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Article *in* Journal of Medical Biography · September 2015

DOI: 10.1177/0967772015596276

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J Med Biogr OnlineFirst, published on September 18, 2015 as doi:10.1177/0967772015596276

Original Article

Journal of Medical Biography
0(0) 1–11

DOI: 10.1177/0967772015596276
jmb.sagepub.com
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Sir William Brooke O'Shaughnessy (1808–1889), MD, FRS, LRCS Ed: Chemical pathologist, pharmacologist and pioneer in electric telegraphy

Neil MacGillivray

Abstract

This article reviews the life and work of Sir William O'Shaughnessy Brooke (formerly Sir William Brooke O'Shaughnessy), an Edinburgh doctor of medicine and Fellow of the Royal Society who as a young doctor in London analysed the blood and excreta of cholera victims, an action which led to the first successful use of intravenous replacement therapy. His career in India was distinguished in several spheres: chemistry, pharmacology in which he introduced *cannabis indica* to Europe, and in the field of electric telegraphy where he became the superintendent of telegraphs for India.

Keywords

Edinburgh, cholera, India, chemistry, Calcutta, cannabis, electric telegraphy

The purpose of this article is to examine the life and work of a largely forgotten Irish-born physician whose career at home and abroad was remarkable in its diversity. William Brooke O'Shaughnessy can claim distinction in three spheres of scientific activity: as a professor of chemistry and pioneer in chemical analysis particularly in the chemical pathology of cholera where his investigations led to the introduction of intravenous fluid therapy; in pharmacology as editor of the Bengal Pharmacopeia and his research into the therapeutic properties of cannabis; finally as the man who helped to change the face of British India by his researches on and promotion of electric telegraphy and its eventual development across the Indian subcontinent.[1]

Professor Mel Gorman has reviewed O'Shaughnessy's career as a 'pioneer chemical educator' and has also examined his role in the establishment of the telegraph in India and acknowledgment of his meticulous scholarly research is hereby made.[2] J.A.Bridge in 1998 in an article for the Royal Society, described by the author as 'a biographical appreciation by an electrical engineer', examined the life of O'Shaughnessy in considerable detail and focused on his work in India on the electric telegraph.[3] This paper, however, will consider O'Shaughnessy's career from a medical perspective, while at the same time examining his role in the development of the telegraph in India.

This extraordinary man was born in Limerick, County Clare, Ireland, the son of Daniel O'Shaughnessy and Sarah Boswell in 1808. There is no reference to a medical background in any biographical notes, the only mention of his family being of kindred who were clergymen, his uncle being the Dean of Ennis and his great uncle the Roman Catholic Bishop of Killaloe.[4] The young O'Shaughnessy studied for a year at Trinity College, Dublin, matriculating in the medical school on 17 November 1825 but left before graduating, transferring in 1827 to the faculty of medicine at the University of Edinburgh where his place of origin was recorded as Ennis in County Clare.[5] He graduated MD in 1829 with a thesis entitled *De Metastasi Rheumatismi Acuti* becoming LRCSEd the

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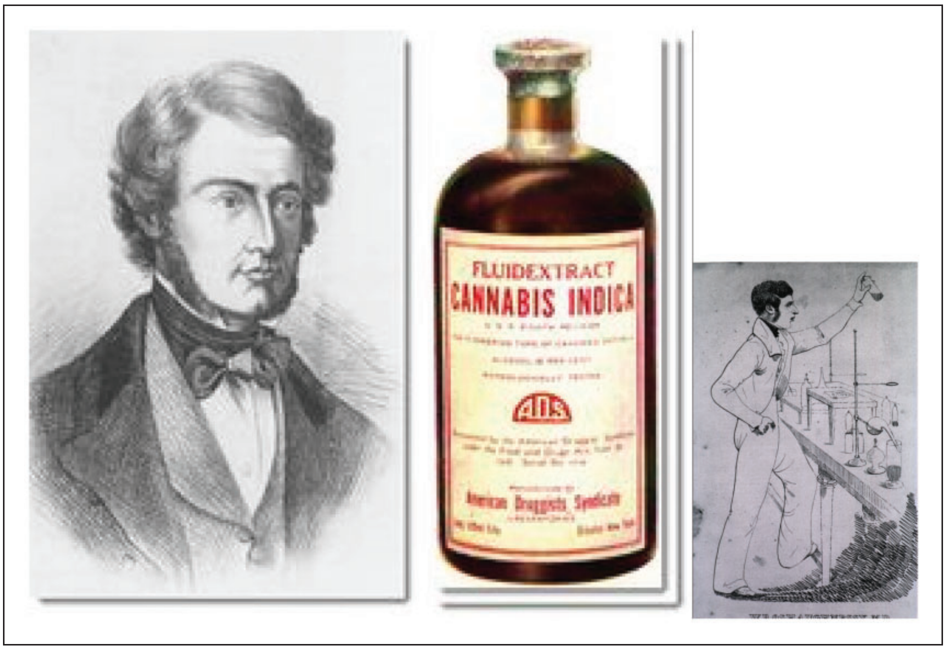

