

of the financial operations of the colony; and during his term of office he brought out no less than twelve public loans, amounting together to about £3,000,000, every loan, with one exception, being a great financial success; and the present solid position of the South Australian securities in the London market is due in great measure to the efforts of Mr. Dutton. In his official relations with the home authorities Mr. Dutton was no less fortunate, his opinions commanding considerable respect; while in the commercial duties attached to the office the interests of the colony were carefully cared for and protected. The long and protracted negotiations with the British Australian Telegraph Company—which resulted in the construction of the line and cable which now connects Australia with the mother country—were conducted by him with consummate skill; and upon the opening of the line, in 1872, Mr. Dutton's services were recognised by his appointment to be a Companion of the Order of St. Michael and St. George. Mr. Dutton visited Vienna in 1873, as the colonial representative to the International Exhibition of that year, and was appointed by the Emperor of Austria to the second class or Knight Commandership of the Imperial Order of Franz Joseph. Besides these honours Mr. Dutton was also decorated by the King of Würtemberg. His death, which happened on the 25th of January, 1877, was undoubtedly accelerated by his devotion to the service of his colony; and in his loss the colony will mourn not only a zealous and honest servant, but also one who has done as much as any one to advance her interests and help her to that proud state of prosperity which she now enjoys. Mr. Dutton was elected an Associate of the Institution on the 6th of February, 1866, and constantly attended the meetings.

Mr. DAVID FORBES,¹ F.R.S., late Secretary of the Geological Society, Foreign Secretary of the Iron and Steel Institute, &c., was born in Douglas, Isle of Man, on the 6th of September, 1828. He was the fifth son of the late Mr. Edward Forbes, banker, and the younger brother of the late Professor E. Forbes. His earlier education was conducted at the Athole Academy, Isle of Man.

When only nine years of age he was very studious, and took more

¹ A very full memoir of Mr. David Forbes was included in the anniversary address of Professor P. Martin Duncan, as President of the Geological Society—*vide* Quar. Jour. Geol. Soc., xxxiii., 41. An obituary notice was also given in the Jour. of Chem. Soc., xxxi., 496; and similar notices have appeared in the "Geological Magazine," iv., 45, and in the "Chemical News" in December 1876.

pleasure in reading the works of Wollaston and other celebrities than in joining his younger brother and companions in their play; and even thus early showed the strong predilection for scientific subjects for which he became so distinguished in after years. Writing to his sister Jane (Mrs. M. Attwood) from Ballaugh, Isle of Man, on the 15th of August, 1842, he says: "I am busy learning short-hand from Mark Howard, and I can write it slowly; but I expect to write it better by practice. I write in a scrap-book every day, and have just finished a short life of W. H. Wollaston, a celebrated chemist, which I began to write on August 3rd, and I have made a task for myself as long as the holidays continue. I have now begun to write a small life of Sir Humphry Davy, which I dare say I shall have finished by the end of the holidays."

Soon afterwards Forbes left the Isle of Man, and was sent to school at Brentwood, in Essex, whence he moved to the University of Edinburgh in October 1844, to study under Dr. Wilson and other eminent men. Although only sixteen years of age, he had shown at school such a remarkable talent for, as well as practical knowledge of chemistry, that Dr. Wilson appointed him at once to the position of assistant chemist at the University. In 1846 he accepted a position under Dr. Percy (from whom he acquired much valuable metallurgical skill), in Birmingham, and remained there until 1847, when he was fortunate enough to obtain a still better situation under the large and extensive firm of Evans and Askin, smelters and refiners of nickel, cobalt, &c. The firm having then upwards of ten nickel mines in Norway, he accompanied the senior partner, Mr. Brooke Evans, to that place, to assist in the examination of their mineral resources. Shortly after Mr. Forbes took charge of the construction of mining and smelting works necessary to extract and reduce the ores obtained from the Andreasberg and other adjacent mines situated in the valley of Espedal, in the province of Gulbrandsdal, about 2,000 feet above sea-level, and in the centre of the Norwegian Alps; and he there obtained his first practical experience in engineering science.

Having managed successfully for upwards of nine years these extensive properties, he became a partner in the firm of Evans and Askin. During the above period he travelled extensively in Norway and Sweden and on the Continent, and acquired the great knowledge of languages for which he became so celebrated. Scientific investigations occupied all his spare moments, and his pen was constantly employed in writing up the observations

