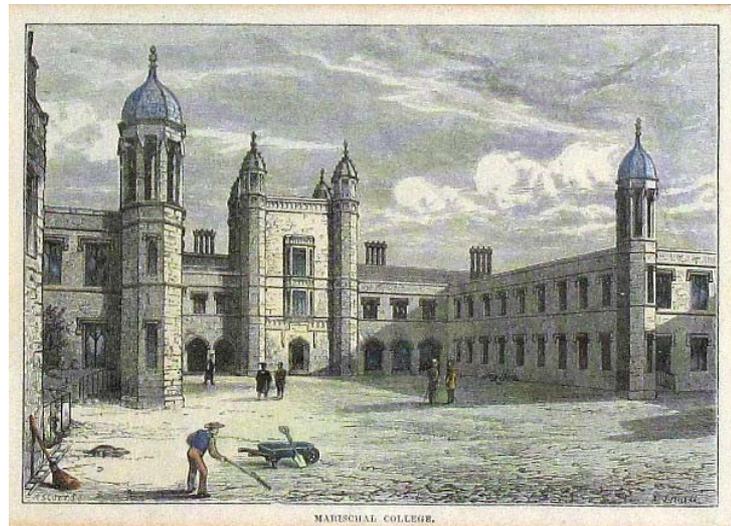


Marischal College

James Clerk Maxwell – pioneer in electrical science, molecular science, colour science, optics and more, and sympathetic educator



James Clerk Maxwell FRS, FRSE (1831-1879) was the most famous and influential professor Aberdeen has ever had – ‘up there’ with Newton and Einstein as a person who changed science in his day and whose work will be influencing his successors for centuries to come. Maxwell’s Marischal College can be seen in the accompanying illustration. His posthumous bust is still in the building. As a person he was charming and modest. Although he was no orator at the lectern, he prepared his teaching thoughtfully and was conspicuously student friendly.

Adopting the practice of inviting students for ‘breakfast’, after one year in the College he wrote in a letter to a friend “*I am becoming skilful in the conduct of students teas and breakfasts. I almost prefer to get together a rough lot and set them agoing. I find the uproarious and idle ones best at tea*”. After he left Marischal College in 1860, Maxwell wrote three undergraduate textbooks. His ‘Theory of Heat’ and his ‘Matter and Motion’ both ran to many editions well into the twentieth century and are still available as reprints.

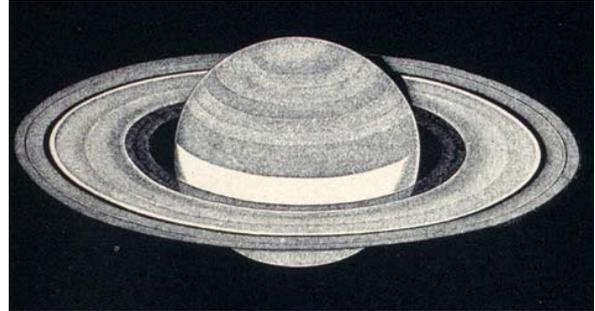
Maxwell was appointed to teach students but it’s not on this account that he is considered among the great physical scientists. He had an interest in a wide range of natural phenomena, a brilliant, clear, perceptive mind, a facility with applied mathematics that ranked him with the best in his day and a feel for objects and equipment that came from playing with them since he was a youngster. He took up his post as Professor of Natural Philosophy in 1856 at the age of 25, by which time he had already published substantive papers on Electricity, Mechanics, Optics and Colour Science. He brought his interest in these topics with him to Aberdeen, developed them all and began a new interest in ‘molecular science’, in particular the description of gases on the assumption that they are composed of identical molecules in random motion. In his day, Maxwell was known as a leading molecular scientist. The only fairly fundamental law of physics particularly associated with Aberdeen is the Maxwell distribution law of velocities of molecules in a gas that he announced in Aberdeen at the 1859 meeting of the British Association for the Advancement of Science (the BAAS).

As well as laying the foundations of modern kinetic theory of gases, Maxwell laid the foundations of modern colour science at Aberdeen with his innovative ‘colour box’

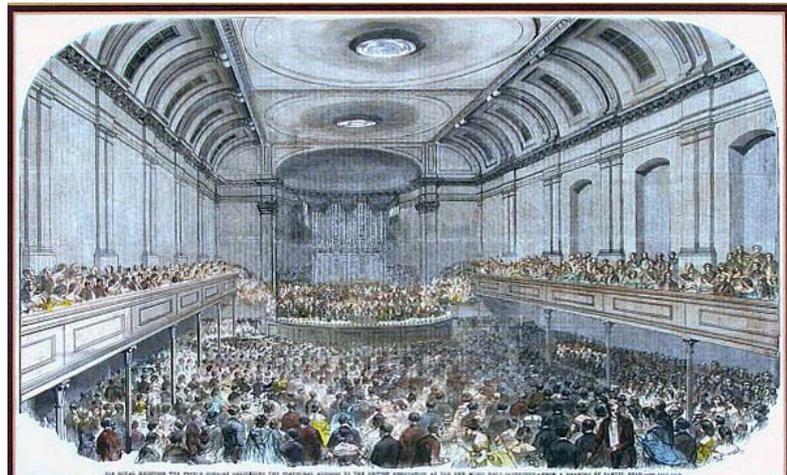
The Scientific Tourist: Aberdeen

experiments that allowed him to explore how spectral colours can be reproduced by mixtures of three primary colours. This is the key to colour science, for all colours are ultimately mixtures of spectral colours. Maxwell's colour triangle that represents the results appears now in colour science in the variant form of the CIE chromaticity diagram. He also showed in principle how colour photographs could be made. The 'colour box', along with other apparatus Maxwell devised, was made by the Aberdeen instrument making firm of Smith & Ramage at 45 Marischal Quay.

The Aberdeen work that particularly impressed his contemporaries, and still impresses posterity, is his lengthy essay on the stability of Saturn's rings which showed from mathematical considerations that Saturn's rings had to be composed of a myriad small orbiting bodies. This was before a single good photograph had been taken of Saturn and more than a century before the first space probe flew past, completely confirming the result. Maxwell won the Adams' Prize for this work. The sketch alongside is an 1850s drawing of Saturn, the best available to Maxwell.



While in Aberdeen, Maxwell played a significant part in the organisation and running of the 1859 BAAS meeting, for which the Music Hall in Union Street had been specially built onto the back of the existing Assembly Rooms. Maxwell was a subscriber to the public fund that helped pay for it. The Music Hall is still very much as Maxwell would have seen it in 1859 (gas lights excepted) so when you are next inside, imagine the stage seated with worthies that include James Clerk Maxwell, local Secretary to the BAAS, with Prince Albert at the rostrum giving the opening address (as in the illustration).



Clerk Maxwell Crescent is in Kincorth, an Aberdeen suburb south of the river Dee. Zoom out on the map and look for marker '2b'.



While at Marischal College, Maxwell married Katherine Dewar, a daughter of the Principal, who shared many private interests with him but did not participate much in his scientific work or his scientific circle. Today Maxwell is recognised as the founder of the modern theory of Electricity and Magnetism, which amongst many other achievements predicts the existence of electromagnetic waves now identified with radio, infra-red, light, X-rays and so on. Maxwell's was the first mathematical field theory, conceptually several decades ahead of his contemporaries. Even today many outstanding scientists will look back on Maxwell's work in the context of the knowledge of his time and say to themselves 'how did he do it?'. It is the same with Newton and Einstein.

John S. Reid