

John Young Buchanan, M.A., F.R.S.

JOHN YOUNG BUCHANAN was born in Glasgow on 20th February 1844. He was the second son of Mr John Buchanan of Dowanhill and the elder brother of the Right Hon. T. R. Buchanan, M.P., who represented Edinburgh in Parliament for many years. He was educated at the Glasgow High School and the University of Glasgow, where he graduated in Arts in 1863. His attention had been turned to Chemistry, and he proceeded to study this science on the Continent, spending several years in Germany at the Universities of Marburg, Bonn, and Leipzig, and going on in 1867 to Paris, where he worked in the laboratory of Würtz, a master for whose scientific genius and personal kindness he always cherished a warm admiration.

Shortly after his return to Scotland Buchanan was appointed Assistant to Professor Crum Brown, then recently established in the Chair of Chemistry in the University of Edinburgh, and in 1870, on Crum Brown's nomination, he was elected a Fellow of the Royal Society of Edinburgh.

When the voyage of H.M.S. *Challenger* was planned for the purpose of investigating the physical and biological conditions of the great ocean basins, it was decided that one representative of the physical sciences should be charged with all matters concerning physics, chemistry, and geology, except such hydrographical and meteorological observations as had been assigned to the naval officers. Buchanan was chosen for this comprehensive post by the Circumnavigation Committee of the Royal Society, who had prepared the programme of scientific work. His selection was due largely to his skill and resourcefulness in devising and making apparatus, his reputation as a practical chemist, his knowledge of mineralogy, and his interest in all natural phenomena. The wisdom of the choice was fully justified. Five years were entirely occupied by the *Challenger* work; the preparations for the cruise, and the fitting up of a chemical laboratory in the small space available on board, taking up several months before the ship sailed in December 1872, and the completion of work in hand occupying a longer time after the ship returned in June 1876.

Throughout those years Buchanan's mind was bent on the practical problems arising in the study of sea-water; but he took full advantage of the many opportunities for excursions into little-known lands when

the ship was in port, and he acquired a love of travel that never left him.

He returned to Edinburgh and set up a private laboratory, in which he carried on research on his own account. The possession of ample means made it unnecessary for him to seek any professional appointment, and he continued to spend much of his time at sea. He made investigations on the west coast of Scotland and on the lochs of the Great Glen in his steam yacht, the *Mallard*; and he took part in several voyages of the cable-laying ships of the Silvertown Company on the west coast of Africa and across the Atlantic, mastering the new methods of sounding by wire, which superseded the clumsy processes of the *Challenger*.

In Edinburgh he entered into the remarkable revival in the study of physical geography and kindred sciences which was a feature of the eighth decade of the nineteenth century, and he took a share in establishing the Ben Nevis Observatory, the Scottish Geographical Society, and the Scottish Marine Station. He contributed a large quantity of material for the equipment of the Physical and Chemical laboratory of the original Marine Station at Granton in 1884, and the writer of this notice had many opportunities there of profiting by his instruction in the arts of observing and recording. In 1887 the Royal Society of Edinburgh awarded the Keith Prize to Buchanan for his work in chemical oceanography, and in London the Royal Society elected him a Fellow.

Buchanan was on terms of friendship with Professor Robertson Smith, who encouraged him in the study of physical geography, and helped to persuade him to accept the lectureship in Geography in the University of Cambridge in 1889. Buchanan was given the Cambridge degree of M.A., and took rooms in Christ's College, where Robertson Smith was already established. He resigned the lectureship after holding it for four years, but Christ's College continued to be his home for twenty years, and in his will he left substantial proof of the regard he entertained for it. On leaving Cambridge, Buchanan took up house in London; but he was much abroad, frequently visiting South America, where he had property in the Argentine, and staying at continental resorts, where he had many friends, some of them in very high positions. Kindred tastes cemented a close friendship with Prince Albert I. of Monaco, and he spent much time as the Prince's guest on shore and afloat, making many cruises in the Mediterranean, the Atlantic, and to Spitsbergen in the Prince's yachts, which were splendidly equipped for oceanographical research.

