4 Psychical Investigation as Experimental Physics

Few of William Crookes's scientific colleagues were more enchanted by his public performances of experimental physics than William Thomson. Few events proved more enchanting to this eminent Scottish physicist than Crookes's presidential address to the Institution of Electrical Engineers in 1891. Peppered with a string of visually stunning experimental demonstrations, Crookes took stock of nearly two decades of study into the mysterious behaviour of electrified molecules in near-vacuum conditions, including their radiation-like properties.[1] Thomson was so impressed that he nominated Crookes for the Copley Medal, the prestigious award conferred by a much older scientific organisation of which Thomson was president: the Royal Society of London. A year after Crookes's address, he put his case to Rayleigh by emphasising that the chemist and physicist had created "really the greatest things so far, in developing the physics of the 19th century".[2] What surprised Thomson was that such intellectual milestones "all arose from his 'investigating' mesmeric attraction!!"[3]

Thomson's surprise is understandable. About a decade earlier, he had spoken publicly of "that wretched superstition of animal magnetism, and table-turning, and spiritualism, and mesmerism, and clairvoyance, and spirit-rapping", and evidently believed that such "superstition" could neither be the subject of scientific investigation nor the inspiration for physical discoveries.[4] Rayleigh's reply to Thomson's proposal is unknown, but even if he did lend his weighty support, Crookes had to wait until 1904 for his Copley Medal. Rayleigh would have been less surprised than Thomson by the apparent connection between physical experiment and psychical investigation. Like Crookes, he had been interested in using the resources of experimental physics to investigate the

[1] William Crookes, 'Electricity *in Transitu*: From Plenum to Vacuum', *Journal of the Institution of Electrical Engineers*, vol. 20 (1891), pp. 4–49.
[2] William Thomson to Lord Rayleigh, 13 February 1892, Rayleigh Family Papers, Terling Place, Terling, Essex.
[3] Thomson to Rayleigh, 13 February 1892.
[4] Thomson, 'Six Gateways of Knowledge', p. 258.

physical phenomena of spiritualism and did so in his private residence, where rooms for seances were not far from a physical laboratory.[5]

Rayleigh's interest in spiritualism owed a great deal to the strong "impression" made upon him by an article that Crookes had published in an 1874 issue of a periodical that Crookes edited: the *Quarterly Journal of Science* (henceforth *QJS*).[6] This article was the last in a series describing Crookes's investigations into the phenomena of spiritualism, which included the movement of untouched objects, spirit-rapping and other intelligent sounds, moving lights, phantom human forms and disembodied luminous hands that wrote messages. Rayleigh's positive response illustrates the significant role that experimental enquiry played in shaping attitudes towards psychical investigation per se. Chapter 3 showed that theoretical and conceptual developments in the physical sciences certainly stimulated much private and public debate about the plausibility of psychical effects, but the results of what were variously called 'experimental', 'scientific' and 'accurate' tests of psychical phenomena were more significant determinants of the scientific profile of psychical investigation. Physical–psychical scientists were acutely aware of this, as suggested in Lodge's argument of 1902 that the foundation of a "psychical laboratory" modelled on a physical equivalent was needed if the physical phenomena of psychical research were "ever to become recognised as a branch of orthodox physics".[7]

Rayleigh's impression of Crookes's publications was more widely shared, not least among many of those who later founded the SPR. In July 1874, during his early spiritualistic investigations, Rayleigh's brother-in-law Henry Sidgwick told his wife that Crookes's articles bolstered the "idea of the weight of the evidence in favour of the phenomena".[8] But what made it difficult for Sidgwick to accept that Crookes was either "affirming a tissue of purposeless lies, or

[5] Rayleigh, *Life of Rayleigh*, p. 67n. Rayleigh's most intriguing use of physics was a hermetically sealed glass retort within which he left a pencil and paper for 'spirits' to write on. The apparatus, which still exists, has yet to show an inscription. On Rayleigh's domestic laboratories see Donald Opitz, '"Not Merely Wifely Devotion": Collaborating in the Construction of Science at Terling Place', in Annette Lykknes, Donald L. Opitz and Brigitte van Tiggelen (eds.), *For Better or For Worse? Collaborative Couples in the Sciences* (Heidelberg: Birkhäuser, 2012), pp. 33–56; Simon Schaffer, 'Physics Laboratories and the Victorian Country House', in Crosbie Smith and Jon Agar (eds.), *Making Space for Science: Territorial Themes in the Shaping of Knowledge* (Basingstoke: Macmillan, 1998), pp. 149–80.

[6] Rayleigh, 'Presidential Address', p. 278; Crookes, 'Notes of Enquiry'. See also William Crookes to Lord Rayleigh, 27 January 1874, Folder 4, Box #17, Series 4, R-USAF.

[7] Lodge, 'Address by the President', p. 47.

[8] Henry Sidgwick to [Mary] Sidgwick, 11 July 1874, in A[rthur] S[idgwick] and E[leanor] M[ildred] S[idgwick], *Henry Sidgwick: A Memoir* (London: Macmillan and Co., 1906), pp. 290–1, p. 290.

a monomaniac" was that at precisely this time Crookes was displaying considerable experimental acumen in the form of Royal Society exhibitions of his research into the apparent repulsive force of radiation.[9] Sidgwick had fewer problems than did Thomson with the idea of experimental physics being relevant to psychical investigation. Only weeks before his remarks about Crookes, he told Myers that the idea of the famous American medium Katherine Fox-Jencken "rapping away" in Rayleigh's house "using all the resources of his laboratory is too tempting a prospect".[10]

Throughout the last third of the nineteenth century, physical–psychical scientists displayed enormous confidence in the relevance of their experimental resources and skills to the development of psychical inquiry. In the first of his *QJS* papers, Crookes presented a virtual manifesto for the proper scientific study of spiritualism in which both attributes played a prominent role. The kinds of "experimental proof" that "science has a right to demand before admitting a new department of knowledge into her ranks", he insisted, depended critically on the careful use of the delicate instruments used in physical and chemical laboratories, but here deployed in establishing psychical "facts" that could not always be trusted to the "unaided senses" in seance conditions where fraud and mental "excitement" were often present.[11] Spiritualist claims about a mysterious power levitating heavy objects, for example, could only be accepted if the same power supposedly moved a "delicately-poised balance".[12] Together with "a long line of learning" that furnished skills in identifying the "dangers", uncertainties and certainties of inquiries, instruments gave the "scientific man" a "great advantage" over the "ordinary observer" in weighing spiritualists' claims.[13]

Crookes's manifesto made the resources and skills of experimental physical sciences relevant by sidestepping the fact that even the most 'physical' phenomena of spiritualism exhibited intelligence – properties that he (like Maxwell and most other physicists) agreed were beyond the formal boundaries of the physical sciences.[14] This sidestepping was explicit in Lodge's address to physicists at the 1891 meeting of the British Association. He anticipated objections that psychical investigations were psychological

[9] Sidgwick to Sidgwick, 11 July 1874, p. 290.
[10] Henry Sidgwick to Frederic W. H. Myers, 4 June [1874], Add. MS.c.100[262], Henry Sidgwick Papers, Trinity College, Cambridge. Katherine Fox became Katherine Fox-Jencken in 1872 when she married the English barrister Henry D. Jencken.
[11] Crookes, 'Spiritualism Viewed', p. 318.
[12] Crookes, 'Spiritualism Viewed', p. 319. This echoed Faraday, 'On Mental Education', p. 471.
[13] Crookes, 'Spiritualism Viewed', p. 319.
[14] See Crookes's remarks in [Anon.], 'The Psychological Society of Great Britain', *Spiritualist*, vol. 15 (1879), p. 235. See also Barrett, 'Address by the President', p. 332.

rather than physical, but reassured his auditors that since the results of such investigations had a "physical side" then it was a "proper subject for physical enquiry" where physics had to "lead, not to follow".[15] Physical analogies, concepts and theories were obvious ways of illuminating this "side", but they also helped to legitimate ways of achieving the same goal via the hardware of physical investigation, and thereby create a psychical kind of experimental physics.

Arguments for the importance of physical experiment in psychical investigation were often made in the context of attempts to mobilise the resources of the physical laboratory in illuminating the reality, nature and provenance of psychical effects. This chapter analyses four of the most elaborate and revealing of these attempts made by physical–psychical scientists between the 1870s and the 1890s. What chiefly distinguished them from the vast majority of nineteenth-century tests of psychical effects was the presence of scientifically trained participants and the use of a host of devices for studying psycho-physical phenomena with puzzling mechanical, optical, magnetic, electrical, thermal and acoustical properties. As we shall see, however, the resulting transformations of seances into sites of physical enquiry, and sites of physical enquiry into seances, proved less effective than physical–psychical scientists hoped. While some evidence produced in this way persuaded physical–psychical scientists of the reality of specific effects and the need for further inquiries, it proved difficult for them to amass the quantity of evidence required to stimulate greater interest and conviction among professional scientific colleagues. This was partly because the experiments depended too strongly on human (psychic) subjects who were hard to find, whose powers were capricious and who most scientific practitioners associated with fraud. But it was also because leading physical–psychical scientists made the pragmatic decision that their skills and resources in experimental physics could better serve their professional goals by deploying them in purely physical questions.

