OBITUARY NOTICES.

William Spiers Bruce, LL.D. By **R. N. Rudmose Brown,** D.Sc., The University, Sheffield, and **James Ritchie,** M.A., D.Sc., Royal Scottish Museum.

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I.

In William Spiers Bruce, whose death occurred at Edinburgh on 28th October 1921, the Royal Society of Edinburgh has lost a Fellow of many years' standing, and science the foremost authority on Polar regions and an experienced and successful explorer. Born on 1st August 1867, the son of Dr S. N. Bruce, Bruce studied medicine at the University of Edinburgh, but before completing his course sailed for the Antarctic with the *Balœna* in 1892. In 1895 he took charge of the Meteorological Observatory on Ben Nevis, and during 1896–97 he was in Franz-Josef Land with the Jackson-Harmsworth expedition. In 1898 he sailed with Major Andrew Coats in the *Blencathra* to Novaya Zemlya and the Barents Sea, and the same summer accompanied the Prince of Monaco to Spitsbergen in the *Princesse Alice*. In 1899 he was again with the Prince of Monaco in Spitsbergen. In 1902 Bruce organised and led the Scottish National Antarctic Expedition in the *Scotia* to the Weddell Sea, returning home in 1904. Later expeditions to Spitsbergen under his leadership were in 1906, 1907, 1909, 1912, 1914, and 1919. His last visit was in 1920. In 1910 he announced plans for a second Scottish Antarctic Expedition, but did not succeed in raising sufficient funds to start. In 1914–15 Bruce was in the Seychelles in charge of a sperm-whaling venture which closed down on account of the war. Bruce was one of the founders of the Scottish Zoological Park, a scheme of which he had long been an advocate. By his own efforts he equipped and maintained the Scottish Oceanographical Laboratory as a centre of Polar research, until failing health compelled him to disband it a year ago.

Bruce never sought reward for his work, and shrank from any form of publicity, but he was a gold medallist of the Royal Scottish Geographical

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Society, the Royal Geographical Society, and the American Geographical Society. The Royal Society of Edinburgh awarded him the Neill prize and gold medal, 1911–13. He was an honorary LL.D. of Aberdeen, and a Membre de Comité de perfectionnement de l'Institut Océanographique de Paris.

Enthusiasm, modesty, and single-minded devotion to science were characteristics of Bruce, and endeared him to a wide circle of friends. Indomitable, unselfish, and ever thoughtful of others, he made an ideal leader in the field, and succeeded in accomplishing an immense amount of work in a relatively short life. He has left an imperishable mark on the annals of Scottish scientific endeavour.

R. N. R. B.

II. Geographical and Oceanographical Work.

The expedition of the Dundee whalers in 1892, which Bruce accompanied in the *Balæna*, marked the first expedition to Antarctic regions for over half a century. Sailing nominally as surgeon, and actually engaged principally in sealing, Bruce managed, nevertheless, to make many important observations. A series of two-hourly meteorological observations, taken between lat. 60° and 65° S. and long. 51° and 57° W. during three months, was more complete than any previous set of observations, and gave the first strong evidence in favour of an Antarctic anticyclone. Many soundings and sea temperatures around the north-east of Graham Land were also taken. This expedition did much to reawaken interest in the Antarctic, and paved the way for the great effort of the opening years of this century. In the *Challenger* Office, and as meteorologist in charge of the summit observatory on Ben Nevis, Bruce found congenial work for a year. In Franz-Josef Land his work was largely zoological, but he took part in the survey of the western islands of the archipelago.

In 1898 began a long series of visits to Spitsbergen and the Barents Sea which gave Bruce a wider knowledge of Spitsbergen lands and waters than any other explorer of his time. With the Prince of Monaco he helped in the detailed hydrographical charting of Red Bay and the survey of the surrounding land. Bruce Point marks the proximity of the rock where the *Princesse Alice* ran aground, and where Bruce organised a shore camp when the loss of the vessel seemed imminent. Many of the deep-sea soundings off western Spitsbergen were also made by Bruce in company with the Prince of Monaco and Mr J. Y. Buchanan. In Storfjord he also took soundings on several occasions, and removed from the chart the mythical "flat island" which for long was reported to lie in the fjord. Bruce specialised in the exploration of Prince Charles Foreland, which

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before his first visit in 1906 was practically unknown. He spent the greater part of three summers in surveying and exploring the island. The map, on a scale of 1 to 140,000, was published in 1913 by the Prince of Monaco. Expeditions under Bruce's command also completed a map of Bünsow (Garwood) Land at the head of Icefjord, and took many hydrographical observations in Foreland Sound, Sassen Bay, Klaas Billen Bay, and elsewhere. He made one of the first landings on Hope Island, and on another occasion made a new crossing of Spitsbergen from the Sassendal to Mohn Bay.

