

be said of the man, and less of the engineer. No written record can express the singular powers of Mr Thomson's mind and the charm of his character. The specialist in science, the professed chemist, the professed electrician, the professed geologist, the professed lawyer, all received suggestions from his fertile mind. The able and original paper on coal, read in this Society shortly before his death, affords an illustration of this sagacity of thought on subjects not specially his own. In art he had a cultivated taste, in narration and conversation he was unrivalled. All who conversed with him felt that they had never spoken so well themselves, and had seldom met with so sympathetic a listener. He had an untiring toleration for the failings of mankind, without abating for an instant in its application to himself the high standard which he shrank from applying to others. Even under terrible pain, his enjoyment of truth, of nature, of all that was noble, seemed not to flag. He never repined, but worked to the last hour, not with mere resignation, but with a noble contentment.

4. Obituary Notice of Archibald Smith. By Sir William Thomson.

[Abridged (by direction of the Author) from *Proc. R. S.*]

ARCHIBALD SMITH, only son of James Smith, of Jordanhill, Renfrewshire, was born on the 10th of August 1813, at Greenhead, Glasgow, in the house where his mother's father lived. His father had literary and scientific tastes with a strong practical turn, fostered no doubt by his education in the University of Glasgow, and his family connection with some of the chief founders of the great commercial community which has grown up by its side. In published works on various subjects he left enduring monuments of a long life of actively employed leisure. His discovery of different species of Arctic shells, in the course of several years' dredging from his yacht, and his inference of a previously existing colder climate in the part of the world now occupied by the British Islands, constituted a remarkable and important advancement of geological science. In his "Voyage and Shipwreck of St Paul," a masterly application of the principles of practical seamanship renders St Luke's narrative more thoroughly intelligible to us now

than it can have been to contemporary readers not aided by nautical knowledge. Later he published a "Dissertation on the Origin and Connection of the Gospels," and he was engaged in the collection of further materials for the elucidation of the same subject up to the time of his death, at the age of eighty-five. Archibald Smith's mother was also of a family distinguished for intellectual activity. Her paternal grandfather was Dr Andrew Wilson, Professor of Astronomy in the University of Glasgow, whose speculations on the constitution of the sun are now generally accepted, especially since the discovery of spectrum-analysis and its application to solar physics. Her uncle, Dr Patrick Wilson, who succeeded to his father's Chair in the University, was author of papers in the "Philosophical Transactions" on Meteorology and on Aberration.

Archibald Smith's earliest years were chiefly passed in the old castle of Roseneath. In 1818 and 1819 he was taken by his father and mother to travel on the continent of Europe. Much of his early education was given him by his father, who read Virgil with him when he was about nine years old. He also had lessons from the Roseneath parish schoolmaster, Mr Dodds, who was very proud of his young pupil. In Edinburgh, during the winters 1820-22, he went to a day school; and after that, living at home at Jordanhill, he attended the Grammar School of Glasgow for three years. As a boy he was extremely active, and fond of everything that demanded skill, strength, and daring. At Roseneath he was constantly in boats; and his favourite reading was anything about the sea, commencing, no doubt, with tales of adventurers and buccaneers, but going on to narratives of voyages of discovery, and to the best text-books of seamanship and navigation as he grew older. He had, of course, the ordinary ardent desire to become a sailor, incidental to boys of this island; but with him the passion remained through life, and largely influenced the scientific work by which he has conferred never-to-be-forgotten benefits on the marine service of the world, and made contributions to nautical science which have earned credit for England among maritime nations. He was early initiated into practical seamanship under his father's instructions in yacht sailing. He became an expert and bold pilot, exploring and marking passages and anchorages for

himself among the intricate channels and rocks of the West Highlands, when charts did not supply the requisite information. His most loved recreation from the labours of Lincoln's Inn was always a cruise in the West Highlands. In the last summer of his life, after a naturally strong constitution had broken down under the stress of mathematical work on ships' magnetism by night, following days of hard work in his legal profession, he regained something of his health and strength in sailing about with his boys in his yacht, between the beautiful coasts of the Firth of Clyde, but not enough, alas! to carry him through unfavourable influences of the winter that followed.