From Psychic Force to the Radiometer

William Thomson was only partially right in claiming a mesmeric provenance for *all* of Crookes's researches on molecular physics. He probably remembered that in the mid-1870s he had refereed many of the papers on the subject that Crookes had submitted to the Royal Society and that, much to his irritation, one such paper had suggested that the unanticipated movements of a delicate object suspended in near-vacuum conditions

[15] Lodge, 'Address', p. 555.

might be due to an aura around human hands that Reichenbach claimed as a manifestation of od.[16] What had annoyed Thomson about the Reichenbach reference was that it reminded him of the "delusions" into which he believed Crookes had been led, mainly because of seemingly dishonest witnesses to mesmeric and spiritualistic phenomena.[17] But the psychical phenomena that Thomson saw as irrelevant and pernicious to Crookes's physical discoveries had long been seen by Crookes as potential sources of discovery in the physical sciences. This blurring of distinctions between physical and psychical investigation was starkly apparent in, and made possible by, the laboratory that he had installed in his family home near Regent's Park.

When, in July 1870, Crookes published his manifesto for a new experimental approach to spiritualism, he had already found what he called a potential "key to these strange phenomena" in the form of Daniel Dunglas Home, whose reputation for powerful mechanical effects at a distance made him an obvious subject for physical tests.[18] Crookes had been convening seances with Home in his London residence since at least April 1870, when this globe-trotting medium was in the middle of one of his longest stints in Britain and eager to have new, high-profile tests of his abilities.[19] By this time, Crookes had been attending seances with other mediums for about a year and these had persuaded him of the existence of a "power in some way connected with gravitation".[20] His participation in the London Dialectical Society's seances would have encouraged him to regard Home as a potential "key" to spiritualism because opposing David Brewster and others who had accused Home of deception and fraud were Dialectical Society witnesses of such scientific calibre as Varley and Lindsay, who testified to the genuineness of many of Home's powers.[21] With such an impressive history of cooperating with scientific enquirers, Home would have struck Crookes as an

[16] William Thomson, 'Report on Mr. Crookes's Paper "On Attraction and Repulsion Resulting from Radiation"', 16 June 1875, RR/7/369, Royal Society Archives; William Crookes, 'On Repulsion Resulting from Radiation. Part II', *Philosophical Transactions of the Royal Society of London*, vol. 165 (1875), pp. 519–47, p. 526.

[17] Thomson, 'Report on Mr. Crookes's Paper'.

[18] Crookes, 'Spiritualism Viewed', p. 320.

[19] Medhurst, *Crookes and the Spirit World*, pp. 149–50. The following discussion uses R. G. Medhurst's edition of Crookes's notes on the Home seances because it includes material that Crookes did not include in his own published notes: William Crookes, 'Notes of Séances with D. D. Home', *PSPR*, vol. 6 (1889–90), pp. 98–127.

[20] William Crookes to John Tyndall, 22 December 1869, in Medhurst, *Crookes and the Spirit World*, p. 233.

[21] The investigations in which Crookes participated are described in *Report on Spiritualism*, pp. 159–60, 213–17.

excellent experimental subject with whom to achieve his goal of conducting tests "more calmly than is possible when in a party of enthusiasts".[22]

The domestic location and the personnel of these early Home seances were deliberately chosen to create the convivial psychological 'atmosphere' widely believed by spiritualists to favour the exhibition of psychic power. Held in the evening, the sittings were staged at Crookes's residence and the homes of prominent London spiritualists, and among those around the main seance tables were Crookes's wife and brother, some of Crookes's scientific colleagues (including Robert Angus Smith and Alfred Russel Wallace), and many individuals who had sat with Home on previous occasions (notably Lord Adare).

Crookes's published and unpublished notes on these events suggest that until spring 1871 little happened that would have surprised those attending performances by Home or any other leading mediums. Whilst fully conscious or semi-entranced, Home appeared to be able to move tables, bells and other objects without touching them; to levitate himself; to produce a cool breeze and faint disembodied hands; and to channel professed spirits of the dead who rapped out encoded messages on furniture and responded to questions given vocally by participants. These effects were capricious: some seances witnessed the appearance of very few manifestations, and the mysterious bodily force by which Home appeared to produce them was, according to Crookes, subject to "unaccountable ebbs and flows".[23] Very few of the physical effects that Crookes witnessed in these early seances suggested to him the need for scientific tests more elaborate than investigating the possible thermal and electrical properties of the mysterious breeze with a thermometer and gold leaf electrometer respectively, or exploring the effect on manifestations of putting coloured filters over the gas lamps illuminating the seance room.[24] The outcomes of these particular tests were not recorded.

By spring 1871, however, Crookes's experiences of Home had given him confidence in the fruitfulness of more searching instrumental tests. He was impressed that Home performed most of his seances by gaslight, and that the medium allowed him a good deal of freedom in scrutinising the effects, as well as his body and the seance room.[25] The favourable impression that he had of Home's character was bolstered by his failure to

[22] Crookes to Tyndall, 22 December 1869, in Medhurst, *Crookes and the Spirit World*, p. 233.
[23] William Crookes, 'Experimental Investigation of a New Force', *Quarterly Journal of Science*, vol. 1 (New Series) (1871), pp. 339–49, p. 340.
[24] Medhurst, *Crookes and the Spirit World*, p. 153.
[25] Crookes, 'Experimental Investigation', pp. 340–1. See also Crookes's contributions to [Anon.], 'Discussion of Professor Lodge's Paper', *JSPR*, vol. 6 (1893–4), pp. 336–45.

detect any accomplices, wires or other means of defrauding witnesses in any of the seances he convened or attended.[26] But it was Home's capacity to repeatedly exhibit two specific psychical effects that proved most important to Crookes's experimental ambitions: the medium seemed to be able to cause an accordion to expand, contract and play tunes whilst holding it from the end furthest from the keys, and sometimes without holding it at all; and on many occasions, he could cause the weight of the seance table to increase and decrease on Crookes's command, the weight being measured by Crookes with a small spring balance hooked under the table.

The weight tests were particularly appealing to Crookes. They promised to give him additional reasons for challenging the assumption that the movements of objects were due to ordinary mechanical forces exerted by participants: his close observations of Home and other seance participants suggested that they had rarely made any mechanical contact with seance tables and on those occasions when there was such contact, they could not have caused the significant weight changes merely by pushing or lifting.[27] The weight tests were also attractive to Crookes because, as his "friend" and fellow chemist Alexander Boutlerow had shown in tests of Home in late 1870, the effect was measurable with simple mechanical instruments.[28]

To fulfil his manifesto commitment to subjecting spiritualistic phenomena to accurate measurement and "proper tests", Crookes needed to transform the domestic seance into a space that bore key attributes of physical experiment.[29] This was made easier since he persuaded Home to give seances in his dining room, which was near his private laboratory.[30] Moreover, in the seances that he gave in this room between late May and late June 1871, Home was happy to perform in the presence of mechanical and other kinds of apparatus and of scientific participants, notably William Huggins, Edward Cox and Crookes's laboratory assistant Charles Gimingham. Personally trained by Crookes, Gimingham's roles in the seances merely extended those he fulfilled in his employer's purely physical enquiries – observing, measuring and recording effects and undertaking other investigative tasks that Crookes was unable to execute himself owing to other professional and commercial commitments.[31]

[26] For Crookes's positive view of Home's character see William Crookes to Alexander Boutlerow, 13 April 1871, quoted in Fournier d'Albe, *Life of Sir William Crookes*, pp. 196–8.
[27] For example, Medhurst, *Crookes and the Spirit World*, pp. 163, 170–1 and 178.
[28] Crookes, 'Some Further Experiments', p. 475.
[29] Crookes, 'Spiritualism Viewed', p. 320.
[30] Medhurst, *Crookes and the Spirit World*, p. 189.
[31] On Gimingham see Gay, 'Invisible Resource'.

There were two forms of apparatus in the test seances. The first was a cylindrical wire cage, almost as tall as the gap between the seance table and the floor, connected via long wires to an electric battery in the laboratory. By asking Home to hold the accordion inside the cage, Crookes aimed to study the possible effect of electric currents on the musical instrument's striking movements, although this test proved inconclusive. Furthermore, by asking Home to reproduce the effect with the cage under the table, Crookes sought to severely restrict how far Home could surreptitiously use his feet or hands to achieve the effect. The second apparatus was a balance, which was employed to measure Home's apparent ability to change the weight of objects independently of any known force. This comprised a wooden board 36 inches long, one end of which rested on a fulcrum near the edge of the seance table, the other end being suspended from a self-registering spring balance, itself hung from a tripod.

In the test seance whose results eventually formed the basis of his second *QJS* paper on spiritualism, Crookes emphasised that in the accordion test, Home sat near the table, with Crookes and his wife resting their feet on his as an additional form of control.[32] Home took the accordion from the end furthest from the keys and was asked to hold it with one hand in the cage under the table, his other hand resting on the table. Soon the accordion was heard to play successive notes and a tune, and Gimingham and Huggins reported seeing such startling sights as the instrument expanding and contracting, and playing sounds whilst the hand touching the instrument was "quite still".[33] A particularly striking development was when Home let go of the instrument and it carried on playing, suspended in the air.

More striking still, however, were the results of the balance experiment. With Huggins and Crookes observing the wooden board, Home rested his fingers near the fulcrum. The spring balance was seen to register successive increases and decreases, and at one stage the weight of the board reached six pounds more than its normal weight of three pounds. To counter objections that Home could have caused this startling result by secretly pressing down on the end of the board, Crookes jumped up and down on it and observed that this increased the weight by only two pounds. In addition to this crude but clear calibration exercise, Crookes emphasised that Home was only permitted to position his hands near the fulcrum so that any pressure applied there could not have produced the significant weight increases.

[32] Medhurst, *Crookes and the Spirit World*, pp. 172–5.
[33] Crookes, 'Experimental Investigation', p. 343.

