

to the fighting and seaworthy qualities of that ship. He designed the rolling chambers of the *Inflexible*, and went to sea in her to observe the effects of the chambers on rolling.

Sir Philip was thus associated with most of the scientific development of naval architecture at the Admiralty between 1870 and 1885, at which date he began his independent career in charge of the design and construction of warships at Armstrong's works on the Tyne, in which position he remained until 1902, when he accepted the position of Director of Naval Construction at the Admiralty. His active career as warship designer extended for well over half a century, and during this time he was associated with a continuous increase in efficiency and battle power of the many ships for the design of which he was the responsible creator. His reputation stands unrivalled for the quantity and quality of his work. Of the warships which he designed and built when at Armstrongs, the cruisers were the fastest and best armed of their day, and the battleships were the most powerful. Nearly all the warship fighting done by the Japanese victorious fleet in 1894 and 1905 was done in Watts's ships.

When Sir Philip went to the Admiralty, two of the King Edward class of eight battleships had been commenced. He produced designs having much greater gun power, and not inferior in other respects, with the view of building a squadron of eight ships much more powerful than the King Edwards, but My Lords decided to complete the inferior ships. This was discouraging to the man who wanted to give our ships as much gun power as possible. On the appointment of Admiral Fisher as First Sea Lord, however, Sir Philip's chance came, and he had hard work to give Fisher all the guns he wanted. The all-big-gun ship was wanted. Its adoption was approved by the Committee on Warship Design appointed to consider the question, and the Director of Naval Construction produced the complete designs for the Dreadnought type approved by that Committee. Thus, by the energy of Fisher and the skill of Watts, was begun the series of Dreadnoughts and super-Dreadnoughts of which the Grand Fleet was largely composed—which, to adapt the phrase of Mahan, stood between the Germans and the conquest of the world. Watts could not have attained and maintained such a position without a very full knowledge of all that pertains to warships, not only the structure of the ship but also the principles underlying armour, gun and machinery production, and a full appreciation of the strategy and tactics of sea warfare and of the life and ambitions of the great sailors of his time.

Watts was one of the earliest graduates of that school of naval architecture which began in the 'sixties, developed in the 'seventies into the Royal Naval College at Greenwich, and has continued ever since to turn out men of high attainments to fill not only that able Corps of Naval Constructors (over which Sir Philip presided) but also the Royal Naval Engineers, who have so ably assisted in the enormous developments of marine engines which have taken place since the school was founded. Sir Philip, like his predecessors and successors, saw to it that this source of supply of naval constructors and engineers was fully maintained. He assisted in the creation of the professional chairs and the schools of naval architecture in Glasgow, Durham, and Liverpool,

from which so many naval architects and marine engineers have graduated and have found scope for their abilities in the ship and engine works of Great Britain.

Sir Philip's great scientific attainments and his practical skill in applying his knowledge were recognised by the Royal Society, of which he was a fellow and vice-president; and by the universities which conferred on him LL.D. and D.Sc. degrees. It was, however, in the Institution of Naval Architects that his work was best known. He contributed many papers of high value and always took an active part on the Council of the Institution. He frequently presided at the council and general meetings, being for many years the senior vice-president. When at Armstrong's he was an enthusiastic territorial gunner and had the rank of Colonel. He was not a great talker in public or private, but all who had the privilege of his friendship will remember him as a generous and genial man with sound common-sense and wide scientific interests, which, combined with a gifted imagination and great courage, enabled him to carry through his important work successfully.

PROF. ERNST EHLERS.

PROF. ERNST EHLERS was born on November 11, 1835, in Lüneburg in the kingdom of Hanover, where his early education, carefully supervised by his father, who was a merchant, was received, and where the ancient buildings and historical surroundings doubtless had an influence on his sensitive mind. His training consisted of a good knowledge of classics, of history, mathematics, French, and chemistry, whilst his natural bent found a congenial field in faunistic works. He then (1857) proceeded southward to the University of Göttingen, where he energetically studied medicine and natural science, two subjects so intimately related, as all history shows, that the efforts of the late Scottish Universities Commission to separate them are vain. Amongst the professors there, none interested him more than W. Keferstein, R. Wagner, and Bödeker. There were comparatively few zoologists of the period who, like Ehlers, entered on their later studies with broad views and a thorough acquaintance with both vertebrate and invertebrate anatomy. It is true in his early days he had not the advantage of a life on the sea-coast and of familiarising himself with marine life from Protozoa to mammals, but he balanced this by his able researches on structure and by his skilful pencil, so that amongst the distinguished zoologists of the period he stands prominently forward.

Ehlers' abilities and natural bent were soon observed by Keferstein, who took the young naturalist with him to Naples and Messina, introducing him to the rich marine fauna there, the joint authors producing a memoir on the Siphonophores. In 1861 he received the degree of M.D. at Göttingen, his thesis being the "Anatomy of *Priapulus caudatus*," the material for which he had obtained from the well-known Japetus Steenstrup of Copenhagen. The same year he was appointed prosector to the Anatomical Institute of Göttingen, and two years later a private tutor in zoology and comparative anatomy.

