Michael Faraday and the Promotion of Science

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Since 1986 the Royal Society of London has awarded annually the Michael Faraday Prize to a 'scientist or engineer whose expertise in communicating scientific ideas in lay terms is exemplary'. It has been awarded to such luminaries as George Porter, David Phillips, Ian Stewart, Richard Gregory, David Attenborough and Jocelyn Bell Burnell (one of only four women to have been so honoured). The prize was founded following the 1985 report produced by a Royal Society of London committee chaired by Walter Bodmer (himself a winner of the prize) *The Public Understanding of Science* which recommended that the Society establish such an award. Bearing in mind the lack of historicity of the Bodmer report, it is surprising that the award was named after a major historical figure rather than, say, a modern corporation, a number of which have graced the name of the Society's science book prize, another outcome of the report. Also, due to the lack of historical understanding displayed by the Society, naming the prize after Faraday, who twice declined its Presidency on the grounds that it was a corrupting office, might, at first sight, seem a bit surprising. So, why would Faraday have seemed in the mid-1980s the best person to name the prize after? As we shall see, Faraday for much of his career was a strong advocate of science communication and so if one wanted an historical figure, choosing him would be entirely historically and ideologically sound.

But such high profile choices are never made simply on the merits of a particular individual, but involve negotiation and usually a high degree of contingency. In this case the key figure was George Porter who saw his scientific hero Faraday (slightly inaccurately) as his predecessor at the Royal Institution. Another outcome of the Bodmer report was the formation during 1986 of a Committee on the Public Understanding of Science (COPUS) jointly by the Royal Institution, the Royal Society of London and the British Association. Coincidentally, for a few months from the end of 1985 Porter, coming to the end of his Directorship of the former and beginning his Presidencies of the latter two organisations, held all those posts simultaneously. He was thus in a strong position to become the first chair of COPUS which he duly did and therefore in a position to deploy Faraday's name for the Royal Society of London's new prize. Using Faraday's name also had the advantage of commending itself to the Prime Minister, Margaret Thatcher. Since 1980 Porter had been

endeavouring to form a constructive relationship with Thatcher, who had studied chemistry at Oxford University, in the (forlorn) hope of mitigating the government's cuts in science and education (**IMAGE of Thatcher in the RI**). He did however, turn her into a hero-worshipper of Faraday, whose life and work on a superficial reading could be seen as ticking many Thatcherite ideological boxes – the rise from poverty and obscurity to fame and fortune (or at least fame), by his own hard work, innate genius, without going to university and so on. In 1982 she borrowed Matthew Nobel's mid-1850s bust of Faraday (**IMAGE of bust**) from the Royal Institution and for the following fourteen years it was the first thing anyone saw on entering Downing Street. Although she seems not to have publicly announced that Faraday was her hero until 1987, the elite scientific community, or at least Porter, its undisputed leader, knew. So, naming the Public Understanding of Science Prize after Faraday was a further way in the attempt of the scientific community to ingratiate itself with the government. Thatcher reciprocated, not by ending the spending cuts, but by overseeing the Bank of England putting Faraday on its £20 note thus displacing Shakespeare, much to the displeasure of some.

How did an idealised image, which well beyond the point of the usual hagiographical misrepresentation, of a dissenting blacksmith's son come to be such a key figure in the science politics of the 1980s? From the 1830s onwards, just as he turned forty, Faraday began enjoying (probably not the word he would have chosen) considerable fame which continued to grow after his death in 1867. The origins of his fame are found in three separate but connected strands. First, Faraday's research in chemistry and natural philosophy produced a long string of experimental and theoretical fundamental understandings of the physical world. These included his discovery of electro-magnetic induction - the principle behind the electric transformer and generator which came to be explicitly viewed by many (including Thatcher) as the origin of electrical engineering with its enormous wealth producing technology. Later Faraday formulated the field theory of electro-magnetism which in the hands of figures such as James Clerk Maxwell and Peter Higgs became and remains one of the cornerstones of our modern understanding of the physical world. Second, throughout his career Faraday provided advice to the state and its agencies: Seventeen percent of all his letters written after 1836 deal with issues related to the crucially strategic lighthouse service; from 1830 for twenty years the officers of the Royal Artillery and Royal Engineers learnt their chemistry from Faraday at the Royal Military Academy, Woolwich; whenever there were very difficult technical problems at sea or in mines or in art galleries, one can almost hear the call 'send for Faraday' go up in Westminster or Whitehall. One might have thought that with such a record of achievement Faraday would, like his predecessor at the Royal Institution, Humphry Davy, have been

knighted or created a baronet. Neither happened due his publicly stated view that such honours were politically corrupt which as a Sandemanian, a religious dissenter from the state established Anglican Church, would be unacceptable to him; the evidence, however, is ambiguous as to whether any Prime Minister ever made an offer in the first place.