The version of these seances that Crookes published in the July 1871 issue of the *QJS* was carefully designed to make a scientific case for the existence of some kind of new force exuded by Home, a force that he provisionally identified with Edward Cox's "psychic force", whose "correlation" with known forces he refused to "hazard the most vague hypothesis" about, owing to its close connection with "rare physiological and psychological conditions".[34] Evidently mindful of Tyndall's warning about mixing matters of the heart and mind in questions of phenomena bordering the supernatural, his paper was also designed to counter suspicions that he was a closet spiritualist whose judgement had been clouded by "[r]omantic and superstitious ideas".[35] This version emphasised his "critical acumen" and the frequency with which he had experimented on the "capricious" force, and included supportive letters from Huggins and Cox, and also omitted potentially embarrassing references to exchanges with disembodied spirits that occurred in these test seances.[36]

Crookes undoubtedly used the same rhetorical strategies in papers on the psychic force that he sent to the Royal Society in June 1871, but neither these nor the *QJS* versions resulted in strongly favourable responses. Reactions to the *QJS* paper in spiritualistic and general intellectual quarters were mixed, but in scientific and medical circles they were generally more negative.[37] While some scientific commentators believed that Crookes had successfully distanced himself from spiritualist theories of 'spirits' and made a case for further investigation, others saw flaws in experimental design (including those allowing vibrations to produce the movements of the board), contradictions and gaps in the observations, and a failure to repeat the tests a satisfactory number of times.[38] Most of these raised suspicions that Crookes had deluded himself or been duped by a medium who was not as spotless as Crookes seemed to think.

[34] Crookes, 'Experimental Investigation', p. 347.
[35] Crookes, 'Experimental Investigation', p. 347.
[36] Crookes, 'Experimental Investigation', p. 340. An account of one such seance with 'spirits' is published in Medhurst, *Crookes and the Spirit World*, pp. 172–5.
[37] [James Burns], Editorial Comments, *Medium and Daybreak*, vol. 2 (1871), p. 231; C. W. Pearce, 'Mr. Crookes's Experiments', *Spiritualist*, vol. 1 (1869–71), p. 190; [Anon.], 'Psychic Force', *Saturday Review*, 15 July 1871, p. 83; [Anon.], 'A Scientific Testing of Mr. Home', *Spectator*, vol. 44 (1871), pp. 827–8.
[38] Other critical responses include [Anon.], 'On a New Force, Falsely So Called', *Medical Times and Gazette*, vol. 2 (1871), pp. 99–100; J. P. Earwaker, 'The New Psychic Force', *Nature*, vol. 4 (1871), pp. 278–9; P. H. Van der Weyde, 'On the Psychic Force', *Scientific American*, 23 September 1871, p. 197. More positive were George Fraser, 'The New Psychic Force', *Nature*, vol. 4 (1871), pp. 279–80; 'A Fellow of the Royal Astronomical Society', 'Psychic Force, &c', *English Mechanic and World of Science*, vol. 13 (1871), p. 539; and Cromwell F. Varley to William Crookes, 8 July 1871, published in [Anon.], 'Correspondence Between Mr. Cromwell F. Varley and Mr. William Crookes', *Spiritual Magazine*, vol. 6 (New Series) (1871), pp. 350–3.

Among the scientific criticisms that Crookes took most seriously were those from the physicists George Gabriel Stokes and Balfour Stewart. As one of the Royal Society's secretaries to whom Crookes had sent his psychic force papers, Stokes wielded much power as an "arbiter" of British physical sciences.[39] From previous experience of Stokes's refereeing, Crookes was acutely aware that the physicist could seriously help or hinder his ambition to secure scientific attention for the new research. But having read Crookes's manuscript, Stokes signalled his low opinion of the work by refusing to witness the effects in Home's presence and by suggesting that the medium could have easily caused the puzzling weight increases by careful application of pressure on the board.[40] For Stokes, whose strong Christian faith underpinned a private abhorrence of dubious mediators of potentially unclean spirits, mediums were simply not legitimate features of sound physical enquiry. The disappointment that Crookes felt in response to Stokes's resistance turned to exasperation when he discovered that the physicist's verdict had inspired rumours that his experiments had been officially rejected by the Royal Society as lacking "*scientific precision*".[41]

Stewart's problem was with Crookes's state of mind rather than experimental design. In a leading article in *Nature*, he echoed many scientific commentators' praise for Crookes's courage in tackling "mysterious" phenomena but regarded the evidence of mesmerism, and in particular the power of an individual to induce subjective impressions in another, to be strong enough to doubt the chemist's conclusions.[42] It was more likely that Crookes had only imagined the manifestations and instrumental measurements of psychic force because of Home's subtle influence over him.

Between June and October 1871, Crookes made three major changes to his weight test apparatus that aimed to eliminate the specific problems identified by these two formidable scientific adversaries. Probably inspired by Robert Hare's apparatus of the 1850s, the first change added, near one end of the board exactly over the fulcrum, a water-filled glass vessel in which a perforated copper bowl was

[39] See David B. Wilson, 'Arbiters of Science: George Gabriel Stokes and Joshua King', in Kevin C. Knox and Richard Noakes (eds.), *From Newton to Hawking: A History of Cambridge University's Lucasian Professors of Mathematics* (Cambridge University Press, 2003), pp. 295–342.

[40] See Stokes's remarks in Crookes, 'Some Further Experiments', p. 478.

[41] Crookes, 'Some Further Experiments', p. 481. Crookes's disappointment with Stokes was echoed in other scientific quarters: see, for example, [Anon.], 'Psychic Force', *English Mechanic and the World of Science*, vol. 14 (1871), p. 85.

[42] Stewart, 'Mr. Crookes'. Stewart's concern about Home's mesmeric influence was shared by Barrett in 'On Some Phenomena', p. 87.

suspended.[43] Addressing Stokes's criticism that small impulses applied to the fulcrum could cause large weight changes, this change eliminated direct mechanical contact between the hands and the board. Shaking the heavy stand holding the vessel or dipping hands into the water caused no "appreciable" deflection of the spring balance.[44]

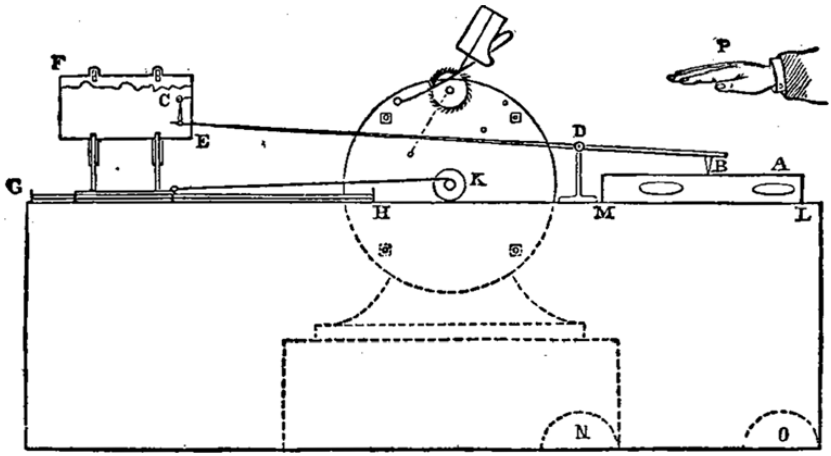
The second change responded to Stewart's criticism insofar as it aimed to eliminate the subjectivity of impressions of mechanical force. This involved mechanising the registration of the movements of the spring balance indicator by allowing the indicator to trace curves on smoked glass plates that moved relative to the indicator via a clockwork mechanism. By taking over the registration process, this mechanism also enabled Crookes and other leading investigators to focus more closely on holding and watching Home. The third major change, implemented after the results of the first two, involved replacing the board arrangement entirely with a still more delicate apparatus that Crookes had mentioned in his 1870 manifesto: a phonautograph. This was a circular parchment membrane whose movements in response to the mechanical effect of the pulsing psychic force were magnified and registered via an indicator moving across a smoked glass plate. The crucial feature of the phonautograph was that it promised to detect pulses of psychic force when the medium was standing away from the apparatus (Figure 4.1).

The seances featuring the new apparatus were organised in much the same way as the previous series, except that Crookes's wife Ellen now played a more significant role as a close observer of Home's body, and an unnamed non-professional female medium replaced Home for some of the phonautograph experiments.[45] The first experiment run during the seances involved Home placing his hands in the water vessel, which eventually resulted in a series of irregular curves on smoked glass plates, one indicating the exertion of a force of about 0.7 pounds. Similar curves arose from subsequent experiments, in which the glass vessel was removed entirely and Home asked simply to make gentle contact with the board, and then to stand three feet away from it. Far subtler traces resulted from the final experiments, in which Home and the unnamed female medium held their hands near the phonautograph. In each case, Crookes satisfied himself that he had good control of his psychical

[43] Crookes accepted that Hare's apparatus was similar to his own, rather than being the inspiration for it: Crookes, 'Some Further Experiments', p. 477. Crookes may have known about Hare's apparatus long before 1871. Hare's work was discussed in Epes Sargent's *Planchette* (1869), a spiritualist book admired by Crookes: see William Crookes to Epes Sargent, 17 April 1874, Mss.Acc.420, Boston Public Library.

[44] Crookes, 'Some Further Experiments', p. 486.

[45] Medhurst, *Crookes and the Spirit World*, pp. 194–203.