which he most carefully made during his travels. After leaving Norway he resided for a short time in Birmingham, when, in 1857, the business affairs of the firm called him away to South America, and he was there enabled to pursue one of the greatest pleasures of his life, *i.e.* scientific research in nearly all its branches. He travelled continuously for six years, and traversed Chile in all directions from considerably south of Santiago, northwards to the frontiers of Bolivia, in the Desert of Atacama. He inspected all the principal and some of the lesser mining districts along the range of the Cordilleras; and from these he collected a valuable and extensive series of minerals, including about one hundred and ninety species, of which he published a list in 1865, classifying them according to their mode of geological occurrence in an important Paper "On the Mineralogy of Chile." In December 1857 he was heard from at Panama, on the way to Chile; and in March 1858 from Santiago, when he complained of fever, having been on horseback for six weeks under a strong sun, and sleeping on the ground up in the Andes. On the 1st of February, 1858, he wrote from Valparaiso: "My last to you was from Panama; since then I have coasted along and visited Guayaquil, Lima, Copiapo, Coquimbo, &c., and arrived here some three weeks ago; and since then have been a journey up in the centre of the Andes, of great difficulty, but also of great scientific interest, and managed to ascend to the height of 18,000 feet, which is nearly the highest yet ascended by man." Again, from Santiago in September 1858 he says: "I have just returned from a journey of 1,500 miles on horseback, which took two months and a half, during which time I was on the ground, with the exception of a few days when I had a bed." In April 1859: "On account of the revolution I only managed to reach here a few days back with much difficulty, escaping at night with some friends in an open coal barge, a small boat, and sailing along the coast until we got into Bolivian territory, having previously been a sort of prisoner. At Copiapo I had to serve in the foreign legion which was formed to protect the town, and hard work it was at first, I being in the cavalry, and thirty-three nights in command, and never was in a bed or had my clothes off." He was next heard of on board the "Dart," off Valparaiso, the 7th of May, 1859, going to Tahiti and the Fiji Islands with an exploring expedition; whence he writes on the 30th of May, 1859: "We are under way for Pitcairn's Island and Chile." In 1860 he returned home for a short time, leaving, however, by the next steamer for Peru, Bolivia, and Rio de Janeiro; subsequently proceeding to Monte Video and Buenos Ayres, then

across the Pampas to Mendoza, Santiago, Valparaiso, Copiapo, Cobija, and Arica; and then across the Andes to the Brazilian side of the continent. In crossing the Pampas he arrived at Mendoza only four days after its almost total destruction by an earthquake, and was detained there more than a month making a report on the terrible catastrophe to the authorities. The photographs that he took with his travelling camera, representing the ruins of the once flourishing town, are most interesting.

Mr. Forbes wrote from San Baldomero, in Bolivia, on the 8th of October, 1862, complaining of the difficulties surrounding his investigations owing to the country being again in a state of revolution, and that he had been nearly killed in La Paz, and received two bayonet wounds, which, however, were not very bad. He also mentioned that Mendoza was not yet rebuilt, and so much the better, as there was another still more severe earthquake that year, which would certainly have again wrecked it. In September 1863 Mr. Forbes returned from a journey in Missouri and other places in the United States and Canada, where he made some extensive scientific investigations. He afterwards visited Egypt, and spent a large portion of his time in Spain, Germany, and Norway, examining mineral deposits and mining works. Mr. Forbes collected and brought home from the many different countries through which he travelled extensive collections of minerals and rocks, which he classified with great care, and on many of which he wrote valuable papers.

During the last twelve years of his life he was busily employed as Consulting Mining Engineer for many large and extensive mining companies, both in Europe and abroad, and in that capacity he was also employed by the Imperial Government of Japan to make estimates, plans &c., for large iron-smelting works and rolling mills in Nippon. As foreign secretary of the Iron and Steel Institute he prepared for six years (1871-1876) careful and elaborate details of the progress of the iron and steel industries in foreign countries. He contributed upwards of fifty papers to various scientific societies and technical journals, the most important of which are:—

“On the Determination of Copper and Nickel in Quantitative Analysis.”
(Edin. New Phil. Jour., lv., 1853, p. 131.)

“On the Occurrence and Chemical Composition of some Minerals from the South of Norway.” (British Assoc. Rep., 1854 (pt. 2), p. 67.)

“On the Causes producing Foliation in Rocks.” (Quar. Jour. Geol. Soc., xi., 1855, p. 166.)

“On the Effects of Chlorine in Colouring the Flame of Burning Bodies.”
(Phil. Mag., xi., 1856, p. 65.)

