OBITUARIES

Sir Sidney Gerald Burrard, Bart., K.C.S.I., F.R.S.

SIDNEY GERALD BURRARD was born on August 12, 1860. He was the eldest son of Lieut.-Colonel Sidney Burrard of the Grenadier Guards, and was born at Yarmouth, Isle of Wight, in the Dower House built by his grandfather, the Rev. Sir George Burrard of Walhampton. His first school was Uppingham, where Thring was headmaster, but later he was transferred to Wellington, chiefly for the sake of the shorter journey from his home. From Wellington he went up for Woolwich and passed in at the head of the list. He was at the R.M.A. until September 6, 1879, when he received his commission in the Royal Engineers. After two years at the School of Military Engineering, Chatham, he sailed for India. In September 1884 he joined the Survey of India and was posted to the Trigonometrical Branch, in which he so greatly distinguished himself.

A brief outline, with a more detailed account of his most notable achievement, must suffice for this short notice:

1884-94: latitude and longitude observations with some periods at the headquarter office.

1894-96: redetermination of the longitude of India from Greenwich, via Germany, Russia, Persia and the Persian Gulf.

1896-98: tidal and levelling operations.

1898, January: in charge of a camp for the reception of astronomers visiting India for the observation of the total eclipse of the sun. The Astronomer Royal (Sir William Christie) and Prof. H. H. Turner of Oxford were the principal guests.

1899: became Superintendent of the Trigonometrical Survey.

1901: published the paper entitled "The Attraction of the Himalaya Mountains on the Plumb Line in India".

1904: elected to the fellowship of the Royal Society.

1906-7: published, in collaboration with Sir Henry Hayden, "A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet".

1909: while on furlough attended the general assembly of the International Geodetic Association in London and Cambridge.

1911: appointed Surveyor-General of India.

1912: received C.S.I. at the Delhi Durbar.

1913: awarded the Victoria Medal by the Royal Geographical Society.

1914: made K.C.S.I.

1915: tenure of the office of Surveyor-General extended for the duration of the War.

1919: Retired from the Service.

After retirement Sir Sidney bought a house at Farnborough and settled there.

In 1933 he inherited the baronetcy of Walhampton from his cousin and became seventh baronet.

All Burrard's work during his long career was excellent, but his great contribution to knowledge was contained in the paper published in 1901 entitled "The Attraction of the Himalaya Mountains on the Plumb Line in India". To make the nature of this contribution clear, it will be necessary to explain the state of opinion on the subject of mountain attraction which prevailed before this paper was published. One must go back to the observations of

Everest and Waugh and the calculations of Pratt. The discrepancy between the observed attractions and the results of Pratt's calculations showed that the apparent added mass of the mountains must somehow be balanced by a deficiency of mass in the crust underneath them. This led to the theory of mountain compensation. It was shown by observation that the deflexion of the plumb line towards the mountains was quite large at places close to them, but that it petered out rapidly and quite disappeared at a moderate distance from them. If then the effect of the great Himalayan ranges does not extend far, it follows that all deflexions found at more remote stations of observation must be due to local causes, visible or subterranean, and that they would therefore resemble random errors unconnected with any structural principle, and ought to be dealt with in further determinations of the figure of the earth by taking the average of a large number of observations evenly spread over a large area. To secure an adequate number of such observations had been the aim of the programmes of latitude determinations which had been systematically carried out, and by the end of the last century a considerable number of results was available. Burrard soon noticed that the arrangement of the deflexions was not random at all, and he then proceeded to study the whole question.

The outcome of this study was the paper mentioned above, in which three major conclusions are arrived at:

(1) The distribution of deflexions of the plumb line is not random but systematic. The deflexions are arranged in zones and these zones are parallel to the curve of the Himalaya Mountains.

(2) No arrangement of mountains and their compensation, whether the latter be situated near the surface or at a great depth, is capable of producing large deflexions at places close to the mountains and small deflexions at places moderately distant from them.

(3) It follows that to account for the observed facts a second cause is required, and a hidden range of high density running across India, parallel to the Himalayas, and with its crest some 400 miles from the foot of the mountains, would be a possible explanation.

The immense importance of these conclusions, especially of the first, is easily seen. Whereas hitherto deflexions of the plumb line had seemed to be unconnected with the tectonics of the earth's crust and therefore of little interest, it was now shown that they were closely bound up with mountains and mountain compensation, and would repay intensive and systematic study. This discovery had a profound effect on all geodetic thought, and from the time of its publication the study of the nature and extent of mountain compensation by means of the observation of gravity anomalies, whether in direction or intensity, has become a major field of scientific inquiry.

Space does not permit of further description of Burrard's attainments or of his personality and character, but as one who had been his colleague for thirty years, intimately acquainted with all that he thought or did, and who continued for twenty more years to be on terms of the closest friendship with him, I may say that there never was a man more delightful to work with, and that he never gave his mind to any subject, music, art, history or science, without throwing some new light upon it. His conversation was the most refreshing and stimulating that I have ever known, and his death leaves a blank that cannot be filled.

G. P. LENOX-CONYNGHAM.