In 1826 he went to a school at Redland, near Bristol, for two years; and in 1828 he entered the University of Glasgow, where he not only began to show his remarkable capacity for mathematical science in the classes of Mathematics and Natural Philosophy, but also distinguished himself highly in classics and logic. Among his fellow-students were Norman Macleod and Archibald Campbell Tait, with both of whom he retained a friendship throughout life. After completing his fourth session in Glasgow, he joined in the summer of 1832 a Cambridge reading party, under Hopkins, at Barmouth in North Wales, and in the October following commenced residence in Trinity College, Cambridge.

While still an undergraduate he wrote and communicated to the Cambridge Philosophical Society a paper on Fresnel's wave-surface. The mathematical tact and power for which he afterwards became celebrated were shown to a remarkable degree in this his first published work.

In 1836 he took his degree as Senior Wrangler and first Smith's Prizeman, and in the same year he was elected to a Fellowship in Trinity College.

Shortly after taking his degree, he proposed to his friend Duncan Farquharson Gregory, of the celebrated Edinburgh mathematical family, then an undergraduate of Trinity College, the establishment of an English periodical for the publication of short papers on mathematical subjects. Gregory answered in a letter of date December 4th, 1836, cordially entering into the scheme, and undertaking the office of editor. The result was the "Cambridge Mathematical Journal," of which the first number appeared in

November 1837. It was carried on in numbers, appearing three times a year, under the editorship of Gregory, until his death, and has been continued under various editors, and with several changes of name, till the present time, when it is represented by the "Quarterly Journal of Mathematics" and the "Messenger of Mathematics." The original "Cambridge Mathematical Journal" of Smith and Gregory, containing as it did many admirable papers by Smith and Gregory themselves, and by other able contributors, early attracted to it, among whom were Greatheed, Donkin, Walton, Sylvester, Ellis, Cayley, Boole, inaugurated a most fruitful revival of mathematics in England, of which Herschel, Peacock, Babbage and Green, had been the prophets and precursors.

It is much to be regretted that neither Cambridge nor the university of his native city could offer a position to Smith, enabling him to make the mathematical and physical science for which he felt so strong an inclination, and for which he had so great capacity, the professional work of his life. Two years after taking his degree, he commenced reading law in London, but his inclination was still for science. Relinquishing reluctantly a Trinity Lectureship offered to him by Whewell in 1838, and offered again and almost accepted in 1840, resisting a strong temptation to accompany Sir James Ross to the Antarctic regions on the scientific exploring expedition of the "Erebus" and "Terror" in 1840–41, and regretfully giving up the idea of a Scottish professorship, which, during his early years of residence in Lincoln's Inn, had many attractions for him, he finally made the bar his profession. But during all the long years of hard work, through which he gradually attained to an important and extensive practice, and to a high reputation as a Chancery barrister, he never lost his interest in science, nor ceased to be actively engaged in scientific pursuits; and he always showed a lively and generous sympathy with others, to whom circumstances (considered in this respect enviable by him) had allotted a scientific profession.

About the year 1841 his attention was drawn to the problem of ships' magnetism by his friend Major Sabine, who was at that time occupied with the reduction of his own early magnetic observations made at sea on board the ships "Isabella" and "Alexander," on the Arctic Expedition of 1818, and of corres-

ponding magnetic observations which had been then recently made on board the "Erebus" and "Terror" in Captain Ross's Antarctic Expedition of 1840-41. The systematic character of the deviations, unprecedented in amount, experienced by the "Isabella" and "Alexander" in the course of their Arctic voyage, had attracted the attention of Poisson, who published in 1824, in the "Memoirs of the French Institute," three papers containing a mathematical theory of magnetic induction with application to ships' magnetism. The subsequent magnetic survey of the Antarctic regions, of which by far the greater part had to be executed by daily observations of terrestrial magnetism on ship-board, brought into permanent view the importance of Poisson's general theory; but at the same time demonstrated the necessity for replacing his practical formulæ by others, not limited by certain restrictions as to symmetry of the ship, which he had assumed for the sake of simplicity. This was the chief problem first put before Smith by Sabine, and his solution of it was the first great service which he rendered to the practical correction of the disturbance of the compass caused by the magnetism of ships.