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- "On the Chemical Composition of some Norwegian Minerals." (Edin. New Phil. Jour., vi., 1857, p. 112.)
- "On the Borders of the Fossiliferous and so-called 'Primitive Formation, and On the so-called Primitive Formation of the South Coast of Norway.'" (Quar. Jour. Geol. Soc., xiv. (pt. 2), 1858, p. 19.)
- "On the Geology of Bolivia and Southern Peru." (Quar. Jour. Geol. Soc., xvii., 1860, p. 7.)
- "On the Chemical Composition of some Chilian Minerals." (Phil. Mag., xxv., 1863, p. 103.)
- "On Evansite, a new Mineral Species." (Phil. Mag., xxxvii., 1864, p. 341.)
- "On the Mineralogy of South America." (Phil. Mag., xxix., 1865, pp. 1 and 129; xxx., 1866, p. 139.)
- "On Phosphorite from Spain." (Phil. Mag., xxix., 1865, p. 340.)
- "On the Igneous Rocks of Staffordshire." (Geol. Mag., iii., 1866, p. 23.)
- "On the alleged Hydrothermal Origin of certain Granites and Metamorphic Rocks." (Geol. Mag., iv., 1867, p. 149.)
- "On the Chemistry of the Primeval Earth." (Geol. Mag., iv., 1867, p. 433.)
- "Researches in British Mineralogy." (Phil. Mag., xxxiv., 1867, p. 329; xxxv., 1868, p. 171; and xxxvii., 1869, p. 32.)
- "On Dr. Sterry Hunt's Geological Chemistry." (Geol. Mag., v., 1868, p. 105.)
- "On some Points in Chemical Geology." (Chemical News, 1868.)
- "Chemical Examination of the Oriental Jargon." (Chemical News, 1869.)
- "On the Application of the Blowpipe to the Quantitative Determination of certain Minerals." (Chemical News.)
- "The Nature of the Interior of the Earth." (Pop. Science Rev., viii., 1869, p. 121.)
- "On the Contraction of Igneous Rocks in Cooling." (Geol. Mag., vii., 1870, p. 1.)
- "The Structure of Rock Masses." (Pop. Science Rev., xi., 1870, p. 113.)
- "On the Aymara Indians of Bolivia and Peru." (Communicated to the Ethnological Soc. of London, June 1870.)
- "On Volcanos." A Lecture. (Geol. Mag., vii., 1870, p. 314.)
- "On the Nature of the Earth's Interior." (Geol. Mag., viii., 1871, p. 162.)
- "On the Geology of Donegal." (Geol. Mag., ix., 1872, p. 12.)
- "On Meteorites." A Lecture. (Geol. Mag., ix., 1872, p. 222.)
- "The First Chapter of the Geological Record." (Pop. Science Rev., xi., 1872, p. 350.)

Mr. Forbes devoted himself almost entirely to his professional and literary pursuits, and took but little physical exercise, and it is probable that his too sedentary habits, together with a sad domestic loss he had recently suffered, depressed his spirits and broke up a constitution already to some extent enfeebled by intermittent fever caught in South America, and so accelerated his end. But notwithstanding, he continued to work until within a week of his death, which occurred on the 5th of December, 1876, at the comparatively early age of forty-eight years. He was elected an Associate of the Institution on the 1st of February, 1853, and served on the Council during the session 1872-73.

Being an old traveller, Mr. Forbes was a most entertaining and

sociable companion, and his genial manner made him many friends wherever he went. His home was the resort of men of science from all parts of the world, and a place where they were always certain of a kind and hospitable welcome.

ADMIRAL SIR STEPHEN LUSHINGTON, second son of the late Sir Henry Lushington, Bart., was born on the 12th of December, 1803. He entered the Navy in 1816, as a first-class volunteer on board the "Tagus," 38, Captain Dundas. After serving in South America he was appointed midshipman in the "Hind," 20, Captain Hon. Henry J. Rous, in the boats belonging to which vessel he was actively employed in the suppression of piracy in the Archipelago in 1823 and two following years. For these services he was made Lieutenant in July 1824; and in the "Zebra," 18, and "Cambrian," 48, he again performed similar active work against the pirates, which led to their entire suppression. Lieutenant Lushington was appointed in October 1827 to the "Asia," 84, Admiral Sir J. Codrington, on the same station. In the following May he commanded the "Etna," bomb, in the operations against Morea Castle, and for his distinguished services on that occasion he obtained the order of St. Louis of France and the Redeemer of Greece; and in October 1829 was promoted to Post Captain. His next appointment was, 19th January, 1839, to the "Cleopatra," 26, fitting for the West Indies, whence, after nine months of severe illness, he was ordered by Sir Thomas Harvey, the Commander-in-Chief, to be invalided in November 1840. He next commanded the "Retribution," steam frigate, and "Vengeance," 84, on the home station, till he was appointed Superintendent of the Indian Navy, in 1848, an office he held till 1852. At the siege and capture of Sebastopol, in 1855, he was in command of the Naval Brigade, and for his services against the Russians he was nominated a Knight Commander of the Order of the Bath, and made an officer of the Legion of Honour, of which he was promoted to Commander in 1857. He was made Rear-Admiral in 1858, appointed Lieutenant-Governor of Greenwich Hospital in May 1862, and Admiral on the reserve list in December 1865. He received the Grand Cross of the Bath in March 1867. Admiral (then Captain) Lushington was elected an Associate of the Institution on the 6th of May, 1845, on the proposition of Mr. Joseph Maudslay, on account of his acquirements in connection with steam navigation and machinery. He died on the 28th of May, 1877.