on enzyme synthesis, explains his statement[46] that RNA inhibitors do not affect memory within the first few hours[49], but do inhibit the storage of memory[50].

Mental disorders may bear a relation to the postulated impulse transfer system, since a close correlation seems to exist between water and ion metabolism on one hand and especially the manic-depressive psychosis on the other (for example, ref. 51). The transient nature of this disease is in agreement with the influence exerted on the neuroglial impulse transmission system, for example by the hormonal balance and the local electrolyte concentration.

On the whole the flexibility of the proposed system within certain limits seems to represent its major advantage for transfer of impulses in the central nervous system. It provides a physiological basis of giving external stimuli an integrated response, which is dependent on heredity (anatomical arrangement), previous experience (enzyme induction), simultaneous or immediately preceding activity in neighbouring areas (local concentrations of potassium) and the total state of the individual (hormonal balance, drug effects). It is in agreement with this point of view that the potassium induced stimulation and spreading depression—both of which represent the suggested impulse transmission system—are limited to the highest developed parts of the central nervous system.

This work was supported by a research grant from the National Institutes of Health, U.S. Public Health Service, and by grants from the Danish Foundation for the Advancement of Medical Science, the Danish State Research Foundation and the Reinholdt W. Jorck Foundation.

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OBITUARIES

Sir Edward Appleton, G.B.E., K.C.B., F.R.S.

THE world of science and education was shocked at the news of the sudden death on April 21, at his home in Edinburgh, of Sir Edward Appleton, one of the world's most eminent scientists, a professor and lecturer of outstanding repute, a Nobel prizewinner, head of a civil service department and, later, principal and vice-chancellor of the University of Edinburgh.

Edward Victor Appleton was born in Bradford, Yorkshire, on September 6, 1892. He was an enthusiastic games player in his youth, and one of his early ambitions was to become a professional cricketer. However, a scholarship took him to St. John's College, University of Cambridge, where he graduated in physics, gaining the Natural Science Tripos Parts I and II in 1913 and 1914. In the First World War he served first in the West Riding Regiment, and later became a captain in the Royal Engineers where his interest in wireless signalling was aroused. Appleton returned to Cambridge in 1919 as a Fellow of St. John's, and later became assistant demonstrator in experimental physics in the Cavendish Laboratory under Lord Rutherford.

After investigating some of the properties of thermionic valves, which had first been applied and developed during the War, he investigated the reception of atmospherics and the fading of wireless signals, thereby laying the foundations of his well-known researches on the propagation of wireless waves. Although in 1901 Marconi transmitted wireless signals across the Atlantic Ocean, and around the curved surface of the Earth, and in 1902, Oliver Heaviside and A. E. Kennelly had independently suggested that an electrified layer in the upper atmosphere would act as a reflector of electromagnetic waves, it remained for Appleton to provide the experimental proof of such reflexion in December 1924.

The first experiments were made by arranging for the British Broadcasting Corporation to vary the frequency—or wave-length—of its Bournemouth broadcasting transmitter while the strength of the received signal was recorded at Cambridge. The resulting interference fringes indicated the reception of both a direct wave along the ground and of an indirect wave reflected from the upper atmosphere. Later, measurements were made with a transmitter at the National Physical Laboratory, Teddington, which could be either frequency-modulated or arranged to emit pulses of radio waves over a selected range of frequencies. Systematic measurements made in this way soon demonstrated the existence of a second reflecting region, sometimes termed the Appleton layer by analogy with the first or Kennelly–Heaviside layer. In this way was initiated the investigation of the ionosphere on a world-wide scale, which grew to such an extent

that during the International Geophysical Year of 1957–58, some sixty-six nations at more than a thousand observatories were making detailed measurements of the electrical properties of the upper atmosphere.

All this research work was carried out while Appleton held the chairs of Wheatstone professor of experimental physics in King's College, University of London, during 1924–36, and later Jacksonian professor of natural philosophy in the University of Cambridge during 1936–39. During this period of fifteen years he demonstrated his great ability as a remarkably clear lecturer, and as a stimulating leader of many research students, who have since carried on in the same tradition both in Great Britain and in many other parts of the world.

In 1939, Appleton was called to the service of H.M. Government and, for the next ten years and during the critical and strenuous period of the Second World War, he was secretary of the Department of Scientific and Industrial Research. In this position he was responsible for the many laboratories and industrial research organizations covering a very wide field of science and technology. His public services during this period were recognized by the awards of K.C.B. in 1941 and G.B.E. in 1946, and world recognition of his scientific work was given by his being awarded the Nobel Prize for Physics in 1947. Having demonstrated his unusual administrative ability, combined with penetrating scientific insight and a natural shrewdness in practical matters, he was appointed in 1949 principal and vice-chancellor of the University of Edinburgh—a post he held with conspicuous success until his untimely death. It was as a result of his proposal that the Duke of Edinburgh was elected chancellor of the University in 1952.

