

BJHS, 1999, 32, 421–59

# Telegraphy is an occult art: Cromwell Fleetwood Varley and the diffusion of electricity to the other world

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In May 1862 Desmond G. Fitzgerald, the editor of the *Electrician*, lamented that

telegraphy has been until lately an art occult even to many of the votaries of electrical science. Submarine telegraphy, initiated by a bold and tentative process – the laying of the Dover cable in the year 1850 – opened out a vast field of opportunity both to merit and competency, and to unscrupulous determination. For the purposes of the latter, the field was to be kept close [*sic*], and science, which can alone be secured by merit, more or less ignored.<sup>1</sup>

To Fitzgerald, the ‘occult’ status of the telegraph looked set to continue, with recent reports of scientific counterfeits, unscrupulous electricians and financially motivated saboteurs involved in the telegraphic art. Nevertheless, Fitzgerald reassured his readers that the confidence of ‘those who act for the public’ had been restored by earnest electricians, whose ‘moral cause’ would ultimately be felt and who ‘may be safely trusted even in matters where there is an option between a private interest and a public benefit’.<sup>2</sup> As a prominent crusader for the telegraph, Fitzgerald voiced the concerns of many electricians seeking public confidence and investment in their trade in the wake of the failed submarine telegraphs of the 1850s. The spread of proper knowledge about the telegraph would hinge on securing an adequate supply of backers and the construction of telegraphy as a truly moral cause – an art cleansed of fraudsters, ignoramuses and dogmatists.

Few were as expert at managing these problems of ‘occult’ telegraphy as the electrician and Atlantic telegraph engineer, Cromwell Fleetwood Varley (1828–83). This paper explores how Varley, in the years following the failure of the first Atlantic telegraph (in 1858), sought to build public confidence in two schemes that had been greeted with

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This paper is condensed from chapters in my doctoral dissertation, “‘Cranks and Visionaries’: science, spiritualism and transgression in Victorian Britain”, University of Cambridge, 1998. I wish to thank Simon Schaffer, Iwan Morus, Kevin Knox, Alison Winter, Jeff Hughes, Nani Clow, Patrick Curry, Sven Widmalm and two anonymous referees for their help in the preparation of this paper. Special thanks to John Cromwell Varley. For permission to quote from unpublished material in their collections I would like to thank the University Library, Glasgow, British Telecom, the Syndics of Cambridge University Library, the President and Council of the Royal Society, the British Library and the Institution of Electrical Engineers. I would also like to thank the College of Psychic Studies for permission to reproduce published material in their keeping.

1 [D. Fitzgerald?], ‘Moral causes’, *Electrician* (1862), 2, 39–40, 39.

2 Fitzgerald, op. cit. (1), 40.

scepticism or ridiculed as ‘occult’: the construction of a commercially workable Atlantic cable and spiritualists’ practices of communicating with spirits of the dead. Varley’s attempts to bridge the perilous gulfs between the New and Old World and between this and the other world were not wholly unprecedented. Indeed, Victorians in the mid-nineteenth century often found it hard to distinguish between telegraphy and spiritualism. In the early 1850s, the British public grappled with mysterious spiritual communications at the same time as new telegraph companies told them it was possible to use electricity to contact friends on earth. Spirits of the dead ‘rapped’ out messages on a ‘spiritual’ telegraph, much as messages on the electric telegraph were exchanged via Samuel Morse’s code of raps. The spirit of Benjamin Franklin, one of the Victorians’ favourite fathers of telegraphy, was inspiring séance-goers with rapped eulogies on the spirit world and blessing the science of the spiritual telegraph. And finally, the celebrated architect of the Atlantic telegraph, William Thomson, probably amused many Victorian investigators of spirit-rapping when he described telegraphy as ‘the art of interchanging ideas by means of dead matter occupying space between two intelligent beings’.<sup>3</sup>

Scholarly interest in the connections between the worlds of telegraphy and spiritualism has focused principally on the use made by spiritualists of telegraphic concepts to interpret and legitimate their activities.<sup>4</sup> Varley presents a greater challenge to historians since, as this paper will show, he attempted to merge these worlds on a much deeper and more practical level. The few historical analyses of Varley’s practical moves, however, have been written by scholars who assume implicitly that his telegraphic practices can be taken as straightforward and who are keen to assess how far his séance exploits imitate or reach the ‘scientific’ standards of telegraphy.<sup>5</sup> This is symptomatic of a general historiographical tradition in which a given investigator’s laboratory practices are implicitly regarded as robust, rational and ‘scientific’ while their séance investigations are regarded as inherently problematic, irrational and ‘pseudo-scientific’. Unable to reconcile the investigator’s laboratory and séance behaviour, historians in this tradition have been forced to conclude that the investigator was either lying, duped or schizophrenic.<sup>6</sup> Sociologists and historians of science have rightly challenged the application of this asymmetrical, teleological and essentialist approach to so-called ‘fringe’ sciences: they reject ‘science’, ‘pseudo-science’ and ‘rationality’ as self-evident determinants of actors’ practices and regard such categories as the contingent and locally achieved outcomes of disputes about those

<sup>3</sup> Thomson cited in [Anon.], ‘Professor Thomson on the electric telegraph’, *Electrician* (1863), 4, 49–50, 49.

<sup>4</sup> See, for instance, W. Sollors, ‘Dr. Benjamin Franklin’s celestial telegraph, or Indian blessings to gas-lit American drawing rooms’, *Social Science Information* (1983), 6, 983–1004; R. Laurence Moore, ‘Spiritualism and science: reflections on the first decade of spirit rappings’, *American Quarterly* (1972), 24, 474–500.

<sup>5</sup> T. Hall, *The Spiritualists: The Story of Florence Cook and William Crookes*, London, 1962, esp. 47–53; C. Broad, ‘Cromwell Varley’s electrical tests with Florence Cook’, *Proceedings of the Society for Psychical Research* (1964), 54, 158–72; C. Stephenson, ‘Further comments on Cromwell Varley’s electrical tests on Florence Cook’, *ibid.*, 363–417; R. Pearsall, *The Table-Rappers*, London, 1972, 227–32; F. Podmore, *Modern Spiritualism: a History and a Criticism*, 2 vols, London, 1902, ii, 156–7.

<sup>6</sup> J. Palfreman, ‘William Crookes: science and spiritualism’, *Ethics in Science and Medicine* (1976), 3, 211–27; J. Oppenheim, *The Other World: Spiritualism and Psychical Research in Britain, 1850–1914*, Cambridge, 1985, 326–97; Hall, *op. cit.* (5).

practices.<sup>7</sup> The traditional approach is particularly troublesome in the case of Varley's supposed 'science' of telegraphy since, as several studies have shown, this was one of the most disputed of the 'great' Victorian technologies and its architects fought hard to make their claims scientific and their inventions robust.<sup>8</sup> This paper challenges traditional approaches to Victorian science and spiritualism and demonstrates the importance of problematizing the 'science' practised by scientific investigators of spiritualism. It insists that Varley's approach to the spirit world is better understood by situating such spiritualistic forays in the context of his attempts to overcome the troubles of telegraphy.

This paper begins in the mid-Victorian period – a period when both telegraphic and spiritualistic forms of communication proved troublesome and promoters of either scheme could be accused of fraud, ignorance or over-credulity. It was the period in which Varley learnt his electrical trade and developed strategies for selling his authority and for making the putatively 'occult' form of telegraphic communication credible. I shall argue that Varley used these hard-won resources not only to build, defend and sell the Atlantic telegraphs of the 1860s, but also to investigate, reform and publicize spiritualism's 'occult' communication forms in the same and immediately succeeding periods. By the early 1870s, Varley had further developed his strategies for upholding 'occult' communication since he was using telegraphy to support spiritualism and exploiting spiritualism's platforms to uphold the intellectual and moral values of telegraphic engineering and science. The first two sections of this paper show how Varley's attempt to make credible claims about both telegraphy and spiritualism involved dissipating popular misgivings about strange new forms of communication and finding earnest and respectable participants in these 'occult' arts. Thus, in Varley's opinion, Fitzgerald's 1862 analysis of the true investigators, fraudsters and superstitious audiences of electric telegraphy was also true of spiritualism. By the late 1860s this had become a particularly compelling similarity for him. With the successful laying of the 1866 Atlantic cable, electricians, engineers and natural philosophers had, in Varley's opinion, proved their ability to deal with the 'occult' and thereby earned the right to turn the ridiculed practice of spirit communication into a workable and respectable art. Indeed, Varley became so convinced of electricians' (and in particular his own) authoritative role in spiritualism that he began to use its audience's enthusiasm for science as a way of disseminating the values of telegraphy and science. The middle sections

7 Exemplary in this field are R. Wallis (ed.), *The Margins of Science: The Social Construction of Rejected Knowledge*, Keele, 1979; H. M. Collins and T. J. Pinch, *Frames of Meaning: The Social Construction of Extraordinary Science*, London, 1982; R. Cooter, *The Cultural Meaning of Popular Science: Phrenology and the Organisation of Consent in Nineteenth-Century Britain*, Cambridge, 1984; P. Curry, *Prophecy and Power: Astrology in Early Modern England*, Princeton, 1989; A. Winter, *Mesmerized: Powers of Mind in Victorian Britain*, Chicago, 1998.

8 B. Hunt, 'Michael Faraday, cable telegraphy and the rise of field theory', *History and Technology* (1991), 13, 1–19; idem., 'The ohm is where the art is: British telegraph engineers and the development of electrical standards', *Osiris* (1994), 9, 48–63; idem., 'Scientists, engineers and Wildman Whitehouse: measurement and credibility in early cable telegraphy', *BJHS* (1996), 29, 155–69; C. Smith and M. N. Wise, *Energy and Empire: A Biographical Study of Lord Kelvin*, Cambridge, 1989, 649–722; C. Hempstead, 'The early years of oceanic telegraphy: technology, science and politics', *Proceedings of the Institution of Electrical Engineers* (1989), 136A, 297–305; I. Morus, 'Telegraphy and the technology of display: the electricians and Samuel Morse', *History and Technology* (1991), 13, 20–40, and 'The electric Ariel: telegraphy and commercial culture in early Victorian England', *Victorian Studies* (1996), 40, 339–78.

of the paper accordingly illustrate how Varley used material and rhetorical resources wrought for the Atlantic cable to negotiate authority in the spiritual séance and the spiritualist press. Varley's final dramatic attempts to bolster the scientific and moral values of his engineering practices are discussed in the final sections. In these episodes, Varley wanted to generate better evidence for spiritualism, greater respect for telegraph engineers, a restored 'moral cause' for the commercialized telegraph and spiritualists' actual investment in his engineering schemes.

#### A CHIMERICAL SCHEME: VARLEY AND THE CONSTRUCTION OF SUBMARINE TELEGRAPHY

In his diary of the 1865 Atlantic cable expedition, the journalist W. H. Russell recorded that the Irish end of the cable was laid from Foilhummerum Bay, Valentia, a locality graced by the 'grey walls of a ruined fort' attributed to the great Old World republican, Oliver Cromwell.<sup>9</sup> Just as Cromwell's fort symbolized British efforts to extend its empire westwards so, according to at least one of Cromwell's descendants, was the telegraph that left Valentia for the New World. The proud descendant was Cromwell Fleetwood Varley. Born in April 1828, Cromwell Varley was raised in a London family noted for its artistry, invention, religious nonconformity and divination of terrestrial futures.<sup>10</sup> His father, Cornelius, a celebrated inventor and landscape artist, turned his fascination with transient natural lighting effects into inventions for exploring visual perspectives and studies of atmospheric electricity. His uncle, John, also gained distinction for his artistry but was equally celebrated for his astrological forecasting. Cornelius enjoyed connections with fashionable London natural-philosophical circles (notably the fledgeling Royal Institution) both through his instrument trade and his marriage, in 1821, to Elisabeth Straker, a devout Sandemanian and relative of Michael Faraday.<sup>11</sup> Cromwell Varley was neither happy with the narrow and pessimistic creed in which his mother raised him nor with the little schooling he received at St Saviour's, Southwark. Sandemanian doctrines, he later regretted, 'wholly failed to satisfy my anxiety about the future', and he gained more satisfaction learning to build electrical apparatus in Cornelius's workshop, perusing Henry Noad's *Lectures on Electricity* and attending William Robert Grove's lectures at the

9 W. H. Russell, *The Atlantic Telegraph* (1865), reprinted Newton Abbot, 1972, 44.

10 Varley's mother was descended directly from the marriage of Cromwell's daughter Bridget and his deputy, Lieutenant-General Charles Fleetwood. The symbolic significance of the fort for Varley was probably strengthened by the fact that Charles Fleetwood once served as Cromwell's Irish Commander-in-Chief. For biographical details of Varley see *DNB*; A. Lee, 'The Varley brothers: Cromwell Fleetwood Varley and Samuel Alfred Varley', *Journal of the Institution of Electrical Engineers* (1932), 71, 958–64; John Varley Jeffrey, 'The Varley family: engineers and artists', *Notes and Records of the Royal Society of London* (1997), 51, 263–79 and the following obituaries: [Anon.], 'Death of Mr. C. F. Varley', *Electrician* (1883), 11, 397–8; [Anon.], 'The late Mr. C. F. Varley', *Electrical Review* (1883), 13, 203–4; W. Thomson *et al.*, 'Cromwell Fleetwood Varley', *Minutes of Proceedings of the Institution of Civil Engineers* (1883), 77, 373–81. For details of the Varley family life see [Anon.], 'Samuel Alfred Varley', *Electrical Review* (1892), 31, 313–17.

11 For Cornelius Varley see C. Klonk, *Science and Perceptions of Nature: British Landscape Art in the Late Eighteenth and Early Nineteenth Century*, New Haven, 1996, 101–47. His Sandemanianism is mentioned in G. Cantor, *Michael Faraday: Sandemanian and Scientist*, London, 1991, 301–3. On John Varley's astrology see P. Curry, *A Confusion of Prophets: Victorian and Edwardian Astrology*, London, 1992, 18–45.

London Institution.<sup>12</sup> In Grove's lectures, Varley would have learnt that the correlation and efficient management of physical forces were engines of social, moral and economic progress.<sup>13</sup> His decision to ply his workshop skills in the electric telegraph trade suggests that Grove's vision of the future was more appealing to him than that of the Sandemanians.

It was probably through Cornelius that Cromwell Varley was first introduced to William Fothergill Cooke, the telegraphic inventor and adviser to the fledgeling Electric Telegraph Company (ETC), who, in 1846, hired Varley as an engineer for the company's London offices. Varley entered a business still suffering from poor public investment and dealing in commodities that, on being introduced to the public only a decade before, had met with considerable scepticism.<sup>14</sup> Indeed, Varley had grown up in a decade in which Cooke, Charles Wheatstone and other inventors struggled to build trust in telegraphic practices that were hard to distinguish from magic and conjuring. John Frederick Daniell, the eminent chemistry professor at King's College, London, spoke for many Victorians of the late 1830s when he told a friend that, having experienced the new London and Birmingham Railway Telegraph, he was 'quite surprised at, and almost at a loss to account for, the different effects produced upon my mind by *believing* and *seeing*'. After conducting experimental trials on a replica of the apparatus, Daniell convinced himself that seeing was believing, but nevertheless felt the simplicity of communication had 'produce[ed] in me something like magic'.<sup>15</sup> Daniell's idea of using telegraphy to improve signalling and safety on the railways was still, however, too 'magical' to the majority of the rich railway entrepreneurs, and it was only in the mid-1840s that company directors began seriously to exploit the possible uses of the new apparatus.<sup>16</sup> It took the Victorian public even longer to appreciate that the telegraph was more than a magical invention and something that, with their investment, could bring considerable social benefits. According to *The Times* in 1850, the electric telegraph in England had 'proved comparatively a failure' as 'a mere mercantile adventure' because it was 'without utility', served simply to 'excite wonders at the marvellous feats achieved by modern science' and was 'talked of, wondered at, and neglected'.<sup>17</sup>

From the late 1840s, the ETC worked hard to market the idea of communicating with invisible people via the electric fluid as socially and commercially rewarding, trustworthy

12 Varley, 'Evidence of Mr. Varley', in *Report on Spiritualism of the Committee of the London Dialectical Society*, London, 1871, 157–72, 168. Sydney Waterlow, a contemporary of Varley's at St Saviour's, and a telegraph entrepreneur, regretted the school's narrow curriculum of 'writing, arithmetic, and Latin, Greek and Hebrew'. G. Smalley, *The Life of Sydney H. Waterlow*, London, 1909, 10. For Varley's interest in Noad and Grove see 'The Late Mr. C. F. Varley', op. cit. (10), 203. See also H. Noad, *Lectures on Electricity: Comprising Galvanism, Magnetism, Electro-magnetism, Magneto- and Thermo-electricity* London, 1844.