Figure 1. Images of O'Shaughnessy and Cannabis Indica. The image on the right is Courtesy of the U.S. National Library of Medicine.

same year and then promptly matriculated for the academic year 1829–1830, presumably in order to pursue further study.[6]

Chemistry: Edinburgh and London

The professors in the University of Edinburgh during the 1820s included Robert Christison (1797–1882) in medical jurisprudence and Thomas Hope (1766–1844) in chemistry.[7] Both these men appear to have had a major influence on O'Shaughnessy and the direction of his life and interests when one considers his early publications were in the fields of toxicology and chemistry. Hope who held the chair of chemistry from 1799 to 1843 was reputedly one of the finest chemistry lecturers of his time in Europe. According to Morell, Hope 'held the limelight and delighted big audiences' in his fluent style but did not promote practical chemistry despite the increasing importance of laboratory experience; the result of this neglect was that extra mural classes sprang up where aspiring chemists and physicians could learn essential laboratory skills. The increased emphasis on this aspect of chemical science was clear when in 1829 new regulations were passed by the Royal College of Surgeons of Edinburgh requiring candidates to take classes in practical chemistry.

Although University class records do not record O'Shaughnessy in either Christison's medical jurisprudence class or Hope's chemistry class, Gorman has pointed out that he may have attended classes given by one of the many extra-mural lecturers attracting medical students at that time. Hope's neglect of practical chemistry allowed men like Andrew Fyfe, John Anderson, Edward Turner, and David Boswell Reid to set up classes in practical chemistry outwith the university, all attracting large numbers of students.[8] Despite a lack of hard evidence that O'Shaughnessy attended classes in theoretical and practical chemistry, it is clear that as an undergraduate in Edinburgh he developed an interest and proficiency in both aspects of chemistry and in toxicology. Turner and Reid were important influences in his enthusiasm for chemistry and of course Reid was an undergraduate at the same time as O'Shaughnessy between 1827 and 1829.[9]

O'Shaughnessy published his first paper in May 1830, at the age of 21, a year after completing his medical degree. The article reviewed the accepted methods of detecting nitric acid in forensic cases, agreeing with Dr Christison as to the importance of providing the medical jurist with 'not only satisfactory evidence but also the best evidence which his science affords.'[10] In describing the tests used to detect nitric acid, which apparently at that time was commonly used as a poison, he explained that he had 'been very recently engaged in a series of toxicological experiments' and had discovered 'a glaring fallacy in one of the tests recommended by the most eminent authorities.' Although in the article he refers admiringly to the

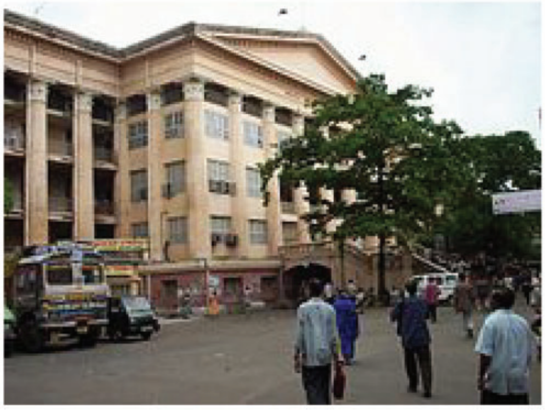

Figure 2. Kolkata Medical College or Calcutta Medical College.