While these two strands secured his fame within the scientific community and the state, his reputation beyond lay with his ability to communicate science to a largely lay audience, the third strand. Faraday joined the Royal Institution in 1813 as a laboratory assistant and worked his way up the hierarchy, becoming Acting Superintendent in 1821, a position he held until 1826 when he became Assistant Superintendent; nevertheless, under both titles he effectively ran the Institution. In 1825 he was appointed Director of the Laboratory, while in 1833 the Fullerian Professorship of Chemistry was created especially for him by John Fuller. In these roles, Faraday set about reforming the Royal Institution's lecture programme. From its founding in 1799 the Institution had provided afternoon or evening lecture courses for its members, which in the early days, when Davy lectured, had attracted enormous audiences. Following Davy's retirement in 1812 (aged thirty-three following marriage to a wealthy widow), numbers tailed off and during the global financial crisis of the mid 1820s the Royal Institution found itself in difficulty.

Faraday's solution to the problem was to found the Friday Evening Discourses during the first half of 1825. He initially viewed Discourses as an 'agreeable – easy – meeting – where members have the privilege of bringing friends and where all may feel at ease … relieved from all formalities' (RI MS F/4/C, p.229). He told the engineer Marc Brunel 'After tea & coffee we go the Lecture room … [for] a sort of social lecture' (Letter 281a) and to the naval officer and Arctic explorer, John Franklin, he wrote that the Discourses 'have been numerously and well attended[.] We light up the house bring forward a subject in the Lecture room illustrated by experiments diagrams models &c and this serves as matter for the Evening. We then adjourn to the library where we take tea and seldom part till 11 o clock or past' (Letter 292).

At these events, generally eminent figures delivered lectures on the latest pieces of work in science, engineering, medicine and indeed the arts and humanities. As well as delivering 127 Discourses himself Faraday (not all on his own research), because of his reputation in scientific research and in providing advice, was able to secure lectures from many of the most prominent scientific and other figures of the day. These included the geologist Charles Lyell, the experimental philosopher Charles Wheatstone, the printer Warren De La Rue, the painter Benjamin Haydon, the

inventor of the fuel cell William Grove, the philosopher of science William Whewell, the Astronomer Royal George Airy, the biologist Thomas Huxley, the natural philosophers John Tyndall, William Thomson (later Lord Kelvin) and James Clerk Maxwell, the Archbishop of Westminster Cardinal Wiseman and the art critic John Ruskin amongst many many others. It is perhaps little wonder that George Eliot referred to them 'as fashionable an amusement as the Opera'. As audience size grew the informality vanished and they became very formal events with the Procession of Managers, the speaker and host entering on the stroke of nine and finishing as the clock struck ten and woe betide any lecturer who went beyond the hour! As only Royal Institution members could attend the Discourses, this led, as the lectures became ever more popular to an increase in the number of members. In the years before their founding the average number of new members joining the Royal Institution annually was just under eleven; after it was sixty-five. In such way did the Institution's financial position recovered.

However, Faraday was not only concerned with ensuring that the members of the Royal Institution enjoyed a good time, but that knowledge of the content of the lectures, and thus of modern science, was made available to a far larger public. To this end he cultivated good relations with editors of newspapers and journals, persuading Charles Dickens, for example, to report lectures in his *Household Words*. But it was with the influential weeklies, *The Literary Gazette* (circulation c.4000) and *The Athenaeum* (c.18,000) that Faraday's efforts were most rewarded. For the forty years or so from the mid-1820s to the mid-1860s, these journals reported on the vast majority of Discourses devoting in total more than 600,000 words to their accounts. This was only one part of their coverage of contemporary science. Both provided accounts of meetings of other learned societies and during the summer would devote pages to the annual meetings of the British Association, though one does have the suspicion that this helped to fill space during what would otherwise be a slack period. Nevertheless, these weeklies were a powerful medium to ensure that science was an integral part of overall culture and in achieving this Faraday played a key role.