13 I. Morus, 'Correlation and control: William Robert Grove and the construction of a new philosophy of scientific reform', *Studies in History and Philosophy of Science* (1990), 22, 589–621, esp. 591–7.

14 J. Kieve, *The Electric Telegraph: A Social and Economic History*, London, 1973, 29–100, esp. 94–6. For contemporary anecdotes testifying to public superstition about the telegraph see C. Archer, *Guide to the Electric Telegraph*, London, 1852.

15 Cited in [Anon.], 'Seeing and believing', *Telegraphic Journal* (1864), 1, 59. Daniell was probably referring to Wheatstone and Cooke's famous railway telegraph experiments of 1837.

16 For railway entrepreneurs' resistance to Wheatstone and Cooke's claims see Morus, 'The electric Ariel', op. cit. (8).

17 [Anon.], *The Times*, 26 September 1850, 5.

and altogether less magical than previously thought.<sup>18</sup> But with growing competition from rival telegraph companies, the ETC became increasingly cautious about showing details of its operation to the public. The young engineer William Henry Preece strongly disagreed and privately declared that secrecy had earned the ETC a reputation as a company of ‘knaves and swindlers’ and was undermining public confidence and business. He was convinced that keeping the ‘ignorant’ English in the dark about the ETC made them ‘doubt the powers of the telegraph’ and forced them to ‘fly to the post or any other conveyance with which they are acquainted and can depend on’. The ETC directors would undoubtedly have agreed with Preece’s advice to ‘court the public’, but they seemed to favour more strategic ways of selling their commodities.<sup>19</sup> Like other telegraph companies, the ETC exploited such events as the much publicized ‘telegraphic’ capture of the fleeing murderer John Tawell, organized widespread advertising campaigns and promoted popular telegraphic guides to convince the sceptical and indifferent Victorian public that the telegraphic art was, as Varley succinctly put it in 1866, ‘no chimera, but a really *sound, practical, commercial* undertaking’.<sup>20</sup>

These commercial and epistemic desiderata strongly informed telegraphic practice. The ETC’s instrument-room (where signals were transmitted and received) was carefully policed to exclude possible sources of disruption to the telegraphic clerks’ duties, while clerks who neglected their duties or interfered with company apparatus were punished.<sup>21</sup> As Varley saw it, clerks’ behaviour and their difficulties with using telegraphic apparatus constituted ‘some of the elements which enter into the calculation as to the availability of a line for commercial purposes’.<sup>22</sup> The tedious and costly maintenance work required on the ETC lines (not least on their underground and submarine lines) meant that engineers themselves were no less accountable for precious company funds. To strengthen their positions, engineers had to translate their inventive strategies into the commercial language of their most important audience: the capitalist ETC directors and the ‘moneyed mercantile

18 This compares with the efforts of the architects of late-Victorian physics laboratories to defend electrical and telegraphic measurements as a moral pursuit. See S. Schaffer, ‘Late Victorian metrology and its instrumentation: a manufactory of ohms’, in *Invisible Connections: Instruments, Institutions and Science* (ed. R. Bud and S. Cozzens), Bellingham, 1992, 23–56, and ‘Accurate measurement is an English science’, in *The Values of Precision* (ed. M. N. Wise), Princeton, 1995, 135–72 and G. Gooday, ‘The morals of energy metering: constructing and deconstructing the precision of the Victorian electrical engineer’s ammeter and voltmeter’, *ibid.*, 239–82.

19 William Henry Preece, Memorandum dated 23 April 1855, cited in E. C. Baker, *Sir William Preece, F.R.S. Victorian Engineer Extraordinary*, London, 1976, 56 and 57.

20 C. Varley, ‘The electric telegraph’, *Reader* (1866), 7, 958–9, 959. Original emphasis. On Tawell and telegraphy see G. Hubbard, *Cooke and Wheatstone and the Invention of the Telegraph*, London, 1965, 105–35. D. Lardner, *The Electric Telegraph Popularised*, London, 1855 and Archer, *op. cit.* (14) are exemplary popular guides. Later Victorian reactions to the telegraph are discussed in C. Marvin, *When Old Technologies Were New*, Oxford, 1988.

21 *The Electric Telegraph Company: Rules and Regulations to be Observed by the Officers and Servants of the Company*, London, 1863, British Telecom Archives (henceforth BTA), POST 81/45.

22 C. Varley, ‘Evidence of Cromwell Fleetwood Varley’ in *Report of the Joint Committee on the Construction of Submarine Telegraphs, British Parliamentary Papers*, 1860, 62, London, 1861, paragraph 2909. On the relationship between telegraphy and commerce see Smith and Wise, *op. cit.* (8), 649–722; Schaffer, ‘Late Victorian metrology’, *op. cit.* (18); I. Morus, ‘Currents from the Underworld: electricity and the technology of display in early Victorian England’, *Isis* (1993), 84, 50–69.

class'.<sup>23</sup> They turned Company interests in economy of time, space and material resources into rich sources of experiments and 'ingenious' ways of improving signalling. For instance, on promoting quantity batteries in 1857, Varley stressed that their expenditure would allow lines to be worked when they 'should otherwise be broken down ... that extra outlay will be returned, and the credit of the Company saved'.<sup>24</sup> For the ETC chairman, John Lewis Ricardo, any such suggestions were upheld as 'good service to the Company' and grounds for remuneration and promotion.<sup>25</sup>

As an engineer for telegraph cables laid beneath the London streets, Varley was constantly exposed to the inextricable connections between skill, time and money. Underground cables were 'very liable to get out of order' owing to problems such as defects in the cable insulation and poorly joined conductors.<sup>26</sup> In the 1840s and early 1850s, strategies for tackling these problems were extremely simple and reflected the technological display culture from which telegraphic instruments were developed.<sup>27</sup> In this period, maintenance of cables did not involve, as Latimer Clark and Robert Sabine recalled, any 'exact measurements', and it was common among electricians to test the 'continuity' of the cable simply by tasting or feeling the electric current in the cable, or by checking to see whether the current through the cable produced a sufficiently large deflection on a simple galvanometer.<sup>28</sup> On underground cables, however, 'rough and ready' testing techniques were increasingly viewed as a 'serious inconvenience' since they usually involved repeated unearthing and testing of cables and thus expenditure of telegraph company time and money.<sup>29</sup> As Bruce Hunt has pointed out, it was the concern to develop more reliable and economic cable-testing techniques that gave commercial value to accurate measurement in electrical practice.<sup>30</sup> Varley was one of a handful of mid-nineteenth-century electricians who, despite the scepticism of colleagues, responded to these concerns with sophisticated

23 C. Bright, *The Life Story of Sir Charles Tilston Bright*, Rev. edn., London, 1908, 33.

24 Cited in 'The Electric and International Telegraph Company. Thirteenth Officers' Quarterly Meeting' (6 January 1857), in *The Electric and International Telegraph Company: Quarterly Meetings of the Superintendents: Reports 1854–57*, BTA, POST 81/20, 17. In the quantity battery, two series of electric cells were connected in parallel, thus increasing the effective area of each cell and the overall intensity of electricity leaving the battery. Varley claimed that such an arrangement was more economic (in terms of space and money) and more reliable (regarding current levels) than the common Daniell battery.

25 Cited in 'The Electric Telegraph Company. Seventh Officers' Quarterly Meeting' (5 July 1855), in *The Electric and International Telegraph Company*, op. cit. (24), 3. Between 1861 and 1863, Varley was paid a total of £300 for using telegraph patents that he had secured in 1854 and 1855. See *The Electric and International Telegraph Company: Precedents and Legal Opinions*, BTA, POST 81/41. The ETC's role in fostering telegraphic innovation can be compared to that of corporate 'machine shops' in the development of American telegraphy. See P. Israel, *From Machine Shop to Industrial Laboratory: Telegraphy and the Changing Context of American Invention, 1830–1920*, Baltimore, 1992, 57–151.

26 Varley, op. cit. (22), paragraphs 2896–2900, citation on 2900. For the problems of underground cables see W. Siemens, *Inventor and Entrepreneur: Recollections of Werner von Siemens*, London, 1966, 71–90.

27 Morus, 'Telegraphy and the technology of display', op. cit. (8).

28 L. Clark and R. Sabine, *Electrical Tables and Formulae for the Use of Telegraph Inspectors and Operators*, London, 1871, 7. For examples of engineers using their bodies to assess the quality of cable insulation see Varley, op. cit. (22), paragraph 2896 and G. Prescott, *The History, Theory and Practice of the Electric Telegraph*, Boston, 1860, 268, 282–3, 341. For other simple tests of current strength see Siemens, op. cit. (26), 72 and 119.

29 Citations from C. Bright, *Submarine Telegraphs. Their History, Construction and Working*, London, 1898, 10 and Lardner, op. cit. (20), 147. See also Siemens, op. cit. (26), 78.

30 Hunt, 'The ohm', op. cit. (8), 48–57.

fault location techniques and arguments for the adoption of standard resistance coils. In his early years at the ETC, for example, he located distant faults by trying to mimic the observed current through a defective cable on a ‘good’ company wire of a certain length, all other conditions being judged equal: the chosen length of wire then approximately determined the distance of the fault.<sup>31</sup> As we shall see below, submarine telegraphy exposed the shortcomings of ‘rough and ready’ cable-testing techniques even more powerfully and gave even greater commercial importance to accurate measurement in the manufacture and testing of cables.

Other disturbances to the telegraph lines proved much more difficult to handle. During electrical storms and aurorae, telegraphic signalling was severely disrupted by mysterious ‘earth-currents’ – currents of variable strength and direction that appeared to flow between various parts of the Earth and which were correlated with the axial rotation of the Earth.<sup>32</sup> The effect of earth-currents on cable networks could be so dramatic and far-reaching that large numbers of telegraph subscribers were worried about the vulnerability of their investment to strange forces. Varley recalled, for instance, that on one occasion in 1858, earth-currents were so strong that they caused ‘considerable excitement at the Stock Exchange, the telegraph communication being almost suspended’.<sup>33</sup> In his judgement, the health of the telegraph depended on quelling investors’ fears as well as earth-currents. His 1859 collaboration with the Astronomer Royal, George Biddell Airy, on maps of earth-current distribution across Britain, and his 1862 electrical apparatus for filtering earth-currents from human signals were direct responses to these commercial and electrical threats.<sup>34</sup>

Projects to lay telegraphs between Britain and the Continent gave the telegraph company personnel severe difficulties. Submarine telegraphs had been mooted in the early 1840s but it was approximately a decade before the necessary expertise, resources and money could be mobilized to lay the first successful long submarine cable – the Dover to Calais cable of 1851.<sup>35</sup> Driven by the prospect of a lucrative overseas market for their electrical commodities, telegraph firms were soon trying to follow the Dover–Calais example with their own submarine telegraph ventures but meeting with only moderate success: over one-third of all the submarine cables laid between 1850 and 1860 stopped working shortly after having been laid, whether through imperfect insulation, complete breakage, mechanical damage during the laying operation, or what the ETC classed as cable casualties of a ‘baffling and unexpected nature’.<sup>36</sup> It was statistics such as this that undermined public interest and investment in submarine telegraphy. J. S. Fourdrinier, ETC secretary, summed

31 Varley, *op. cit.* (22), paragraph 2900.

32 For earth-currents see R. Culley, *A Handbook of Practical Telegraphy*, London, 1863, 94–5.

33 Varley, *op. cit.* (22), paragraph 2914.

34 For Varley’s earth-current apparatus see C. Varley, ‘On the Atlantic telegraph [1867]’, *Proceedings of the Royal Institution* (1869), 5, 45–59, 56–8. For Airy and Varley’s exploration of earth-currents see C. Varley, ‘Observations and correspondence on the subject of deflections’, in *Report of the Joint Committee*, *op. cit.* (22), 502–11.

35 For the history of early submarine telegraphy and its problems see Bright, *op. cit.* (29), 1–22; W. Smith, *The Rise and Extension of Submarine Telegraphy*, London, 1891, 1–37; Siemens, *op. cit.* (26), 119–33, 144–57.

36 For submarine cable statistics see D. Lardner, *The Electric Telegraph*, revised and re-written by E. Bright, London, 1867, 80–1. The ETC cited in Kieve, *op. cit.* (14), 91.



up the attitude of many affluent Victorians towards submarine telegraphy when he observed during an 1862 half-yearly meeting of ETC that ‘the subject of submarine telegraphy was not a very favourite one with the majority of [ETC] shareholders’ and was the ‘least profitable part of the [ETC’s] operation’.<sup>37</sup>

Varley, however, did rather well out of the troubled business of submarine telegraphy, not least because he worked hard to market his solutions to two problems that, while already recognized on insulated underground cables, were greatly exacerbated on insulated submarine cables: the retardation and distortion of signals by electrostatic induction, and a reliable method of fault detection. In 1854, for example, he sold the ETC his patent for a double-current key, a device for removing electrostatic charge on lines between signals, and which Varley offered as a way of attaining ‘commercial’ rates of signalling.<sup>38</sup> Likewise, he devised a ‘loop-test’ method for locating cable faults that could be performed remotely (i.e. from the shore) and which claimed greater precision over existing methods.<sup>39</sup> Many of those involved in the telegraph business viewed these sophisticated new electrical testing methods with considerable scepticism and it often took protracted debate or, in the case of Varley’s pinpointing of a fault on the ETC’s Dutch cable, a spectacular demonstration, before engineers were able to convince employers and colleagues of the reliability and commercial value of their methods.<sup>40</sup> Varley’s solutions to submarine telegraphy’s problems helped his promotion to chief electrician at the ETC’s Lothbury headquarters, in London’s stockbroking and banking centre.<sup>41</sup> He exploited this position to negotiate the company’s use of ‘Varley’ resistance coils for accurate cable-testing and his patents for expediting telegraphic signalling. His efforts were again rewarded in 1858 when he was appointed chief electrician to a new telegraph company formed by the 1855 merger of the ETC and the International Telegraph Company – the Electric and International Telegraph Company (EITC). Thus Varley reached a powerful position within a Victorian telegraph firm that boasted the largest number of customers and miles of telegraph cable.<sup>42</sup>

As chief electrician to the EITC, Varley was in a good position to observe the vicissitudes of Atlantic telegraphy during the late 1850s. Like many electricians, scientists and entrepreneurs who supported plans to build an Atlantic telegraph, Varley had to grapple with powerful arguments for and against the very possibility of laying and working a

<sup>37</sup> Fourdrinier cited in ‘Report of the proceedings at the Half-Yearly Meeting of the Electric and International Telegraph Company...February 6th, 1862’, in *Electric and International Telegraph Company: Half-Yearly Reports*, BTA, POST 81/19, 2.

<sup>38</sup> C. Varley, ‘Apparatus for transmitting electric telegraph signals’, *Letters Patent*, 16 June 1854, No. 381.

<sup>39</sup> In this technique Varley sought to locate faults by balancing the current through a good wire of a submarine cable against the current through a faulty wire and standard resistance coils in the testing station. C. Varley, ‘On some of the methods adopted for ascertaining the locality and nature of defects in telegraphic conductors’, *Report of the British Association for the Advancement of Science* (1859), 29, 252–5. The method was widely adopted by the ETC and discussed favourably in the leading (and, not coincidentally, ETC-approved) telegraphic textbook of the mid-Victorian period: Culley, *op. cit.* (32), 121–5.

<sup>40</sup> Varley to William Thomson, 10 October 1859, V2, Kelvin Papers, University Library, Glasgow (henceforth K-ULG).

<sup>41</sup> Thomson, ‘Varley’, *op. cit.* (10), 379. In 1856, Varley was promoted to consulting electrician with a salary of £200. H. Weaver to Varley, 26 January 1856, in ‘Electric and International Telegraph Company: Private Letter Book 1855–59’, BTA, POST 81/27, 91.