work on chemistry by Dr Turner and that on toxicology by Dr Christison, he does not accept that their work is infallible.[11] Both these men were Edinburgh medical graduates and had spent time together in Paris studying chemistry and toxicology. Turner returned to Edinburgh in 1824 as an extra-mural teacher of chemistry and Christison was appointed professor of medical jurisprudence on his return in 1822 and published his treatise on poisons in 1829. Edward Turner (1796–1837), MD Edinburgh 1819, published in 1827 his *Elements of Chemistry,* the work referred to by O'Shaughnessy, and in the same year took the chair of chemistry at the University of London.[12] Robert Christison, later Sir Robert, MD Edinburgh 1819, studied chemistry in Paris with Pierre-Jean Robiquet (1780–1840) and toxicology with Mathieu Joseph Bonaventure Orfila (1787–1853). Not only did O'Shaughnessy criticize Christison's method of identifying the presence of nitric acid and that of Turner but he also objected to certain aspects of Dr Liebig's process, Liebig at this time being Professor of Chemistry at the University of Giessen.[13] His objections were based on the failure of the tests to demonstrate unequivocally the presence or absence of nitrates, tests which depended on the addition of indigo and sulphuric acid to, for example, stomach contents; the mixture was then heated and some drops of sulphuric acid added to the mixture. The expectation was that first the liquid would turn blue on heating and then pale and colourless when the sulphuric acid was added, thereby proving the presence of nitrates. However, O'Shaughnessy pointed out that the presence of muriate of soda (sodium chloride) in the stomach would turn the experimental mixture colourless, thereby falsely indicating the presence of nitric acid. He went on to show how more sophisticated methods could be used without the risk of false positive or false negative results. It seems that the youthful O'Shaughnessy was already a confident and competent chemist with a growing interest in toxicology.

In July 1830, O'Shaughnessy published a second paper, again on forensic pathology, in which he stressed the importance of accuracy in toxicological analysis, describing his methods for detecting the presence in the body of two potential poisons: iodine and muriate of potash (potassium chloride). He urged that in any case of suspected poisoning with either of these chemicals, if tests on the intestinal contents proved negative, the substances may be detected in the blood and urine, a circumstance which he had proven by poisoning six dogs and testing their body fluids.[14] Such animal research is considered totally unacceptable in the 21st century but was quite unremarkable in the early 19th century.

At about this time O'Shaughnessy moved to London and the next phase of his career began. Shortly after his arrival he published a paper, again on toxicological chemistry, analysing the methods used to detect the presence of opium, an important technique for the prosecution of medico-legal cases. On this occasion also he referred to Christison and Hope and admitted that this contribution was not an original one but rather a collection of 'some isolated and scattered chemical facts' which he hoped might prevent confusion during the course of criminal trials. His next foray into the world of forensic chemistry concerned food analysis, especially confectionery, in order to detect adulteration from poisonous substances. This was published in the *Lancet* in May 1831 at the behest of Dr Thomas Wakley (1795–1862), the founder and editor of the journal.[15] He explained that a year previously Dr Wakley had asked him to carry out 'a series of analytic investigations into the truth or accuracy of various alleged adulterations' in order that the information obtained 'might lead to the efficient protection of the public health.' Wakley had stimulated his interest by sending him a copy of the *Journal de Chimie Medicale* in which was an article by the French chemist and pharmacist Jean–Baptiste Chevallier (1793–1879) on the adulteration of confectionary by mineral poisons.[16] The exposure by Chevallier of these dangerous practices resulted in an order from the Paris prefecture of police in December 1830 condemning their use, listing those which were harmful and ordering all confectionary to be labelled with the name of the maker so that he could be held responsible. O'Shaughnessy analysed the green, red, yellow and blue coloured confections finding dangerous substances in all those examined and although he had not quantified the amounts present he wrote that 'it appears to me to be altogether unnecessary to take the trouble, [to weigh and measure quantities] as the mere presence of the minutest possible quantity of any such substance should not be allowed.' He put his findings to the Government after obtaining an interview with the Secretary of the Home Department but wrote: 'how far this representation may induce the authorities to direct their attention to matters of this description, I should not be justified in offering even a conjecture.'[17]