Faraday's other significant contribution to communicating science was his role in the Royal Institution's Christmas lectures. Like the Discourses, these were founded in 1825, though Faraday's role in this process remains opaque. They appear to be an evolution of the Institution's afternoon lectures rather than something novel like the Discourses. The first Christmas lecture series (1825/6) was delivered by the Royal Institution's Professor of Mechanics, John Millington. Faraday did not provide a series until 1827/8, but thereafter gave a further eighteen, including all those in the 1850s. Each course comprised six lectures, all illustrated with copious experimental demonstrations. By the

1860s, Faraday and the Christmas Lectures had become indissolubly linked in the public mind. In a profile of Faraday, the *Illustrated London News* in early 1861 commented:

> For the last eight seasons Professor Faraday has undertaken this task with a modesty and a power which it is impossible to praise too much. There can be no greater treat to any one fond of scientific pursuits than to attend a course of these lectures.

Publishers, realising the popularity of Faraday's Christmas Lectures, sought to persuade him to allow them to be published, reportedly offering him almost unlimited terms for the copyright. In 1853 the chemist John Scoffern published *The Subject Matter of a Course of Six Lectures on the Non-metallic Elements by Professor Faraday* based on his 1852 Afternoon Lectures. The key word here is 'subject' since this was not a verbatim record of the lectures, but editorially expanded by Scoffern because as he wrote in the preface:

> that a chemical lecturer, more perhaps than any other, possesses a means of demonstrating facts not available to the essayist – *the demonstration of experiment* – that mute eloquence of action which silently compressed whole pages of written lore into one short act of manipulation, and renders verbal explanation unnecessary.

Even as late as January 1859 Faraday wrote to one publisher in very similar terms about his rejection of an earlier offer and the problems of turning lectures into text:

> [It was] proposed to take them by short hand & so save me trouble - but I knew that would be a thorough failure. Even if I cared to give time to the revision of the M.S. still the Lectures without the experiments & the vivacity of speaking would fall far behind those in the lecture room as to effect:- (Letter 3541)

Very soon afterwards, Faraday changed his mind. This reversal may have been connected with his opposition to the rise of spiritualism, especially table turning, which arrived from the United States in the spring of 1853. Throughout London tables began to turn, levitate and occasionally fly in and out of windows. It was inevitable that Faraday, as one of the leading scientific figures of the day, would be asked about these phenomena and indeed he reported receiving 'numerous' requests for his opinion. At the end of June Faraday turned his experimental attention to table turning. He attended two séances and devised an indicator which showed that table-turning was due to 'a <u>quasi</u> involuntary muscular action' on the part of those placing their hands on the tables and not some known or unknown force as the turners claimed.

Faraday stated his position in an article for *The Athenaeum* and a letter to *The Times* describing his experiments and blaming the widespread belief in table-turning on the educational

system: ‘I think the system of education that could leave the mental condition of the public body in the state in which this subject has found it must have been greatly deficient in some very important principle’. Very quickly Faraday received letters of support from the scientific and education communities, but he was also severely criticised. The poetess Elizabeth Browning privately expressed her outrage accusing Faraday of ‘arrogance & insolence’. Faraday was

> shocked at the flood of impious & irrational matter which has rolled before me in one form or another since I wrote my times letter ... I cannot help thinking that these delusions of mind & the credulity which makes many think that supernatural works are wrought where all is either fancy or knavery are related to that which is foretold of the latter days & the prevalence of unclean spirits (Letter 2703)

By quoting from Revelation 16:13, Faraday indicated that not only had his sense of scientific propriety been transgressed, but so had his Sandemanian religious beliefs. It was probably this combination that led him to denounce table-turning publicly. He was well aware of the pitfalls involved in entering the fray in such areas and in the end Faraday came to have contempt for table turners, especially when they attempted to circulate rumours that he had changed his mind. It is difficult to gauge what effect Faraday’s efforts had on the table-turning fashion, other than it was open to wildly differing interpretations. In later years Faraday’s name was invoked both by supporters of research into spiritualist phenomena on the grounds that he had taken the subject sufficiently seriously to experiment on it, and by opponents on the grounds that he had provided an entirely satisfactory explanation of such occurrences.

Faraday’s criticism of the system of education, which permitted, in his view, table-turning to achieve such wide spread popularity in a supposedly educated country, led to the Royal Institution arranging a course of Lectures on Education delivered by a number of eminent savants to demonstrate the value of scientific education. He delivered the second lecture entitled ‘Observations on Mental Education’, before Prince Albert, on 6 May 1854. Unusually, he wrote the lecture out entirely for reading without any experimental demonstrations since it was to be published by the Royal Institution. In the lecture, much discussed then and since, he returned to the attack on table-turning and gave an autobiographically based account of how the judgement should be educated.