4.1 Crookes's automatic machine for registering psychic force. The force emanating from a medium's hand (P) impacts on a drum (ALM) made from thin parchment. The movement of the parchment causes the lever (CB) to pivot about D, and this causes the pointer at C to inscribe curves on a smoked glass plate (FE), which is pulled to the right by a clockwork mechanism (K). From William Crookes, 'Some Further Experiments on Psychic Force', *Quarterly Journal of Science*, 1 (2nd Series) (1871), pp. 471–93, p. 489. Reproduced by permission of Leeds University Library, Special Collections.

subjects, whether through close observation of their movements or by ensuring that their hands and feet were held by or were in contact with those of another participant. These controls underpinned Crookes's conviction that the curves could not have been produced by any known forces and confirmed "*beyond doubt*" the existence of some kind of force associated with the body that could alter the weight of material bodies.[46]

Once again, Crookes turned these experiments into papers for the Royal Society and the *QJS*, and again, these papers omitted potentially embarrassing references to the spirit-rapping that we know took place.[47] But none of these papers proved significantly more successful than the earlier ones. Some scientific commentators accepted that his *QJS* paper was scientifically more credible than the previous instalment and that it justified the need for further enquiry, but others saw no improvement.[48]

[46] Crookes, 'Some Further Experiments', p. 490.
[47] See, for example, Medhurst, *Crookes and the Spirit World*, pp. 194–203.
[48] Sympathetic responses were [Anon.], 'Further Experiments by Mr. Crookes', *Spiritualist*, vol. 1 (1869–71), p. 177 and [Anon.], 'Psychic Force', *English Mechanic and World of*

In response to the Royal Society submission, Stokes warned Crookes that Home could have caused significant mechanical forces simply by moving his hands whilst they were submerged in the water vessel, a verdict that evidently carried weight with the Society's Committee of Papers, which officially rejected Crookes's psychic force manuscripts in January 1872.[49]

By this time, Crookes's professional reputation had already suffered a huge public battering from scientific critics (and even some close friends and colleagues), who severely questioned his scientific competence per se, not just his abilities to safeguard against well-known sources of deception arising from studies of spiritualism, mesmerism and od.[50] Much of the controversy that followed the second *QJS* paper on psychic force focussed more on these general issues than on the details of his new experiments. What was painfully clear to Crookes from this debate was that no increases in the delicacy of apparatus or controls over mediums removed the fact that the prime experimental subjects remained a liability because of their reputation for deception.[51] Yet even before the controversy over psychic force peaked at the end of 1871, Crookes was exploring a way of exhibiting psychic forces independently of mediums, seances, communications with professed spirits and spiritualism altogether. This would prove to be Crookes's most telling attempt to make experimental physics matter to psychical investigation.

Towards the end of his second *QJS* paper on psychic force, Crookes made the provocative suggestion that psychic force did not require "access to known psychics" and was "probably possessed by all human beings", although this supposition could only be verified with a "more delicate apparatus" that registered fractions of a grain rather than the cruder instruments he had been using.[52] Within months, he had made significant steps towards this non-spiritualist goal when he told Huggins that "I have got an indicator so delicate that it will work without a medium" and showed a "new force, or a new form of a known force".[53] Frustratingly, Crookes's surviving correspondence and laboratory notebooks are silent on the exact

Science, vol. 14 (1871), p. 85. A particularly hostile one was P. H. Van der Weyde, 'On Mr. Crookes's Further Experiments on Psychic Force', *Journal of the Franklin Institute*, vol. 92 (1871), pp. 423–6.

[49] Crookes, 'Some Further Experiments', pp. 478–9; George G. Stokes to William Crookes, 18 January 1872, Letter Book, MS/426, p. 356, Royal Society Archives.

[50] One such close friend and colleague was the chemist John Spiller: John Spiller, 'Mr. Crookes's "Psychic Force"', *Echo*, 6 November 1871, p. 1.

[51] This was an argument in 'Fellow of the Royal Astronomical Society', 'Psychic Force, &c'.

[52] Crookes, 'Some Further Experiments', pp. 491–2. He had made a similar suggestion to Stokes earlier in 1871: Crookes, 'Some Further Experiments', p. 478.

[53] William Crookes to William Huggins, 6 November 1871, in Fournier d'Albe, *Life of William Crookes*, p. 227. Cf. William Crookes, 'Mr. Crookes' Psychic Force', *Echo*, 10 November 1871, p. 2.

nature and provenance of this "indicator", but it is likely that it arose from a significant, albeit short-lived, convergence of one of Crookes's physical researches with spiritualism.[54]

The physical research was a painstaking attempt to establish the atomic weight of thallium.[55] Having secured a Royal Society fellowship (in 1863) and much professional fame from the co-discovery of this chemical element, Crookes was now trying to further raise his reputation as an accurate investigator by focussing on one of its major physical attributes. As several historians have shown, Crookes needed to produce the atomic weight measurement in a good vacuum because minute changes in air pressure compromised the accuracy of this gravimetric work.[56]

In the midst of this work, Crookes had observed an anomalous physical effect: at pressures as low as his mercurial pressure gauge would register and where the effects of convection currents and vapour films were believed to be insignificant, the human body, sunlight and other sources of heat outside the iron vacuum chamber he had built seemed to decrease the measured weight of bodies inside it, while cold sources increased their weight. This seemed anomalous because heat and light were not believed to exert *direct* mechanical action or to interfere with the force of gravity. To achieve more consistent results, Crookes and Gimingham built a series of increasingly sensitive evacuated glass instruments which showed a surprisingly strong repulsive action of warm bodies, and a corresponding attractive action of cold bodies, on delicate material indicators that either pivoted about a central axis or were suspended from torsion fibres. It was the capacity of these instruments to respond to a force somehow associated with heat that made them so promising as detectors of psychic force. They embodied Crookes's declaration of 1870 that the delicate instruments of the physical sciences were the ultimate court of appeal in judging the mechanical effects of spiritualism.

There is no *direct* evidence to suggest that Crookes's prior quest to show psychic force without mediums inspired the particular instrumental strategies that he and Gimingham adopted after the discovery of the anomalous heat action. But it is likely that Crookes's parallel psychical and physical investigations were nurturing each other at this stage – the psychical investigations dramatising the existence of exciting new forces

[54] The earliest surviving notebook from the 1870s is from the period July 1875 to December 1877 but contains no references to od or spiritualism: William Crookes, Laboratory Notebook IV, MS / 0410, William Crookes Papers, Science Museum Group Collection.

[55] William Crookes, 'Researches on the Atomic Weight of Thallium', *Philosophical Transactions of the Royal Society of London*, vol. 163 (1873), pp. 277–330.

[56] Brock, *William Crookes*, chapter 9; Robert K. DeKosky, 'William Crookes and the Quest for the Absolute Vacuum', *Annals of Science*, vol. 40 (1983), pp. 1–18.

to be discovered, and the physical investigations suggesting new possible ways of persuading scientific audiences of their reality. The fertile effect of psychical ideas on Crookes's physical research is apparent from his correspondence with Gimingham and the Irish chemist James Emerson Reynolds. In October 1871, he urged Gimingham to explore the effect on one of his delicate instruments of "hot water[,] spirit lamp[,] magnesium wire[,] your fingers, &c.[,] as well as magnets[,] crystals &c", and over a year later was still "very anxious to ascertain if there are any causes" of the deflection of a kyanite needle suspended in a highly exhausted apparatus "which are *not* due to heat".[57]

Crookes's choice of candidate sources for the effect, and his emphasis on causes besides heat and those associated with the human body, is telling: they suggest a strong debt to Reichenbach's od, a force which the German chemist had, in the late 1860s, linked to the movement of material bodies at a distance, as well as magnetism, heat, light, vitality and crystalline action.[58] He shared his interest in Reichenbach with Reynolds, and this exchange may well have resulted in Reynolds lending Crookes a "little instrument" that showed, more decidedly than anything Crookes had then built, an unexpected repulsive force produced by the hand and other sources of heat.[59] Crookes's and Reynolds's interest in od clearly owed much to the fact that Reichenbach and his greatest English champion (William Gregory) were respected chemists, and their exchanges illustrate the seriousness with which they took Reichenbach's insistence on the inclusion of od within the "domain of physics".[60]

A telling insight into the psychical uses to which Crookes put his instruments is provided by the statistician Francis Galton, who, in spring 1872, attended seances with Home and Katherine Fox at Crookes's house. What intrigued Galton was that at one point during his encounter with Fox, Crookes brought out instruments comprising "needles" suspended in evacuated glass bulbs, and that the needles were both attracted and repelled by the finger, especially if, as Galton told his cousin Charles Darwin, the "operator" was "bright and warm and comfortable after

[57] William Crookes to Charles H. Gimingham, 8 October 1871 and 9 November 1872, MS/0409, William Crookes Papers Science Museum Group Collection.

[58] Reichenbach discussed the mechanical action of od on pendulum bobs in *Die odische Lohe und einige Bewegungserscheinungen als neuendeckte Formen des odischen Prinzips in der Natur* (Vienna: Wilhelm Braumüller, 1867), pp. 39–80.

[59] William Crookes, 'On Attraction and Repulsion Resulting from Radiation', *Philosophical Transactions of the Royal Society of London*, vol. 164 (1874), pp. 501–27, p. 505. Reynolds's instrument comprised a glass flask in which a deal slip was suspended from a thin fibre. See also Crookes to Gimingham, 9 November 1872.