Later that year he demonstrated his versatility by publishing in the *Lancet* a translation from the French of Lugol's work on iodine, later published as attracted Wakley's attention and it was his chemical knowledge that enabled him to develop a successful teaching programme in Calcutta (Figure 2), an aspect of his career which will be addressed later. It seems that he was forced to adopt a career in chemical analysis on discovering that the regulations of the College of Physicians would not permit him to practice medicine in London not being a Licentiate of the college. The young physician was ambitious not only in the field of chemical analysis but also in academic forensic medicine for the archives of University College London record that he applied unsuccessfully for the chair of medical jurisprudence in that institution.[19] His inability to practise medicine led to his involvement in medical politics becoming secretary of a group, encouraged by Wakley, to promote a London Medical College in order to counter the closed shop of the College of Physicians. The movement failed.[20] However, it is his next endeavour which ensured his place in the annals of medical research; his publications on chemistry and his connections in London were the key to his selection as the scientist best qualified to analyse the blood and discharges of cholera victims.

Cholera Epidemic of 1831–1832

Although it is generally accepted that the first cholera pandemic occurred between 1817 and 1823, there is some disagreement as to the exact dates of the second pandemic. However, it is most likely that it began in 1829 spreading from Asia through Russia and thence to the rest of Europe, arriving in Britain in October 1831.[21] The appearance of cholera in Russia triggered a flurry of official action with many European countries sending medical observers to study the modes of spread, the clinical features and the management of the disease. The British Privy Council in June 1831 established the Central Board of Health, consisting of 11 men, six medical and five from the military and the government; one of the first acts of the new Board was to appoint two medical envoys to study the epidemic in Russia and the Russian response to it.[22] The two physicians, William Russell (1773–1839) and David Barry (1780–1835), both later knighted, reported back to the Central Board of Health after visiting Russia in the summer and autumn of that year.[23]

Their report from St Petersburg in July 1831 made disturbing reading. They had consulted Sir James Wylie (1768–1854), a Scottish surgeon whose power and influence in Tsarist and military circles were considerable.[24] Wylie had approved their request that they might take exclusive charge of a certain number of military cholera patients in order to gain experience 'but the violent excitement of the people against all foreigners, more particularly against medical men ... has rendered the adoption of our proposition inadmissible'; a German physician had been killed by the mob and six were severely beaten on the 26 and 27 June.[25] In their final report, they warned that 'no remedy at all approaching to the nature of a specific has been as yet discovered for this disease.' Reports from abroad show just how varied and improbable some of the suggested treatments were, a state of affairs illustrated in a letter to Barry and Russell from the British Vice–Consul at Cronstadt who wrote that 'the methods of cure are as various as incredible.'[26] The British government knew full well that it was only a matter of time before the epidemic entered Britain, island state or not, and undoubtedly there was great apprehension as to the political consequences, both from the expected high mortality and the public's reaction to it.

Within a few months of the establishment of the Central Board, cholera reached England claiming its first victim in Sunderland on 20 October 1831, and it was there that O'Shaughnessy was sent – one theory is that a Vice President of the London College of Surgeons requested the young physician to go there to analyse the blood and excreta of cholera victims.[27] Whatever the immediate reason, there is no question but that O'Shaughnessy had become prominent as a chemical analyst and was therefore an ideal choice for the task.

On his return from the north of England, O'Shaughnessy presented his findings to the Board of Health on 7 January 1832, a report that was subsequently published.[28] This included a detailed analysis of contemporary knowledge of the chemistry of the blood in the healthy state, a review of publications on blood chemistry in cholera, emphasising the research carried out in Russia by Hermann and Jaehnichen, who had found that the blood of cholera victims had lost almost 30% of its water, and who had attempted to replace the loss with six ounces of fluid.[29] Prior to his official report of 3 December 1831, O'Shaughnessy read a paper to the Westminster Medical Society in which he referred to Dr Stevens, a West Indies doctor, who had observed that the blood of yellow fever patients was often darker than normal; Stevens administered salt solutions orally to restore the red colour to the blood and when cholera reached England, it appears that Stevens treated patients using this method but with the intention only of restoring the red colour to the blood. The *London Medical Gazette* proposed an extension of Stevens' method suggesting a trial of intravenous medication but, as Howard–Jones points out, there was at this time no intention of rehydration merely of changing the colour of the blood from black to red.[30] In contrast to the earlier recommendations in his paper of December 3, O'Shaughnessy now concluded that it was essential first to restore the blood to its natural specific gravity and second to correct the deficiency in 'saline matters'. He wrote that 'the first of these can only be affected by absorption, by imbibition, or by the injection of aqueous fluid into the veins. The same remarks... apply to the second.'[31]

