

the fins of fishes had been derived from continuous fin-folds. He also proved that the body-cavity of this primitive shark extended backwards almost as far as the tail fin, by examining microscope sections of the fossil which revealed the structures of the kidney. His researches on the Arthrodira led him to the conclusion that they were not Dipnoi, but while recognising them as much more primitive fishes, he failed to discover their connexion with ancestral sharks which Stensiö has lately demonstrated. Dean also devoted much attention to the supposed Devonian lamprey *Palaeospondylus*, which he regarded as wrongly interpreted: he thought it might be the larva of some larger fish.

Dean made many observations on the embryos of all the existing ganoid fishes, the Port Jackson shark, and certain hag fishes, besides the chimæroid fishes already mentioned. He prepared series of beautiful drawings, but many still remain unpublished. His memoir on the embryology of *Bdellostoma stouti*, contributed to Carl von Kupffer's "Festschrift" in 1899, may be specially mentioned as illustrated by some of his finest drawings.

Dean also took every opportunity of studying living fishes, and he made many important observations on the specimens of *Ceratodus* living in the London Zoological Gardens, which were published in the *Proceedings of the Zoological Society* in 1906 and 1912.

From the beginning of his career, Dean realised the difficulty of becoming acquainted with existing knowledge of his subject, and devoted much time to the preparation of an adequate bibliography. By 1910 this had become so unwieldy that he felt he could not complete it himself, and he then succeeded in obtaining the co-operation of the American Museum of Natural History for the final preparation and publication of the work. Under his general direction, the two volumes of the index to authors and titles were extended and edited by the late Dr. C. R. Eastman, and published in 1916-17. The third and final volume, extended and edited by Dr. E. W. Gudger with the co-operation of Mr. A. W. Henn, includes an exhaustive subject index, and was published in 1923. This great work of reference, which extends to the year 1914, is of inestimable service to ichthyology, and gained for Dr. Dean the D. G. Elliot medal of the United States National Academy of Sciences, immediately on its completion.

In 1893 Bashford Dean married Miss Alice Dyckman, who belonged to one of the oldest Dutch families of Manhattan Island, and his wife not only furthered his life-work by her sympathy and help, but also accompanied him on his numerous and extensive travels. He was as well known among the zoologists of Europe as among those of North America, and he had a large circle of friends in Britain. He was a corresponding member of the Zoological Society of London. His always delicate health handicapped him in his activities, but his enthusiasm never flagged, and his old-world courtesy and friendliness endeared him to all who were associated with him.

A. S. W.

PROF. E. H. L. SCHWARZ.

THE death of Prof. Ernest H. L. Schwarz, professor of geology in the Rhodes University College, Grahamstown, leaves South African geology much poorer owing to the loss of his enthusiasm, originality, and ability as a teacher and lecturer. Prof. Schwarz was born in London on Feb. 27, 1873, and educated at Westminster School and the Royal College of Science. His father was a London merchant engaged in the South American trade, but he went to South Africa, being attracted by its mining development, and in 1895 settled in Johannesburg, where he became editor of the *Scientific African*.

Prof. Schwarz was more interested in academic than in applied geology, and in 1896 joined the Geological Survey of Cape Colony and spent nine years in its service under Dr. A. W. Rogers. He investigated the older rocks of Cape Colony, and in co-operation with Dr. Rogers correlated them with those of the Transvaal. During his surveys of the Cape Devonian beds he described the complex folds in the Bokkeveld Series, the glacial beds in the Table Mountain Sandstone, and in an account of a collection of rocks from Tristan da Cunha founded his Flabellites Land for a Devonian continent occupying the South Atlantic and extending northward into the Mississippi Valley. In an account of some Karroo beds he suggested that certain tuffs had been formed by the deep-seated shattering of the granite basement. He made important contributions to the Cretaceous and Kainozoic geology of the eastern Cape Colony, and described Baviaan's Kloof (1903), with the series of tectonic basins which he called 'fault-pits'; he gave the name of the Alexandria Formation to a succession of beds which have been recorded as ranging from the Upper Cretaceous to the Pliocene. He also urged the great influence of marine planation in forming the plateau of the same part of Cape Colony.

In 1905 Prof. Schwarz was appointed to the chair of geology at Grahamstown, and had the opportunity to give play to his interests in the speculative sides of geology and cosmogony, and in his "Causal Geology" (1910) he applied some of the natural corollaries of T. C. Chamberlin's planetesimal theory to later geological history. In connexion with his educational work he prepared an excellent summary of the geology of South Africa and a small work on African geography.

While working in the backblocks of the Cape, Prof. Schwarz had been impressed with the diminution of the agricultural population and attributed it to growing desiccation of the country. The reduction of Lake Ngami from a great lake to a swamp, and later to a bare plain, seemed to Schwarz one effect of a process that was doing widespread injury throughout South Africa. He published his conclusions in 1920 in "The Kalahari, or Thirstland Redemption," in which he advocated the diversion from the Upper Zambezi of some of the flood waters that now rush wasted to the sea. He held that much of the water could be turned back

into the dry valleys and lake basins of the Kalahari and the climate of the interior of South Africa materially improved. The scheme has been set aside as too costly; but Schwarz was probably correct in his views that the Kalahari has suffered by the capture by the Zambezi of some of its rivers and that some of the water could be restored to the ancient channels. He, however, probably exaggerated the effects that would follow from this expensive undertaking.