[60] Reichenbach, *Researches on Magnetism*, p. 3.

dinner".[61] More intriguingly, Fox reputedly had a greater effect on the needles than either Crookes or Galton. The "grand discovery" that Galton claimed Crookes thought he had made was undoubtedly that there was a new force exuded by the body, but Crookes knew that to persuade the scientific world of this was going to require much more work.[62] Having suffered so much scientific hostility towards his psychic force research, he needed to regain the confidence of senior colleagues in his experimental abilities, a goal towards which his painstaking work on thallium's atomic weight would soon move him. Achieving this goal via a new instrumental display of psychic force was going to be difficult because such an apparatus needed convincingly to show the new force independently of known physical forces and of the bodies and spaces of Crookes's domestic spiritualistic enquiries.[63]

The intense work that Crookes and Gimingham devoted to the anomalous mechanical action of heat from spring 1872 eventually gave them considerable control over the effect, but no convincing evidence that it was anything other than something arising from known invisible and visible forms of radiation (notably, heat and light). By August 1873, when he submitted his first paper on the anomalous heat effect to the Royal Society, Crookes was confident that the quality of the vacuum he and Gimingham had achieved within his delicate indicators justified the argument that convection currents were not plausible causes, but he was also somewhat disappointed to report that he had not "yet been able to get distinct evidence of an independent force (not being of the nature of heat and light)".[64] What finally persuaded him that his delicate instruments were not detecting psychic, od or any other "independent" force was that with delicate instruments (notably a pith index suspended within a glass tube) exhausted by Gimingham's powerful version of the Sprengel vacuum pump, inorganic sources were as effective as living bodies in producing the mechanical effect. Tubes of warm water, for example, produced the same results as fingers.

In a second paper accepted for the Royal Society's *Philosophical Transactions*, Crookes summarised this significant conclusion in the

[61] Francis Galton to Charles Darwin, 28 March 1872, cited in Karl Pearson (ed.), *The Life, Letters and Labours of Francis Galton*, 3 vols. (Cambridge University Press, 1914–30), vol. 2, p. 63.

[62] Galton to Darwin, 28 March 1872.

[63] Darwin well understood this objective. He told Galton that the "question" of a new bodily power would be "settled at once" if Crookes could build an apparatus that could be sold by an instrument maker for everyone to try for themselves: Charles Darwin to Francis Galton, 21 April [1872], Frederick Burkhardt et al. (eds.), *The Correspondence of Charles Darwin, vol. 20 1872* (Cambridge University Press, 2013), pp. 168–9, p. 169.

[64] Crookes, 'Attraction and Repulsion', p. 523.

passage that Thomson criticised for illustrating the author's spiritualistic "delusions":

> Many persons believe that there is a peculiar emanation or aura proceeding from the human hand and Baron von Reichenbach considered that he had proved this to be the case. Were this true it was not impossible that the emanation would affect the pith index. I have been unable, however, to detect the slightest action exerted by my or any other person's hand which I could not entirely explain by heat.[65]

This was one of the few places where Crookes publicly revealed the entanglement of his psychical and physical researches, but it was more ambiguous than many readers might have assumed. He was indeed announcing that his instruments had failed to detect od or a similar bodily force and that any effect originally ascribed to such a force was due to the anomalous mechanical action of radiation, but he was not ruling out the possibility that od existed and was detectable by other means, a position which Stone, Varley and other physical–psychical scientists endorsed.[66]

The ambiguity of Crookes's conclusion about od is supported by the fact that long after 1875 he defended his original claims about psychic force and believed in the existence of a "residuum of fact" pointing to "other kinds of force than what physicists are accustomed to deal with".[67] He did so despite the fact that he had not been able to achieve with psychic force what he would with the anomalous mechanical action of radiation: to convince senior scientific colleagues of its objective reality and to embody the effect in instruments that were not contingent on particular spaces and persons.

The series of papers on radiation that Crookes submitted to the Royal Society from 1873 onwards impressed referees of the calibre of Thomson and Maxwell, who praised the care with which Crookes had been able to isolate, replicate and control the radiation effect and approved the work for publication in the Society's prestigious *Philosophical Transactions*.[68] Thomson judged that Crookes had made a discovery of "transcendent interest and first rate importance", but Crookes's hopes of achieving something even remotely similar with psychic force had started dimming

[65] Crookes, 'Repulsion Resulting from Radiation', p. 526; Thomson, 'Report on Mr. Crookes's Paper'.

[66] Crookes later privately defended Reichenbach: William Crookes to Alfred R. Wallace, 24 May 1877, ff. 139–40, ARW-BL.

[67] Crookes, 'Address by Sir William Crookes', p. 30. Citation from William Crookes to Robert Bulwer-Lytton, 19 November 1891, V16/280, Bulwer-Lytton Papers, Knebworth House Archive, Hertfordshire.

[68] On Maxwell's and Thomson's responses see Brock, *William Crookes*, pp. 162–72; DeKosky, 'William Crookes and the Quest for the Absolute Vacuum'.

in 1873.[69] Although his instrumental approach to the subject had raised the hopes of Barrett, Rayleigh and others for a genuinely scientific approach to spiritualism, he could no longer rely on the most powerful and reliable source of the psychic force: Home.[70] Until mid-1873, the medium had continued giving seances for Crookes and other British-based spiritualist enquirers who were impressed with his usual manifestations of raps and levitating objects as well as rarer effects such as handling hot coals and displaying ghostly human figures.[71] However, after this time, Home was unavailable for seances owing to deteriorating health and an increasing devotion to foreign travel.[72] Most other spiritualist mediums were evidently not attractive alternatives because, unlike Home, they lacked "extraordinary powers" and a willingness to be subjected to close scrutiny, and behaved in ways likely to threaten a newly restored scientific reputation.[73]

For Crookes, the radiation researches were proving so important to his professional objectives and so time-consuming that, as well as burdensome commitments to a host of other scientific, journalistic and commercial enterprises, they took priority over the spiritualistic inquiries that partly inspired them and whose credibility hinged on them. As he explained to one prominent American spiritualist in early 1875: "I *dare* not (for my reputation's sake) omit prosecuting physical research, that is the only thing which will cause my spiritualistic publications to be looked at by men of science".[74] By the end of the year, Crookes had another good reason to think that his strategy was working, since his radiation researches had secured him the Royal Society's prestigious Royal Medal.[75]

The radiation researches, however, were far from being the unproblematic sources of scientific credibility that this honour implied. They prompted heated debate about whether radiation alone or trace gases in 'evacuated' vessels coerced by radiation caused the mechanical effects,

[69] William Thomson to George G. Stokes, 18 February 1874, RR/7/294, Royal Society Archives.

[70] See [Barrett], 'Science and Spiritualism'; Rayleigh, 'Presidential Address', p. 278. Crookes's instrumental tests may have inspired a simple mechanical apparatus that Rayleigh built to test the movement of tables: see Eleanor Sidgwick to Gerald Balfour, 7 February [1876], GD433/2/449/2/7–8, Papers of the Balfour Family of Whittingehame, National Records of Scotland.

[71] Medhurst, *Crookes and the Spirit World*, pp. 203–20.

[72] Home, *D. D. Home*, pp. 206–30.

[73] Crookes quoted in [Anon.], 'Discussion of Professor Lodge's Paper', p. 345.

[74] William Crookes to Robert Dale Owen, 2 January 1875, L122, Robert Dale Owen Papers, Indiana State Library. I owe this reference to Bill Brock.

[75] [Anon.], 'Anniversary Meeting', *Proceedings of the Royal Society*, vol. 24 (1874–5), pp. 70–121, pp. 91–3.

and which explanation Crookes advocated.[76] One of the most spectacular instruments that Crookes and Gimingham built for the research was the radiometer. Comprising an evacuated bulb in which black and white vanes spun around a central pivot when exposed to heat or light, the radiometer was built and marketed by instrument-makers for the wealthier and more scientifically minded consumer. It advertised Crookes's ability to bottle and export a puzzling effect well beyond his laboratory, an effect that at least one scientific observer believed was even more wonderful than the physical phenomena of spiritualism.[77] But the radiometer's puzzling behaviour exposed it to enormous scientific scrutiny and would spark further controversies over the precise cause of the effect and over Crookes's continuing and apparently delusive attachment to mysterious forces.

Tying Mediums with Electricity

In his second (1875) *Philosophical Transactions* paper on the mechanical action of radiation, Crookes explained that to eliminate the possibility that the movements of a delicate torsion apparatus were due to static electricity, he had built an apparatus suggested by Cromwell Varley but found no evidence of the supposed connection.[78] This was not the first time that year that Crookes had borrowed the electrician's suggestions for an apparatus that might limit interpretations of mysterious effects. In early March 1875, over a week before submitting the radiation paper to the Royal Society, he had published an account of his adaptation of Varley's 'electrical test' of the spiritualist medium Florence Cook.[79] Like Varley's electrical test, this seemed to yield evidence in favour of the sensational powers of another young female medium – Annie Eva Fay – whose genuineness had been severely questioned inside and outside spiritualist circles. Less ambitious than Crookes's psychic force investigations – they were designed to evidence the absence of fraud rather than the presence of a new force – the electrical tests further highlight the extent to

[76] Brock, *William Crookes*, chapters 9 and 12.

[77] After attending a Royal Society soirée in 1874 featuring Crookes's experiments, Maxwell reported to his friend Tait that the repulsive effects associated with radiation "whip spirits all to pieces". James Clerk Maxwell to Peter G. Tait, late April 1874, in Harman (ed.), *Scientific Letters and Papers of James Clerk Maxwell*, vol. 3, pp. 66–7, p. 66.

[78] Crookes, 'On Repulsion Resulting from Radiation', p. 546.

[79] William Crookes, 'A Scientific Examination of Mrs. Fay's Mediumship', *Spiritualist*, vol. 6 (1875), pp. 126–8. Harrison promoted the results of Varley's test as Cromwell F. Varley, 'Electrical Experiments with Miss Cook When Entranced', *Spiritualist*, vol. 4 (1874), pp. 134–5.

which physical–psychical scientists saw the physical sciences as a resource for tackling the problems of psychical experiment.