O'Shaughnessy wondered if in cholera 'the habits of practical chemistry which I have occasionally pursued... might lead to the application of chemistry to its cure.'[32] His analysis and conclusions are in stark contrast to contemporary orthodoxy, the belief that venesection would remove the supposedly tainted blood and therefore aid recovery, a notion based on outdated humoral theory. O'Shaughnessy wrote that the blood had lost a large proportion of its water, 1000 parts of cholera serum having but the average of 860 parts of water and that it had also lost a great proportion of its neutral saline ingredients. Moreover, he found that all the salts deficient in the blood, especially the carbonate of soda, were present in large quantities in the dejected (sic) matters.[33] He concluded: '*I would not hesitate to inject some ounces of warm water into the veins*. [original italics]. I would also without apprehension dissolve in that water the mild innocuous salts... which in Cholera are deficient.'[34] It was following these articles in the *Lancet* that Dr Thomas Latta, a medical practitioner in Leith near Edinburgh, determined to put into practice the treatment suggested by O'Shaughnessy which was a radical step – totally opposed to the accepted treatment of the time, bloodletting.[35] Bloodletting was so common that one medical historian commented that 'the physician also constituted himself the unwitting ally of the Vibrio cholerae by practising forced exsanguination of patients who were dying for want of circulating fluid.'[36]

The Edinburgh Board of Health in November 1831 'having maturely considered what steps should be taken for checking cholera' expressed the opinion that if it became contagious, cleanliness and sobriety would greatly diminish the risk of spread and the most essential precaution was sobriety. In a long list of recommended treatments which included mustard poultices, hot air baths (including a model of simple construction at a cost of ten shillings) the Board were certain that bloodletting if resorted to within the first three hours 'has generally been found very useful.'[37] The contrast between the Edinburgh Board's report and that of O'Shaughnessy is remarkable; equally remarkable is that in 1847, Edmund A. Parkes, MD, FRS, in his MD thesis, later published, writing on the pathology and treatment of cholera was still advocating bloodletting, quoting a case in which he had bled to the extent of 40 ounces. Later in his thesis, he discussed the use of saline intravenously and had injected 4.5 pints [2.55 litres] of saline with the albumen of one egg after which the pulse improved briefly but the patient developed 'a violent rigor and died'. It is probable that the addition of a foreign protein, egg albumen produced an anaphylactic reaction and the rigor. Parkes was recognised as an expert on cholera. It was little wonder that Sir Thomas Watson, a London physician, once remarked that 'if the balance could be fairly struck, and the exact truth ascertained, I question whether we should find the aggregate mortality from cholera in this country was in any way disturbed by our craft.'[38]