In 1850 he published separately an account of his theoretical and practical investigations on the correction of the deviations of a ship's compass, which was afterwards given as a supplement to the Admiralty "Practical Rules" in 1855. The large deviations found in iron-plated ships of war "having rendered necessary the use of the exact instead of the approximate formulæ," this article was rewritten by Smith for the Compass Department of the Admiralty. It now forms Part III. of the "Admiralty Manual for the Deviations of the Compass," edited by Evans and Smith, to which are added appendices containing a complete mathematical statement of the general theory, proofs of the practical formulæ, and constructions and practical methods of a more mathematical character than those given in the body of the work for ordinary use. A separate publication, of "Instructions for Correcting the Deviation of the Compass," by Smith, was made by the Board of Trade in 1857.

It is satisfactory to find that the British Admiralty "Compass Manual," embodying as it does the result of so vast an amount of labour, guided by the highest mathematical ability and the

most consummate practical skill, has been appreciated as a gift to the commonwealth of nations by other countries than our own. It is adopted by the United States Navy Department, and it has been translated into Russian, German, Portuguese, and French. Smith's mathematical work, and particularly his beautiful and ingenious geometrical constructions, have attracted great interest, and have called forth fresh investigation in the same direction, among the well-instructed and able mathematicians of the American, Russian, French, and German Navy Departments.

The constancy to the compass problem, in which Smith persevered with a rare extreme of disinterestedness, from the time when Sabine first asked him to work out practical methods from Poisson's mathematical theory, until his health broke down two years before his death, was characteristic of the man. It was pervaded by that "ténacité passionnée" which a generous French appreciation describes as a peculiarity of the English nation; but there was in it also a single-mindedness and a purity of unselfishness to be found in few men of any nation, but simply natural in Archibald Smith.

Honourable marks of appreciation reached him from various quarters, and gave him the more pleasure from being altogether unsought and unexpected. The Admiralty, in 1862, gave him a watch. In 1864 he received the honorary degree of LL.D. from the University of Glasgow. The Royal Society awarded to him the Royal Medal in the year 1865. The Emperor of Russia gave him, in 1866, a gold compass, emblazoned with the Imperial Arms and set with thirty-two diamonds, marking the thirty-two points. Six months before his death Her Majesty's Government requested his acceptance of a gift of L.2000, as a mark of their appreciation of "the long and valuable services which he had gratuitously rendered to the Naval service in connection with the magnetism of iron ships, and the deviations of their compasses." The official letter intimating this, dated Admiralty, July 1st, 1872, contains the following statement, communicated to Smith by command of the Lords of the Admiralty:—"To the zeal and ability with which for many years you have applied yourself to this difficult and most important subject, My Lords attribute in a great degree the accurate information they possess in regard to the influence of magnetism, which has so far conduced to the safe navigation of iron

ships, not only of the Royal and Mercantile Navies of this country, but of all nations.”

In private life those who knew Archibald Smith best loved him most; for behind a reserve which is perhaps incident to engrossing thought, especially when it is concerned with scientific subjects, he kept ever a warm and true heart; and the affectionate regrets of his friends testify to the guileless simplicity and sweetness of his disposition, which nothing could spoil or affect. About the close of 1870 he was compelled by ill-health to give up work, but two years later he had wonderfully rallied; and though he was not strong enough to resume his legal or scientific work, he was able to take his old interest in his boys' mathematical studies. A few weeks before his death he revised the instructions for compass observations to be made on board the “Challenger,” then about to sail on the great voyage of scientific investigation now in progress; and he spoke several times of the satisfaction it gave him to feel able again to do such work without effort or fatigue. The attack of illness which closed his life was unexpected and of but a few hours' duration. In 1853 he married a daughter of Vice-Chancellor Sir James Parker, then deceased, and he leaves six sons and two daughters. He died on the 26th of December 1872.

The following Gentlemen were elected Fellows of the Society:—

A. FORBES IRVINE, Esq.

BENJAMIN CARRINGTON, M.D., Eccles, Lancashire.

WILLIAM FERGUSON, F.L.S., F.G.S.,

T. B. SPRAGUE, M.A. Cantab.

THOMAS MUIR, M.A.

J. BATTY TUKE, M.D., F.R.C.P.E.

WILLIAM DURHAM, Esq.