Both Crookes and Varley had published the results of their electrical tests in the *Spiritualist*, a leading spiritualist weekly whose editor, William H. Harrison, diverged from many spiritualists in the vigour with which he championed the use of scientific instruments in better understanding mediumship and establishing the laws underlying spirit manifestations.[80] The choice of publishing venue suggests that Crookes and Varley did not think the results of these tests were appropriate for the scientific audiences at whom Crookes had aimed his psychic force researches. I want to suggest two main reasons for this. First, the *Spiritualist* was one of the most vigorous public platforms for accounts of the principle mediums involved, and it welcomed the electrical tests as crucial interventions in its debates on these mediums' abilities. Second, and more significant, the performances of Cook and Fay were highly controversial, and Varley and Crookes were evidently not prepared to risk their professional reputations by engaging scientific audiences with studies on phenomena that even scientists sympathetic to spiritualism found hard to accept.

Born in London in 1856, Florence Cook rose to become one of the most extraordinary materialisation mediums of the late Victorian period.[81] By the early 1870s, several mediums seemed to be able to materialise 'spirit forms' that resembled human faces and hands, and were anything from solid to vaporous to touch. The faces often spoke and the hands sometimes wrote and carried objects. By December 1873, when Crookes had been attending Cook's seances for nearly 20 months, the 17-year-old girl could, when entranced, fully materialise the spirit of a young woman that she claimed controlled her.[82] The spirit called itself 'Katie King', a familiar visitor to late-nineteenth-century seances who claimed to be the daughter of Henry Owen Morgan, the seventeenth-century Welsh-born Lieutenant-Governor of Jamaica. Clothed in white robes and headdress, it breathed, had a pulse, walked, talked, joked and interacted with seance-goers. An important feature of Cook's performances was the use of a darkened cabinet. Often an improvised wooden construction or a room flanking the main seance area, the 'cabinet' was where some mediums sat during seances and was often required by them for channelling the subtle energies required to produce startling

[80] For example, William H. Harrison, 'The Work of a Psychological Society', *Spiritualist*, vol. 1 (1869–71), pp. 206–7.

[81] On Cook see R. G. Medhurst and K. M. Goldney, 'William Crookes and the Physical Phenomena of Mediumship', *PSPR*, vol. 54 (1964), pp. 25–157, pp. 48–89; Owen, *Darkened Room*, chapter 3.

[82] Medhurst and Goldney, 'William Crookes', pp. 63–4.

manifestations. To prevent this delicate process being upset, seance-goers were usually prohibited from entering or shining a light into the cabinet.

A measure of exactly how controversial Cook's performances were is suggested by the January 1874 number of the *QJS*, where Crookes summarised his observations of spiritualistic phenomena. There was an account of Home's "phantom" human form but no mention of 'Katie King'.[83] Fully and partially formed materialised spirits seemed too incredible and material even for sympathetic spiritualist enquirers. One attendee at Cook's seances explained that the "difficulty" he had with a materialised spirit form was that it seemed "so thoroughly material and flesh-and-blood like", while Barrett refused to pass judgement on the objective reality and provenance of such "amazing" visitors from the unseen universe.[84] In the case of 'Katie King', the problem of her materiality was compounded by the striking facial resemblance between her and Cook. For many spiritualists, this was not surprising given their belief that spirits borrowed many of their physical and psychological attributes from mediums, but for others the similarity was deeply suspicious and encouraged the method of tethering Cook to her chair or the floor of her cabinet to prevent her from masquerading as her spirit form.[85] This latter method fuelled rather than settled the burning question of Cook's relationship to 'Katie', since many were alarmed to find that after her seances the restraints had been loosened or cut, although this did not resolve the question of whether Cook had *consciously* pretended to be 'Katie'.[86]

Other participants in Cook's seances resorted to more direct methods of exposing what they believed to be fraudulence. During one widely reported seance in early December 1873, a spiritualist called William Volckman grasped 'Katie' and declared it to be the medium. A struggle ensued between Volckman and other participants which led to 'Katie' fleeing to the cabinet and the seance being prematurely terminated. Volckman's actions were not entirely self-motivated. He was an intimate friend of the medium Agnes Guppy, who, like Cook and many other women, saw spiritualist performance as a way of making a career that would provide her with an income, a conspicuous public identity, and powers over male and female visitors to her domestic sphere otherwise denied to her. A medium wielding materialisation powers herself, Guppy

[83] William Crookes, 'Notes of an Enquiry into Phenomena Called Spiritual', *Quarterly Journal of Science*, vol. 3 (New Series), pp. 77–97, p. 90. Crookes clearly intended his instrumental evidence for psychic force to stand independently of these notes.

[84] Charles Maurice Davies, *Mystic London; Or, Phases of Occult Life in the Metropolis* (London: Tinsley Brothers, 1875), p. 346; Barrett, 'Phenomena of Spiritualism', p. 1019.

[85] [William H. Harrison], 'Spirit Forms', *Spiritualist*, vol. 3 (1872–3), pp. 451–4.

[86] Medhurst and Goldney, 'William Crookes', pp. 51–2.

seems to have been so jealous of the performances of Cook and other rivals that she sought to ruin their careers.[87] The Volckman 'exposure' divided spiritualists. Many agreed that his actions were justified in the cause of truth, while Cook's closest supporters (including relatives and *Spiritualist* contributors) were outraged that he had violated his voluntary agreement to comply with the rules of the seance and widely accepted codes of conduct of gentlemen towards women.[88]

Severely shaken by the incident, Cook later recollected that she turned to Crookes, one of her most distinguished sitters, and requested that he subject her to observations and experiments that would determine whether or not she was an "impostor".[89] For her manager, the wealthy spiritualist patron Charles Blackburn, Cook's reputation had been seriously damaged and an intervention by spiritualistic investigators of Crookes's and Varley's stature was desirable. Irrespective of the controversial nature of materialisation, Crookes and Varley clearly found Blackburn's invitation morally very appealing. Impressed by what he had already seen in Cook's seances, Crookes considered lending the "weight of his testimony" to the act of "removing an unjust suspicion" on a young woman who was willing to submit to careful tests and who, by virtue of her being "young, sensitive, and innocent", was unlikely to deceive careful observers.[90] Moreover, he and Varley clearly wanted to demonstrate that a scientific approach to this question, *pace* Volckman and his allies, did not have to violate the specific conditions under which 'Katie' appeared and those of civil society. Indeed, it was Crookes's apparently gentlemanly behaviour, his acceptance of 'Katie's' requests, and refusal to play tricks of a kind made notorious by Tyndall that eventually persuaded the medium and spirit to allow him to make more conclusive scientific tests, which involved relaxing the rules about entering the 'cabinet' and a greater degree of physical intimacy between the scientist and his subjects.[91]

The main purpose of Varley's electrical test was to establish the bodily relationship between Cook and 'Katie', a question that Crookes had already started to address with an observation of 'Katie' at the precise

[87] Medhurst and Goldney, 'William Crookes', pp. 57–61; Owen, *Darkened Room*, pp. 66–7.
[88] J. C. Luxmoore, 'The Outrage at a Spirit Circle', *Spiritualist*, vol. 3 (1872–3), p. 491; Henry Edward Thompson, 'Grasping a Spirit', *Medium and Daybreak*, vol. 4 (1873), pp. 598–9.
[89] Cook quoted in [Anon.], 'Miss Florrie Cook', *Two Worlds*, vol. 10 (1897), pp. 173–4, p. 185.
[90] William Crookes, 'The Outrage at a Spirit Circle', *Spiritualist*, vol. 4 (1874), p. 71.
[91] [Anon.], 'Miss Florrie Cook', p. 185; William Crookes, 'Spirit Forms', *Spiritualist*, vol. 4 (1874), pp. 158–9, p. 159. Crookes revealed his obedience to 'Katie's' "orders" in William Crookes to Mr. Noyes, 10 March 1874, Rayleigh Family Papers, Terling Place, Terling, Essex.

moment that he had heard what he believed to be Cook's sobbing sounds from within the cabinet.[92] The test was effectively a remote sensing device that permitted investigators to gauge what Cook was doing without violating the crucial condition of not entering or illuminating the cabinet. Staged in the London home of one of Cook's closest supporters, John Chave Luxmoore, the equipment comprised a small battery of electrical cells, wires and a "regular cable testing apparatus".[93] The latter comprised standardised electrical resistance coils and a 'reflecting' galvanometer that measured tiny currents in terms of the position of a spot of light on a graduated scale, and was the very equipment on which Varley had built his scientific reputation.[94] Indeed, in declaring that "Miss Cook took the place of a telegraph cable under electrical test", Varley wanted to extend his hard-won authority as an investigator of hidden electrical circuits from oceanic depths to mediums' cabinets.[95] He was also allying himself with an increasing number of medical practitioners, physiologists and electricians who believed that the human body was a mass of electrically resisting material whose properties could be measured with electrical instruments.[96]

Affixed to Cook's wrists were electrical contacts made from sovereigns and blotting paper moistened with an alkaline solution. Wires led from the contacts, under thick curtains separating a room functioning as her darkened cabinet, to a gas-lit room where the cable-testing equipment and participants were situated. To render the movements of the galvanometer spot more meaningful, Varley calibrated it before the seance commenced. He noted that once connected, Cook's bodily resistance produced a deflection of 220 divisions; that the drying of the blotting paper produced a steady decline in this reading; and that shorting the circuit produced a decided deflection of 300 divisions. More significant, when Cook moved her hands the galvanometer spot moved between 15 and around 30 divisions, but when the circuit was broken the spot moved over 200 divisions. Varley now had the measurements required to establish whether Cook escaped from his electrical tether.