<sup>42</sup> For EITC statistics see Kieve, *op. cit.* (14), 73–100.

commercially viable deep-sea telegraph. Moreover, these individuals had to cope with the fact that deep-sea telegraph enterprises had resulted in some of the most expensive engineering disasters of the period: the 1857 expedition to lay a telegraph from Ireland to Newfoundland was abandoned when the cable snapped 380 miles from Valentia, while both the Atlantic cable of 1858 and the Red Sea cable of 1859–60 stopped working shortly after having been laid.<sup>43</sup> Electricians' problems with telegraphy reached tragic proportions with these cables since their failures were ascribed to sloppy electrical testing practices, as well as poor cable construction and handling. The dismissal of Edward Orange Wildman Whitehouse from the post of chief electrician to the Atlantic Telegraph Company (ATC) – the Anglo-American company formed to finance, construct and lay the 1857 and 1858 Atlantic cables – dramatically illustrated electricians' grave responsibilities and the measures submarine telegraph company managers were willing to take to circumvent the public's 'indifference' towards or downright 'distrust' of their deep-sea enterprises.<sup>44</sup> The ATC was financially ruined by the 1858 enterprise and, according to its long-serving secretary, George Seward, faced the 'hopeless and thankless problem of raising capital' for a new cable from a public who now viewed the Atlantic telegraph as little more than an 'interesting but commercially impracticable experiment'.<sup>45</sup> On the other hand, there were many engineers, scientists and entrepreneurs connected with telegraphy who shared the opinion of William Thomson, the rising star of British physics and scientific consultant to the ATC, that the events of 1858 had demonstrated that Atlantic telegraphy was 'no longer chimerical and merely visionary' and that 'instantaneous communication between the Old and the New Worlds is now a fact'.<sup>46</sup> It remained for supporters of Atlantic telegraphy such as Varley to convince the public that the 1858 'experiment' had proved that signals could be transmitted across the Atlantic and that another Atlantic cable project was a sound investment opportunity. They sought to refine the art of deep-sea telegraphy and to show that it deserved to be treated, as one anonymous *Mechanics' Magazine* writer urged in 1861, with 'the dignity of a science'.<sup>47</sup>

As several studies have shown, the demise of the Atlantic and Red Sea cables sparked protracted debate among the architects of submarine telegraphy and demonstrated the inextricable connections between the telegraph's commercial plausibility, public confidence, field physics and an electrician's ability.<sup>48</sup> Electricians fought hard to restore public confidence in their expertise and in the Atlantic telegraph: at the British Association

43 There are many detailed accounts of these and later deep-sea telegraph enterprises but see especially B. Dibner, *The Atlantic Cable*, New York, 1959; H. Field, *History of the Atlantic Telegraph*, New York, 1866; Russell, op. cit. (9); Bright, op. cit. (29), esp. 23–105; Smith, op. cit. (35), V. Coates and B. Finn, *A Retrospective Technology Assessment: Submarine Telegraphy. The Transatlantic Cable of 1866*, San Francisco, 1979, 1–65; Hempstead, op. cit. (8).

44 On public reaction to cable failures see G. Seward, *The Trans-Atlantic Submarine Telegraph*, London, 1878, 35–47 and Hempstead, op. cit. (8), 298–300.

45 Seward, op. cit. (44), 41, 38.

46 Thomson, speech reported in *Glasgow Herald*, 21 January 1859, reprinted in S. Thompson, *Life of William Thomson, Baron Kelvin of Largs*, 2 vols, London, 1910, i, 389–96, 390.

47 [Anon.], 'The prospects of deep sea telegraphy', *Mechanics' Magazine* (1861), 5, 281.

48 Smith and Wise, op. cit. (8), 649–722; Hunt, 'The ohm', op. cit. (8); Hunt, 'Whitehouse', op. cit. (8); Schaffer, 'Late Victorian metrology', op. cit. (18).

Committee on Electrical Standards (1861–9) they negotiated new standards and practices of cable construction and testing; at the 1862 International Exhibition in South Kensington they displayed their latest techniques for securing reliable telegraph signalling; they embarked on nationwide fund-raising tours; and in electrical journals and telegraph factories, they sought to cleanse their ranks of individuals such as Whitehouse, with whose crude, wasteful and dishonourable activities they starkly compared their own practices.<sup>49</sup> Although Varley was not directly involved in the enterprises to lay either the first Atlantic or the Red Sea cables, he nevertheless exploited his promotions in the telegraph business as an additional way of building his reputation: whilst maintaining his EITC position, he accepted the ATC's invitation to become Whitehouse's unsalaried replacement, travelled to Newfoundland where he tested the moribund 1858 cable and impressed William Thomson with his standardized resistance coils for making accurate estimates of the positions of cable faults.<sup>50</sup>

In late 1859 Varley's ATC position brought him a more exposed but powerful role on the joint ATC and Board of Trade committee investigating the unhealthy state of submarine telegraphy.<sup>51</sup> There, he sat alongside engineers and inventors acting for the Board of Trade (William Fairbairn, Douglas Galton and Charles Wheatstone) and fellow ATC employees (Edwin Clark, Latimer Clark and George Saward) in the cross-examination of submarine telegraphy's principal players. More than most committee members, Varley was willing to show his colours: he was clearly irritated with Whitehouse's attempt to justify his crude and ultimately fatal cable-testing procedures but was firmly supportive of the precision measurement approach to Atlantic cable manufacture and testing advocated by William Thomson, the committee's most distinguished witness. When the committee finally published its report and minutes of evidence, larger audiences of electricians and possible sponsors of Atlantic telegraphy could see how Varley had made Thomson's work a prominent part of his case for a commercially viable Atlantic cable: Varley believed the success of the enterprise would hinge on exploiting Thomson's mirror-galvanometer (the highly sensitive instrument that had enabled the detection of the weak signals sent through the 1858 Atlantic cable), exploitation of Thomson's mathematical 'law of squares' relating signal quality to cable conductivity (for which Varley also furnished experimental support) and the use of standardized resistance coils for assaying the quality of the conductor and gutta-percha cable insulation. The following decade would witness further harmony between Varley

49 For the British Association Committee on Electrical Standards see Hunt, 'The ohm', op. cit. (8), Smith and Wise, op. cit. (8), 684–98, and Schaffer, 'Accurate measurement', op. cit. (18) and 'Late Victorian metrology', op. cit. (18). For fund-raising tours see Varley to R. Glass, 10 June 1868, V20, K-ULG. For the International Exhibition see Fleeming Jenkin, 'Report on electrical instruments', in 'Class XIII: philosophical instruments and processes depending on their use', *International Exhibition, 1862. Reports of the Juries*, London, 1863, 44–98. Varley, for example, exhibited his resistance coils, his 'loop-test', a galvanometer relay and a machine producing static electricity. See *ibid.*, 60, 64–5, 81–2, 86–7.

50 W. Thomson, 'Evidence of Professor Thomson', in *Report of the Joint Committee*, op. cit. (22), paragraphs 2524–42. Thomson disagreed with Varley's estimate of the position of the fault on the 1858 Atlantic cable but considered the electrician's report on the cable as 'evidence of high scientific and practical talent'. Thomson to [George Saward], 24 September 1858, cited in Thompson, op. cit. (46), i, 377–8, 377.

51 *Report of the Joint Committee*, op. cit. (22). For an overview see Coates and Finn, op. cit. (43), 18–47.

and Thomson, resulting in a business partnership and the electrician's cautious use of the professor to help him build his career.<sup>52</sup>

In several quarters, Varley's name was now indispensable for spreading the value of telegraphy. Between 1861 and 1863, the EITC invited him to conduct entertaining tours of their headquarters for journalists and foreign visitors, whilst the Gutta Percha Company began to use his testimony to sell their chief product.<sup>53</sup> Varley's joint committee writ did not, however, run easily through new journals dedicated to spreading engineering, scientific and business interests in telegraphy. As Fitzgerald's remarks at the opening of this paper suggest, contributors to journals such as the *Electrician* and *Telegraphic Journal* spent much of the early 1860s conducting their own crusade against unscrupulous colleagues and 'unscientific' practices, and this frequently involved attacks on dubious promises made by Varley and other joint committee members about such fundamental telegraphic characteristics as the rate of signalling and the quality of gutta-percha insulation.<sup>54</sup> In response, electricians such as Latimer Clark, Fleeming Jenkin and Varley sought to affirm positive consensus about electrical practice, as witnessed by Varley's debunking of bogus inventions and all three electricians' push for a clear and stable language of electricity at the British Association Electrical Standards Committee.<sup>55</sup> It was with these strategies that Varley sought to reassure his anxious public constituencies that submarine telegraphy was no longer a chimerical scheme. At a soirée for 'diffusing information' to ATC investors in 1862, Varley tackled popular doubts about commercial rates of signalling and gutta-percha insulation with a reminder of the 'strides that telegraphy had made during the past 15 years'. Long service in the telegraphic trade had convinced him that sceptics of Atlantic telegraphy were like the cynics who, when the ETC began, 'scarcely believed in the possibility of sending a message from London to Birmingham' and would have 'set down as a little less than a madman' anyone who could signal from St Petersburg to London.<sup>56</sup>

During the next few years, Varley, Thomson and other leading telegraph engineers would help the ATC convince major investors that their money was going towards a project that was neither chimerical nor lacking the unanimous blessing of scientific authorities, but one that now rested on the most reliable and sophisticated techniques in

52 For Varley's evidence supporting Thomson's theory see C. Varley, 'Experiments on the "Mediterranean Cable"' in *Report of the Joint Committee*, op. cit. (22), 501. It was probably through Thomson that Varley gained a Royal Society audience (his first) for these researches. C. Varley, 'On the relative speed of the electric wave through submarine cables of different lengths', *Electrician* (1863), 4, 88–9. The Royal Society did not publish this paper.

53 [Anon.], 'The Electric and International Telegraph Company', *Electrician* (1862), 1, 147–8, 158–60; [Anon.], 'Visit of the officers of the Japanese Mission', *ibid.*, 2, 29–30. For an example of a Gutta Percha Company advertisement see *ibid.*, 17 April 1863, 3, p. iii.

54 See, for example, 'M', 'Some obstructions to submarine telegraphy', *Electrician* (1863), 4, 43–5, and S. Taylor, 'Submarine insulation', *ibid.*, (1863–4), 5, 298–300. Taylor accused Varley of using 'legerdemain' to produce his claimed speeds of Atlantic cable signalling.

55 C. Varley, 'Haworth's system of telegraphing without wires', *Electrician* (1863), 3, 200–1. Varley served on the British Association Committee between 1863 and 1869 and contributed towards the design of standard condensers and the names of electrical units: see F. Jenkin (ed.), *Reports of the Committee on Electrical Standards*, London, 1873, esp. 137–42; Varley to Thomson, 27 November 1865, V11, K-ULG.

56 Quoted in [Anon.], 'The Atlantic Telegraph Company', *Electrician* (1862), 1, 255–7, 255, 256.

the theory and practice of submarine telegraphy. By 1865 their words had directly or indirectly helped raise enough capital to construct a new cable. But that was not the end of the publicity exercise for Varley. Beyond the communities of self-assured electricians, there remained the greater British public who, according to an 1864 *Telegraphic Journal* editorial, still held ‘erroneous views and prejudices’ and ‘a deep-rooted antipathy ...towards the electric telegraph’.<sup>57</sup> It was an antipathy that may have prompted one contemporary spiritualist to boast in 1862 that spiritualism enjoyed ‘a literature... much more extensive than [that of] the electric telegraph’.<sup>58</sup>

#### DARK OPERATIONS: ELECTRICAL EXCHANGES WITH OTHER WORLDS

For some electricians, Varley’s designs for the Atlantic telegraph had been as worrying as his studies of subtler telegraphs. In 1863, for instance, a pseudonymous correspondent in the *Electrician* accused Varley of making apparently contradictory statements about the quality of gutta-percha. Attributing Varley’s ‘temporary deviation’ to poor experience in working with long submarine cables, the correspondent hoped he would make amends by devoting attention to the crucial gaps in his telegraphic knowledge instead of to ‘the dazzling mists of certain influences which shall be nameless’.<sup>59</sup>

The unspoken influence was spiritualism and by 1863 Varley, his EITC colleague, Latimer Clark, and other electricians were among the thousands of Victorians who were lost for straightforward explanations of the strange American import. Spiritualism had arrived in Britain a decade earlier in the form of popular crazes for table-turning and table-rapping and the much-publicized exploits of touring American ‘mediums’ such as Mrs W. R. Hayden and Daniel Dunglas Home.<sup>60</sup> As such, spiritualism was principally concerned with evidencing the survival and progress of the human spirit beyond the grave, exploring the extraordinary powers of so-called spiritualistic mediums – the individuals through whom professed spirits of the dead manifested themselves – and promulgating ‘spirit’ teachings. It took many forms: it was a polite game in which people gathered around a table and felt it tilt and turn under the influence of spirits; it was about hearing mediums deliver spirit-guided lectures on the glorious other world and the new science of spiritualism; and above all it was about visiting dimly lit spiritualistic séances where mediums enabled ‘rapped’ conversations with spirits, or where they levitated household objects, had clairvoyant visions and produced materialized spirit forms. The practical engagement with spiritualistic phenomena served a wide range of social, emotional, religious, political and intellectual interests. Plebeians used spiritualism to support their anti-Christian beliefs and radical social programmes, bourgeois Victorians exploited their séance experiences to bolster their Christian faith and to raise their socio-economic

57 [Anon.], ‘Popular notions of the telegraph’, *Telegraphic Journal* (1864), 2, 193–4, 193.

58 T. Barkas, *Outlines of Ten Years’ Investigations into the Phenomena of Spiritualism*, London, 1862, 44.

59 ‘M’, op. cit. (54), 44.

60 For surveys of Victorian spiritualism see Oppenheim, op. cit. (6), 1–110; B. Inglis, *Natural and Supernatural: A History of the Paranormal from Earliest Times to 1914*, London, 1977; Pearsall, op. cit. (5); Podmore, op. cit. (5).

positions, women cultivated mediumistic skills as a way of turning the feminine ideal of spirituality into the basis of an independent career, and scientific and medical practitioners investigated spiritualistic phenomena to develop their studies of physical and mental powers.<sup>61</sup> Many Victorians were so convinced by their séance experiences that spiritualism became an integral part of their daily lives. For others, however, mediums were clever conjurers, spirits were figments of the imagination and spiritualism was a dangerous threat to the moral and social order since it dissolved the boundary between this world and the next, twisted people's minds and gave dangerous 'spiritual' powers to the masses.

The plausibility, language and gestures of the spiritualistic séance were partly built upon existing practices for the investigation and exploitation of new forces. Mid-Victorian mesmeric healing practices, for instance, provided useful precedents to spiritualist concepts such as the mediumistic séance and trance state, powers of clairvoyance and imponderable bodily fluids.<sup>62</sup> For some séance-goers, including Cromwell Varley, mesmeric healing also furnished an important personal skill to be used for restoring the health of mediums after the nervous toil of séances.<sup>63</sup> An equally compelling resource for mid-century spiritualists was the electric telegraph. American spiritualists and their British disciples actively associated the nascent practices of spirit-rapping with the 'rapping' electric telegraph apparatus of Samuel Morse and other inventors. They frequently referred to mediums' communion with the dead as 'spiritual' or 'celestial' telegraphy and organized séances around the idea that participants constituted positive and negative elements of a 'vital' electrical battery connected to the spiritual telegraph.<sup>64</sup> Some mid-nineteenth-century spiritualists were confident that raps on the spiritual telegraph had collapsed the distance between the living and the dead at least as effectively as the electric telegraph had annihilated space. In 1849, for instance, an American Methodist minister was so impressed by a séance experience that he told a spiritualist friend (ironically, via the electric telegraph): 'God's telegraph has outdone Morse's altogether.'<sup>65</sup>

For electricians who subscribed to the policies of the *Electrician* and the *Telegraphic Journal*, 'spiritual telegraphs' and other phenomena associated with spiritualism were to be either openly criticized or discreetly discussed.<sup>66</sup> The same journals, however, showed a contrasting enthusiasm for mesmerism, animal magnetism and the claim of the German industrial chemist, Baron Karl von Reichenbach, that some people could see a luminous 'odic' aura surrounding magnets, crystals, plants and the human body. That lamenter of 'occult' telegraphy, Desmond Fitzgerald, opened an 1862 *Electrician* with an article that enthused over possible connections between mesmerism and magnetism and urged that

61 Logie Barrow, *Independent Spirits: Spiritualism and English Plebeians, 1850–1910*, London, 1986; A. Owen, *The Darkened Room: Women, Power and Spiritualism in Late Victorian England*, London, 1989.

62 For Victorian mesmerism see Winter, op. cit. (7).

63 Varley, op. cit. (12), 157–9.

64 E. Hardinge [Britten], *Modern American Spiritualism*, New York, 1870, 29–39. For séance organization see idem., 'Rules to be observed for the spirit circle', *Human Nature* (1868), 2, 48–52, 49.

65 A. Jervis to E. Capron, 10 April 1849, cited in [Britten], *Modern American Spiritualism*, op. cit. (64), 51. See also Sollors, op. cit. (4), 992–6.

66 [Anon.], 'Spiritualism', *Electrician* (1863), 5, 35, 46, 58 and 70. This was a scathing review of Allan Kardec's 'spiritist' text: *Qu'est ce-que le Spiritisme?*, Paris, 1859. Cf. the briefer and more discreetly placed [Anon.], 'Telegraphing without wires', *Telegraphic Journal* (1864), 2, 132.

