He obtained the Ph.D. degree from the California Institute of Technology in 1925 and then spent two years in Germany as a National Research Fellow at Göttingen and Munich. He joined the Mathematics Department of the California Institute of Technology as an assistant professor of mathematics for the period 1927–29.

During 1929–47 he was at Princeton University, occupying successively the posts of assistant professor, associate professor and professor of mathematical physics. In 1947 he returned to the California Institute of Technology as professor of mathematical physics, a post he held until his death.

Although Robertson devoted most of his scientific efforts to the general theory of relativity and to its application to cosmological problems, he was interested in the foundation of physical theories and the application of various branches of abstract mathematics to physical problems. His excellent translation of Herman Weyl's *The Theory of Groups and Quantum Mechanics*, which he completed in 1931, demonstrates his profound knowledge of the theory of groups, quantum mechanics and the relationship existing between these two subjects.

He was a master in applying the theory of groups of motion of Riemannian spaces to problems in relativity. His 1933 paper entitled "Relativistic Cosmology", which appeared in the *Reviews of Modern Physics*, illustrates his use of the technique. In this classic paper he summarizes his own basic work and that of others on the consequences of the symmetry assumptions made in relativistic cosmology and relates these to the astronomical observations. He afterwards studied the implications of the symmetry assumptions alone, divorcing these from the Einstein field equations. The latter work was stimulated by the lively controversy over kinematical relativity, in which he and E. A. Milne engaged, and appeared in three papers and in the *Astrophysical Journal* (1935, 1936) entitled "Kinematics and World Structure".

Robertson's contributions to relativity should not be measured only by his own papers. He engaged in extensive discussions with, and participated in the work of, others. His aid is acknowledged by many authors; in particular, he played an important part in the work of Einstein, Infeld and Hoffmann on the equations of motion of singularities in the gravitational fields and published his solution of the equations for two bodies with comparable masses obtained by these authors.

In 1939 Robertson responded to a call from his friend and mentor, R. C. Tolman, and began his work on scientific problems important to United States military agencies. He stopped his intensive work in relativity, which was just coming to fruition, and answered to the demands made on him with characteristic vigour. He quickly produced a scholarly review of work in terminal ballistics and made contributions to this field. He took an active part in organizing the group that became Division II of the National Defense Research Committee and in directing the early work of this group.

He served with the National Defense Research Committee from 1940 until 1943 and as scientific liaison officer, London Mission, Office of Scientific Research and Development, during 1943–46. From 1944 until 1947 he was an expert consultant to the Office of the Secretary of War. In 1945 he was chief of the Scientific Intelligence Advisory Section of Supreme Headquarters, Allied Expeditionary Force in France. For his war service he received the United States Medal of Merit.

In 1950 he was called back to Washington and served for two years as deputy director and research director of the Weapons Systems Evaluation Group of the Department of Defense until 1952. During 1954–56 he was the scientific adviser to General A. M. Gruenther, the then Supreme Allied Commander in Europe. For four years beginning in 1956 he was member at large and chairman of the Defense Science Board. He was also a member of the President's Scientific Advisory Committee.

In addition to belonging to a number of scientific societies, Robertson was a member of the U.S. National Academy of Sciences, of which he was foreign secretary from 1958 until his death.

Although Robertson never lost his interest in working in the theory of relativity and in teaching this subject, his many Washington duties to which he gave himself unstintingly made it impossible for him to do more than publish a few papers after the Second World War. In some of these he again reviewed the theoretical and observational state of the theory of cosmology. He was much interested in the possibilities of using satellites for experimental tests of theories of gravitation and took part in organizing, and was chairman of, a conference on this subject in July last at Stanford University.

This review of some of Prof. Robertson's achievements and activities must of necessity omit much that should be said about him. Suffice it to say that he made his mark in science, in service to his country, and in the hearts of the many people from all walks of life who were privileged to know him.

A. H. TAUB

Mr. Lewis Eynon

THE news of the death on October 18 at the home of his son at Stoke Bishop, Bristol, of Lewis Eynon will sadden his friends in many countries. The sugar industry has lost a most experienced analyst, who further had done so much to help the analytical profession. Eynon was born in 1878 at Stoke Newington and was educated at the City of London School. On leaving there he became a student at Finsbury Technical College during 1895–99 under Prof. Meldola. He was then appointed a chemist to the Beetroot Sugar Association. Another Finsbury student, J. H. Lane, was also there with him, and the two became partners in 1910 as consulting chemists. Having acquired the laboratories from the Sugar Association of London, as it had then become, and also the business of the analysis of its sugar samples, they had spare time which they used for research on sugar, chiefly on improvement of methods of sugar analysis. Their long search for a sensitive internal indicator for use with Fehling's solution for testing reducing sugars eventually led them to methylene blue. The result was the Land and Eynon method which has become well known throughout the sugar world. It has eventually been accepted as an official method by many countries and also by the International Commission.