Having set out his agenda, Faraday’s entirely self-conscious consistency of character meant that he could not just complain about something expecting others to address the issues without doing so himself. Thus, at some point he agreed for his 1859-60 Christmas Lectures on ‘The Various Forces of Matter’ to be published. This was sufficiently successful that his next (and final) course of

Christmas lectures 'On the Chemical History of Candle' was also published. Starting with the very familiar object of a candle, Faraday developed a scientific understanding of the entire world in such a way that little of the science has dated. Arguably, the book has become the most popular science book of all time. It has never been out of print in English and has been translated into more than a dozen languages. While, of course, it is impossible to properly assess its impact, anecdotally, Desmond Bernal, the Marxist X-ray crystallographer, recounted that he became interested in chemistry by repeating the more explosive experiments described by Faraday.

Knowledge of Faraday's life and work continued to be promulgated after his death. By 1900 four serious biographies of him had been published which until recently formed the basis of the large number of popular accounts of him that appeared during the twentieth century. In 1931 there were huge celebrations to mark the centenary of his discovery of electro-magnetic induction, including hiring the Albert Hall for a two-week exhibition devoted to his research and its legacy. The Royal Institution, under both William Bragg and later his son Lawrence Bragg, promoted Faraday's image and contribution, especially in science communication. So, it is little wonder that Lawrence Bragg's successor, Porter, Director of the Royal Institution from 1966 to 1986 continued the tradition. For example, he explicitly emulated Faraday in entitling his 1976/7 Christmas Lectures 'The Natural History of a Sunbeam'. Porter arranged a series of events to mark the centenary of Faraday's death in 1967 (including a 'Horizon' docu-drama on Faraday), opened the Faraday Museum in 1973, published an anthology of Faraday's various writings on the art of lecturing and so on. By doing this Porter not only promoted the Royal Institution and its place in British science as both a centre of research and communication but also established his own place in the scientific community. Thus, choosing Faraday's name for the new award on the public understanding of science would have made perfect sense to him for personal, historical and political reasons.

Further reading

Cantor G (1991) Educating the Judgment: Faraday as a Lecturer. *Bulletin for the History of Chemistry* **11**: 28-36.

Cantor G (1992) How Michael Faraday brought law and order to the West End of London *Physis* **29**: 187-203.

Cole R (2017) *The Common Culture: Promoting Science at the Royal Institution in Postwar Britain*. UCL PhD thesis

Gregory J and Miller S (1998) *Science in Public: Communication, Culture, and Credibility*. New York and London: Plenum Trade.

James F A J L (1991-2012) *The Correspondence of Michael Faraday*. 6 volumes. London: Institution of Electrical Engineers / Institution of Engineering and Technology.

James F A J L (2002) Running the Royal Institution: Faraday as an Administrator. In James F A J L ed *'The Common Purposes of Life': Science and Society at the Royal Institution of Great Britain.* Aldershot: Ashgate 119-146.

James F A J L (2004) Reporting Royal Institution Lectures, 1826 to 1867. In Shuttleworth S and Cantor G eds *Science Serialized: Representations of the Sciences in Nineteenth-Century Periodicals*. Cambridge MA: MIT Press 67-79.

James F A J L ed (2007) *Christmas at the Royal Institution: An Anthology of Lectures, by M. Faraday, J. Tyndall, R.S. Ball, S.P. Thompson, E.R. Lankester, W.H. Bragg, W.L. Bragg, R.L. Gregory, and I. Stewart.* Singapore: World Scientific.

James F A J L (2008) The Janus Face of Modernity: Michael Faraday in the Twentieth Century. *The British Journal for the History of Science* **41**: 477-516.

James F A J L (2010) *Michael Faraday: A Very Short Introduction*. Oxford: Oxford University Press.

James F A J L ed (2011) *Michael Faraday, The Chemical History of a Candle. Sesquicentenary Edition With a facsimile reproduction of Faraday's manuscript lecture notes from Royal Institution MS F4 J21.* Oxford: Oxford University Press.

James F A J L (2017) Introduction: Some Significances of the Two Cultures Debate. *Interdisciplinary Science Reviews* **41**: 107-17.

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Frank James is Professor of the History of Science at University College London and at the Royal Institution. His has written widely on science and technology in the nineteenth century and how they relate to other areas of society and culture, for example technology, art, religion and the military. He edited in six volumes *The Correspondence of Michael Faraday* (IET) and wrote *Michael Faraday: A Very Short Introduction* (OUP) and is currently studying Humphry Davy's practical work. He has been President of both the Newcomen Society for the History of Engineering and Technology and the British Society for the History of Science and is now Chair of the Society for the History of Alchemy and Chemistry.