The outbreak of war in 1914 was a blow from which Buchanan never

recovered. He had been on terms of personal friendship with the Kaiser and other distinguished Germans, while his old scientific associations with France had been strengthened by his membership of the governing body of the Oceanographical Institute, founded by the Prince of Monaco in Paris. In real distress of mind, Buchanan gave up his London house and betook himself to Havana, in the West Indies, until hostilities ceased.

His last work was the preparation of three volumes, published by the Cambridge University Press, containing reprints of those of his papers which appeared to him the most worthy of preservation. To these he prefixed very copious analytical Tables of Contents, with comments and criticisms often of great interest. The volumes were: *Scientific Papers*, vol. i.—*Oceanographical*, published in 1913; *Comptes Rendus of Observation and Reasoning*, in 1917; and *Accounts Rendered of Work Done and Things Seen*, in 1919.

After his return to London in broken health, the isolating shadow of old age fell on him, and he withdrew more and more from the society of his remaining scientific friends. He died at the age of eighty-one, on 16th October 1925.

Buchanan's scientific work was directed to the elucidation of practical problems presented to him during the voyage of the *Challenger*. He did not care for theoretical deductions or comprehensive generalisations. He seemed to work mainly for the satisfaction of his own mind, for once a definite result was obtained the problem lost its driving power; and only a portion of the notes which he amassed, with a care and precision that can only be described as meticulous, were ever worked up for publication. He used to say that he loved work but hated writing; still, the number of his published papers exceeds one hundred.

On the *Challenger* most of his time was filled by a routine prescribed by the Circumnavigation Committee, but the tedium was lightened by flashes of discovery. One was the fact of large concretionary deposits of manganese peroxide produced by chemical action of sea-water on minerals. Another was the discovery that the gelatinous substance found on all preserved deep-sea deposits, which Huxley had taken for a primeval organism and named *Bathybius Haeckeli*, was really a precipitate of calcium sulphate thrown down from sea-water by the addition of alcohol.

The short stay of the *Challenger* in Antarctic waters raised the question of the formation and melting of sea ice, on which Buchanan worked with great keenness for several years, producing a series of valuable

papers on "Ice and Brines," in which he worked out the chemical and thermal changes accompanying the freezing of saline solutions and the temperature at which pure ice melted in them. This led to a further series of calorimetric researches on "Steam and Brines."

Another subject raised on the *Challenger* and settled in a shore laboratory, was the compressibility of glass and other substances under the pressure of the deep sea, ranging up to 5 or 6 tons per square inch. The apparatus invented for this purpose was handed over to Professor P. G. Tait, and used by him in determining the pressure corrections of the *Challenger* thermometers.

Buchanan's most important contribution to the *Challenger* Reports was a memoir on the "Salinity of Ocean Water," in which he published the first complete map of the world-wide distribution of surface salinity, the main features of which have been fully confirmed by later investigators.

His work on the Telegraph ships resulted in a study of continental slopes and oceanic shoals, which had scientific as well as practical value. One of his few general papers was a suggestive survey of Similarities in the Physical Geography of the Great Oceans, contributed to the Royal Geographical Society in 1886. In Limnology he was the first to prove that vertical circulation set up by the wind produced a winter temperature of the deep water in a lake far below the maximum density point.

The work of Buchanan was that of a pioneer breaking new ground, and it was his fate, which he recognised and perhaps resented, to make observations of fundamental importance, which were lost sight of under the superstructure raised by others whose names are better known to the scientific public. All he did was original work in the fullest sense. He owed nothing to other workers. He insisted always on going to the fountain-head, preferably by direct observation, for all data, and on handling such data in the way most likely to ascertain their true relationships even if that required difference from recognised authorities.

His character exhibited singular sincerity, and a kindness which he did nothing to advertise. Although to acquaintances his manner may often have seemed cold and distant, his nature showed a very warm and friendly side to the few congenial comrades of his choice.

H. R. M.