

Michael Faraday (1791 – 1867), science, medicine, literature and his disability

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ABSTRACT

Numerous studies on Michael Faraday were published, but this article will shed some light on Faraday's diseases and disability, and on some of his scientific and medical achievements.

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There is a famous story about Einstein's room at Princeton. He had three portraits on his wall. One was Sir Isaac Newton, another Michael Faraday. The third was James Clerk- Maxwell." [Professor Stephen Hawking] "Fortunate, indeed, is the man who takes exactly the right measure of himself and holds a just balance between what he can acquire and what he can use." [Dr. Peter Mere Latham (1789-1875)]

A few years ago, five physicians, each from a different country, met at The Athenaeum, 107 Pall Mall, London . Our British colleague was kind enough to invite us to this historical Club. Fond memories from the day's long discussions within the library, the excellent lunch, and above all- the echoes of the past. From the "History of The Athenaeum". "The iron-tired wheelchair in which Faraday is thought to have died in 1867 is kept in the building and can be seen on the main bedroom landing. The club benefitted from its first secretary's inventiveness just before he died when in 1886 it became one of the earliest building ever to be lit by electric light , using its own generator until a public supply became available in the mid 1890s."

The Club's first secretary was Michael Faraday, the discoverer of electromagnetic induction, Fullerian professor of chemistry at the Royal Institution, Scientific Adviser to Trinity House, Commander of the Legion of Honour (by Napoleon the III) , member of the Academie des Sciences.. the University of Oxford granted Faraday a Doctor of Civil Law degree (honorary). ...member of the Royal Swedish academy of Sciences .But the beginning of his outstanding career was rather modest:

"When Michael Faraday aged 13 he started to work as an apprentice of George Riebau, a bookbinder and bookseller. Later, he joined the City Philosophical Society. Members of the society attended lectures and exchanged ideas on scientific matters. In 1812, Riebau showed to Mr.Dance, a member of the Royal Institution of London and one of his customers, some of Faraday's notes. Dance was so impressed that he invited young Michael to attend Sir Humphry Davy 's lectures at the Royal Institution. At this time, Faraday had finished his seven-year apprenticeship with Riebau and had become a qualified bookbinder. Davy was impressed with Faraday's notes, and when Davy was temporarily blinded from a chemical experimental explosion, he took Faraday to assist him. Davy introduced him to Volta and Ampère. Faraday's only problem was that Davy's wife treated him like a servant...' [1].

The connections between chemistry and medicine, is found in Davy's story. In Bristol, Davy, Faraday, Samuel Taylor Coleridge, and Robert Southey, were part of a circle of chemists, poets, and political radicals who surrounded" the

stout, wheezing, pioneering doctor" Thomas Beddoes, founder of the Pneumatic Institution. "When the brilliant twenty-recently founded Pneumatic Institution in Bristol in April 1799, he inhaled the new mind- altering substance himself, and shared it with his friends.[2]. The benefit to medicine by Davy's work was enormous. Davy wanted to study medicine at Edinburgh , but his father's death, forced Humphrey to apprentice to an apothecary and surgeon [3]. There he became interested in chemistry.

"This is the patent-age of new inventions For killing bodies, and for saving souls, All propagated with the best intentions; Sir Humphrey Davy's lantern, by which coals Are safely mined for in the mode he mentions, Timbuktoo travels, voyages to the Poles, Are always to benefit mankind, as true, Perhaps, as shooting them at Waterloo. " [Lord Byron]

Was Faraday aware of others' previous discoveries?

The Italian priest, philosopher and physicist, Francesco Zantedeschi (1797-1873) anticipated Faraday's classical experiments of 1831when in 1829 and in 1830 he published papers on the production of electric currents in closed circuits by the approach and withdrawal of a magnet.

He is regarded among the first to recognize the marked absorption by the atmosphere of the red, yellow, and green rays; he also thought that he had detected in 1838 a magnetic action on steel needles of ultra-violet light. Controversy erupted when Faraday , who was undoubtedly the first to build a working electrical motor, refused to grant Wollaston credit for his earlier work on electricity. William Hyde Wollaston (1766-1828) was an English physician-chemist who discovered palladium in 1803 and rhodium in 1804. Sir William Robert Grove (1811 - 1896) was a Welsh lawyer, judge and physical scientist who anticipated the general theory of the conservation of energy and was a pioneer of fuel-cell technology. By Faraday's invitation, Grove presented his discoveries at the prestigious Royal Institution Friday Discourse on 13 March 1840. Faraday and Grove illustrated the extent and variety of the transformation and correlation of forces, not only heat being changed into work, but light occasioning chemical action, and this generating heat, and, and heat producing electricity, capable of being again converted into motion, and so on round the cycle. Faraday knew how to adopt novel discoveries: he welcomed the invention of photography and the Victorian media industry, for recording observations, and incorporated it for the advancement of science. [4]. He was wholly aware that "pictures could provide powerful propaganda'..[4]. In 1831, he discovered electromagnetic induction, a breakthrough that

ushered in an entirely new era of technology. With Faraday's discovery it became possible to create such things as electrical generators and motors, and because of the practical nature of his discoveries, he was quickly awarded government grants and positions that enabled him to continue his work with electricity. On March 1st, 1932, "The Reading Eagle" published this short report: "When a modern physician employs any of the numerous electrical machines at his disposal in making a diagnosis or treating a patient, he owes a royalty of gratitude to Michael Faraday to Faraday we are indebted for the basis discoveries in dynamic electricity without the dynamo, there could hardly be an x-ray machine, the ECG, the electric cattery, the ultraviolet generating lamp..."