Reichenbach's claims were 'well worthy of further investigation on the part of those who are qualified for research, and who are not deterred from such inquiry by the somewhat startling character of the results involved'.<sup>67</sup> Fitzgerald believed his readers fell into the latter category: unlike practitioners of 'modern science', who were stifled by 'academic organization' and prejudiced against isolated facts, he considered electricians were 'at liberty to recognize facts, however obnoxious to scientific orthodoxy'.<sup>68</sup> The EITC workers Cromwell Varley and Latimer Clark would have agreed. In their case, however, electricians' struggles against the professoriate for cultural identity were to be fought out in the spiritualistic séance. The representatives of 'scientific orthodoxy' they were challenging would have included Michael Faraday, Britain's foremost authority on physical forces and a notorious denouncer of the public's fascination with table-turning. Clark and Varley followed Faraday's example of going to séances and undoubtedly shared Faraday's belief that the alleged forces of spiritualism were 'a fit, though very unpromising subject for experiment' and that the experimenter who evidenced such forces would 'gain... the attention of the whole scientific and commercial world' and 'universal respect and most honourable reward'.<sup>69</sup> But Clark and Varley certainly did not share Faraday's conviction that the alleged forces of 'spirits' were merely the result of mundane physiological forces located within the bodies of séance participants; instead, they sought to use their alternative conclusions about spirits to raise their scientific and public profile.

Clark had first experienced spirit-rapping and seen furniture levitating in 1857 when his brother-in-law had challenged his belief that the phenomena were 'a mass of self-delusion and trickery' and invited him to the séances of the 'highly respectable' Blackheath mediums Mr and Mrs Newton Crosland. Clark left the séance satisfied that the objective existence of the 'strange' intelligent phenomena was 'beyond question' and that spiritualism was a subject 'worthy of scientific investigation'.<sup>70</sup> He tried unsuccessfully to invite Faraday to the Croslands' séances and, despite a continued interest in spiritualism, seems to have been too worried by the effect of evil spirits on people's minds to publicize the results of his enquiries.<sup>71</sup>

67 Fitzgerald cited in [D. Fitzgerald], 'Animal "magnetism"', *Electrician* (1862), 2, 157–8, 158. See also B. Fincke, 'Some magnetic experiments', *ibid.*, 68–9. Fitzgerald had been an 'ardent investigator' of mesmerism since the early 1850s. See W. Harrison, *Spirits Before Our Eyes* (London, 1879), 202. By the early 1870s, however, Fitzgerald had not only overcome his doubts about spiritualism but was also zealously promoting it in his own family and local community. See Fitzgerald, 'A distinct view of Katey King', *Medium and Daybreak* (1872), 3, 348–9 and Fitzgerald's remarks in [Anon.], 'The Brixton Psychological Society', *Spiritualist* (1875), 6, 172–4.

68 Fitzgerald, 'Animal "magnetism"', *op. cit.* (67), 157. Fitzgerald's boasts are symptomatic of earlier Victorian electricians' antagonism towards the polite presentations of the scientific professoriate. See I. Morus, 'Different experimental lives: Michael Faraday and William Sturgeon', *History of Science* (1992), 30, 1–28.

69 M. Faraday, 'Observations on mental education' in *Experimental Researches in Chemistry and Physics*, London, 1859, 463–91, 471. On Faraday and table-turning see Winter, *op. cit.* (7), 290–300 and Cantor, *op. cit.* (11), 148–50.

70 Citations from Clark to Faraday, 29 April and 2 May 1857, Faraday Papers, Institution of Electrical Engineers Archives, SC MSS 2/5, 15 and 22. I owe these references to Bruce Hunt. Clark's continuing interest in spiritualism is suggested in a cordial letter to the medium D. D. Home. Clark to Home, 11 May 1864, D. D. Home Papers, Society for Psychical Research Archives, Cambridge University Library, letter 95.

71 For Faraday's reply to Clark's invitation see Faraday to Clark, 7 July 1857, cited in L. P. Williams, *The Selected Correspondence of Michael Faraday*, 2 vols., Cambridge, 1971, ii, 874–5.

Varley's initial interest in spiritualistic 'matters' began in the early 1850s, when he explored the craze for table-turning and satisfied himself that, contrary to popular opinion, electrical forces would not be strong enough to account for the effects. His first direct experiences of 'spirits' began much closer to home, when his wife Ada suddenly developed mediumistic powers: he claimed she could mentally answer his thoughts and was the mouthpiece of 'invisible' intelligences calling themselves 'spirits'. The spirits also seemed to be able to read his thoughts and predict the precise timing and nature of a serious change in Ada Varley's health. By early 1860, séance experiences at his Beckenham residence had at least convinced him that spirits were not phenomena derived from his 'own brain, or that of another person in the room' and that opportunities for studying more powerful sources of spirits had to be exploited.<sup>72</sup> His subsequent moves through the world of London spiritualism soon facilitated an invitation to subject D. D. Home's powerful feats of spirit-rapping and self-levitation to 'the most jealous and searching scrutiny'.<sup>73</sup> Home's respectable séance record, his gentility, apparent probity and, above all, his insistence on performing in the light, made him by far the best subject for Varley to investigate.<sup>74</sup> Home's invitation was also a perfect opportunity for Varley to further his reputation as an authority on physical forces. Thus, on arriving at Home's London residence, he announced himself as electrician to the EITC and the ATC, stressed that he was 'well acquainted with electricity, magnetism and other physical forces' and wanted to investigate the cause of Home's powers. Having searched Home's house for concealed machinery and imposters, he sat down to a dimly lit séance where he adopted his *métier* – a 'simple telegraphic alphabet' of raps – to communicate with the 'spirits'. Later, the spirits correctly answered his mental requests to touch his limbs a specified number of times. Varley ruled out the possibility that other séance participants could have impersonated the spirits since he believed he had made no visible gestures and that nobody else in the room 'was aware of what had taken place' between him and the spirits 'until I described it to them'.<sup>75</sup>

For Clark and Varley, like most Victorian séance-goers, the plausibility of spirit communicators also depended on judgements of the character of its mediums and promoters. Mediums of high moral standing and independent means, commonly known as 'private' mediums, were trusted more than their notoriously unprincipled and financially motivated 'professional' rivals.<sup>76</sup> As Varley was now beginning to appreciate, the problem of finding and investigating trustworthy mediators of invisible worlds was at least as central to the spiritual telegraph as to its electrical counterpart. Throughout the 1860s, he spent considerable spare time exploring the English and American spiritualistic scene for

72 C. Varley to W. Crookes, W. Huggins and E. Cox, 8 July 1871, *Spiritual Magazine* (1871), 6 (New Series), 350–3, 350.

73 C. Varley, 'Affidavit of Mr. C. F. Varley [1868]', reprinted in [W. Harrison], 'Facts for non-spiritualists', *Spiritualist* (1869), 1, 31–2, 31; Mme Home, *D. D. Home: His Life and Mission*, 2nd edn. (ed. A. Doyle), London, 1921, 126–8. For the Varleys' séances see W. Harrison, *Spirit People*, London, 1875, passim; G. Houghton, *Evenings at Home in Spiritual Séance*, London, 1881, 138–251.

74 For Home's reputation see E. Jenkins, *The Shadow and the Light: A Defence of Daniel Dunglas Home, the Medium*, London, 1982, 11–125; Oppenheim, op. cit. (6), 10–16.

75 Citations from Varley to J. Tyndall, 19 May 1868, *Spiritual Magazine* (1868), 3, 273–8, 273–5.

76 On this distinction see Owen, op. cit. (61), 49–61.



such trustworthy individuals. His verdict mirrored contemporary misgivings about the state of telegraphy discussed earlier in this paper; he reported ‘opportunities and inducements for fraud’ and intellects too feeble to receive the strange new ‘stimulus’, but also the existence of ‘able, learned and scientific men’, who shared his conviction in the evidence for spirit communication.<sup>77</sup>

In 1869 Varley expatiated on these and other experiences of ‘spirits’ before a panel of sceptical lawyers, physicians and clergymen investigating spiritualism – the Spiritualism Committee of the London Dialectical Society.<sup>78</sup> Towards the end of his evidence, he gave five principal reasons for asserting that ‘spirits of kindred beings *do* visit us’: first, he had distinctly seen forms calling themselves spirits; second, during several séances, a spirit had told him correct information about things unknown to the medium and ‘known only to myself and to the deceased person purporting to communicate with me’; third, he argued that spirits could not be the result of mediumistic ‘thought-reading’ since spirits of deceased acquaintances had reminded him of information that he had forgotten about and was known only to himself and the deceased; fourth, he had given mental questions to spirits and received correct written answers through a reputable medium – ‘a private lady in independent circumstances’ – who was quite ‘unconscious of the meaning of the communications’; fifth, and finally, he recalled occasions when ‘invisible informants’ calling themselves spirits had accurately predicted the time and nature of coming events ‘unanticipated and unknown both to myself and the medium’. For Varley, since the spirits’ predictions were correct and ‘no other mortals in the room had any knowledge of some of the facts [the spirits] communicated’, he saw ‘no reason to disbelieve them’.<sup>79</sup> The latter was exactly the kind of test that might be expected from an electrician attempting to establish the veracity of ‘invisible informants’ on the electric telegraph. In addition to evidence for spirits of other people, the Committee also heard Varley soberly claim that he had been able to transcend his own material body. Whilst sleeping or immobilized with chloroform, Varley had frequently perceived his own spirit and had been able to use it as

<sup>77</sup> Varley, ‘Affidavit’, op. cit. (73).

<sup>78</sup> *Report on Spiritualism*, op. cit. (12), 157–72. The London Dialectical Society was founded in 1868 and described as a group of about eighty ‘persons of Education & respectability’ who had as their object ‘the unbiased consideration of those important questions, which have at various times occupied the Attention of Philosophers & all thinking men’. D. H. Dyte (the Society’s honorary secretary) to Viscount Amberley (a future vice-president of the Society), 14 May 1868, cited in *The Amberley Papers: The Letters and Diaries of Lord and Lady Amberley*, (ed. B. and P. Russell), 2 vols., London, 1937, ii, 167. After an ‘acrimonious’ discussion on spiritualism in 1869, the Society formed a committee of lawyers, physicians, journalists and other learned figures for conducting test séances, cross-examining spiritualism’s proponents and receiving correspondence on the subject. Leading scientific men were invited to participate but the response was mixed. George Henry Lewes, Thomas Henry Huxley and William Benjamin Carpenter responded hostilely and refused to participate; John Tyndall was more sympathetic to the Committee’s objectives (not least because of Varley and Crookes’s investigations) but did not participate; Robert Chambers and the astronomer Camille Flammarion and the Master of Lindsay (later Lord Lindsay) testified to the reality of spiritualistic phenomena; and Alfred Russel Wallace joined the Committee. By the end of their six-month investigations, most committee members were convinced of the objective reality, if not the spiritualistic provenance, of séance manifestations. For background to the Spiritualism Committee, see [Anon.], ‘The London Dialectical Society and spiritualism’, in *The Year-Book of Spiritualism for 1871*, (ed. H. Tuttle and J. Peebles), Boston, 1871, 178.

<sup>79</sup> All citations from Varley, op. cit. (12), 167–8.



Figure 1. The *Great Eastern* cable-testing room during the 1866 Atlantic cable expedition. On the right, electricians judge the strength of signals through the cable using the movements of a light beam reflected from William Thomson's 1858 mirror-galvanometer. *Illustrated London News*, 13 October 1866, 357. Reproduced by permission of the British Library.

an agent of his will – for instance, to wake himself from sleep or communicate with his wife in a distant room. His spirit’s power to act without the powerless body was a ‘fact’ that had convinced him that ‘we are not our bodies’.<sup>80</sup>

By the time he spoke to the London Dialectical Society, Varley had only recently decided to publicize his belief in spiritualism. He justified his reticence by complaining ‘how all new things are received in this world of contention’ and pointing to the ugly fate of his heroes: Joan of Arc, Galileo and especially John Elliotson, the professor of medicine at University College, London, who, in Varley’s judgement, had lost his position for ‘telling the truth’ about mesmerism.<sup>81</sup> In the 1860s, whilst surrounded by the nervous engineers and investors for the second Atlantic telegraph, Varley had good reasons to fear the public response to novelty. His contemporary *Electrician* critic, Desmond Fitzgerald, could publicly endorse Reichenbach’s ‘odic’ force but his responsibility for the new cable was negligible compared with Varley’s. As a senior electrician for all the Atlantic cables of the 1860s, it was enough for Varley to contemplate Whitehouse’s fate, let alone Elliotson’s. Indeed, during the excitement of deep-sea cable-laying aboard the *Great Eastern*, Varley was made painfully aware of electricians’ grave responsibilities and the fragility of their authority and expertise (Figure 1). For instance, the breakage and temporary loss of the 1865 cable brought Varley (as electrician for the sponsors, the ATC) into fierce conflict with electricians acting for the cable contractors, the Telegraph Construction and Maintenance Company (TCMC). His criticism of the TCMC’s electrical and mechanical procedures for cable-laying testified to his growing frustration at rival attempts to wrest control of the Atlantic enterprise.<sup>82</sup> Four years later, during the voyage to lay the first French Atlantic cable, Varley again found himself battling with the TCMC, who were engaged to build and lay the cable on behalf of the sponsors, the Société du Câble Trans-Atlantique. On this expedition, Varley and the engineer Fleeming Jenkin served as electricians to the sponsors and had to contend with Willoughby Smith, the senior electrician to the TCMC, who was not always happy with Varley and Jenkin’s cable-testing protocol or with the way they ‘interfered in the [cable] test room during my absence’. On one occasion, Jenkin and Varley claimed evidence for a serious electrical fault in the cable and consequently stopped the cable being paid out from the ship. Smith disagreed with the evidence and found it so difficult to convince his rivals that cable-laying should continue that he was forced to summon Daniel Gooch, the chief owner of the *Great Eastern* and the Atlantic cable who, annoyed by the protracted arguing over his cable, authorized Smith’s course of action ‘under protest’ from Jenkin and Varley.<sup>83</sup> By the end of the voyage, Gooch had become so irritated by the ‘unpractical and unreasonable’ behaviour of the latter pair that he hoped his ‘company [would] never again enter into any contract where Jenkins [*sic*] or Varley are to accompany the expedition’.<sup>84</sup>

Smith had long harboured other doubts about Varley and Jenkin’s credibility. As far as he could tell, they seemed to be profiting from a business partnership with William

80 Varley, op. cit. (12), 170. Varley’s experiences of self-transcendence are detailed on 161–4.

81 Varley to Tyndall, op. cit. (75), 277; Varley to the *Eastern Post*, 6 June 1869, reprinted in C. Varley, ‘Spiritualism’, *Human Nature* (1869), 3, 367–71, 370.

82 Seward, op. cit. (44), 64.

83 Smith, op. cit. (35), 233–4.

84 D. Gooch, diary entry for 15 July 1869 in *Memoirs and Diary*, reprinted Newton Abbot, 1972, 182.

Thomson without having made any material contributions to it. The formidable Thomson, Jenkin and Varley partnership was formed in 1865, when Thomson and Jenkin welcomed Varley to their original 1860 team for building telegraphic inventions, securing patents, and trading inventions with telegraph companies.<sup>85</sup> When Varley joined the partnership, he saw a way of translating his convergence with Thomson into greater material profits for the partners, increased credibility for the telegraphic art and elevated professional status for himself. Working with Thomson and Jenkin suggested to him the possibility of exerting greater trading power over cable companies, power over rival and humbugging electricians and, eventually, power over the world.<sup>86</sup> In the months before the 1865 expedition to lay the second Atlantic cable, Varley acted as the partnership's chief trader, negotiating with the TCMC cable contractors for the exclusive use of inventions such as Varley and Thomson's 1865 'curb-key' (for expediting signalling), Thomson's 1858 mirror-galvanometer and Varley's 1862 'artificial' telegraph line. Varley had designed the latter for at least three related purposes: to mimic and explore the effects of signal retardation and earth-currents on possible Atlantic cable designs; to display the commercial plausibility of these designs; and to teach novice clerks the art of efficient deep-sea cable signalling. For each invention, Varley spent months trying to translate its claimed benefits to the speed and clarity of telegraphic signalling into the language of TCMC profit. The conversion of the wealthy TCMC Managing Director, Richard Glass, was crucial to the commercial and epistemic success of these inventions and Varley needed Thomson's authority and discretion to strengthen his salesmanship. He asked Thomson for 'a letter stating that my artificial line is an electrical representative [*sic*] of a long submarine cable, in order that Glass may have confidence in what he sees' and cautioned him to 'keep our operation dark as much as possible'.<sup>87</sup>

Although Thomson's counsel seems to have secured the TCMC's custom, the partners were not always satisfied with the financial arrangements. The company's use of the partners' instruments on the two successful Atlantic cables of 1866 (the resurrected 1865 and a successful new 1866 cable) prompted the partners to argue for their moral right to claim remuneration from what many now saw as the heroic business of Atlantic telegraphy (Figure 2). However, this success also spelt more financial problems and disputes for cable

85 For the Thomson, Jenkin and Varley partnership see Smith and Wise, *op. cit.* (8), 698–712. Charles Bright, who acted as a consulting engineer on the 1865 and 1866 cable expeditions, shared Smith's doubts about the originality of Varley's inventions. 'So many hallucinations appear to exist in his mind on the subject of his inventions', he told Jenkin. See Bright to Jenkin, 25 February, 1865, Letter Book of Sir Charles Bright, 1863–7, Institution of Electrical Engineers Archives, SC MSS 20/1. My thanks to Colin Hempstead for this reference. Cromwell's brother, the electrician Samuel Alfred Varley, was even more scathing and spent much of his life bitterly claiming that Cromwell had taken all the credit for 'his' inventions. S. A. Varley to Lord Rayleigh, 29 September 1890, Rayleigh Papers, Imperial College Archives, London; S. Varley, 'Artificial lines', *Electrical Review* (1883), 13, 251–2.