The first notice of Latta's new treatment appeared in a letter to the Central Board of Health from a friend and colleague, Dr Lewins, also from Leith, in which he described the successful use of intravenous saline during the cholera epidemic in Edinburgh and Leith. The immediate reaction to his letter was generally favourable but there were exceptions, the negative reports often following the injudicious addition of other substances to the saline solution; a Liverpool physician, injected saline with added egg white but after an initial good response the patient developed an intense fever with rigors, presumably a reaction to the foreign protein.[39]A leading article in the *Lancet* claimed that intravenous saline had failed only in one case in which it had been 'fairly tried – that is, where no organic disease had pre-existed and where enough of life was left to sanction the least anticipation of success.'[40] The following week in a letter to the *London Medical Gazette,* Professor Robert Christison who had been asked by the Dutch government to report on the saline method stressed that 'no other remedy has anything like the immediate effect of the injection of saline solution into the veins'. However, he pointed out possible dangers: air embolism, phlebitis and the unknown effects of introducing so great a quantity of saline into the blood. Christison's opinion was based on the Edinburgh and Leith experience of treating 37 patients of whom 12 patients were alive and of those who died all showed signs of extensive organic disease at post mortem examination. It is worth noting that Latta had selected his patients carefully, choosing those who were on the threshold of death.[41] Despite his reservations, Christison approved of the treatment and said that had he been in charge of cholera patients he 'should certainly have given it a trial.'[42] In view of later events, it is interesting to record extracts from a letter written by the Professor of botany, and Regius Keeper of the Royal Botanic Garden of Edinburgh, Robert Graham, (1786–1845) to his opposite number, the Superintendent of the Calcutta Botanic Garden, Dr Nathaniel Wallich, (1786–1854) in which he describes the recent remarkable and successful use of intravenous saline in the treatment of cholera. Graham, who was not only a botanist but also a physician and President of the Royal College of Physicians of Edinburgh in 1840, wrote from Edinburgh on 28 May 1832:

> We are producing here the most marvellous effects on the worst cases of Cholera by injecting marvellous quantities of salt water into the veins. I saw a man today who was far on to the grave yesterday. Into his veins there have been since that time 49 pounds [22.23 litres] of salt water injected, and his eye and feeling and general appearance are now like a man in perfect health. [original emphasis]

Graham went on to describe the method of preparing the solution and the temperature at which it was injected:

> to ten pounds [4.54 litres] were added four drachms [7 grams] of muriate of soda and four scruples [5 grams] of bicarbonate of soda and the solution is injected at a temperature varying from 112 to 115 or even as high as 120 but this generally produces flushing—if at a lower temperature than 110 it generally produces a rigor—it is positively worth your while to come and see this before you return to India….'

It is worth noting that prior to his appointment to the Calcutta Botanical Garden Wallich, like almost all those who held 'professional' botanical posts at this period, was trained as a doctor of medicine, starting his Indian career as surgeon to the Danish colony at Frederiksnagore (Serampore), before transferring to the East India Company primarily as a botanist.[43]

The interest in Latta's therapy and the subsequent use of intravenous saline was short lived: the cholera epidemic ended in 1832 and the following year Latta died from pulmonary tuberculosis. There were many reasons why the treatment fell into disrepute, not least being unwanted and sometimes fatal side-effects such as phlebitis, anaphylaxis, circulatory overload and cerebral oedema. In August 1833, O'Shaughnessy joined the East India Company as a surgeon in the Bengal service, a decision perhaps triggered by two events: a failure to be appointed Professor of Medical Jurisprudence in the University of London and his marriage.[44]

East India Company and Calcutta (present day Kolkata)

The Bengal medical service at this time had a complement of 350 officers who before appointment had to undergo an examination in medicine by the East India Company's chief physician. The cost of the voyage from London to Bombay via Egypt was £150, whereas the cost via the Cape of Good Hope was £120. This was a considerable sum when an assistant surgeon's salary was £118 per annum with a three year furlough to Europe after 10 years' service.[45] O'Shaughnessy's first appointment with the Company was as an assistant surgeon but within two years he had been promoted to the rank of Surgeon, the next rung on the professional ladder. India at this time was in the process of change with the promoters of Anglicisation beginning to succeed in at least some of their aims – and in terms of O'Shaughnessy's career this change was highly significant. Whereas, since 1822 basic medical training had been available in the vernacular at the Native Medical Institute, in 1835 the Calcutta Medical College was opened, with instruction in English.[46]

O'Shaughnessy was appointed as the College's first Professor of Chemistry and gave his introductory course in January 1836; one of the texts he used was David Boswell Reid's *Practical Chemistry* but he also corrected and criticised certain sections of the book.[47] Reid (1805–c.1862) was an Edinburgh contemporary of O'Shaughnessy, graduating in 1830, who ran classes in practical chemistry and it is possible that O'Shaughnessy attended some of these. In October 1838, O'Shaughnessy writing on Indian Materia Medica declared his aim of enabling 'the native practitioner… to dispense with exotic or imported remedies, and turn with confidence to those supplied in every direction around us, by a bountiful providence.'[48] By 1841, he was sufficiently well versed in Indian pharmacology to edit a volume in which he drew on the works of colleagues including Dr Nathaniel Wallich, Dr John Forbes Royle (1798–1858) and Dr Robert Wight (1796–1872), all botanists and physicians.[49]