Reverting to Sir Edward's more directly scientific work, it was perhaps natural that the investigation of the properties of the ionosphere as a reflector of radio waves would bring him into close contact with similar research in other countries. The investigation both of radio wave propagation, and of atmospheric disturbances originating in lightning discharges was closely concerned with the work of the International Scientific Radio Union, known among radio scientists throughout the world as U.R.S.I. Appleton was president of the Union during the period 1938–54; and both before and after this had been chairman of several of its commissions dealing with scientific research on radio wave propagation by way of both the ionosphere and troposphere, and with the origin of atmospheric disturbances and their effect on radio reception conditions in all parts of the world. He was a notable exponent of international research in these fields in his presidential addresses and lectures to the general assemblies of the Union in Australia, the United States, as well as in various European countries. He was very active in promoting the long-period investigation of ionospheric conditions and their variation over the eleven-year sunspot cycle.

Appleton was one of the most enthusiastic leaders in promoting the programme of the second International Polar Year of 1932–33, which was organized fifty years after the first, and during which radio wave technique was available for the first time to explore the physical conditions in our atmosphere. He is well remembered by the staff of the Radio Research Station at Slough as leading the group which set up the ionospheric recording station at Tromsö. It was there that, for the first time, the properties of the ionosphere within arctic regions were examined by radio wave technique. Twenty-five years later, as chairman of the U.R.S.I. committee of the International Geophysical Year (1957–58), he was again instrumental in sponsoring international collaboration in a very comprehensive and more advanced investigation of conditions in the ionosphere during a period of sunspot activity which—in the event—proved to be the highest recorded during the previous two hundred years of systematic observations.

In all this work, during some of which he was the eminent university professor, Sir Edward Appleton demonstrated his great ability not only as a leader in original scientific research, but also as an inspiration, guide and wise counsellor to all the many younger physicists who were encouraged by his example to follow a career in radio research. Many of the students who graduated under him, and others who came from overseas to do post-graduate work with him, are to be found to-day in leading positions throughout the world, and he is acknowledged by them all to have been the greatest pioneer of international scientific radio research.

R. L. SMITH-ROSE

FROM 1949 Sir Edward Appleton was principal and vice-chancellor of the University of Edinburgh, during the whole of which time he carried a vast burden of administrative responsibility. The changes at the University during his period of office have been extensive and profound. Probably the most significant for the long-range development of the University was the beginning of the great building programme in the George Square area. To-day, the David Hume Tower is already functioning on that site, as the centre of a complex of buildings serving the Faculties of Arts and Social Sciences. A large first-year science building is rapidly approaching completion on an adjoining site and the first phase in the creation of a modern University Library has begun on another side of the Square. In a University in which a geographical split was unfortunately inherited from past planners, it required bold and firm decisions to determine this pattern of growth, and it is undoubtedly due to Sir Edward Appleton's qualities of vision and determination that, despite strong opposition from some, the George Square development is becoming a reality.

In the past few years in Edinburgh, as elsewhere, problems of increased intake of students and the need to adapt to new patterns of education have loomed large. Though it was natural that the development of departments of pure and applied science was dear to Sir Edward's heart, he stood far above any suspicion of favouritism, and tributes to his deep sense of justice are now heard from members of all faculties.

Constitutional reform in Edinburgh and the other Scottish universities is another topic which exercised Sir Edward extensively of late, and active discussion of these questions with the Principal are among the most recent memories shared by a wide section of the academic staff. Whatever solution to these problems emerges in the future, Sir Edward's role in reaching it will have been of great importance.

The student body, the staff, the office staff and University students down to the humblest have an abundance of vivid and warm personal memories of Sir Edward. For the scientists among us, one special memory will always be Sir Edward's delight on so many occasions to return, however briefly, to exchanges of ideas on the physics of the atmosphere. It was a source of wonder to all that he continued to find time to work in this field in between all his other duties.

N. KEMMER

Prof. Alexander Forbes

PHYSIOLOGISTS of every country will miss the familiar figure of Alexander Forbes, emeritus professor of physiology in the Harvard Medical School, who died after a short illness on March 27. He was eighty-two but had been as vigorous as ever, and his deafness, dating from an early age, was certainly no worse.

He was a member of a well-known New England family, was born in 1882 and lived and died at Milton, Massachusetts. He graduated at Harvard, took the degree of M.D. in 1910 and spent a short time as a research student with Prof. Cannon in the Department of Physio-