86 C. Varley to Thomson, 20 February 1865, V9, K-ULG. For Varley's worries about humbugs see Varley to Thomson, 16 February 1867, V16, K-ULG.

87 Varley to Thomson, 20 February 1865, V9, K-ULG. Varley was extremely sanguine about the consequences of gaining TCMC custom. He told Thomson that 'as soon as what we have done becomes a "fait accompli", all the world will be striving to rival us & it is very desirable to avoid litigation. Could we get the Tel[egraph] Construction & M[ainten]ance Co. to take it up, no one unless possessed of great means, would dare fight it. What is more important their influence would be secured to protect it at home & abroad'.

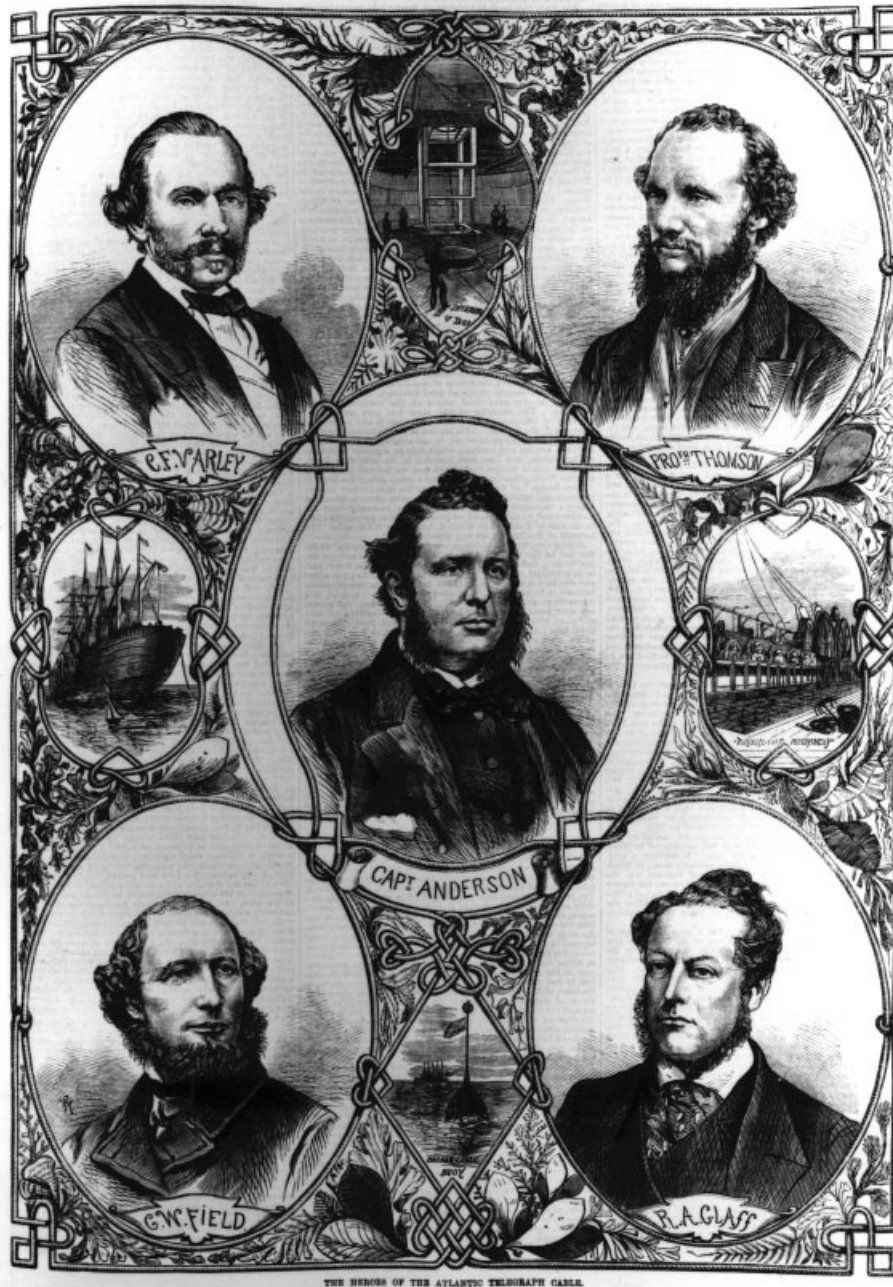


Figure 2. The Victorian popular press celebrate the protagonists and machinery of the successful 1866 Atlantic cable expedition: Cromwell Varley (electrician to the ATC), William Thomson (director and scientific consultant to the ATC), Richard Glass (financier and cable contractor), Cyrus Field (financier), James Anderson (captain of the *Great Eastern*), the *Great Eastern* and the cable-laying equipment. *Illustrated Times*, 25 August 1866, 21. For abbreviation see text. Reproduced by permission of the British Library.

firms and forced the partners' new clients, the Anglo-American Telegraph Company (AATC), into an extremely tight financial situation.<sup>88</sup> Varley was astonished by the AATC's refusal to meet Thomson's, Jenkin's and his own claims and exploited every opportunity to advertise connections between the partners' labours and the making of Atlantic telegraphy. For instance, in February 1867 he entertained a Royal Institution audience with spectacular illustrations of the partners' inventions and emphasized how such work had secured expedient and clear signals through the 1866 cable. The lecture seems to have fulfilled at least one of Varley's objectives, since the following day he was telling Thomson about the AATC chairman's 'warm & kind' enquiries 'about the success of my lecture'.<sup>89</sup>

In New York, Varley's trading efforts were further resisted by language problems. In November 1867, he 'overtaxed & overexcited' his brain trying to make the partners' claims perspicuous to American jurors and took great pains to remind Jenkin that 'the patent has to be drawn intelligently to a Jury of 12 Common men & this must be kept in view. In this country but little is known of Electricity much less than in England & God help the 12 poor Devils who shall have to sit in judgement upon the 1858 [mirror-galvanometer] patent'.<sup>90</sup> The success of Varley's New York operation therefore hinged on understanding how forces of nature looked to the common American and using this knowledge to smooth the communication of Thomson, Jenkin and Varley's telegraphy to the New World.

While in New York, Varley exploited another opportunity of communicating telegraphy to a world where his descriptions of natural forces were not necessarily recognizable. Having met several 'excellent' spiritual mediums and 'some very clear-headed men' investigating spiritualism (including Charles F. Livermore, a distinguished banker, Dr. John F. Gray, a physician, and Robert Dale Owen, the social reformer) Varley decided his next target for telegraphy was the spirit world.<sup>91</sup> Varley's reputation for earnest séance conduct had clearly survived the Atlantic crossing better than his inventions since Livermore and Gray were soon inviting him to séances with Kate Fox, the medium they had been investigating and patronizing since the early 1860s and who was internationally celebrated as the medium through whom 'Modern Spiritualism' began. The medium and her backers also granted Varley the rare privilege of using electrical apparatus in an 'accurate investigation' of séance phenomena. Varley entered Miss Fox's darkened séance with Grove cells, a magnetized helix and other instruments with which he wanted the medium's spirits 'to narrate what they saw, and if possible to explain the analogies existing between the forces I was dealing with, and those which they employ'.<sup>92</sup> While fumbling

88 Coates and Finn, *op. cit.* (43), 53–5; Smith and Wise, *op. cit.* (8), 702–4. Following the collapse of the 1865 cable and the ATC's subsequent financial problems, TCMC directors decided to form the AATC to build, lay and operate the third (1866) cable on behalf of the ATC.

89 Varley, 'Atlantic telegraph', *op. cit.* (34) and Varley to Thomson, 16 February 1867, V16, K-ULG.

90 C. Varley to Jenkin, 29 November 1867, V1, Kelvin Papers, Cambridge University Library. Varley's emphasis. At least the Americans at the Western Union Telegraph Company seem to have understood his language since in 1868 they hired him to assess the quality of their lines and eventually adopted his telegraph post insulators. [Anon.], 'International insulatorial interchange', *Telegrapher* (1868), 4, 211. For Varley's Western Union work see Israel, *op. cit.* (25), 131.

91 Varley, *op. cit.* (12), 164.

92 Varley, *op. cit.* (12), 165–6.

with his circuit in the dark, Varley occasionally touched wires by accident and asked the spirits to tell him the direction of the current through his body. On ten occasions, the spirits answered his question and, after striking a light and examining his circuit, Varley noted that he had been ‘correctly advised’. Varley was confident that this feat was not due to trickery on the part of Miss Fox or other participants since he believed that nobody in the séance, including himself, could have seen the circuit. Remaining in the dark, Varley then asked the spirits to describe what happened when he repeatedly held a magnetized helix over his head. On each occasion, the spirits warned him that such actions caused him pain, despite his own failure to sense the pain. Judging that nobody in the séance room could have seen what he was doing with the helix, Varley concluded that the actions must have been ‘made known by some means inexplicable as yet by orthodox science’.<sup>93</sup>

Varley’s account of the Kate Fox séance to the Dialectical Society powerfully illustrates his explicit attempt to transfer the skills and resources of the telegraph testing-room into spaces for spirit communication. In this transfer, Varley was clearly trying to fashion himself as a multi-talented and indispensable communication expert – a triumphant builder of trans-Atlantic telegraphy, an authority on ‘orthodox’ science and a competent séance-goer. The Dialectical Society and its audiences (who would later mainly consist of spiritualists) had to be persuaded that there were few more qualified than those practitioners of the ‘unorthodox’ techniques of telegraphy to authorize the limits of scientific orthodoxy and work out the possible communication conventions used in new worlds. Varley’s mastery of the electrical and magnetic forces associated with the ‘occult’ telegraphic art undoubtedly informed his conviction that ‘there are probably other powers accompanying electric and magnetic streams, which other powers are seen by spirits, and are by them mistaken for the forces which we call electricity and magnetism’.<sup>94</sup> For many séance-goers, Varley’s use of triumphant Atlantic telegraphy was eminently justifiable. As far as they were concerned, electricians and telegraphic engineers had now been fully vindicated and their practices could be further appropriated for explaining the art of spiritual telegraphy to sceptical audiences. A sense of Atlantic telegraphy’s impact on the study of spiritualism can be gauged from the preface to *Psychic Force and Modern Spiritualism*, an 1871 polemical pamphlet written by William Crookes, the chemist and journalist celebrated for his spectroscopic discovery of the metal ‘thallium’ and, in 1871, a relative newcomer to the art of spiritualistic enquiry. Crookes knew exactly which analogy to use for presenting himself as a credible and ‘strictly physical’ enquirer into the confusing signals on the spiritual telegraph. He wanted to be

considered in the position of an electrician at Valentia, examining by means of appropriate testing instruments, certain electrical currents and pulsations passing through the Atlantic cable; independently of their causation, and ignoring whether these phenomena are produced by imperfections in the testing instruments themselves – whether by earth-currents, or by faults in the insulation – or whether they are produced by an intelligent operator at the other end of the line.<sup>95</sup>

93 Varley, op. cit. (12), 166.

94 Varley, op. cit. (12), 166–7.

95 W. Crookes, *Psychic Force and Modern Spiritualism*, London, 1871, 1. Reprinted in Crookes, *Researches in the Phenomena of Spiritualism*, London, 1874, 45–72, 45.

## VARLEY'S MARTYRDOM FOR COMMUNICATION FUTURES

When Varley arrived back in England from New York in early 1868, he faced an ongoing battle to convince the AATC of the Thomson, Jenkin and Varley partnership's moral rights to the telegraph. By June, AATC resistance had increased to the point where its chairman, Richard Glass, was forcing Varley to make a concise case for the partners' supposed benefits to the Company. Staggered by the AATC's apparent impertinence, Varley penned a pithy, self-congratulatory and increasingly acerbic history of Atlantic telegraphy. He cast the partners as virtual martyrs to the telegraph, charting their generous services to the ATC and AATC and stressing the personal expense they had incurred in stabilizing inventions in the face of poor remuneration. In his opinion, it was precisely because of the trading agreement between the partners and the AATC that the latter had been able to show sceptical audiences that a commercially viable Atlantic cable was no chimera:

The possession of that agreement allowed the Comp<sup>y</sup> to promise confidently to the public a rate of transmission which had been persistently deemed impossible by a large section of the scientific world. Our promises have been more than fulfilled, but we all had to bear the brunt of persistent attacks before the verification of our words – and now our fulfilment of the very statements are ignored.<sup>96</sup>

Although the letter produced 'a very favourable feeling' towards the partners, the final agreement was not settled until the following spring.<sup>97</sup> The pay-off was lucrative enough for Varley to retire from regular telegraphic service in 1868 (when, not coincidentally, the Post Office began its purchase of the EITC and other British firms operating land telegraphs) and to occupy himself with inventions and private consultancy work. The length and bitterness of the AATC wrangle painfully reminded Varley that the public's appreciation of the telegraphic art still left much to be desired. In the public clamouring for spiritualism, however, Varley identified an audience whose misconceptions about electric telegraphy were balanced by an undoubted enthusiasm for telegraphy and science *per se*. This public had to be shown the truth of electric telegraphy and that it was in their best interests to subscribe to one of its chief architects.

It was in the early days of the AATC wrangle that Varley had first broadcast his views on spiritualism. In June 1867 Varley rose to defend his favourite medium, D. D. Home, against Jane Lyon, a wealthy widow who accused Home of falsely claiming to have contacted the spirit of her dead husband and gaining its permission to claim part of her sizeable fortune. The subsequent (and successful) case for Home's defence included an affidavit from Varley that invited the world to understand spiritualism's physical manifestations as 'the introduction to an extensive field of mental and physical knowledge which will in a great measure explain and reconcile the beliefs of all ages and nations'.<sup>98</sup> This was familiar social prophecy to a promoter of the Atlantic telegraph.<sup>99</sup> Indeed, by this

<sup>96</sup> C. Varley, to R. Glass, 10 June 1868, V20, K-ULG.

<sup>97</sup> C. Varley to Thomson, 6 July 1868, V21, K-ULG.

<sup>98</sup> Varley, 'Affidavit', op. cit. (73).

<sup>99</sup> On mid-nineteenth century expectations about the telegraphic future see Coates and Finn, op. cit. (43), 125–39.



time, Varley was confident that the progress of electricians and natural philosophers towards the harmonious telegraphic utopia on earth justified their prominent role in the management of a possibly more harmonious spiritual utopia. To Varley, William Robert Grove's ideal managers of physical forces could succeed where the Sandemanians of his youth had failed: they could correlate and control the physical forces of the séance so that the social benefits of the spiritual telegraph would be maximized.<sup>100</sup> Electricians and natural philosophers with interests in spiritualism therefore had an important duty to perform for society. In early 1869, Varley discussed his plan with the most eminent scientific séance-goer of the late 1860s, Alfred Russel Wallace. He told Wallace that spiritualists had to remember that 'science had reached its present brilliant position...through our philosophers doubting, disbelieving and testing everything until further disbelief was impossible'.<sup>101</sup> The implication was that spiritualists had much to gain from those 'philosophers' who were not only well-versed in these 'brilliant' and robust methods of science but also competent enquirers into the spirit world. Identifying Wallace and himself as such, Varley urged that 'we privileged ones owe it to the world to present spiritualism so clearly defined and demonstrated, that those who follow us, shall be able to make themselves as much masters of the subject as we are'.<sup>102</sup> The proper diffusion of spiritualism's teachings into the world would begin by changing séances into spaces for correlating known and unknown forces:

What is wanted is to bring together a large number of harmonious mediums to form of these, several circles of different characters, and to secure the assistance of several clairvoyants.