During the 45-minute test, Varley occupied himself with the galvanometer readings, Crookes and Luxmoore observed 'Katie', and Harrison recorded vocalised observations. Varley's suspicions were aroused at around 36 minutes when the movement of 'Katie's' arms corresponded

[92] Crookes, 'Outrage at a Spirit Circle'. [93] Varley, 'Electrical Experiments', p. 134.
[94] Varley's reputation is evident from numerous electrical manuals of the period: see, for example, Latimer Clark and Robert Sabine, *Electrical Tables and Formulae* (London: E. & F. N. Spon, 1871), pp. 43–4.
[95] Varley, 'Electrical Experiments', p. 134.
[96] Morus, 'Physics and Medicine', pp. 688–9.

with a spot movement of 17 divisions, but were removed by what he considered a few "excellent" tests several minutes later: the spot did not move more than one division when 'Katie' touched Crookes's head, wrote on and threw some paper, and repeatedly opened and closed her fingers.[97] He was evidently equally impressed by the fact that the galvanometer spot had never shown any of the large movements associated with circuit breakage. Varley left it to *Spiritualist* readers to draw their own conclusions from his report, which offered proof that Cook and 'Katie' were bodily distinct and implied that Cook was a genuine medium. For some spiritualists, the test was a welcome vindication of a cherished medium, but there remained many others who criticised it for being beyond the expertise and pocket of most spiritualists, who had long held that simple tests using sight and touch were more meaningful than those with "scientific appliances".[98]

Harrison and Crookes were, predictably, among the most enthusiastic champions of Varley's test. A former telegraph operator himself, Harrison sought to reassure *Spiritualist* readers with his own supportive testimony: he saw no tell-tale wires trailing behind 'Katie' or any deflection of the galvanometer spot when she dipped her hands into a bowl of alkaline solution (which would have shorted the circuit).[99]

For Crookes, the test confirmed the conclusions he was drawing from a long series of test seances that Cook had been giving in his house since December 1873.[100] As in the Home seances, the domestic setting gave Crookes greater control over his experimental subject and her performance space. He could more effectively safeguard his investigations against potential trickery, which included searching and locking rooms, and delegating to his wife Ellen some of the responsibility for observing and holding the medium, and the obviously delicate duty of checking Cook's body for hidden props.[101] With his locked library functioning as the darkened cabinet and his adjacent laboratory as the location for seance participants, Crookes's tests also aimed to establish the bodily relationship of Cook and 'Katie' by more direct means. Owing to the trust that they had in him, Cook and 'Katie' allowed Crookes the rare privilege of entering the cabinet during the seance, to see and touch the figure in the gloom that was purportedly Cook, and to illuminate her and 'Katie' with the light of a phosphor lamp. By seeing

[97] Varley, 'Electrical Experiments', p. 135.
[98] Benjamin Coleman, 'Spirit Forms', *Spiritualist*, vol. 4 (1874), p. 177; citation from [James Burns], 'Electrical Tests with Miss Cook When Entranced', *Spiritual Magazine*, vol. 9 (New Series) (1874), pp. 161–8, p. 168.
[99] [William H. Harrison], 'Miss Cook's Mediumship', *Spiritualist*, vol. 4 (1874), pp. 133–4.
[100] Crookes told the American spiritualist Epes Sargent that he organised over forty such seances: see note 43.
[101] Ellen Crookes's role is documented in Medhurst and Goldney, 'William Crookes', pp. 63–70.

'Katie' only seconds after touching and seeing what he believed to be Cook, Crookes was even more confident in the medium's honesty. 'Katie' also allowed him to take a long series of photographs in the seance, which Crookes used to argue for the "absolute certainty" of the medium and the spirit having separate bodies (Figure 4.2).[102] Like Varley's, Crookes's conclusion conspicuously avoided the question of 'Katie's' alleged spiritual provenance. Many spiritualists took the verdict as further evidence for 'Katie's' reality *qua* spirit of the dead, but it did not give Crookes the proof of the survival of deceased personalities that he had been seeking for several years.[103]

The context within which Crookes publicly praised Varley's test was his adaptation of it for testing Annie Eva Fay. Five years Cook's senior, Ohio-born Fay came to London in 1874 and gave public performances of her sensational abilities to move untouched objects while tied to a chair.[104] Fay was hardly unique in her apparent telekinetic powers, but the regularity and power with which she displayed them drew the attention of Crookes, Myers, Henry Sidgwick and other scientific enquirers into spiritualism. What made her so controversial, however, was that she performed for a fee (and such mediums were generally suspected of being more tempted to defraud their audience) and behaved in other ways that put her closer to the world of popular stage magic than the domestic seance. Few would have been surprised that the leading 'anti-spiritualist' magicians of the day, John Nevil Maskelyne and George Cooke, claimed to have made an "exact re-production of all Miss Fay's tricks".[105] In the midst of private seances with her, Sidgwick told Myers that he thought the decision to advertise her as an "entertainer" rather than a "medium" was "degrading and humiliating", and he found her father–manager to have "Tradesmanlike Dignity".[106] Sidgwick's distaste ultimately prompted him to focus his spiritualistic enquires elsewhere, but Myers, Crookes, Rayleigh and others had more confidence in her character and persuaded her to give them a series of private seances.

[102] William Crookes, 'The Last of Katie King. The Photographing of Katie King by the Aid of the Electric Light', *Spiritualist*, vol. 4 (1874), pp. 270–1, p. 271. Crookes described rather than reproduced these photographs because Cook and 'Katie' only allowed them to be taken if they were circulated privately: Medhurst and Goldney, 'William Crookes', p. 149.

[103] William Crookes to Madame B[oydanof], 1 August 1874, in [Anon.], 'Sir William Crookes on "Invisible Intelligent Beings"', *Light*, vol. 20 (1900), p. 223. Boydanof's identity is suggested by Fournier d'Albe, *Life of Sir William Crookes*, p. 180.

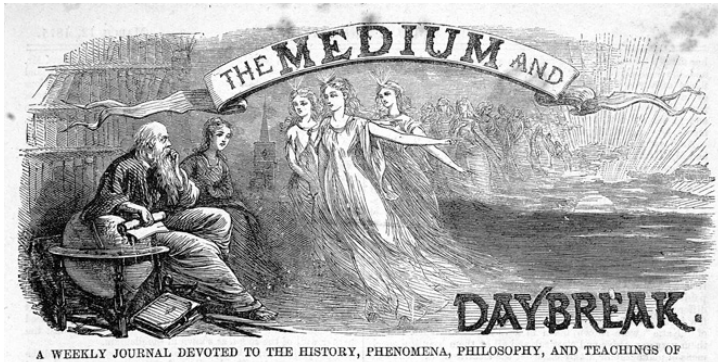
[104] For Fay see Barry H. Wiley, *The Indescribable Phenomenon: The Life and Mysteries of Annie Eva Fay* (Seattle, WA: Hermetic Press, 2005).

[105] John Nevil Maskelyne, *Modern Spiritualism: A Short Account of Its Rise and Progress, with Some Exposures of So-Called Spirit Media* (London: Frederick Warne and Co., 1875), p. 121.

[106] Henry Sidgwick to Frederic W. H. Myers, n.d., Add. MS.c.100[136], Henry Sidgwick Papers, Trinity College Library, Cambridge.

4.2 The only known 'double' photograph that Crookes made to compare the heights of Florence Cook and 'Katie King'. The figures, including Crookes arm-in-arm with his experimental subjects, were photographed at the curtain dividing Crookes's laboratory (in the foreground) from his library (which functioned as Cook's darkened room). Reproduced by permission of the Estate of Emil Prinz zu Sayn-Wittgenstein-Berleburg, Private Collection, Gerd H. Hövelmann, Marburg.

The most elaborate of these seances involved the electrical test and these took place in Crookes's house on several evenings in February 1875 (Figure 4.3). Similar to the Cook seances, Fay sat on a chair in a locked and darkened library whilst seance participants sat in his gas-lit laboratory,



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 that 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

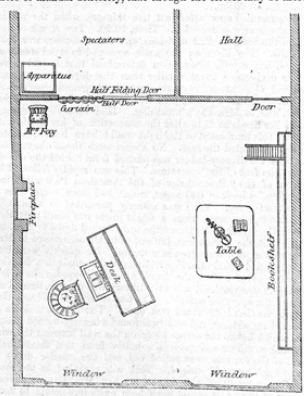
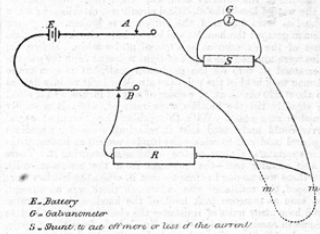


DIAGRAM OF MR. CROOKES'S LIBRARY.

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 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



E. Battery
G. Galvanometer
S. Shunt to cut off more or less of the current in order to regulate the deflection of the Galvanometer
R. Box of Resistance Coils
mm'. Wires passing to Medium
A&B. Keys to make and break contact
A is always closed and used only to correct or check Zero.
B pressed down puts the resistance coils 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 o 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.