Bruce took a leading part in the economic development of Spitsbergen, and as long ago as 1899, before any claims to mining estates had been made, brought home samples of coal for analysis. Only those who sailed with Bruce to Spitsbergen could appreciate his marvellously detailed knowledge of its coasts and anchorages, the localities for camping, the distribution of bird rookeries and of driftwood, and the routes for land travel; while his acquaintance with the course and nature of sea ice round the coasts was seldom, if ever, at fault.

It was in the Antarctic, however, that Bruce's most important geographical work was done. The expedition of the *Scotia*, financed in Scotland, largely by Mr James Coats of Paisley and Major Andrew Coats, was designed principally for research in oceanography (including zoology) and meteorology. Bruce was too earnest in the advancement of science to put the attainment of a high latitude in the forefront of his plans. The results can only be briefly summarised. During two summers the *Scotia*, ably handled by Capt. T. Robertson, penetrated the dangerous Weddell Sea without serious mishap, and at the end of the second season discovered a new part of the coast-line of Antarctica in lat. 74° S. Coats Land, as Bruce named it, was traced for 150 miles to the south-west. No landing on its ice-cliffs was possible, but high land could be discerned in the far interior. This discovery, together with a long series of soundings in the uncharted Weddell Sea and South Atlantic, especially the re-sounding in 2660 fathoms of Ross' 4000 fathoms no bottom (lat. 68° 32′ S., long. 12° 49′ W.), entirely revised ideas of the extent and conformation of Antarctica on the Atlantic side. Other discoveries included the southern extension of the mid-Atlantic ridge, and strong evidence in favour of submarine connection between Graham Land and South America *via* the South Sandwich group and the South Orkneys. Wintering at the South Orkneys, the expedition explored and mapped Laurie Island, and founded, in Scotia Bay, a meteorological observatory which has since been maintained by the Argentine Government—the only Antarctic observatory in existence.

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Gough Island (lat. 40° 20′ S., long. 9° 56′ W.) was visited for the first time by a scientific expedition.

The scientific results of the *Scotia* expedition were published in a series of volumes, many of the papers previously appearing in the *Transactions* of this Society. Some six volumes have appeared, but there is material for several more if funds were available. A Government grant towards the cost, after years of effort on Bruce's part, was on the eve of materialising when the outbreak of war checked all such schemes. Other papers of Bruce's have appeared in the *Scottish Geographical Magazine*, the *Geographical Journal*, etc. He wrote a volume on *Polar Exploration* (1911), and contributed a section on "The Falkland Islands and Dependencies" to *The Oxford Survey of the British Empire* (1914). His researches into the early history and exploration of Graham Land are partly incorporated in the new *Antarctic Pilot*; and his views on the structure of Antarctica appeared in "Über die fortsetzung des antarktischen Festlandes," *Schweiz. natur. Gesell. zu Basel*, 1910.

R. N. R. B.

III.—Biological Work.

Deeply implanted in Dr Bruce's temperament was an intense love of nature, and this passion was directed into definite channels during his attendance at the University of Edinburgh. There the influence especially of Professor Cossar Ewart and Sir William Turner, of whose teaching he always spoke with enthusiasm, laid a broad foundation of zoological knowledge which stood Bruce in good stead during his wanderings. Two characteristics stand out prominently in his biological work—a scientific opportunism and an universal interest. No chance that offered of adding to the raw material of zoological science was allowed to slip by unused: when meteorology took him to the summit of Ben Nevis, he spent his spare hours making the first extensive collection of insects gathered at a high altitude in this country; when commercial whaling took him to the Seychelles, he seized every opportunity of collecting zoological material, and confirmed a recent observation, first communicated to this Society, regarding the functioning of the so-called embryonic upper teeth of the sperm whale. The wideness of his biological interests could not be more concisely illustrated than by the materials he gathered, in his spare moments and often at great inconvenience to himself, during the Seychelles enterprise; for these range from portions of whales, sucker-marks of giant squids upon whale-skin, marine polychaet worms and other invertebrates, to odds and ends of drift refuse picked up on the shore, by the identifica-

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tion of which and of their original provenance he hoped to determine the prevalent oceanic currents in the area.

It was fortunate for biological science that Bruce preserved his wide sympathies throughout life, and refused to be drawn into the narrow path of the specialist. The expeditions in which he took part and which he planned afforded unique opportunities of observation and of collecting on broad lines, and these he used to such advantage that he stands in the first rank of the great naturalist travellers. No man in recent years has done more to enrich, in variety as well as in numbers, the accumulated stores on which the science of systematic zoology is based.

How much Bruce might have accomplished had he been free to follow the lines of special investigation of animal life he had planned for himself it is difficult to say, for the task of gathering specimens was perhaps the least onerous part of his labours, and, with a generosity that was characteristic of him, he spent many years and grudged no pains in the sorting and grouping of his enormous wealth of material, so that each specialist might enter upon the last stage of detailed classification free from the drudgery of the initial unravelling.