Each circle should be under the management of a clever man and each should carry on a continuous and exhaustive examination of the groundwork of the subject. Once establish a clue to the relations existing between the physical forces known to us and those forces by which the spirits are sometimes able to call into play the power by which they produce physical phenomena – once establish this clue there will be no lack of investigators, and the whole subject will assume a rational and intelligible shape to the outside world. We must also remember that for this purpose, we not only require good investigating minds & bodies of flesh and blood but also spirits of a similar character to communicate with.<sup>103</sup>

Judging by Varley's contemporary opinions on séance participants, he was not always hopeful that his 'good investigating minds' would be found. There were problems at both ends of the spiritual telegraph. He told the *Daily Telegraph* that the spiritualists were 'as a body...far too credulous' regarding purported evidence for communications from spirits, whilst the spirits themselves inhabited a world where 'superstition seems to reign...as much as on this' side of the grave and was 'as difficult to eradicate as here'.<sup>104</sup> Varley held emphatically that many of the problems with terrestrial operators of the new

100 On Grove's social uses of correlation see Morus, *op. cit.* (13).

101 C. Varley to A. R. Wallace, 28 January 1869, Wallace Papers, British Library, MSS ADD 46439, fol. 47. Partly reprinted in A. R. Wallace, *My Life: A Record of Events and Opinions*, 2 vols., London, 1905, i, 293–4.

102 Varley to Wallace, *op. cit.* (101).

103 On Wallace and spiritualism see M. Kottler, 'Alfred Russel Wallace, the origin of man, and spiritualism', *Isis* (1974), 65, 145–72; Oppenheim, *op. cit.* (6), 296–325. R. Smith, 'Alfred Russel Wallace: philosophy of nature and man', *BJHS* (1972), 7, 177–99; F. Turner, *Between Science and Religion: the Reaction to Scientific Naturalism in Late Victorian England*, New Haven, 1974, 87–103.

104 C. Varley, 'Spiritual manifestations', *Daily Telegraph*, 28 June 1868, 2.

telegraph derived from their poor grounding in natural philosophy. He was not surprised by mediums' failure to translate 'into intelligible language ideas of a scientific nature' or by the poor progress of 'the scientific branch' of spiritualism given that the 'mis-education of English ladies' had left them unaccustomed to 'accurate investigation'.<sup>105</sup> He was clearly convinced that teaching natural philosophy to mediums and spiritualists would vastly improve their precious telegraphing skills and thus help broadcast the progressive and sublime messages of spiritualism into the wider world. Varley's comments suggest not only that natural philosophy could refine and support spiritualism but also that the need to protect the ever-popular spiritualism from misinterpretation and abuse was a good reason for spreading natural philosophy to the spirit-rapping public. Spiritualism, in Varley's judgement, would only stop being a superstition when people explored séances 'with the same perseverance that characterises the investigators of natural philosophy' and turned from 'fiction' to the more 'interesting facts' of 'astronomy, geology, chemistry, and natural philosophy generally'.<sup>106</sup>

By dissolving putative boundaries between telegraphy and spiritualism, Varley sought to create one of his most powerful tools for diffusing the exotic wonders of natural philosophy and telegraphy among the wider Victorian public. In 1869, for instance, he criticized the *Eastern Post* for ridiculing his Dialectical Society evidence, for persecuting those who investigated the 'facts of the material universe' and for maintaining that there was 'a boundary beyond which man's intellect will never be able to pass'.<sup>107</sup> He pointed out that the recent wonders of photography, railways and telegraphs proved the transcending powers of mankind's intellect and that spiritualism could not therefore legitimately be dismissed. Aware that the newspaper's East London readership would also include a notoriously dense population of spiritualists, Varley cleverly inverted this argument and sought to show how telegraphy could be understood and legitimated in terms of his readers' séance experiences. Spiritual telegraphy was thus used to teach electric telegraphy. A message on the Siberia to London line, he observed,

was rapped out by electricity in Siberia in a manner not much unlike that by which "spiritual" communications are often transmitted by sounds through living media, the only difference being that while in the former case the power used has received the name of "electricity," and the channel that of "metal wire," in the latter case the power employed has not yet been christened, its nature is not understood, and its medium of communication is only partially known.<sup>108</sup>

#### THE BROADER GROOVES OF ELECTRICAL SCIENCE

Varley's reconciliation of telegraphic and spiritualistic problems was given currency in the plethora of spiritualistic newspapers founded in the late 1860s. Although spiritualist editors disliked his occasional criticisms of spiritualists' claims, they gladly used the spiritualistic testimony of an eminent Atlantic telegraph engineer in their campaign to attract

<sup>105</sup> Varley, op. cit. (12), 169.

<sup>106</sup> Varley, op. cit. (104).

<sup>107</sup> Varley, 'Spiritualism', op. cit. (81), 368.

<sup>108</sup> Varley, 'Spiritualism', op. cit. (81), 368.

newcomers to the séance and to deal with spiritualism's critics.<sup>109</sup> William Henry Harrison, editor of the London-based *Spiritualist*, was a decisive agent in Varley's diffusion of telegraphy into spiritualism. A former telegraphic clerk and reporter on daily newspapers and once Varley's personal secretary, Harrison turned to scientific journalism and photography in the early 1860s and developed an interest in spiritualism following private séances with Ada Varley in 1868. A year later, he combined his writing skills, a growing spiritualistic passion and the personal income he received from scientific journalism to found one of the most successful spiritualist periodicals of the late-Victorian period: the *Spiritualist*.<sup>110</sup> In contrast to more religiously-inclined spiritualist periodicals such as the *Spiritual Magazine* and *Human Nature*, this 'Record of the Progress of the Science and Ethics of Spiritualism' paid considerable attention to the bearing of contemporary science on spiritualism and in particular to Varley's, Crookes's and Wallace's struggles to gain scientific audiences for their spiritualistic evidence. Like many spiritualists, Harrison linked the progress of spiritualism to the construction of a credible science of spiritualism. Accordingly, he encouraged readers to study scientific practices and concepts and to exploit them in the development of séance protocol and the framing of laws of spirit.<sup>111</sup> On the other hand, Harrison tempered his enthusiasm for science with scathing criticisms of scientists: with the exception of enquirers such as Varley, he held that most scientists were too arrogant and uncompromising in their approach to the séance and basically ignorant of the spiritualistic culture they frequently attacked.<sup>112</sup>

Varley's particular expertise was especially useful to Harrison since it embraced electrical and magnetic fluids – the very terms in which spiritualists tended to couch their experiences. For Varley, Harrison's *Spiritualist* audience consisted of just the kind of scientifically enthusiastic but not necessarily well-informed people whom he wanted to instruct in the new sciences of telegraphy and spiritualism. For instance, in the *Spiritualist* between 1870 and 1871 he sought to correct spiritualists' misconceptions about electrical forces emanating from the body, revealed his suggestive electrical evidence of matter suspended by imponderable forces, and presented himself as an expert who could advise

109 See, for instance, B. Coleman, 'Passing events – the spread of spiritualism', *Spiritual Magazine* (1869), 3, 318–24; [W. Harrison], 'Testimony of Mr. C. F. Varley', *Spiritualist* (1873), 3, 307. Harrison printed Varley's affidavit for D. D. Home (op. cit. (73)) in practically every issue of the *Spiritualist* between 1869 and 1873. For a survey of spiritualist periodicals see Oppenheim, op. cit. (6), 44–9.

110 [Anon.], 'The presentation of the Harrison Testimonial', *Spiritualist* (1876), 8, 53–8; Harrison, op. cit. (73). Unlike editors of rival spiritualist newspapers, Harrison initially refused subscriptions for the *Spiritualist*. By 1872, however, he was finding it so difficult to meet the £200 yearly costs of the newspaper that he was forced to set up a *Spiritualist* fund. In 1875, this fund included donations from Martin R. Smith, a banker (£50), Charles Blackburn, a businessman (£50), Alexander Calder, a City merchant (£50), Sir Charles Isham, the writer (£10) and Varley (£5): 'Testimonial to Mr. W. H. Harrison', *Spiritualist* (1875), 7, 186. On Blackburn's patronage see Hall, op. cit. (5), passim. On Smith and Calder see E. Rogers, *Life and Experiences of Edmund Dawson Rogers*, London, [1911], 44.

111 [Harrison], 'The nomenclature of spiritualism', *Spiritualist* (1869), 1, 69; 'A Psychological Society', *ibid.*, (1870), 1, 177; 'The work of a Psychological Society', *ibid.*, (1871), 1, 206–7; 'Further movements in spiritualism', *ibid.*, (1872), 2, 49.

112 See, for example, [Harrison], 'Professor Tyndall at a spirit circle: spiritualism and scientific men', *Spiritualist* (1871), 1, 156–7; 'The "Quarterly Review" on spiritualism', *ibid.*, 209; 'Spiritualism and Men of Science', *ibid.*, (1875), 7, 25–7.

those séance-goers who, despite a ‘careful examination’ of professed spirits, had not come to his ‘spiritualistic’ conclusion about their provenance.<sup>113</sup>

In July 1871 William Crookes published sensational experimental evidence of a ‘psychic force’ emanating from D. D. Home’s body and consequently the thorny question of scientific authority in the séance gained widespread publicity and caused some of the bitterest conflicts amongst spiritualists and scientists.<sup>114</sup> Varley greatly appreciated the experimental approach that Crookes and his collaborators (the astronomer William Huggins and the lawyer Edward Cox) took towards the ‘forbidden’ topic of spiritualism and told them that ‘by interrogating the “new force” itself, you will come to somewhat similar conclusions to those which, almost without exception, we Spiritualists have arrived at’.<sup>115</sup> William Harrison likewise welcomed the favourable testimony of eminent scientific practitioners but James Burns, the editor of the best-selling plebeian spiritualist weekly, the *Medium and Daybreak*, attacked Crookes for devising experiments that were acceptable as neither physical science nor spiritualistic science, and for producing results that were of little use to spiritualists.<sup>116</sup> However, the editors were unanimous in their condemnation of public denouncements of spiritualism made at the 1871 British Association meeting in Edinburgh.<sup>117</sup> Addressing Section A of the Association, the physicist Peter Guthrie Tait had admonished ‘Spiritualists, Circle-squarers, Perpetual-motionists, [and] Believers that the earth is flat’, while in his address to Section D, the anatomist Allen Thomson had praised Huxley’s work on biological evolution and then castigated those men of science who lent their authority to ‘the delusive dreams of the practitioners of spiritualism, and similar chimerical hypotheses’.<sup>118</sup> ‘The natural tendency to a belief in the marvellous’, Thomson added,

is sufficient to explain the ready acceptance of such views by the ignorant; and it is not improbable that a higher species of similar credulity may frequently act with persons of greater cultivation, should their scientific information and training have been of a partial kind.<sup>119</sup>

113 C. Varley, ‘Electricity, magnetism and the human body’, *Spiritualist* (1871), 1, 137, 166; ‘The force of gravitation’, *ibid.*, 197. Citation from Varley to Harrison, [July 1870], published in *ibid.*, 84.

114 W. Crookes, ‘Experimental investigation of a new force’, *Quarterly Journal of Science* (1871), 1 (2nd Series), 339–49. Crookes’s biographer, Edmund Fournier d’Albe, claimed that Varley had prompted Crookes’s interests in spiritualism in 1867 during the inquest over the death of Crookes’s brother aboard a telegraph-laying ship. Crookes was equally impressed, however, by the séance experiences of chemist colleagues such as Robert Angus Smith and Walter Weldon. See E. E. Fournier d’Albe, *The Life of Sir William Crookes*, London, 1923, 133, 182–6. In 1869, whilst describing his growing spiritualistic interests to John Tyndall, Crookes opined that Varley and Wallace were the ‘honourable exceptions’ amongst the mass of credulous spiritualists. Months later, he was warmly appreciating Varley’s pioneering séance labours. Crookes to Tyndall, 22 December 1869, printed in R. Medhurst (ed.), *Crookes and the Spirit World*, London, 1972, 232–4, 233; Crookes to Varley, 13 July 1870, *Spiritualist* (1870), 1, 86.

115 Varley, *op. cit.* (72), 350 and 351.

116 [Harrison], ‘An experimental investigation of spiritual phenomena’, *Spiritualist* (1871), 1, 180. [J. Burns], ‘Remarks’, *Medium and Daybreak* (1871), 2, 231. See also Burns’s earlier views in [Burns], ‘About scientific spiritualism’, *Medium and Daybreak* (1870), 1, 201–2.

117 [Harrison], ‘Spiritualism at the British Association’, *Spiritualist* (1871), 1, 185–6; [Burns], ‘Spiritualism at the British Association’, *Medium and Daybreak* (1871), 2, 270–1.

118 P. Tait, ‘Address to the Mathematics and Physics Section’, *Report of the British Association for the Advancement of Science* (1871), 41, 1–8, 4; A. Thomson, ‘Address to Biology Section’, *ibid.*, 114–22, 121.

119 Thomson, *op. cit.* (118), 121.

Thomson evidently felt that Crookes's, Varley's and Wallace's poor scientific education explained their 'belief' in spiritualism. Nevertheless, Thomson still could not understand how his peers could believe in phenomena that conflicted with the 'best established physical laws' and that 'patient and careful' examination had shown to be either fraudulent or the product of unconscious muscular action.<sup>120</sup>

Varley and Crookes were outraged and shared the repugnance felt by leading spiritualists over Thomson's dishonourable words about his fellow scientists and apparent lack of experience in matters he was so keen to criticize.<sup>121</sup> Of course, by reacting so strongly against Thomson, Varley and Crookes were allying themselves with a group of eminent physicists – notably George Gabriel Stokes and William Thomson – who considered the threat to science from supporters of the natural selection theory of evolution far more dangerous than that from scientific supporters of spiritualism.<sup>122</sup> In a ferocious reply, Varley accused Allen Thomson and the Royal Society of holding double standards about scientific investigations into unusual physical phenomena:

It is a singular thing that when Mr. Crookes wrote a paper upon 'Thallium', a new metal, he was believed by men such as yourself. When last year I wrote a paper to the Royal Society upon experiments tending to explain that very unusual phenomenon 'ball-lightning', I was not doubted a moment; but when either Mr. Crookes or I come forward and state that we have seen in the most unmistakable manner phenomena not more startling than those described (but called 'psychic') the scientific world seems to go mad – dubs us liars, charlatans, or madmen...<sup>123</sup>

Varley was certain he knew who had acted irrationally and unscientifically in the controversy over spiritualism and who could be trusted to speak reliably about supposedly occult arts. As a final volley, he invited Thomson to ponder the fact that he was as certain of the existence of Crookes's psychic force as he was 'that messages can be and are sent from one side of the Atlantic to the other by means of telegraph cables' and that he had 'as conclusive proof of the one as of the other'.<sup>124</sup> Here, I suggest, Varley was implicitly recalling Atlantic telegraphy's chequered history and claiming that Atlantic telegraphy was still as hard to accept as spiritualism. But he was also implicitly reminding Thomson that he had played a significant part in showing that Atlantic telegraphy was no longer fantasy, but reality. He believed he had proved people wrong about Atlantic telegraphy and would prove them wrong about spiritualism.

Varley's membership of old and new scientific societies lent pugnacious irony to his

120 Thomson, op. cit. (118), 121.

121 C. Varley to A. Thomson, 19 August 1871, cited in *Spiritualist* (1871), 1, 194; Crookes, 'Some further experiments on psychic force', *Quarterly Journal of Science* (1871), 1 (2nd Series), 471–93, 482–3. Reprinted in Crookes, *Researches*, op. cit. (95), 21–43, 32–3. For further examples of spiritualist response to Thomson's address see the letters of A. Swinton and C. Pearce published in [Harrison], 'The British Association', *Spiritualist* (1871), 1, 194.

122 G. Stokes, 'Presidential address', *Report of the British Association for the Advancement of Science* (1869), 39, pp. lxxxix–cv, esp. ciii–cv; W. Thomson, 'Presidential address', *ibid.* (1871), 41, pp. lxxxiv–cv, esp. ciii–cv. For discussion see D. Wilson, *Kelvin and Stokes: A Comparative Study in Victorian Physics*, Bristol, 1987, 74–99;

Smith and Wise, op. cit. (8), 633–44.

123 Varley op. cit. (121). Varley's 'ball-lightning' studies concluded an 1870 paper on electrical discharge in rarefied gases: 'Some experiments on the discharge of electricity through rarefied media and the atmosphere', *Proceedings of the Royal Society* (1871), 19, 236–42.