Faraday's Medical history

Faraday worked for long years, for long hours every day in the laboratory, lecturing and tutoring, and totally bound to his mission. In 1839, when he was 48 year old, he suffered from some acute episode which apparently left a trace on him throughout his life: loss of memory, recurrent attacks of giddiness and confusion, which Ernst Jentsch suggested in 1915 that this implies cerebral arteriosclerosis. Dr Peter Mere Latham examined Faraday and noticed he had vertigo, gait disturbances and strabismus. TIA? amnesic syndrome? [5-7]. In 1841 Faraday experienced a "nervous breakdown" and did not return to his studies until 1844. Poor health and exhaustion forced him to take a break, and his research did not begin again until 1845. In 1846, he presented his ideas about the nature of electricity. Faraday developed some sort of physical disability, most probably, paraparesis or paraplegia. Were both physical and mental disorders part of one disease? Thomas Twining III of Twickenham made an "invalid chair" for him. In 1895 this chair was hold by Dr. John Rudd Leeson, Twining's doctor and Charter Mayor of Twickenham. Lesson gave the chair to the Athenaeum Club in 1908 In the mid-1850s Faraday began to experience dementia, and as he gradually lost the ability to take care of himself he was forced to leave his work. Queen Victoria offered Faraday knighthood, but he declined it, but accepted the Queen's offer of free residence at Hampton Court, where he lived until the end of his life.

Thomas Twining III (1806 – 1895) and Dr John Rudd Leeson (1854 – 1927)

Thomas Twining III was the fifth generation of the family to have been connected with Twickenham and he was, perhaps, the most notable member. Twining was badly injured by a snow glare in a trip in Switzerland, walked aided with

crutches, his eyesight diminished, and his voice was damaged by some medical treatment. In Twickenham, Twining established Museum of Domestic and Sanitary Economy (The Twickenham Economic Museum) devoted to the technical and scientific education. In Twickenham, there was another museum: " Alexander Pope's museum of mining and geology" created in his grotto in 1739. (From the age of 12, Pope suffered from Pott's disease which deformed his body and stunted his growth, leaving him with a severe hunchback. His tuberculosis infection caused also respiratory difficulties, hyperpyrexia, inflamed eyes, and abdominal pain. Pope moved to the rural Twickenham in 1719. In 1739, after his visit to the Hotwell Spa at the base of the Avon Gorge, he found much interest in geology and mining). " the Muse but serv'd to ease some friend, not wife, To help me thro' this long disease, my life.." (Pope).

Faraday contributions to medicine

Dr Robert Bentley Todd (1809-60) was a clinical scientist and Professor of Physiology and Morbid Anatomy, with a special interest in the nervous system, at King's College, was influenced by Faraday. Todd found the basis of our understanding of brain electricity and electrical discharges in epilepsy. Todd formulated the concept of nervous polarity, generated in nerve vesicles and transmitted in "nerve fibres", which was confirmed a century later by the Nobel Prize-winning work of Hodgkin and Huxley, who demonstrated the ionic basis of neuro-transmission, involving the same ions which had had been discovered by Faraday's mentor, Sir Humphry Davy (1778-1829) [8-9]. His contributions to cardiology [10] and anesthesiology [11] are well known. Faraday demonstrated the shielding effect of a hollow conductor in 1836 by building a cubic chamber of metal- the Faraday Cage a new electrode system for activation and pain associated with a shock. He central feature of their design is a Faraday Cage [10]. Like Davy's old experiments with the "laughing gas", Faraday's contribution to introduction of anesthesia was his announcement in 1818 that inhalation of ether produced the same effects on consciousness as the breathing of nitrous oxide. Henry Bence-Jones was an English physician and chemist, (1813-1873). He studied medicine at St. George's Hospital in London and later worked for a year in the laboratory of the hospital dispensary. He became interested in chemistry, and parallel to his medical education, he was a private pupil in chemistry of professor Thomas Graham (1805-1869) in his laboratory at University College and attended lectures in physics by Michael Faraday. Among his friends were Charles Darwin (1809-1882), who for a period was also his patient, Thomas Huxley (1825-1895),

Florence Nightingale (1820-1910) and Michael Faraday, of whom Bence- Jones in 1870 published a comprehensive biography, *Life and letters of Faraday* [12-18] .

The End

An excerpt from C A Russell's "Michael Faraday: physics and faith" : " ..he delivered his last Friday night discourse, on the gas furnaces of the German engineer Charles William Siemens ,on June 20, 1862, a few weeks after making the final entry in his laboratory notebook. Two years later, he resigned from his position as elder in the Sandemanian church, and the next year , in 1865, he stepped down from the position of superintendent of the house at the Royal Institute and severed his long connection with Trinity House. For the remaining two years of his life, he was confined to his chair at home, and those who came to see him, were impressed as much by his serenity as his withdrawal from the world of science he had served so long, in the year Charles Darwin published his book *The Origin of Species*, which may have seen as undermining such a confident faith. The remarkable thing is that Faraday says nothing about evolution that implies any kind of un-resolvable problem. Though by now his physical condition was deteriorating , he could think clearly for much of the time and expressed himself eloquently where that was necessary then on August 25, 1867, while sitting quietly in his study chair, he died" [19].

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