To glance more closely at some of the results of Bruce's biological labours. Botany, geology, and zoology have one and all been enriched through his energies. The recent floras of Gough Island, the isolated volcanic islet midway between South America and South Africa, and of the South Orkney Islands, were described for the first time by Dr R. N. Rudmose Brown—the former as the result of the first scientific exploration of the island, made during the return voyage of the *Scotia*; and the plants obtained there, together with representatives of the cryptogamic floras of the Antarctic islands and seas he visited, form, according to Professor Sir Isaac Bailey Balfour, late Keeper of the Royal Botanic Garden in Edinburgh, one of the most valuable collections deposited there in recent years. His careful botanical collecting in Prince Charles Foreland added much to the knowledge of the flora of Spitsbergen.

In spite of the fact that numerous geological surveys of Spitsbergen had preceded Bruce's visits, it was he who first discovered that Prince Charles Foreland was not wholly of Lower Palæozoic formation, as had been asserted; and Dr G. W. Lee's examination of his fossil collections proved that Bruce was right, and that over the Lower Palæozoic formations there lay in places on the east coast deposits representing Tertiary strata.

But it was on zoology that Bruce's main efforts were concentrated, and scarcely a branch of the science, especially in its systematic and biological aspects, but is the richer for his travels.

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His first voyage to the Antarctic, on the *Balæna* in 1892 and 1893, brought news of an undreamed-of abundance of finner whales in high southern latitudes; and although, with a misfortune that seemed to dog his steps, his attempt to start a commercial venture failed, others have since reaped where he had sown. His subsequent voyages added materially to our knowledge of the mammal life of Spitsbergen, and of both northern and southern Polar seas.

Ornithology owes much to his keen observation. At Spitsbergen in 1906 he discovered for the first time the chicks of the Sanderling, as well as the first European breeding station of this wader. But already he had added several birds to the island faunas of Northern Europe In 1896-7 he found in Franz-Josef Land the Lapp Bunting, the Shore Lark, the Turnstone, and the Purple and Bonaparte's Sandpipers, all previously unrecorded, and in 1898 added the Grey Phalerope to the fauna of Novaya Zemlya. As was to be expected, even greater gains resulted from so well conceived and executed an expedition as that of the *Scotia*. Not only were many new facts regarding the distribution of sea-birds discovered (for example, the range of several species was extended to within the Antarctic circle), but much information regarding the life-histories and habits of southern birds was accumulated, including the discovery of the eggs of the Cape Petrel, of the eggs and young of the Snowy Petrel, and of the eggs and two stages of down plumage in the chicks of the Ringed Penguin. The bird-life of the South Orkneys was all but unknown until the visit of the *Scotia*; the known avifauna of Gough Island was doubled; and the series of bird skins is one of the most important ever made in the regions of the far South.

Perhaps even more important, from the freshness of the knowledge they added to zoology, were the collections of fishes made by Dr Bruce. The *Scotia* collections alone contained seven new genera and more than two dozen new species, with many interesting representatives of the distinctively Antarctic Notothenidæ, and several abyssal forms from depths of two miles and over.

The sea and life in the seas ever stood in the forefront of Bruce's plans; and in spite of the difficulties of marine collecting, owing to the need of complicated apparatus, of more discrimination in selecting from captures, and of greater expenditure of time and labour, his series of marine invertebrates form the most important of all his contributions to the raw material of zoology. His earliest Arctic voyages extended many a known range of distribution, and added some seven new species of Entomostracan crustaceans to the fauna of the Arctic seas; and of his

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extraordinary *Scotia* collections need more be said than that, in the three volumes of the *Scientific Reports* which deal with invertebrates, the colossal total of some 1100 species is recorded, of which 212 are made known to science for the first time?

To the advance of our knowledge of some of the general problems of zoology Bruce's investigations contributed not a little. His unique experience of both Arctic and Antarctic seas and their inhabitants aroused again prolonged discussion of the bi-polar theory of the distribution of marine life, the chief result of which was to place a new emphasis upon the similarity of habit and of structural adaptation induced by similar conditions of environment and livelihood.

Till recently the Arctic and Antarctic collections made by Dr Bruce were housed in the Scottish Oceanographical Laboratory at Surgeon's Hall, and the arrangements he adopted showed how far his interest extended beyond the identification of specimens. Nothing could have been more instructive than the cases in which, layer above layer, he showed the characteristic inhabitants of different depths in the sea; or those where the marine faunas of the islands he visited were placed side by side in comparative series. Some months before his death he presented these great collections, as well as his meteorological and physical apparatus, to the Royal Scottish Museum, and there a series of specimens representative of his most striking discoveries has been arranged for exhibition.

I cannot close these remarks on Dr Bruce's services to zoology without adding that no earnest student was turned away empty from his vast stores of knowledge. Close contact with him and his work for many years impressed me more and more with his striking personality, with his lovableness, generosity, and enthusiasm, which throughout sacrificed self for science.

J. R.

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