124 Varley op. cit. (121).

reply. On 8 June 1871 he had formally been elected to the Royal Society Fellowship, only a week before Crookes sent his psychic force researches to the Society. Varley's nominators included his business partners (Thomson and Jenkin), leading members of the British Association Electrical Standards Committee (James Clerk Maxwell and James Prescott Joule), his childhood heroes (Grove and Noad), Airy, John Tyndall, and ironically, Allen Thomson.<sup>125</sup> William Thomson had probably worked harder than most of Varley's nominators since months earlier he had written to the Royal Society with a recommendation that brushed aside Varley's 'mesmerism' and 'spiritualism' as 'fatal objections' to election and praised the electrician's electrolytic researches that Thomson had already eased on Varley's behalf into the Society's *Philosophical Transactions*.<sup>126</sup> Though proud of his election, Varley was at this time still actively promoting a new forum that aimed to uphold the cultural legitimacy of telegraphic engineering and tackle its apparent neglect at traditional engineering and scientific societies – the Society of Telegraph Engineers (STE). Varley urgently wanted the STE to transcend the limits of science set by ancient forums like the Royal Society. Addressing the telegraph engineers' inaugural meeting in February 1872, he hoped that the STE would evolve from a society of telegraphy into a society that discussed all aspects of electricity because 'electrical science' would then rise from 'the narrow groove into which it seemed to be drifting, into the most extensive of all grooves, because it will be found to embrace every operation in nature'.<sup>127</sup> Varley's allusion to the 'narrow groove' is especially significant given his contemporary struggles over séance phenomena and his remark to spiritualists in June 1872 that spiritualism was a subject 'far too big for the Royal Society'.<sup>128</sup> The 'science' Allen Thomson and the Royal Society had exhibited in their reaction to spiritualism was, I suggest, far too narrow-grooved for Varley's liking and represented the very restricted view of nature that he hoped the new electrical society would help to eradicate. The STE had to symbolize the telegraph's triumph over learned ridicule, electricians' ability to manage the 'occult' and the ability of science to 'embrace' the bigger and more exotic operations of nature.

#### TYING MISS COOK WITH ELECTRICITY: THE TELEGRAPHIC CONSTRUCTION OF A SPIRIT

After William Thomson's successful Royal Society negotiations for his partner, Varley upheld the value of Thomson's inventions with sustained vigour. In December 1871

125 'Cromwell Fleetwood Varley' in *Royal Society Printed List of Candidates 1871*, Royal Society Archives, London. For a chronicle of Crookes's Royal Society vicissitudes see Crookes, 'Further experiments', op. cit. (121), 478–81. Reprinted in Crookes, *Researches*, op. cit. (95), 21–43, 27–31.

126 W. Thomson to E. Sabine, 23 March 1871, Royal Society Archives, MC.9.182; Thomson to G. Stokes, 5 January 1871, Royal Society Archives, RR.7.141. Thomson waited until a month after Varley's death to denounce publicly his former partner's interest in 'that wretched superstition of animal magnetism, and table-turning, and spiritualism, and mesmerism, and clairvoyance, and spirit-rapping...'. See W. Thomson, 'The six gateways of knowledge', cited in Thomson, *Popular Lectures and Addresses*, 3 vols., London, 1891–4, i, 253–99, 258. C. Varley, 'Polarisation of metallic surfaces in aqueous solutions etc.', *Philosophical Transactions of the Royal Society* (1871), 161, 129–36.

127 C. Varley, 'Remarks', *Journal of the Society of Telegraph Engineers* (1873), 1, 34. On the STE's foundation see R. Appleyard, *The History of the Institution of Electrical Engineers (1871–1931)*, London, 1939, 29–40 and W. Reader, *A History of the Institution of Electrical Engineers 1871–1971*, London, 1987, 18–30.

128 Varley cited in [Anon.], 'Testimonial to Mr and Mrs Everitt', *Spiritualist* (1872), 1, 44.

Thomson praised the ‘admirable apparatus’ that Varley had built for displaying Thomson’s mirror-galvanometer to judges considering Thomson’s application for extending his instrument’s patent. The apparatus had ‘a very good effect’ and helped secure an eight-year extension for the patent and the use of the instrument in the exotic settings of Suez, Aden and Bombay.<sup>129</sup> These settings were not, however, exotic enough to satisfy Varley’s push for the telegraph. Neither, I suggest, did these translations resolve his dilemma that the telegraph, far from fulfilling lofty scientific and syncretist purposes, appeared to be stuck in the narrow groove of commercialism. Ironically, by the early 1870s Varley seems to have become deeply concerned that commercialism, that building block of telegraphy, was one reason for an apparent decline in the moral standing of both the telegraph and the Victorian public. In early 1873 his agonies over morality erupted in the press. In the January *Spiritualist*, he blamed recent press attacks on his spiritualist evidence on ‘public narrow-mindedness’, wealth-worship and disregard for ‘future existence, or really spiritual matters’. Consequently, he resolved to stop publishing his views on spiritualism until the public approached him ‘in earnest and anxious to know the truth’.<sup>130</sup> Reminders of the disreputable state of public conduct had already, and literally, been brought home to him by his discovery that his wife had, in 1871, formed an illicit relationship with a Greek-American spiritualist, Ion Perdicaris. Weeks after Varley’s *Spiritualist* fulmination against public morality, *The Times* reported that the ‘well-known engineer and electrician’ had won his divorce case.<sup>131</sup> This two-year fight for a moral high ground had not, however, left Varley without private and public scars.

Much to William Harrison’s relief, Varley’s threats regarding spiritualism did not apply to the readers of the *Spiritualist*. This constituency still offered the guileless mediums, sublime spirits and wealthy Victorians that could help him propagate telegraphic engineering as both a suitably moral and commercial enterprise. A closer association of telegraphy and spiritualism could not only bolster spiritualism but rescue telegraphy from the mire of pure commercialism. In early 1874 Harrison, Charles Blackburn, a wealthy businessman from Manchester who financed the *Spiritualist* and other spiritualist causes, and John Chave Luxmoore, a wealthy spiritualist and Justice of the Peace in Devon, offered Varley an opportunity to make this association: a test of the famous medium from Hackney, Florence Cook. Varley accepted and so joined another famous scientific practitioner that Blackburn and Luxmoore had invited to test Miss Cook, William Crookes.

Financially assisted into ‘private’ mediumship by Blackburn and partly managed by Luxmoore, Miss Cook’s mediumistic ascent was sensational. In 1870 the fourteen-year-old Miss Cook ‘discovered’ her ability to levitate furniture and write under the influence of a

129 Thompson, op. cit. (46), ii, 620–1, 621.

130 Varley, ‘Mr. C. F. Varley, F.R.S., on the “Times” discussion’, *Spiritualist* (1873), 3, 75–6. It is highly likely that Varley was replying to the physiologist William Benjamin Carpenter’s *Quarterly Review* attack on his spiritualistic interests. Carpenter had insisted that Varley had only imagined what he took to be objectively existing spirits and attributed this deficiency to a narrow ‘technical’ rather than broad scientific education. [W. Carpenter], ‘Spiritualism and its recent converts’, *Quarterly Review* (1871), 131, 301–53, esp. 347–8.

131 [Anon.], ‘Varley vs. Varley and Perdicaris’, *The Times*, 1 February 1873, 11. I thank Bruce Hunt and John Cromwell Varley for this information.

spirit, but within a year she had developed her powers so rapidly that she was manifesting, to private and vetted spirit circles in London, the most striking phenomenon in Victorian spiritualism – a fully-formed materialized spirit.<sup>132</sup> Harrison and his *Spiritualist* readers followed the progress of this manifestation with such enthusiasm that the *Spiritualist*'s rival journal, the *Spiritual Magazine*, cynically suggested to Harrison that he rename his newspaper *Miss Florence Cook's Journal*.<sup>133</sup> Reports in the *Spiritualist* testified to the strict protocol enforced at Miss Cook's 'materialisation' séances. At the beginning of her séances, Miss Cook would usually be tied to an armchair in a darkened 'cabinet'; the latter was either a purpose-built box or, more typically, an adjoining room, searched for imposters, locked, darkened and separated from the main séance by curtains. As in most séances, participants would then take their positions around or near a table and either engage in polite conversation or communal singing; this last aspect of séance practice was believed to harmonize and bolster the imponderable powers of the spirit-circle and thus generate the conditions under which spirits manifested themselves.<sup>134</sup> As the sitters settled down to scrutinize the entrance to the cabinet, the lights in the séance room would be dimmed and moans from the cabinet would indicate that Miss Cook had now begun her mediumistic trance. Minutes later, a striking female figure, clad in diaphanous white robes and bearing suspicious facial similarities to Miss Cook, would appear from behind the curtains. After introducing herself as 'Katie King' (Figure 3), the spirit of the daughter of the seventeenth-century buccaneer, Sir Henry Owen Morgan, she would walk around the séance room, politely converse about the spirit world and its moral teachings, joke with the sitters, write messages to absent friends and then return to her cabinet. Minutes later, the end of the séance would be declared, lights would be struck, the sitters would go into the cabinet and Miss Cook would normally be found entranced and still bound to her chair.

The demands on séance-goers and mediums in such séances exceeded those required in typical séances for physical phenomena. Respect for the medium's hallowed cabinet and her delicate physical and mental conditions was even more important since spiritualists considered that materializations drew directly upon mediums' vital powers and material constitution in order to display themselves (hence the spiritualists' argument defending the necessary facial similarities between 'Katie' and Miss Cook).<sup>135</sup> Unwarranted entrance in the medium's delicate private space or aggressive treatment of either the medium or her spirit would violate these séance conditions and be judged impolite, unscientific, indecisive and even fatal by experienced enquirers. These were certainly some of the reactions to William Volckman who, in December 1873, grabbed 'Katie' and declared it to be the solid and masquerading form of Miss Cook. Although Miss Cook's managers and supporters

132 On Cook's career see Hall, *op. cit.* (5); Owen, *op. cit.* (61), 41–74 and *passim*; R. Medhurst and K. Goldney, 'William Crookes and the physical phenomena of mediumship', *Proceedings of the Society for Psychical Research* (1964), 54, 25–157, 48–89.

133 Cited in *Spiritualist* (1873), 3, 135.

134 For typical justifications of these practices see [J. Burns], 'The philosophy of the spirit circle', *Medium and Daybreak* (1870), 1, 308; [S. de Morgan], *From Matter to Spirit. The Result of Ten Years' Experience in Spirit Manifestations*, London, 1863, esp. 92–118.

135 [Harrison], 'Spirit forms', *Spiritualist* (1874), 4, 205–8.





**Figure 3.** 'Katie King' photographed by William Crookes in the parlour of Florence Cook's Hackney residence. Behind 'Katie' is the curtain in front of Miss Cook's wooden 'cabinet'. G. Hayes, 'Four Photographs of Katie King still in Existence', *Psychic Science* (1934), 13, 25–30, Plate 3. Reproduced by permission of the College of Psychic Studies.



A WEEKLY JOURNAL DEVOTED TO THE HISTORY, PHENOMENA, PHILOSOPHY, AND TEACHINGS OF  
**SPIRITUALISM.**

[REGISTERED AS A NEWSPAPER FOR TRANSMISSION IN THE UNITED KINGDOM AND ABROAD.]

No. 258.—VOL. VI.]

LONDON, MARCH 12, 1875.

[DOUBLE SHEET—PRICE 1½d.]

A SCIENTIFIC SEANCE.—THE ELECTRICAL TEST FOR MEDIUMSHIP.

By what means is the investigator to determine the phenomena which he observes are indeed spiritual; that is, produced by a power other than that furnished by the volitions of someone present? In the ordinary affairs of life, actions can be generally traced to the actors, but with spiritual manifestations of some kinds the case is very different. Some of the most important of these, as indicating a source of action independent of mediums and sitters, usually occur in darkness, when it is impossible to control the conduct of everyone present. True, hands may be held all round, or wrists may be tied together, but there are so many ways of escaping from bondage, and so many tricks indulged in by the practitioners of manual dexterity, that though the sitters may be morally

the question. The man of science is called in, and he demonstrates—by a process of investigation—that muscular force or the action of the sitters could in no wise cause the movements; and so it is rendered certain that they are due to some other agency. This important demonstration is beautifully afforded in Mr. Crookes's published "Researches," part I, which contains sixteen diagrams of the apparatus and methods used by him in his numerous experiments with Mr. Home. A more difficult task than that of proving that an object being moved in a dark room, the act is due to a so-called spiritual agency. This was the work which Mr. Crookes undertook on Thursday evening week. We were invited to witness the experiments for the benefit of the readers of this journal, and the following is the account of what took place:—

The medium selected was Mrs. Fay, and the result will prove a source of satisfaction to many who have witnessed her public seances. The genuineness of Mrs. Fay's mediumship has been

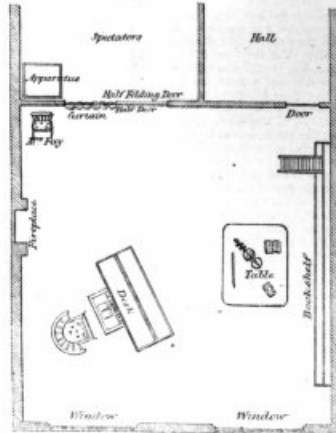
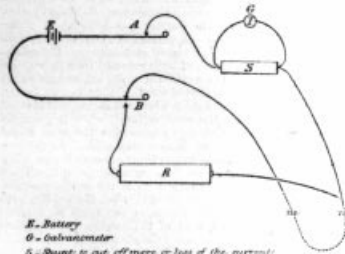


DIAGRAM OF MR. CROOKES'S LIBRARY.

certain that all is genuine, yet the stranger who hears the story may ask—How am I to know that someone did not loose hands or play some trick which his fellows could not detect? Though these objections do not in the least invalidate the genuineness of the physical manifestations, yet they are an obstacle to their being received by all as an experimental demonstration.

Natural phenomena of many kinds are familiar to ordinary observers, which are so little understood that few can give a satisfactory definition of them. To individualise knowledge, so to speak, is the work of science. A table moves when several hands are placed lightly thereon. This movement may be due to some force other than muscular pressure, but the sitters may be divided on



- E.—Battery
- G.—Galvanometer
- S.—Switch to cut off more or less of the current in order to regulate the deflection of the galvanometer
- R.—Box of Resistance 600 ohms
- Wires passing to Medium
- Adv. Keys to make and break circuit
- A is always closed and used only to correct or check the current
- B pressed down puts the resistance wire in place of the Medium.

DIAGRAM AND EXPLANATION OF THE ELECTRICAL APPARATUS FOR TESTING MEDIUMSHIP.

widely questioned—as, indeed, has been the probity of every other medium—more particularly because she permitted herself to be advertised and exhibited in showman fashion. The phenomena occur at her seances with such pre-arranged regularity, that many cannot escape the suspicion that the experiments are a series of tricks, inscrutable to the public, but capable of imitation by experts.\* (Others again boast that they can permit themselves to be tied and then perform "all her tricks." At the present moment the showman who worked her seances at Hanover Square is now imitating

\* Those accustomed to investigate with well-developed mediums, are favoured with an almost equal certainty and regularity of the phenomena. The objections raised against mediums are often unnecessary, and sometimes malicious.



(who were mainly to be found amongst the *Spiritualist* readership) castigated the moral impropriety of such actions, they were deeply embarrassed and sought decisive ways of guaranteeing spiritualists' confidence in their star medium's good character.<sup>136</sup> It was therefore no coincidence that in early 1874 Blackburn sought the help of such eminent and sympathetic enquirers as Varley and Crookes in the problem of Miss Cook's mediumship. What Miss Cook's supporters sought from Varley was a more convincing way of showing that Miss Cook was in her cabinet while 'Katie' moved about in front of it. This would help dissipate mounting suspicions about Miss Cook's character and furnish one of the most powerful pieces of evidence for the objective existence of disembodied spirits. It was not going to be easy showing that Miss Cook and her spirit were physically independent; Miss Cook could not leave her cabinet and stand next to 'Katie' in the séance-room or allow investigators to see her and 'Katie' together inside the cabinet. According to Miss Cook, the simultaneous exposure of herself and her spirit to light, either inside or outside the cabinet, would make a huge, if not fatal, drain upon her vital energies. Varley's problem, like so many investigators before him, was to devise a remote way of establishing the medium's bodily relationship with her spirit.