Prof. Schwarz's book on the Kalahari and its natives, published in 1928, recorded his observations during a canoe voyage across that country when wet seasons had refilled its lakes and rivers and thereby thrown doubt on his theory of the progressive desiccation of South Africa. He also described the natives of the Kalahari, and advanced views which, as usual, were of daring unconventionality. His interest in irrigation projects led to his study of the river system of Africa as a whole, and it was probably in connexion with its problems that he was visiting St. Louis in Senegal, where he died on Dec. 19.

Schwarz's conclusions were often highly speculative, and his great scheme for the irrigation of the Kalahari has been rejected as impracticable; but he has left many contributions of permanent value to the geology of Cape Colony, and his death will be widely regretted owing to his gifts of friendship and the stimulating originality of his views.

J. W. G.

#### DR. W. G. SMITH.

SCIENCE has lost a distinguished agricultural botanist in the death of Dr. W. G. Smith, who died in Edinburgh on Dec. 8, 1928. Dr. Smith was born in Dundee on Mar. 20, 1866. He graduated in pure science in the University of St. Andrews, and after a short period of teaching in the Morgan Academy, Dundee, became a lecturer in agriculture under the Forfarshire County Council. Later he acted as a demonstrator in botany in the University of Edinburgh under the late Sir Isaac Bayley Balfour. Proceeding to Munich, he took a two years' course of study, gaining there in 1894 his doctorate of philosophy for a thesis entitled "Untersuchung der Morphologie und Anatomie der durch Exoasceen verursachten Spross- und Blatt-Deformationen." This thesis was afterwards translated into Italian. Another result of his sojourn in Munich was his translation of von Tubeuf's standard work on the "Diseases of Plants by Cryptogamic Parasites," which appeared in 1897. On his return from Germany, Dr. Smith became lecturer in botany in the University of Leeds, where he remained for eleven years. In 1908 he was appointed chief of the biology department of the Edinburgh and East of Scotland College of Agriculture. For the last twenty years the College was his headquarters. Recently, under the scheme for the development of research work in agricultural problems, Dr. Smith was appointed advisory officer in agricultural botany to the Board of Agriculture for Scotland.

Three fields in botany attracted Dr. Smith's particular interest, and in each of these he was acknowledged an expert. His earlier training under von Tubeuf gave him a keen interest in researches on the diseases of plants, especially those of concern to agriculture and horticulture. Along with his brother, Robert Smith, who died young, he instituted the first detailed botanical surveys in Britain. Numerous papers dealing with ecological botany appeared from his pen. Amongst these were botanical surveys of Forfar and Fife and of various areas in Yorkshire and Teesdale. He was always in close touch with Warming and other distinguished Continental ecologists. The third field in which Dr. Smith distinguished himself was the study of grassland, especially of hill pastures, including the utilisation of heathland and the eradication of bracken.

These three phases of his work were combined into one harmonious whole, and no one was better fitted from his experience and patient research to act as advisory officer on matters concerning agricultural botany. Throughout most of his career he was engaged in the instruction of students, by whom he was held in the highest regard. Teaching duties, onerous as they were, did not hinder him from pursuing a continuous series of investigations, and the record of his published papers extends from 1894 until 1928.

In 1903, Dr. Smith received the award of the Back Grant by the Royal Geographical Society for research in the geographical distribution of vegetation in England. It is of interest to record that of his four children, two pairs of twins (boy and girl), three have had distinguished university careers, each taking first-class honours, while one is still an undergraduate. The elder son is professor of botany in Grahamstown University, South Africa.

#### WE regret to announce the following deaths:

Mr. R. H. Cambage, C.B.E., president of the Australian Association for the Advancement of Science and of the Australian National Research Council, and a past president of the Royal Society of New South Wales, on Nov. 28, aged sixty-nine years.

Prof. H. B. Fine, professor of mathematics and dean of the departments of science at Princeton University, distinguished for his work in pure mathematics, on Dec. 21, aged seventy years.

Mr. W. T. Gauss, a grandson of the illustrious German mathematician, Carl Friedrich Gauss, and through his mother a nephew of the noted German astronomer, Friedrich Wilhelm Bessel, on Nov. 14, aged seventy-seven years.

Major-General Sir Gerard Heath, a former chairman of the Building Research Board of the Department of Scientific and Industrial Research, on Jan. 9, aged sixty-five years.

Prof. M. J. M. Hill, F.R.S., emeritus professor of mathematics in the University of London and president of the Mathematical Association, on Jan. 11, aged seventy-two years.

Dr. Alexander A. Maximow, professor of anatomy in the University of Chicago and formerly professor of histology and embryology in the Russian Imperial Military Academy of Medicine, on Dec. 3, aged fifty-four years.