OBITUARIES

Prof. H. U. Sverdrup

HARALD ULRIK SVERDRUP, who died very suddenly on August 21, was born in November 1888. He was a relative of Otto Sverdrup, who had been Nansen's captain on the *Fram* and who was himself the discoverer of a great fjord region west of Ellesmere Land.

Sverdrup became assistant to Prof. Bjerknes in Oslo in 1911, but during 1913–17 studied in Leipzig. From 1917 until 1925 he was leader of research on the *Maud* Expedition led by Roald Amundsen and during this period obtained an intimate knowledge of the Arctic. He was appointed a Research Fellow at the Carnegie Institution of Magnetic Research in 1922. From 1926 until 1931 he was professor of meteorology in the Geophysical Institute in Bergen. In 1931, when Sir Hubert Wilkins planned an expedition towards the North Pole in the submarine *Nautilus*, Sverdrup gave him full support. Unfortunately, apart from dives at the edge of the sea ice, Wilkins was never able to carry out his plans and the submarine was scuttled off Bergen in November of that same year. In 1934 Sverdrup took part in an expedition to North West Spitsbergen, with his close friend, Prof. H. W. Ahlmann, to study heat exchange between the atmosphere and the snow surface in these high latitudes. Sverdrup was appointed director of the Scripps Institution of Oceanography in California and was professor in the University of California during 1936–48. He was invited to become director of the Norwegian Polar Institute in 1948 and in 1949 became professor of geophysics in the University of Oslo.

H. U. Sverdrup's career was quite unusual, and there is no one else who has ever combined a special knowledge of mathematics and physics with familiarity in the field with problems both in the Antarctic and in the Arctic. He is known to a very large number as one of the three authors, the others being Martin W. Johnson and R. H. Fleming, of "The Oceans", published in 1942, which will long remain the most extensive text-book on oceanography. He is equally well known, however, to the smaller number who have been associated with him in polar science. Sverdrup was responsible for the home control of the Norwegian–British–Swedish Expedition to Queen Maud Land in 1949–52, and himself visited Maudheim in January 1951. His polar knowledge was extremely varied. Anyone anxious to obtain information, for example, on sea ice would rely very largely on Sverdrup's opinion, and his views on this subject were invaluable at the time that the Royal Society's Expedition to Halley Bay was under consideration. This, however, was only one of the many fields of rare and unusual knowledge which he covered and which have made him unique among explorers.

J. M. WORDIE

Prof. W. N. Benson, F.R.S.

WITH the death on August 20 of emeritus professor W. N. Benson, of the University of Otago, New Zealand has lost the doyen of her geologists. He passed away after a brief illness, although his general health had given concern for some time.

William Noël Benson was born near London on December 26, 1885, the son of an Australian shipping manager. He was educated at the Friends' High School in Hobart and later at the University of Hobart and the University of Sydney, where he came under the influence of the inspiring personality and teaching of Sir Edgeworth David. While still at Sydney, and before even graduating B.Sc. in 1907, he published a paper on the contact aureole of a granitic body. This early irruption into the field of original inquiry initiated a career that was always devoted primarily to research. The topics he investigated were to involve work in virtually all the geological sciences, though he made especially significant contributions on the interplay of tectonics and magmatism. His work was followed with extraordinary energy, enthusiasm and persistence. All his former students will remember his well-loved figure forging ahead in front of panting field-parties, and in his office, when too tired for other work he would turn to drafting maps and block diagrams, an occupation which, he maintained, did not require great mental effort. He handled a very heavy teaching load, being professor of geology in the University of Otago without any assistant during 1916–26 and with only one assistant (F. J. Turner) for all but three of the remaining years before he retired from active teaching at the end of 1949.

In 1908 Benson acted for a year as lecturer in mineralogy and petrology in the University of Adelaide. Three papers followed, two of them on petrological problems and one on the fault-block structure of the Mt. Lofty Ranges. Back in Sydney during 1909–11 as demonstrator in petrology, he began his classic study of the geology and petrology of the Great Serpentine Belt of New South Wales, which he continued first as 1851 Science Research Scholar at Cambridge under Harker, Bonney and Marr (1911–13), and later (1914–16) as Research Fellow and lecturer in Sydney. The resulting long series of papers culminated in two notable publications that appeared after his appointment to Otago—"The Origin of Serpentine" (1918) and "Tectonic Conditions accompanying the Intrusion of Basic and Ultrabasic Igneous Rocks" (*Mem. U.S. Nat. Acad. Sci.*, 1926).

In Dunedin, he quickly turned his attention to problems of New Zealand geology as well as its relation to the south-west Pacific as a whole. He carried out important researches on New Zealand's then little-known Ordovician rocks and on their graptolite faunas. His geomorphic observations in Fiordland and in the Dunedin district led to the important concept of both a Cretaceous peneplain in the South Island, and a late Cainozoic erosion surface truncating it and later sediments. He also showed that the so-called block mountains of eastern Otago are essentially fault-folds of more or less Saxonian type. His last major discovery was that of the first Cambrian rocks to be found in New Zealand, a brief account of which was published shortly before his death. Benson's major work in New Zealand, however, was undoubtedly his long and detailed study of the late Cainozoic East Otago Petrographic Province. Numerous papers on this and on related topics have already appeared, but a comprehensive memoir is still to be published. Progressive crustal movements are shown to have occurred during the

eruption of repeated differentiation cycles of basic and alkaline volcanic rocks.