'Miss Cook took the place of a telegraph cable, under electrical test'.<sup>137</sup> Varley's brash *Spiritualist* summary of his electrical test captured his ultimate attempt to merge telegraphy and spiritualism. The galvanometers and resistance coils which he had used to gauge cables in the dark oceanic depths now became the means of remotely determining what was happening inside Miss Cook's cabinet. On an evening in late February 1874, he brought 'a regular cable-testing apparatus' into the designated séance room – the front drawing-room of John Chave Luxmoore's Hyde Park residence – and sought to tie the medium by an electrical rope.<sup>138</sup> The chief elements of the apparatus, comprising a Thomson mirror-galvanometer, Daniell's cells supplying a weak current, switches and British Association resistance coils, was placed on a mantelpiece approximately eleven feet in front of Miss Cook's cabinet. In this setting, the 'cabinet' was an adjacent drawing-room, darkened and divided from the main séance room by a thick curtain. Insulated copper wires led from the galvanometer, under the curtains, alongside the medium's armchair, to electrical contacts

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**Figure 4.** No pictures of the electrical apparatus with which Varley tested Florence Cook appear to have survived. However, in March 1875, the spiritualist and journalist James Burns was invited to William Crookes's house to see the chemist use his version of Varley's apparatus on the American medium Annie Eva Fway. The figure shows Burns's *Medium and Daybreak* report on this 'scientific séance'. The diagram on the right shows the battery, wires, resistance coils, switch and galvanometer of the electrical apparatus. On the left is a plan of a floor in Crookes's house, showing the large room (Crookes's library) that Mrs Fay used as a darkened cabinet, and a small adjoining room (Crookes's laboratory) where 'spectators' saw various objects (for example, books and a violin) levitating and where Crookes scrutinized the heart of the electrical apparatus. James Burns, 'A scientific séance – the electrical test for mediumship', *Medium and Daybreak* (1875), 6, 161–3, 161. Reproduced by permission of the British Library.

136 For the Volckman incident see Hall, *op. cit.* (5), 27–32; Medhurst and Goldney, *op. cit.* (132), 57–61; Owen, *op. cit.* (61), 67–9.

137 C. Varley, 'Electrical experiments with Miss Cook when entranced', *Spiritualist* (1874), 4, 134–5, 134.

138 Varley, *op. cit.* (137), 134.

## THE STEAM-SHIP AND FACTORY SHAFT-COUPLING COMPANY, LIMITED.

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### PROSPECTUS.

This Company has been formed to supply an urgent want which has long been felt by the Shipping and manufacturing interests, namely, the repair of broken shafts at sea and in factories.

The "Engineer," of 29th December, 1872, observes:

"It is not a little remarkable that, notwithstanding all the ingenuity expended on the marine engine, no one has thought of devising some method of patching up a broken screw shaft at sea."

The invention consists of a coupling, which can be easily and expeditiously applied to fractured shafts, and which renders them as strong as they originally were.

That such an invention was much required and will be largely taken advantage of, cannot be doubted, for, on reference to Appendix No. 3, it will be seen that a large percentage of vessels become disabled, and many of them total wrecks, through the breakage of screw shafts and paddle shafts, thus causing serious loss, both of life and property.

After the machinery of a steam vessel has broken down, it is well known that the charges for towing, &c., are enormous, in addition to which great losses are caused by the delay which takes place in consequence, and it is therefore of the utmost importance that every shipowner should provide himself with the means of enabling his vessels, in case of accident to their shafts, to resume their course without delay.

According to the returns of the "Bureau Veritas" (Appendix No. 3, 244 steamers of over 100 tons and register were totally lost during the year 1872, and of these unquestionably a large percentage were disabled by broken shafts.

The "Glasgow Weekly Mail," of 28th March, 1874, has the following upon the subject:

"Why Steamships are Lost.—Among the numbers of first-class steamships that have disappeared without leaving any record of their fate, I have little doubt that their loss is mainly attributable to their machinery becoming disabled, and the ships unmanageable and getting into the trough of the sea, and from their rolling, and too often from the shifting of bulk cargo, the vessel cannot right herself, and down she goes without leaving a trace behind."—"Times" Correspondent."

The number of merchant steamers afloat in 1872 (vide Appendix No. 4) was no less than 4,336. Of these 2,508 belonged to Great Britain, and averaged 840 tons each. The number of steamers built in Great Britain in 1873, amounted to 469, averaging 1,367 tons each; the average dimensions increasing every year (vide Appendix No. 3), 4,321 steamers in 1872, plus 469 built in 1873, give a total of 4,790 steamers in 1873, and of about 5,250 in 1874.

In factories great numbers of hands are often thrown out of employment for a long time by the breakage of main driving shafts, and the loss inflicted upon owners and men by the stoppage of a mill in consequence is very severe. By employing one of this Company's couplings, a fractured shaft can be restored to work almost immediately.

It is proposed to make immediate arrangements for the manufacture of the Company's couplings, and the result of careful estimates of the cost of

manufacturing them, and the price for which they can readily be sold (assuming that only 10 per cent. of the vessels adopt them), is that the annual profits will yield a handsome percentage to the shareholders on the nominal capital.

In the estimates above referred to, no account has been taken of the number of couplings which it is believed will be required in factories, mines, pumping works, and other undertakings, when once the Company is in a position to supply the demand.

An eminent naval authority, Sir James Anderson, formerly Commander of the man-of-war *Great Eastern*, has written a letter (Appendix No. 2) approving of the invention. "The plan," he observes, "is so simple and inexpensive that I should expect most steamship owners will be willing to put them on board each steamer as a valuable alternative in case of accident to the screw-shaft."

No promotion money, beyond the cost of advertising and registration, will be paid by the Company.

By agreements dated the 30th day of May, 1874, and the 7th of October, 1874, respectively entered into between H. Aguilar on behalf of the Company on the one part, and Cromwell Fleetwood Varley on the other part, the Company have secured the valuable patent for the sum of £15,000 in cash and £35,000 in fully paid-up shares of the Company.

Application for shares must be made, accompanied by the deposit of £1 per share to the Secretary or Bankers of the Company. When a less number of shares is allotted than that applied for, the balance of the deposit will be applied in payment of the sum payable on allotment, and when no allotment is made the deposit will be returned in full.

Prospectuses and Forms of Applications for Shares can be obtained from the Brokers and Solicitors, and at the Temporary Offices of the Company, and a model of the coupling can be seen at any time at the Office of the Engineer, 2, Great Winchester-street-buildings, where the fullest explanation will be given.

The well-known Patent Agents, Messrs. Caryl and Co., have reported upon the validity of the patent, and upon the value of the invention. The following is an extract from their opinion:—

"I have also caused to be examined the specifications of all prior patents, of which the titles refer to the coupling of shafts. Nothing has been found to affect the validity of the above-mentioned patent, nor indeed anything relating expressly to apparatus for coupling broken propeller shafts."

"In my opinion the patent is good and valid, and the invention appears to me to be valuable, and well calculated to attain the object for which it is designed."

WILLIAM CARPMAEL,

"24, Southampton-buildings, May 25th, 1874."

The successful application of the coupling demonstrating clearly its practical value has been several times shown on board the steamer *Essex*, which is still running with her shaft secured by the patent coupling.

Opinions of the Press, and a list of casualties to steamers from broken shafts may be had at the Offices of the Company.

Printed for the Proprietor by BEVENBROEK & Co., at the Holborn Printing Works, Pallwood's Reeds, High Holborn, in the Parish of St. Andrew-the-Martyr and St. George-the-Martyr, London, and published by E. W. ALLEN, Ave Maria-lane London E.C.

Figure 5. The figure shows a *Spiritualist* advertisement for a company selling Varley's invention for repairing ships' propeller shafts at sea. It also illustrates Varley's attempt to involve spiritualists in his engineering schemes and thus merge engineering, commercialism and spiritualism. *Spiritualist*, 30 October 1874, 5, p. iv. Reproduced by permission of the British Library.

(blotting paper moistened with a weak solution of nitrate of ammonia) fastened to the medium's wrists. Shortly before the test, Varley calibrated the galvanometer's response against 'natural' circuit effects (specifically, the slow diminution of battery current and the drying of electrical contacts) and Miss Cook's visible bodily movements. During this procedure, he satisfied himself that a deflection of about '15 or 30 divisions' could plausibly be ascribed to Miss Cook's entranced body movements but that any attempted escape from or interference with the circuit could not be hidden.<sup>139</sup> 'Had the circuit been broken for only one-tenth of a second', he reassured *Spiritualist* readers, 'the galvanometer would have moved over 200 divisions.'<sup>140</sup> Varley later added that this sensitivity would confound Miss Cook even if she secretly possessed electrical skills and used them to fool the galvanometer: 'It is simply impossible for even a thoroughly experienced electrician to escape from the electric circuit without producing such an alteration of resistance as would proclaim the fact instantly.'<sup>141</sup>

According to Varley, it was 7.10 in the evening of the test when Miss Cook was ready to begin her séance. Her cabinet was searched, locked and darkened and the thick dividing curtain drawn. Varley sat with his back to her cabinet, his gaze fixed on the bright galvanometer spot; William Crookes and Luxmoore stood by the curtains awaiting close inspection of 'Katie' (not least for wires trailing behind her), and William Harrison began to record Varley's dictated observations. Blackburn, members of Miss Cook's family and other participants took their places around the séance table and the paraffin lights in the main séance room were dimmed until the brightest light came from the galvanometer. Groans were soon heard from the cabinet and Varley recorded a gentle flicker and steady fall of the meter reading that he ascribed to Miss Cook's 'uneasiness' and drying electrical contacts respectively. At 7.27 'Katie' looked out from under the curtain and as she moved her hands, Varley remained satisfied with the meter deflection. However, when 'Katie' moved her arms at 7.36, Varley recorded a 'very suspicious' fall in the meter reading by seventeen divisions followed by an increase of twenty-one divisions. But when 'Katie' moved forward into the séance room and touched Crookes's head, he rejected his doubts and noted, 'No movement of the Galvanometer. *Excellent Test.*' At 7.42, when the sitters saw 'Katie' starting to write on some paper, Varley recorded that his meter had 'not var[ied] one division' and enthused,

EXCELLENT TEST. After the manifestation, Katie threw the paper at Mrs Cook (the medium's mother). Katie then at my request moved her wrists, opened and closed her fingers, but the Galvanometer was steady the whole time. I was watching the Galvanometer whilst asking the questions, and Crookes and Harrison, and others, told me that she moved her hands again and again in the manner requested by me. While Katie was moving her wrists about and opening and closing her fingers, we all distinctly heard Miss Cook moaning like a person in a troubled dream. The opening and closing of her fingers did not cause any variation exceeding one division on the scale; had it been Miss Cook's hand, the Galvanometer would have varied at least 10 divisions.<sup>142</sup>

139 Varley, op. cit. (137), 134.

140 Varley, op. cit. (137), 134.

141 C. Varley, 'The reality of spiritual phenomena', *Spiritualist* (1876), 9, 205–6, 206.

142 Varley, op. cit. (137), 135.

As the *séance* was terminated, 'Katie' invited Varley into the darkened cabinet where he saw Miss Cook entranced and huddled in her armchair. 'Katie' seems to have disappeared some time later and as Miss Cook awoke from her trance, Varley satisfied himself that her wrist contacts had not been moved and added that her hands were 'small, warm and dry', unlike the 'long, cold, and clammy like' hands of 'Katie'.<sup>143</sup>

This was virtually Varley's final word. *Spiritualist* readers could now consider Miss Cook's integrity in the light of Varley's general conclusion that 'the current was not interrupted an instant during the whole *séance*' and his conviction that 'Katie's' ability to write without deflecting the galvanometer a single division proved that 'Miss Cook was not only in the dark chamber while 'Katie' was in sight, but also perfectly quiescent'.<sup>144</sup> The medium had, in fact, apparently passed the canonical telegraphic test of 'continuity and resistance'. For at least one prominent late Victorian spiritualist, Varley had not only verified courageously 'a fact in which I and many others believed' but also restored the reputation of Royal Society science and greatly promoted spiritualists' desideratum – 'the *science* of Spiritualism'.<sup>145</sup> Other colleagues were more practical and considered the test important enough to circulate its virtues amongst spiritualists by replication, development, popularization and public displays.<sup>146</sup> Harrison was convinced that Miss Cook had been vindicated by Varley's tests and used the opportunity to diffuse the rudiments of electrical science among spiritualists. In the *Spiritualist*, he published Varley's original report, provided a lucid summary of the test, wrote a popular article on the galvanometer and supplied further observations drawn from Crookes's and others' adaptations of the apparatus.<sup>147</sup> In fact, Varley's efforts were quickly overshadowed by Crookes's adaptation of Varley's apparatus for his tests on Miss Cook and the medium Annie Eva Fay, not to mention Crookes's other tests of the same mediums (Figure 4).<sup>148</sup> But even Crookes's unflagging confidence could not dissipate suspicions that mediums, whether consciously or not, masqueraded as ghosts, or stop criticisms that the test only provided indirect proof of mediumship and was inaccessible to non-scientific spiritualists.<sup>149</sup> The *Spiritualist*, however, satisfied itself with the fact that not even an 'accomplished electrician' or two eminent Fellows of the Royal Society (William Huggins and Francis Galton) could escape Crookes's circuit without detection.<sup>150</sup>

143 Varley, op. cit. (137), 134.

144 Varley, op. cit. (137), 134, 135.

145 B. Coleman, 'Spirit forms', *Spiritualist* (1874), 4, 177.

146 In June 1875, for example, the *Spiritualist* reported that the electricians Frederick Henry Varley (Cromwell's younger brother) and Walter Coffin had displayed a version of the electrical test at a soirée of the British National Association of Spiritualists. The audience was invited to observe that an undetected escape from the test was impossible without knowledge of the distant galvanometer readings. [Anon.], 'National Association of Spiritualists', *Spiritualist* (1875), 6, 282–3.

147 [Harrison], 'Miss Cook's mediumship', *Spiritualist* (1874), 4, 133–4; 'Electrical tests popularly explained', *ibid.*, (1875), 6, 135–6.

148 W. Crookes, 'A scientific examination of Mrs. Fay's mediumship', *Spiritualist* (1875), 6, 126–8.

149 E. Cox, 'Mr. Serjeant Cox on "incarnation"', *Spiritualist* (1874), 4, 272–4, esp. 273; [Anon.], 'Electrical experiments with Miss Cook when entranced', *Spiritual Magazine* (1874), 9, 161–8.

150 [Harrison], 'Electrical', op. cit. (147), 136. Huggins and Galton are identified in E. Cox, *The Mechanism of Man*, 2 vols., London, 1879, ii, 446–9.

## CONCLUSIONS: THE BUSINESS OF SPIRITUALIST ENGINEERING

At least until 1880, three years before his death, Varley believed that he had helped vindicate Florence Cook and had plausibly expanded the possible market-places of telegraphy.<sup>151</sup> In his judgement, it was not just Fellows of the Royal Society who would have to respect the gaze and cultural importance of telegraphic apparatus, but mediums and spiritualists. Owing to the telegraph, spiritualists could (and did) have greater trust in ‘Katie’ and her morally refined world and thus now consider their own honesty vindicated. Because of the telegraph, spiritualists could witness the convergence between laws of engineering and the laws of spirits. As far as Varley was concerned, the latter situation had to be exploited. Miss Cook and her *Spiritualist* supporters could now be further trusted to help him reinforce the moral status and commercial value of his engineering practice. The ever loyal Harrison had already made overtures in this direction in the *Spiritualist*, when he boasted that the very electrical engineering skills which had proved Miss Cook’s honesty had ‘been employed for years by the largest cable companies, whereby they have been saved thousands of pounds in expenses’.<sup>152</sup> In November 1875, Varley and Harrison subtly reversed this advertising strategy and invited *Spiritualist* readers to help finance Varley’s new engineering scheme – a company for marketing his apparatus for repairing ship’s screw-shafts at sea (Figure 5).<sup>153</sup> Varley (the company engineer), and Crookes (a company director) touted their own entrepreneurship and sought to involve those well-heeled *Spiritualist* readers who might be as interested in saving lives at sea as in proving life beyond the grave. Thus the commercial success of a Victorian engineering scheme was seen to depend on the probity of spiritualists, a leading patent agent, distinguished commercial and naval men, a chemist and the engineer of ‘Katie King’. Here, as in Varley’s electrical tests of Kate Fox and Florence Cook, the morally refined world of spiritualism and the commercial world of a telegraphic engineer were temporarily welded together. The making of Victorian engineering schemes and money could also be the making of spirits.

151 C. Varley, ‘Phenomena I have seen’, in W. Harrison, *Psychic Facts*, London, 1880, 32–40, 38. This was a reprint of Varley, op. cit. (141).

152 [Harrison], ‘Spirit forms’, *Spiritualist* (1874), 4, 139.

153 *Spiritualist* (6 November 1874), 5, p. iv. Varley and Crookes undoubtedly had individuals like Charles Blackburn in mind as potential shareholders. Blackburn’s patronage was behind at least two prominent spiritualistic engineering schemes of the late 1870s; between 1877 and 1878 he paid John Benjamin Dancer, James Prescott Joule’s instrument-maker, and Frederick Varley to build instruments for registering the changes of weight of a medium during séances. See Harrison, ‘Self-registering apparatus for weighing mediums during manifestations’, *Spiritualist* (1878), 12, 115, and ‘New discoveries in spiritualism’, *ibid.*, (1879), 13, 186–91.