Eynon obtained many qualifications and held many important offices among the various professional bodies to which he belonged. In 1900 he gained the associateship of the Royal Institute of Chemistry and was elected to the fellowship in 1903. A year later he graduated B.Sc. at the University of London with honours in chemistry. For many of the years between

1920 and 1949 he served on the Council of the Royal Institute of Chemistry, and during 1930 he was a vice-president. An early member of the Society of Public Analysts (later the Society for Analytical Chemistry) he served on the Council, was honorary secretary during 1936–47 and president during 1947–49. He attended the meeting of the eighth session of the International Commission for Uniform Methods of Sugar Analysis, held in 1932 at Amsterdam, and was elected honorary secretary, in which position he remained until the end of the ninth session in London in 1936. He was also chairman of the Publication Committee, responsible for the production of the *Proceedings* for the eighth, ninth, and tenth sessions. In 1932 he became honorary secretary of the newly formed British National Committee of the Commission, which position he relinquished in 1948 to become chairman. This post he held until 1954. The same year in Paris at the eleventh session of the Commission he was unanimously elected life honorary vice-president "in grateful recognition of his extensive and valuable services to the work of the Commission and for his distinguished contributions to the literature and practice of sugar analysis".

At the end of more than sixty years of a very busy life, he was still the same gentle-mannered man, a very kindly character, unassuming and loved by all who knew him; his many friends could count on the encouragement and help that was always forthcoming.

H. C. S. de Whalley

NEWS and VIEWS

Nobel Prize for Physics:

Prof. Robert Hofstadter

Prof. Robert Hofstadter, who shares the Nobel Prize for Physics with Prof. R. L. Mössbauer, was born on February 5, 1915; he received the bachelor of science degree from the City College of New York in 1935, and his Ph.D. from Princeton in 1930. He then taught and carried out research at Princeton, Pennsylvania, and the City College of New York until the war years, during which he worked at the National Bureau of Standards and the Norden Laboratory Corporation. For four years after the War he was assistant professor at Princeton, but in 1950 he went to Stanford as associate professor, becoming professor in 1954, and eventually head of the department. Prof. Hofstadter is best known for his use of high-energy (roughly 1 BeV.) electron beams to probe the structure of nucleons. A knowledge of the form of the meson clouds surrounding the proton and neutron has been at the foundation of important recent developments in quantum field theory. It is not possible to give an adequate idea of this work in a short space; but the success of his work is perhaps best illustrated by the discussion it provoked in the United States of the feasibility of constructing an electron accelerator of still higher energy.

Prof. R. L. Mössbauer

The early recognition of the importance of Prof. R. L. Mössbauer's work by a share of the Nobel Prize for Physics will give great satisfaction to all physicists. The recognition might have been even earlier if Prof. Mössbauer's work, carried out at the Max Planck-Institut at Heidelberg in 1957, had not passed strangely unnoticed for nearly two years. The discovery of what is now called the 'Mössbauer effect' is concerned with the spectrum of the γ-rays which are emitted by certain excited nuclei. It has been known for many years that the nuclear levels in many cases are extremely sharp, but considering the problems of nuclear recoil and lattice vibrations which introduce Doppler shifts, physicists had resigned themselves to the conclusion that the very narrow γ-ray lines which exist in principle would remain for ever inaccessible. Mössbauer's achievement lies in recognizing that in certain specific cases, appreciable fractions of the γ-rays may be emitted undisturbed by recoil or lattice vibrations. The imaginative achievement is the more remarkable when one considers that the theory underlying the effect has been known for twenty years, but the relevant inferences had not been drawn. The first spate of new results obtained by making use of the Mössbauer effect in experiments to test the predictions of relativity theory, to investigate the properties of the solid state, the nature of magnetism and the properties of some nuclear excited states has now subsided, but there can be no doubt that the application of the discovery will continue to be a subtle tool in all branches of science.

Nobel Prize for Chemistry :

Prof. M. Calvin, For.Mem.R.S.

Prof. M. Calvin, who has been awarded the Nobel Prize for Chemistry for 1961, took his doctorate at the University of Minnesota and afterwards spent two years at the University of Manchester with the aid of a Rockefeller Grant. In 1937 Prof. Calvin joined the staff of the University of California. Discovery of the long-lived isotope carbon-14 during the War (prior to which only the short-life isotope carbon-11 had been available) provided an opportunity for a comprehensive study of the intermediates of photosynthesis which was immediately realized by Prof. Calvin. Success came when the isotope technique was combined with the then recently discovered paper chromatographic method of analysis. In work with A. A. Benson and later others, the first product of the photosynthetic fixation of carbon dioxide was shown to be phosphoglyceric acid and for the first time the importance of the pentose and heptulose phosphates in photosynthesis was realized. Calvin postulated a sequence of reactions constituting the 'photosynthetic cycle' in which these compounds formed a synthetic cycle for the incorporation of carbon dioxide. About the same time essentially the same reactions were shown to play an important part in the respiratory process (the pentose phosphate shunt) not only of plants but also of animals. The interests of Prof. Calvin's group have now moved towards the investigation of the basic mechanism by which light energy is converted into chemical energy in the chloroplast of the green plant. Attempts have been made to devise model systems in which light energy can be converted to chemical energy with high efficiency, thus necessitating an extension of the earlier studies of the photochemistry of dyes. Prof. Calvin was elected a foreign member of the Royal Society in 1959.