In 1836, Dr John Forbes (1787–1861), later Sir John, and Dr John Conolly (1794–1866) started a new publication: the *British and Foreign Medical Review,* or, *A Quarterly Journal of Practical Medicine*, sharing the editorship from 1836 to 1839.[50] They published in 1840, a review of O'Shaughnessy's 1839 monograph on Indian hemp; O'Shaughnessy had become interested in the properties of cannabis and its potential uses in medicine. Relating how the narcotic effects of hemp were well known in Africa, South America, Egypt, Asia Minor and India, he observed that 'in the popular medicine of these nations we find it extensively employed for a variety of affections. But in Western Europe its use either as a stimulant or as a remedy is equally unknown.... '[51] The *Lancet* in a review of this work on cannabis observed that

> the labours of Dr O'Shaughnessy, as a scientific chemist, are already known in the most favourable manner to our readers; but unlike the greater number of chemists, he combines practice with theory and directs his scientific discoveries to the advancement of medicine as a healing art.

The writer concluded hoping 'that some of our hospital physicians will, without delay, procure the remedy which Dr O'Shaughnessy has thus favourably introduced, and determine how far it may sustain its reputation as a ''powerful anti-convulsive'' in this country.'[52] Remarkably, the same year as O'Shaughnessy's monograph was published in Calcutta Jonathan Pereira referred to the effects of cannabis in his two volume work on materia medica.[53]

O'Shaughnessy experimented with a resinous extract of hemp in several disorders but only after he had used the substance in a series of animal experiments, finding little benefit in rheumatism, hydrophobia or cholera but found it to be useful in tetanus. As Mills, in a wide ranging analysis of cannabis and its uses in the British Empire, points out 'it was O'Shaughnessy who was to write the definitive account of cannabis of the early nineteenth century.'[54] Mills illustrates the distrust almost amounting to contempt shown by British doctors towards Indian medicine and therapeutics but exonerates O'Shaughnessy from this criticism writing:

> 'it does not seem surprising that it was O'Shaughnessy who was the first British doctor to decide to find out for himself exactly what the impact of cannabis substances was rather than to rely on hearsay or on recycled versions of other writers' compilations.'[55]

O'Shaughnessy communicated his findings to Christison in Edinburgh sending botanical specimens to him and to the Royal Botanic Garden in Edinburgh. It is not coincidental that Christison's son, Alexander, wrote his 1850 Edinburgh MD thesis on *Cannabis indica*, describing its use in tetanus in both private practice and in the Infirmary.[56] In a paper published the following year, he wrote that Indian hemp was little known to Europeans until it was brought prominently into notice by Dr O'Shaughnessy of Calcutta in 1839.[57] When O'Shaughnessy published his *Bengal Dispensatory and Pharmacopoeia* in 1842, the section on cannabis extended to 25 pages and has been described as 'the most comprehensive assessment of the properties of cannabis... to appear by the hand of a British Scientist during the entire period of colonial rule.'[58]

In 1840, he was appointed government chemical analyst at the same time continuing his professorship and teaching commitments, but it is likely that the strain was too great and on the grounds of ill health he was allowed to take furlough in England in November 1841, two years earlier than the regulations allowed. He remained on leave until 1844 and it was during this time that he was elected a Fellow of the Royal Society in 1843. His certificate as a candidate for election recorded his designation as an assistant surgeon in the Bengal Medical Service and as late professor of chemistry and natural philosophy in the Calcutta Medical College, now on sick leave. Several of his publications were mentioned and he was described as distinguished in the sciences of medicine and chemistry.[59]

