

medal for mathematics. The same year he was appointed to the Public Works Department of the Government of India and served at Dera Ghazi Khan and other places in the Punjab.

In 1875 he was appointed Professor of Engineering at the Presidency College, Calcutta, and in 1880, when the Engineering Department of that College was formed into an independent residential Engineering College at Sibpur, he took a leading part in its organisation, became one of the original members of its staff, and was eventually appointed Principal in 1891.

He inaugurated a scheme of modern education for the District Schools of Bengal and Assam, and was responsible for the reorganisation of the technical schools of those two provinces. In 1897 he was for some months Inspector of Schools of the Rajshahi Division, and in 1901 officiated as head of the Educational Department of Bengal; in 1904 he was incapacitated by a serious illness which necessitated his retirement from India.

Mr. Slater was responsible for teaching astronomy to the students of the Engineering College, and was always keenly interested in that science. In 1891, while on leave, he devised and patented an Armillary Sphere, which has proved of value for instructional purposes.

After his retirement he devoted himself enthusiastically to an investigation of the pollen of plants, and prepared by microphotography a very large number of enlarged photographs of pollen grains; the value of his work in this direction was recognised by the botanical authorities at Kew.

He married in 1873 Jessie Frances, only daughter of Surgeon Major John Bean attached to the Royal Irish Fusiliers, by whom he had a son, deceased, and a daughter, who is married to Mr. B. Heaton, the present Principal of the Sibpur Engineering College.

He died at Ealing on 1911 April 7, aged 61.

He was elected a Fellow of the Society on 1892 January 8.

GEORGE JOHNSTONE STONEY was the elder son and third child of the late George Stoney, of Oakley Park, King's Co., and his wife Anne, daughter of Bindon Blood, Esq., of Cranagher and Rockforrest, Co. Clare. He was born in Ireland on 1826 February 15, and was educated at Trinity College, Dublin, where he took high honours in mathematics.

On the completion of his studies at Trinity College he became assistant to Lord Rosse at Parsonstown, where he took a share in the work of the six-foot reflector, and made many of the observations of nebulae which were published in the various Memoirs issued from that observatory.

He spent altogether two years and a half with Lord Rosse, from 1848 July to 1850 August, and from 1852 August to December of that year.

In 1852 he was appointed Professor of Natural Philosophy at University College, Galway, where he did excellent work for five

years, until his appointment to the office of Secretary to the Queen's University, and his consequent removal to Dublin.

From 1857 to 1893 Dr. Johnstone Stoney played an active part in the scientific life of Dublin. For twenty years he was an Honorary Secretary of the Royal Dublin Society, greatly occupied in its many-sided activities, which include the world-famous Horse Show. During this period he published many of his most notable researches, of which we may mention in particular his memoir "On the Physical Constitution of the Sun and Stars" (*Proc. R.D.S.*, 1868), the starting-point of his long series of researches on the laws of gaseous atmospheres and the escape of the lighter gases at their upper limits.

In the concluding memoir of this series (*Scientific Transactions of the R. Dublin Society*, vi. 305) he explains the absence of hydrogen and helium from the Earth's atmosphere, and the absence of all known constituents of an atmosphere from the Moon; and he further arrives at the conclusion that the vapour of water cannot exist in the atmospheres of either Mercury or Mars. This investigation also offers an explanation of such gaps in the series of chemical elements as we find upon the Earth between hydrogen and helium, and between helium and lithium; and it shows that if the suspected intermediate elements exist, the conditions upon Jupiter are such that they may all be present in his atmosphere, and that some of them may be present upon the other major planets, though not upon any of the four inner planets to which the Earth belongs.

This important paper was reprinted in *Ap. J.*, vol. vii. p. 25. Dr. Stoney's conclusions were criticised in a paper by Mr. S. R. Cook (*Ap. J.*, vol. viii. p. 36), on the ground that no determination had been made of the number of molecules which would escape, and that the application of Maxwell's law of the distribution of velocities suggested that the number thus actually escaping would be infinitesimal. In the same volume of the *Ap. J.*, Dr. Stoney replied with two papers giving reasons why he considered the Maxwell laws inapplicable to the case, and Professor Bryan then joined issue with him. The long and very profound controversy which ensued ranged over the pages of the *Astrophysical Journal*, *Proceedings of the Royal Society*, *British Association Reports*, *Philosophical Magazine*, and *Nature*, and it is not possible to summarise the wealth of argument with which Dr. Stoney held his ground. But a study of his contributions to the discussion exhibit in the most favourable way the long reflection and profound thought which he gave to any problem in which he became interested.

Two other ideas which we owe to Dr. Stoney are of particular interest to astronomers. He first made the suggestion that the bright clouds of the Sun's photosphere are composed of incandescent carbon; and he introduced the notion of the "electron" within the molecule, which has come to be of prime importance in the theory of radiation. On 1899 Mar. 22 the Boyle Medal of the Royal

Dublin Society was awarded to Dr. Stoney, and in the report of the Committee which recommended the award, his theory of the electron is thus referred to:—

“The bold realisation of events, which we are accustomed to associate with the vast cycles of astronomy, as occurring in orbits too minute and during periods too transient for the mind to grasp, is characteristic of the writer.

“The recent and powerful method of research with which the work of Lorentz and of Zeeman has armed physicists is every day rendering acknowledgment to this beautiful theory of Dr. Stoney’s.”

In 1893 Dr. Stoney removed to London, and since that date he contributed important papers to the Society, of which we may mention, “On the Equipment of the Astrophysical Observatory of the future” (*Monthly Notices*, lvi. 452), “Inquiry as to the Cause of the Shadow Bands upon the Earth which accompany Total Eclipses of the Sun” (*Monthly Notices*, lx. 586), and “Examination of Mr. Whittaker’s Undulatory Explanation of Gravity from the Physical Standpoint.” The first of these contains interesting suggestions on a method of supporting large specula on a flexible diaphragm behind which air is maintained at a pressure automatically controlled to balance the normal component of the weight of the speculum; and an elegant plan for the improvement of the Foucault siderostat, by substituting for the usual sliding sleeve a rectilinear motion obtained from a point on the circumference of a circle rolling inside another of twice the diameter. Models of these devices were exhibited to the Society. The *Monthly Notices* also contain parts of the work which he undertook, in conjunction with Dr. Downing, on the perturbations of the Leonids; the principal paper was published in *Proc. R.S.*, lxiv. 403. His last published work was an extensive inquiry into the theory of Telescopic Vision (*Phil. Mag.*, Series VI.), vol. xvi., 1908.

Dr. Stoney was elected a Fellow of the Royal Society on 1861 June 6, and the degree of Sc.D. was conferred on him by the University of Dublin.

Dr. Stoney married his cousin, Margaret Stoney, and leaves two sons and three daughters. He died in London on 1911 July 5.

He was elected a Fellow of the Society on 1860 February 10.

GEORGE STRAHAN, the son of William Strahan, was born at Ashurst in Surrey in 1839. He was educated at Eton, and in 1857 he entered the Military College of the Honourable East India Company at Addiscombe. He obtained his commission in the Bengal Engineers in 1858, following the footsteps of his elder brother Charles, who rose to be Surveyor-General of India. He went to India in 1860, and was first posted to the Bengal Sappers and Miners at Roorkee, subsequently joining the Irrigation Branch of the Public Works Department. He was employed on the Ganges Canal for fifteen months, and in July 1862 was appointed to the Survey of India. In this he remained for his whole