

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 Tromsø. 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-

logy at the Medical School. After his marriage in that year he came to England to work with Sherrington, who was then professor of physiology in the University of Liverpool. Forbes had already decided to make the nervous system his chief interest, and his year with Sherrington reinforced this decision. It led to a paper read before the Royal Society in May 1912 on "Reflex Rhythm Induced by Concurrent Excitation and Inhibition", in which he stated his intention of turning to electrical methods of recording to obtain more definite evidence.

He returned to Harvard in 1912 to carry out this intention. As instructor at the Medical School he began the "Electrical Studies on Mammalian Reflexes", which were published as a series with various collaborators during the twenties. These investigations covered a variety of problems and continued for many years under various titles as his major contribution to physiology.

During the First World War, Forbes served in the U.S. Navy and was occupied with radio direction-finding apparatus. His familiarity with the new radio techniques

was put to good use when he returned to Harvard and his laboratory, for he was one of the first to construct an amplifier for recording bio-electric currents. The string galvanometer which was used for recording was, in fact, too sensitive and easily damaged: it soon gave way to more robust instruments when amplifiers came into general use; but Forbes preferred it for some of his problems, and in his hands it could be trusted to give reliable data.

Forbes held the post of assistant professor in the Harvard Medical School during 1921-36, professor during 1936-48 and emeritus thereafter. His many papers on reflex action and on nerve conduction always dealt clearly with important problems, and until recently he was still engaged in researches on colour vision. But although his devotion to science came first, his talents and interests covered a very wide field. He enjoyed skating, sailing, flying his seaplane and mapping northern waters, and he never allowed his deafness to cut him off from his many friends, on both sides of the Atlantic.

ADRIAN

NEWS and VIEWS

Sir Henry Dale, O.M., G.B.E., F.R.S.

SIR HENRY DALE celebrated his ninetieth birthday on June 9. Prof. W. S. Feldberg, C.B.E., F.R.S., of the National Institute for Medical Research, one of his younger colleagues, writes as follows:

"Sir Henry Dale is regarded—as Lord Adrian expressed it ten years ago—by physiologists in every part of the world with the affectionate veneration we reserve for our greatest masters. We marvel at his scientific achievements, at his wide grasp of the whole range of physiology, pharmacology, biochemistry, chemistry and clinical science, at the clarity of his ideas and style, and we are grateful also for the stand he has taken for the freedom of science whenever and wherever in the world it was threatened. Many of his finest papers were written about half a century ago, yet the influence they still exert on present-day problems is astonishing. Often these papers contain the seed, hidden from his contemporaries; it seems to us now, of the progress now being made. There are his papers on ergot in 1906, on sympathomimetic amines with Barger in 1910, on histamine with Laidlaw in 1911 and with Richards in 1918, on anaphylaxis in 1914, on acetylcholine in 1914, and the later classics on the isolation of histamine as well as acetylcholine in animal tissues, and on chemical transmission of nerve effects. Words now in present use—such as sympathomimetic, cholinergic, adrenergic or cholinceptive, were coined by him. But Sir Henry, who ceased being actively engaged in research for the past twenty-five years, lives with the scientists of to-day, not through his past achievements alone. Most impressive is the grip he has on any problems related to his previous work that turn up, for example, at meetings of the Physiological or Pharmacological Societies. His discussion remarks at these meetings are most penetrating and often initiate new series of experiments by those who have given papers. His introductory speeches and closing remarks at international symposia are eagerly awaited by participants, as they often clarify and reveal more than do the individual contributions, where we stand and what has still to be done.

"No wonder that Sir Henry's outstanding achievements and far-reaching influence in research have found national and international recognition. In 1943 he received the Knight Grand Cross Order of the British Empire, and in 1944 he was awarded the highest honour that the King had at his disposal—that of the Order of Merit. He is

one of the few who can pride himself on having received two Orders of Merit, as he also received the *Pour le Mérite* from the Bundesrepublik of Germany. And Belgium honoured him with the *Grand Croix de l'ordre de la Couronne*. He has been president of the Royal Society, and the Nobel Prize Committee honoured itself by selecting him, together with Loewi, for one of its laureates. Long is the list of honorary membership of foreign scientific societies and academies, and more than twenty universities have awarded him honorary degrees. There is no other way to deal with a great man—but to love him; and this precious feeling Sir Henry can be assured is extended to him by his younger colleagues".

Institute of Animal Physiology, Babraham

Sir John Gaddum, F.R.S.

SIR JOHN GADDUM, who retired from his post as director of the Institute of Animal Physiology at the end of last year, had formerly held chairs in pharmacology in Cairo, in London and, for sixteen years, in Edinburgh. He joined the Wellcome Laboratories in 1925 and later worked in the National Institute for Medical Research. In 1958, when he accepted the invitation of the Agricultural Research Council to become director of the Institute at Babraham, Cambridge, he left Edinburgh and returned to the town of his undergraduate years. The most acute problem facing him on arrival was the filling of the posts of heads of Departments, all of whom had reached retiring age. This was achieved remarkably rapidly, and so was the challenge to the former professor of pharmacology to familiarize himself with new problems, such as ruminant physiology and pathology, and the economics of animal husbandry. He did this with great enthusiasm, visiting agricultural centres all over the world, and yet finding time to lead a small group of young scientists in the search for biologically active substances in brain tissue, and to do some of the experimental work himself. The appointment of new heads of Departments and the addition to the Institute of a small Pharmacology Unit naturally led to an increase in scientific and technical staff and to intensified demand for adequate accommodation for the workers and their increasingly bulky equipment. Much of Sir John's time was therefore spent on the planning of new buildings, and it was sad that, at his retirement, forced on him by ill-health in December 1964, all he was able to see of these new buildings was a series of excavations disfiguring the Institute site. During