His association with the leading zoologists of Germany and Austria led Ehlers to select the fine field for

work in the group of the polychæts, so that in an expedition (May–August) to Fiume in the Adriatic, he worked his nets and searched the beach specially for those forms, to the study of which he applied modern methods. A better seaman than his distinguished countryman, Albert Kölliker (who was helpless in the surging English Channel), he was enabled to make full use of his opportunities in these waters. Ehlers began systematic work in the polychæts at a time when—by the labours of Grube, De Quatrefages, Johnston, W. Baird, Agassiz, and others, they were attracting attention everywhere—no less from their beautiful coloration than from their wonderful structure and life-histories; and he resolutely, from first to last, adhered to their elucidation both as regards European and more distant seas.

Ehlers' two early volumes "Die Borstenwürmer," each with about a dozen quarto plates, were by their careful systematic treatment sufficient to lay the foundation of a solid reputation, and they attracted much attention in Great Britain, so that when the results of the *Lightning* and *Porcupine* Expeditions were dealt with, Ehlers was assigned the polychæts dredged below 500 fathoms, and they formed a valuable contribution in the *Zeit. f. w. Zool.* for 1871. It would not be possible to deal minutely with his great labours—even in the polychæts—which added many new genera and species to the group, and brought to light new features in their structure and life-history; for his observations ranged from the fossil forms in the Solenhofen slate to the most recent deep-sea expeditions of his own country and of the Americans, and extended from the Atlantic to the shores of New Zealand, as well as ranging from pole to pole. Some of his memoirs formed quarto volumes of considerable size, and most were finely illustrated, sometimes in colour, by his skilled artist, O. Peters. He was *facile princeps* in the Department in his day, yet he bore himself with perfect modesty and was ever ready to help others. Nor were his labours confined to the polychæts. The gephyreans, tunicates, and Bryozoa on one hand, *Lepidosiren*, the Porbeagle shark, the *chorda dorsalis*, and the anatomy of Manis on the other hand, each became the subject of one or more memoirs—thus demonstrating the versatility of his vigorous mind and his indomitable powers of work.

Ehlers' connexion with the *Zeitschrift für wissenschaftliche Zoologie*, the leading journal of zoology in his country, dates from 1875, when the veterans Von Siebold and Kölliker added him to the staff, and as the seniors passed away he became sole editor—until lately. His entrance into this work was signalled by an increase in the size of the journal, and indeed it occasionally doubled its bulk both as regards memoirs and plates. Yet he did not desert the Göttingen publications, in which many of his contributions appeared afterwards. The name of Ehlers is honoured wherever the science of zoology is known, and he truly wore the sword out instead of letting it rust out, for he held office until he had almost reached his ninety-first year, when release from his labours reached him. His unselfish devotion to zoology moved his friends, at home and abroad, in 1905 to prepare a *Festschrift* in his honour, and the memoirs were published in the *Zeitschrift f. w. Zool.*, and are

a sufficient testimony to his fame. Moreover, a second *Festschrift* was in process of arrangement in 1914, but the outbreak of the War put an end to the project. Ehlers thus forms a conspicuous example to all the younger zoologists for his unswerving devotion to his early subjects, his wide and accurate knowledge, his skill with his pencil, and for his arduous and unceasing academic labours. Of him Göttingen may well be proud.

W. C. M'INTOSH.

DR. C. V. PIPER.

By the death, on February 11, of Dr. Charles Vancouver Piper, the United States Department of Agriculture loses a worker of wide reputation and long service. At the time of his death he was in charge of the Office of Forage Crop Investigations, and through his efforts many plants and grasses of much value to American agriculture have been introduced and established in the United States. He was best known to the general public through his work in developing the creeping bent grass for use on golf greens. In 1919 he discovered a particularly useful variety, propagated it by vegetative means, and distributed it throughout the northern section of the United States, where it is now found growing on thousands of golf greens. Dr. Piper was keenly interested in the game, and utilised his knowledge to the full to improve conditions for players everywhere.

Dr. Piper's contributions to the forage and grass industry of practical agriculture were numerous, perhaps the best known being the introduction and establishment of the Sudan grass (from Africa), which is now a very valuable hay and pasture grass in the States. More than one hundred books and papers on agriculture and allied subjects stand to his credit, and he was consulting agricultural editor for the McGraw-Hill Book Company. In his search for new forage plants he travelled widely, spending much time in Japan, China, India, Java, Egypt, the Philippines and Alaska.

Dr. Piper was born at Victoria, B.C., in 1867, took his M.S. degree at Washington in 1892, and remained there as professor of botany until 1903, when he received his appointment to the Agricultural Department at Washington, D.C. He was associated with many societies, serving in 1908-9 as president of the Botanical Society of Washington, and in 1913-14 of the American Society of Agronomy.

WE regret to announce the following deaths:

Dr. William Tufts Brigham, director-emeritus of the Bernice Pauahi Bishop Museum, Honolulu, known for his work on Hawaiian customs, on January 29, aged eighty-four years.

Sir Bradford Leslie, known for his work on bridge design and construction, who studied his profession under Brunel, on March 21, aged ninety-four years.

Dr. William E. Safford, economic botanist for the United States Department of Agriculture, who devoted himself to the study of the plants and plant products of the American aborigines and of the early history of cultivated plants generally, on January 10, aged sixty-six years.

Prof. Sutherland Simpson, since 1908 professor of physiology in Cornell University, Ithaca, and formerly lecturer in experimental physiology in the University of Edinburgh, the author of numerous papers on the nervous system, body temperature, and secretory glands, aged sixty-three years.