John Tyndall

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John Tyndall FRS (2 August 1820 – 4 December 1893) was a prominent 19th century physicist. His initial scientific fame arose in the 1850s from his study of diamagnetism. Later he studied thermal radiation, and produced a number of discoveries about processes in the atmosphere. Tyndall published seventeen books, which brought state-of-the-art 19th century experimental physics to a wider audience. From 1853 to 1887 he was professor of physics at the Royal Institution of Great Britain, where he became the successor to positions held by Michael Faraday.

Early Years and Education

Tyndall was born in Leighlinbridge, County Carlow, Ireland. His father was a local police constable, descended from Gloucestershire emigrants who settled in southeast Ireland around 1670. Tyndall attended the local schools in County Carlow until his late teens, and was probably an assistant teacher near the end of his time there. Subjects learned at school notably included technical drawing and mathematics with some applications of those subjects to land surveying. He was hired as a draftsman by the government's land surveying & mapping agency in Ireland in his late teens in 1839, and moved to work for the same agency in England in 1842. In the decade of the 1840s, a railroad-building boom was in progress, and Tyndall's land surveying experience was valuable and in demand by the railroad companies. Between 1844 and 1847, he was lucratively employed in railroad construction planning.

In 1847 Tyndall opted to become a mathematics and surveying teacher at a boarding school in Hampshire. Recalling this decision later, he wrote: "the desire to grow intellectually did not forsake me; and, when railway work slackened, I accepted in 1847 a post as master in Queenwood College." Another recently-arrived young teacher at Queenwood was Edward Frankland, who had previously worked as a chemical laboratory assistant for the British Geological Survey. Frankland and Tyndall became good friends. On the strength of Frankland's prior knowledge, they decided to go to Germany to further their education in science. (Among other things, Frankland knew that certain German universities were ahead of any in Britain in experimental chemistry and physics. British universities were still focused on classics and mathematics and not laboratory science.)

The pair moved to Germany in summer 1848 and enrolled at the University of Marburg, where Robert Bunsen was an influential teacher. Tyndall studied under Bunsen for two years. Probably more influential for Tyndall at Marburg was Professor Hermann Knoblauch, with whom Tyndall maintained communications by letter for many years afterwards. Tyndall's Marburg dissertation was a mathematical analysis of screw surfaces in 1850 (under Friedrich Ludwig Stegmann). He stayed at Marburg for a further year doing research on magnetism with Knoblauch, including some months' visit at the laboratory of Knoblauch's main teacher, Heinrich Gustav Magnus in Berlin. It is clear today that Bunsen and Magnus were among the very best experimental science instructors of the era. Thus, when Tyndall returned to live in England in summer 1851, he probably had as good an education in experimental science as anyone in England.

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Early Scientific Work

Tyndall's early original work in physics was his experiments on magnetism and diamagnetic polarity, on which he worked from 1850 to 1856. His two most influential reports were the first two, co-authored with Knoblauch. One of them was entitled "The magneto-optic properties of crystals, and the relation of magnetism and diamagnetism to molecular arrangement", dated May 1850. The two described an inspired experiment, with an inspired interpretation. These and other magnetic investigations very soon made Tyndall known among the leading scientists of the day. He was elected a Fellow of the Royal Society in 1852. In his search for a suitable research appointment, he was able to ask the longtime editor of the leading German physics journal (Poggendorff) and other prominent men to write testimonials on his behalf. In 1853, he attained the prestigious appointment of Professor of Natural Philosophy (Physics) at the Royal Institution in London, due in no small part to the esteem his work had garnered from Michael Faraday, the leader of magnetic investigations at the Royal Institution.

Main Scientific Work

Beginning in the late 1850s, Tyndall studied the action of radiant energy on the constituents of air, and it led him onto several lines of inquiry, and his original research results included the following:

- Tyndall explained the heat in the Earth's atmosphere in terms of the capacities of the various gases in the air to absorb radiant heat, a.k.a. infrared radiation. His measuring device, which used thermopile technology, was a significant early step in the history of absorption spectroscopy of gases. He was the first to correctly measure the infrared absorptive powers of the gases nitrogen, oxygen, water vapour, carbon dioxide, ozone,