of apertures 12½ in. and 12 in., at Cambridge; other 12 in. instruments of this design are in use at Rio de Janeiro and at Kodaikanal in India.

IN 1893 Mr. Taylor took out two patents for photographic lenses, which were later put on the market as the well-known Cooke lenses. In the specifications of these lenses, nothing is more striking than the treatment of the theory which leads to the method of eliminating coma simultaneously with curvature and astigmatism. In later years Mr. Taylor has not lost the skill and originality he displayed in his earlier inventions. Many of these fall outside the field in which physicists are specially interested. Mention should, however, be made of the telescope in which he showed that it is possible to combine a large aperture and a large field of view with freedom from aberrations comparable with that attained in the Cooke lenses. This is undoubtedly an achievement of the first order, and may prove of great value in scientific work. Mr. Taylor has not only made outstanding advances in the construction of lenses, but he has also written a systematic treatise, "A System of Applied Optics", which will enable the physicist of the future to understand the scientific basis on which the art of lens designing rests.

Major John Wesley Powell, 1834–1902

THE centenary occurs on March 24 of the birth of Major John Wesley Powell, the distinguished American explorer, geologist and ethnologist. Born at Mount Morris, New York, of English parents who had emigrated to the United States in 1830, Powell was educated at Illinois and Oberlin College. He served in the army during the Civil War, losing an arm at the battle of Shiloh, and in 1865 became professor of geology in the Illinois Wesleyan University at Bloomington. Two years later he began a series of hazardous and important expeditions to the Rocky Mountains and the Green and Colorado Rivers, which led to a Government geographical and geological survey of the Rockies. Powell served on this for several years and his reports, together with those of F. V. Hayden and G. M. Wheeler, were embodied by Clarence King in the United States Geological Survey bulletins. In 1879 Powell was made director of the United States Bureau of Ethnology, and in 1881, on the resignation of King, he became also director of the Geological Survey. He held the latter post for thirteen years, but retained the former until his death at Haven, Maine, on September 23, 1902. Powell was one of those pioneer geologists of the Far West, who as von Zittel said, "by their vivid portrayal of the work of subaerial denudation . . . roused the intellectual life of the middle of the century to new conceptions on a grand scale".

The Electron in Electrical Engineering

MR. C. C. PATERSON gave on March 15 the Faraday lecture to the Institution of Electrical Engineers, choosing as his subject "The Electrical Engineer and the Free Electron". It was the kind of lecture that one could have imagined Faraday himself to have given, consisting of lucid explanations and practical demonstrations of fundamental principles. Mr. Paterson stated that the science of electrical engineering was born again when the physicist showed how electricity could be liberated from metal. In the free state it has potentialities of which no one dreamed before its discovery by Sir J. J. Thomson. Just as physiologists learned that disease can be envisaged in terms of isolated germs and their life-history, so the physicist found that electricity can be thought of in terms of the individual electron, its habits and affinities. Two of the main reasons for the practical usefulness of electricity are the ease with which it can be transported and the ease with which it can be controlled. In the latter respect the free electron has now given the engineer new and extraordinary power. Many applications have been already revolutionised and there are doubtless many more surprises in the future. The secret is that a stream of free electrons, whether in a vacuum or a gas, can be manipulated with such facility that the electrical energy output can be reversed at the rate of millions of times a second. Alternatively, it can be made to fluctuate at any given slow speed. While the agency which imposes this control on the electron stream is usually itself electrical, it is possible to control it by light, magnetism or heat.

NORMALLY the electrons are confined within metal conductors. When a portion of a circuit (a thermionic valve cathode or filament) is heated, electrons emerge freely, like water pouring through a porous section of hose pipe. Heat is the agent which liberates the electrons from the interior of the wire. They swarm in a thin layer round the outside surface, ready to be attracted away by externally applied electrical forces exerted by another metal electrode. As the electrons travel between the electrodes, the control causes them to flow or ebb, reverse or oscillate. Frequencies up to 3,000 million per second are attainable. The photoelectric cell is another liberator of electrons. In this case they emerge from a sensitised cold surface (cathode) where light falls on it, and are collected on the anode. These cells are capable of receiving more than 300,000 impulses per second. Mr. Paterson explained and demonstrated the way in which sound and speech are reproduced in various devices. He said that the electron often behaves as if it were a solid particle, but under other conditions it appears to be a group of waves. It acts the same whether it has the particle or the wave characteristics. In free space it acts like waves, but when it collides with something it has particle characteristics. The filament of the incandescent lamp causes the electrons to crowd together and this heats it so much that it gives out light. If the electrons escape from the filament its light-giving properties deteriorate, but if the gas envelope is filled with suitable gas mixtures, the escaping electrons collide with the gas atoms and produce a brilliant and highly efficient light source. This is the principle utilised in luminous gas discharge tubes. Cold cathode tubes need a high voltage to induce the electron stream, but a hot cathode produces a much more copious stream and enhances the brightness of the light. Some of these luminous tubes produce twice as much light as an ordinary filament lamp taking the same power.

Excavations at Ur

OWING to the late date at which excavations were resumed at Ur this year, Dr. C. L. Woolley's first report on the season's work has only just been received and is published in the *Times* of March 16. The operations of the joint expedition this year are to be directed to the exploration of a cemetery of the Jemdet Nasr period of about 4,000 B.C., which lies at a depth of 54 ft. below the surface and involves the removal of about 5,000 tons of accumulated rubbish. The three weeks' work which had been completed at the time Dr. Woolley wrote has produced a remarkable example of sculpture in the round in the form of a woman's figure in alabaster with lapis lazuli inlay forming a fillet outlining the face, lapis lazuli and shell eyes, bituminous inlay for the eyebrows, which meet above the nose, and hair in dark paint. The statue is ten inches high. It is not only the earliest known example of sculpture in the round at Ur, dating from about the last quarter of the fourth millennium, but it is also remarkable as being the first statue to be found in a grave. It lay in a soldier's grave, close to his head and touching the blade of a bronze axe which he carried over his shoulder. This grave is situated in what would appear to have been a military cemetery in the latter