During his life-time Benson received many honours. He was a foundation Fellow of the Australian and New Zealand Association for the Advancement of Science, and its Mueller Medallist (1951); Fellow of the New Zealand Institute, later Royal Society of New Zealand (1926); Hector medallist (1933), Hutton medallist (1944) and president (1945–47) of the same Society; Lyell medallist of the Geological Society (1939); Fellow of the Royal Society (1941); Clarke medallist of the Royal Society of New South Wales (1945); correspondent of the Geological Society of America (1949); honorary D.Sc., University of New Zealand (1951), and honorary member of the Mineralogical Society (1954).

Benson looked upon himself as a geological child of Sir Edgeworth David, and he always spoke of his old chief with the greatest reverence and affection. There is now another geological family, that of W. N. Benson himself, whose members are spread throughout the world. He has left them—and science as a whole—well over a hundred published memoirs, papers and notes recording his researches and his scientific philosophy, written in his own characteristic style. Above all he has left them the memory of himself, which lives on in the ever-widening circle of his geological descendants.

He is survived by his wife, formerly Miss Helen Rawson, who was professor of home science in the University of Otago at the time of their marriage in 1923.

D. S. COOMBS

Dr. Charles Todd, O.B.E., F.R.S.

CHARLES TODD died at Croydon on September 22. He was born in 1869, coming of farming stock in Cumberland. After ill-health as a small boy, he received an education, mainly classical, at Carlisle Grammar School, but succeeded in obtaining an open scholarship in physics and chemistry at Clare College, Cambridge, in 1888. In due course he obtained a Class I in the Natural Science Tripos, proceeding to St. Bartholomew's Hospital with an open scholarship and qualifying in 1894. After several clinical appointments he became interested in public health problems while working at the London Fever Hospital. In 1900 he became assistant bacteriologist to the serum department of the Lister (then Jenner) Institute and worked on antitoxins with George Dean and later G. F. Petrie. Here he demonstrated the existence of a toxin produced by Shiga dysentery bacilli. He went to Egypt in 1904 to help to make antisera against cattle plague, of which there was a serious outbreak there. This led to an appointment as bacteriologist and afterwards director of the Hygienic Institute in Cairo, and he finally spent twenty-one years in Egypt. In 1906 he was investigating scorpion venom and found out how to make an antiserum. But cattle plague remained a major interest and he made valuable contributions to our knowledge of the disease.

His most important scientific work arose incidentally out of this, for, with R. G. White, he found that cattle repeatedly injected with virulent blood developed isolysins in their sera. The cellular individuality of cattle thus came to light: and Todd and White showed that with suitably absorbed sera the blood cells of any individual could be distinguished from those of any other.

In 1925 Todd left Egypt, having worked on many aspects of public health and received many honours. In 1926 he was given a research grant to work at the National Institute for Medical Research at Hampstead. Here he continued his studies on cellular individuality, now using fowls, in which isohæmagglutinins were readily produced. As with cattle, he found that with absorbed sera he could pick out bloods of individual fowls. He went further and determined that the immunological specificity was inherited: polyvalent sera absorbed with cells of both parents had no action on the cells of their chicks.

At Hampstead Todd worked also on fowl plague and described a 'dilution phenomenon' in which just neutral serum–virus mixtures had their activity restored by dilution. With Perdrau he made studies of the photodynamic action of methylene blue on bacteriophage and other viruses. He finally retired in 1940.

Todd was a delightful and helpful colleague with a great zest for life and a wonderful sense of fun. He had a wide knowledge of public health and microbiology and knew not a little about physics. He delighted in 'Heath-Robinson' gadgets, had a very critical mind and scorn for pretentiousness. He was elected Fellow of the Royal Society in 1930. He was unmarried.

C. H. ANDREWES

Dr. R. O. Page

WITH the death of Robin O. Page, which occurred on July 14 in Christchurch, New Zealand, the science of leather chemistry has suffered a heavy loss. Robin Page was born in 1897 at Christchurch, New Zealand, which was to become his residence for the rest of his life. During his college years he distinguished himself as a scholar and in various sports; he even represented his country in athletics. After receiving the master's degree with first-class honours in chemistry at University College, Canterbury, in 1920, he joined the staff of Woolston Tanneries, Ltd., Christchurch, as a chemist. He was appointed works manager in 1924—a position which he held up to his death.

At an early age he was fascinated by the intricate problems of the mechanism of tanning reactions; an interest which followed him all through his active life. To his inquiring mind the fundamentals and theoretical concepts were vital exigencies. In addition to carrying responsibility in the industry, Page not only kept himself informed about current scientific progress but also contributed a distinguished series of more than twenty original papers—the result of the research which he carried out alongside his practical duties for the love of the great unknown of his 'bread and butter' reactions.

Page was one of the first investigators to realize the importance of the physico-chemical approach in the elucidation of tanning processes, being inspired by the new ideas of the early 'twenties, propounded by Jacques Loeb and John Arthur Wilson, on the behaviour of proteins. This is shown by his lucid papers on ion effects on collagen published in 1927. The subsequent main contributions of Page concern the mechanism of the vegetable tannage. With his sound conception, thorough knowledge of chemistry and critical outlook, the tannery experience became to him a solid background for these pioneering investigations. Among his more recent publications, his clarifying investigation of the classical tannin–