Electric telegraphy

O'Shaughnessy developed an interest in electric telegraphy, writing an article for a Bengal journal in 1839 describing an advanced type of electric motor; later that year he erected an experimental line of 13 miles near Calcutta with a considerable portion under water and obtained excellent transmission of signals.[60] These activities took place only two years after Sir William Cooke (1806–1879) and Sir Charles Wheatstone (1802–1875) demonstrated the feasibility of such a system building a circuit between Euston and Camden. Wheatstone and Cooke's first patent, 'for improvements in giving signals and sounding alarms in distant places by means of electric currents transmitted through electric circuits', was signed by William IV on 10 June 1837. They tested their invention with the London and Blackwall, the London and Birmingham, and the Great Western Railway companies allowing the use of their lines for the experiment.[61] O'Shaughnessy visited Joseph Henry (1797–1878), an American physicist when on sick leave; Henry, the son of Scottish immigrants, was a scientist whose work on electromagnetism was the basis of the electric telegraph and it is clear that by the time of his visit O'Shaughnessy was already interested in the possibilities of such a means of communication.

On his return to India he obtained permission in 1847 to build a length of telegraph of 82 miles from Calcutta; first a 30 mile length was constructed to Diamond Harbour in the space of three months, later extended a further 52 miles to the sea in March 1852. Gorman makes the point that O'Shaughnessy's successful demonstration of telegraphy and his conviction that telegraphs of 1000 miles were possible might have been to no avail had not there appeared a new Governor–General in 1847. The appointment of James Ramsay, Earl (later Marquis) of Dalhousie (1812–1860), thought by some to have been one of India's finest administrators, brought to the country a man who had been President of the Board of Trade in London and an enthusiast for technological change who during his period of office at the Board of Trade had overseen the rapid expansion of railways in Britain. Dalhousie's biographer records that 'he found on the spot a professor of chemistry in the Medical College of Calcutta, Dr William Brooke O'Shaughnessy, who entered heartily into his schemes and satisfied him that he could carry them out.' Dalhousie informed the Military Board that they were not to exercise any authority over O'Shaughnessy who was to report directly to Dalhousie himself.[62] The fact that the first working telegraph in Britain had been constructed only in 1838 on the Great Western Railway between Paddington and West Drayton emphasises O'Shaughnessy's achievement in building an experimental line of 22 miles with excellent transmission of signals in 1839. On the strength of this success Dalhousie ordered his return to London to persuade the Directors of the East India Company to release funds for an extension of the line from Calcutta to Agra, Delhi, Lahore and Simla with a second line from Agra to Bombay and thence to Madras, in total 3200 miles.[63] It was after his return to India that he was appointed to the post of Superintendent of Telegraphs in India but his travels were not over: in 1855 O'Shaughnessy was sent to Europe and America to study the Morse system of transmitting messages. Dalhousie's biographer claims that 'the military and political gains [of the telegraph] were of incalculable value' and that 'telegraphic communication was the most powerful weapon with which Lord Canning confronted the mutiny.'[64]

O'Shaughnessy was created a Knight Bachelor in 1856, largely at the prompting of Dalhousie and promoted to the rank of Surgeon Major in 1858. He retired from the service in 1862 having assumed by royal licence the surname of Brooke in 1861. The reason for this change of name is unknown.

His contributions in three distinct areas of science have been reviewed by several scholars and his career in India recorded in a memoir written in 1889 by a member of the Indian Telegraph Department. In the preface the author indicated that the memoir was based on the records of the Office of Telegraphs, of the Calcutta Mint, of the Surgeon-General's Office together with the Proceedings of the Asiatic Society and that the Director General of Telegraphs had authorised its publication as likely to be of great general interest. In the appendix is included a series of lectures on Natural Philosophy given by O'Shaughnessy in 1841 and which had been earlier published in the *Journal of the Asiatic Society*. Some of the experiments O'Shaughnessy carried out took place in the grounds of the Botanical Garden of Calcutta 'with Dr Wallich's liberal aid' as the lecturer pointed out. With Wallich's appointment as Professor of Botany at the Calcutta Medical College, he became a colleague of O'Shaughnessy, but here in this single reference are gathered together many of O'Shaughnessy's interests: telegraphy, botanical therapies, cannabis, and of course the connection with Robert Graham and Wallich that had started many years earlier as a result of O'Shaughnessy's work on cholera. It is hoped that this article will renew interest in O'Shaughnessy's career.[65]

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

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