4.3 The *Medium and Daybreak*'s account of Crookes's electrical test of Annie Eva Fay. On the left is a plan of the first floor of Crookes's house, showing a large room (his library) that Fay used as a darkened room, and a small adjoining room (his laboratory) where Crookes and the "spectators" located themselves. On the right is a diagram of the apparatus, with the dotted lines representing the part of the circuit held by Fay. From [James Burns], 'A Scientific Seance – The Electrical Test for Mediumship', *Medium and Daybreak*, vol. 6 (1875), pp. 161–3, p. 161. Reproduced by permission of the Bodleian Libraries, University of Oxford.

divided from the library by a curtain. The only significant change that Crookes made to Varley's apparatus was that the medium was asked to hold onto two brass handles covered in cloths soaked in salt water and fixed to a table near the laboratory entrance. Any hand movements greater than an inch were immediately registered as suspicious movements of the galvanometer spot. Crookes also went to much more effort than did Varley to raise the scientific credibility of his experimental spaces. In addition to staging the tests in the laboratory now renowned for many scientific discoveries, he secured the assistance of several unnamed scientific participants (later identified as Galton, Huggins and Rayleigh).[107] Two such participants were also used to calibrate the apparatus: they attempted to fool the galvanometer by connecting the brass handles with a damp handkerchief, but neither could do so without causing tell-tale movements of the galvanometer spot. For Harrison, this powerfully captured Varley's and Crookes's implicit argument that the authority of the electrical test could be transferred from telegraphy to spiritualism: even if the medium had been an "accomplished electrician", they could not have fooled an instrument capable of detecting the tiny currents emerging from 2000-odd miles of Atlantic cable.[108]

During the test seances, Crookes stood near the curtain whilst other participants observed the galvanometer. Despite the occurrence of some startling effects – rapping noises, a hand-bell ringing in the library and a disembodied hand offering copies of books to the authors who happened to be present – the galvanometer spot never moved more than about 60 divisions from its starting point and neither sank to zero (corresponding to broken contact) nor flew off the scale (corresponding to a short circuit).[109] As far as Crookes was concerned, none of the spot movements suggested anything suspicious about Fay or, indeed, her "slightest movement".[110] His conclusion was not much less ambiguous than Varley's about Cook: he was more explicit in denying that the medium could have produced the effects fraudulently but was as reticent as the telegraph engineer as to the provenance of the medium's abilities.

[107] Galton's identity is revealed in Edward Cox, *The Mechanism of Man: An Answer to the Question of What Am I?*, 2 vols. (London: Longmans and Co., 1876–9), vol. 2, p. 447. Huggins's identity is implied by Crookes in his 'Scientific Examination', p. 127. Rayleigh's identity is revealed in Rayleigh, *Life of Lord Rayleigh*, p. 68.

[108] William H. Harrison, 'Electrical Tests Popularly Explained', *Spiritualist*, vol. 6 (1875), pp. 135–6, p. 136.

[109] The books were Edward Cox's *What am I? A Popular Introduction to Psychology and Philosophy*, Francis Galton's *The Art of Travel, or, Shifts in Contrivances Available in Wild Countries*, and William Huggins's edition of Heinrich Schellen's *Spectrum Analysis in Its Application to Terrestrial Substances and the Physical Constitution of Heavenly Bodies*.

[110] Crookes, 'Scientific Examination', p. 128.

Crookes's *Spiritualist* account of the Fay tests would be his last substantial publication on spiritualism for over a decade. He certainly did not abandon the subject, as testified by the private seances he continued to attend with Cook and other mediums and the ongoing inclusion of spiritualistic and more broadly occult subjects in his *QJS*.[111] He and Varley had persuaded some spiritualists that the authority of cable-testing equipment had been transferred to the seance and yielded powerful evidence for Cook's and Fay's genuineness, but most spiritualists maintained that simpler tests of mediumship carried at least as much authority.[112]

Much more troublesome, however, were critics who questioned the integrity of the test and suspected that mediums could still have evaded it. In 1881 the American spiritualist F. F. Cook told an audience of leading British spiritualists that the electrical tests had "no scientific value" in the light of the "seriously compromised" reputations of Cook and Fay, even though this did not undermine the truths of spiritualism.[113] Some of F. F. Cook's auditors would have been painfully aware of allegations about these mediums. In 1875, Florence Cook's honesty was called into question when Mary Rosina Showers, a medium with whom she often gave joint seances and whose honesty Crookes had already questioned, told Fay that she had used fraudulent means to exhibit a materialised spirit, while in 1880 Cook herself was found impersonating a spirit form, although many spiritualists defended her by denying that it was conscious fraud.[114] Doubts about Fay circulated from the mid-1870s onwards and caused Crookes more difficulties: Myers thought she was an "undoubted cheat" despite accepting the robustness of the electrical test, and in 1877 Crookes was forced to defend her against allegations that she was an impostor who had evaded the test.[115]

[111] For Crookes's later seances see Medhurst and Goldney, 'William Crookes', pp. 66–74. Examples of this material in the *QJS* (which changed its name to *Journal of Science* in 1879) are: [Anon.], 'Human Levitation', *Quarterly Journal of Science*, vol. 5 (New Series) (1875), pp. 31–61; [Anon.], 'Occultism Reconsidered', *Journal of Science*, vol. 4 (1882), pp. 404–9, 441–6; 'R. M. N.', 'Psychography', *Journal of Science*, vol. 7 (1885), pp. 143–9. His next major publication was Crookes, 'Notes of Séances'. However, this was a transcription of selected notes he took during Home seances in the early 1870s.

[112] Examples of positive responses are: [James Burns], 'A Scientific Séance – The Electrical Test of Mediumship', *Medium and Daybreak*, vol. 6 (1875), pp. 161–3; Epes Sargent, *Proof Palpable of Immortality* (Boston: Colby and Rich, 1876), p. 100; Alfred Russel Wallace, *Miracles and Modern Spiritualism* (London: James Burns, 1875), pp. 181–4.

[113] F. F. Cook, 'The Relations of Spiritualism to Science', *Light*, vol.1 (1881), pp. 130–1, 138–9, p. 131. See also G. H. Reddalls, 'Spirit Apparatus', *English Mechanic and World of Science*, vol. 21 (1875), p. 283 and 'Sigma' [John T. Sprague], 'Modern Spiritualism', *English Mechanic and World of Science*, vol. 19 (1874), p. 122.

[114] Brock, *William Crookes*, chapter 11; Medhurst and Goldney, 'William Crookes', pp. 80–3, 105–23.

[115] Medhurst and Goldney, 'William Crookes', pp. 93–4, 103–5.

For Crookes, the cases against Cook, Fay and Showers and associated criticisms of the electrical test were outweighed by serious concerns about his professional and moral integrity. The physical intimacy that he had with young female mediums was accepted by many spiritualists, his relatives (including his wife) and others as a necessary part of creating the harmonious psychological conditions within which these instruments of spiritualism could produce powerful manifestations. It was certainly tolerated by Eleanor Sidgwick, Rayleigh, Myers and others, who, inspired by Crookes's tests of Cook, collaborated on their own tests of materialisation mediums.[116] But for many spiritualist believers, critics and uncommitted enquirers, Crookes's behaviour and writings indicated a degree of attraction to the beauty and charm of female instruments of research that was improper for a married man and fatal for a scientific experimenter. They inspired rumours and more concrete allegations that he had been duped or, worse, deliberately concealed mediumistic trickery in exchange for sexual favours.[117] It was hardly surprising that in late 1875, when these stories posed considerable threats to his moral and scientific standing, he admitted to Home that he was sick of spiritualists' "calumny, slander, backbiting and abuse" and threatened to "cut the whole Spiritual connection".[118]

Far from cutting his connections with spiritualism, Crookes maintained his belief in Cook's and Fay's honesty despite claims to the contrary. But the threat posed by these mediums' reputations to his professional scientific ambitions prompted a new strategy for engaging with psychical topics. From the late 1870s onwards, his public statements on spiritualism, including those defending his earliest investigations, rarely mentioned the Cook and Fay tests.[119] As he told Lodge in 1909, when the younger physicist found himself accused of being driven by "immoral motives" in studying Eusapia Palladino, "hints and rumours" were the "tax" to be paid for studying female mediums and this was why he appealed to his evidence for Home rather than Cook when defending his position.[120] Ultimately, Crookes, like Lodge and other professionally ambitious physical–psychical scientists, was only prepared to pay so much

[116] Sidgwick, 'Results of a Personal Investigation', p. 48. For discussion of these investigations see Gauld, *Founders of Psychical Research*, pp. 107–14.
[117] Medhurst and Goldney, 'William Crookes'; Owen, *Darkened Room*, pp. 228–32.
[118] William Crookes to D. D. Home, 3 November 1875, SPR.MS 28/122, Daniel Dunglas Home Papers, Society for Psychical Research Archive, Cambridge University Library; William Crookes to D. D. Home, 24 November 1875, quoted in Home, *D. D. Home*, p. 218.
[119] See, for example, Crookes, 'Address by Sir William Crookes', p. 30; [Anon.], 'Sir William Crookes on Psychical Phenomena', p. 397.
[120] William Crookes to Oliver Lodge, 5 July 1909, SPR.MS 35/357, OJL-SPR.

of this "tax", even when their personal experiences of particular mediums had been largely positive and there remained some potential for further scientific discovery. When, as was the case with Crookes from the mid-1870s, professional and intellectual rewards could be gained from studying purely physical (but nonetheless troublesome) instruments that did not incur this tax, then it was time to switch resources away from psychical investigation.

Magnetic Sense or Nonsense?

If Oliver Lodge ever read Crookes's *Philosophical Transactions* papers on the mechanical action of radiation, he would have agreed that Reichenbach's od had been absent from these experiments but not killed off. In 1889, during his presidential address to the fledging Liverpool Physical Society, he saw it as one of the "likely-looking avenues" awaiting exploration by the emerging "workers in physics", whose field of labour the Liverpool organisation was helping to define.[121] Alongside the photography of ultra-red radiation, phosphorescence and the newly discovered Hertzian waves, the effect of magnetism on living organisms, which included Reichenbach's claims regarding physiological sensitivity to magnetism, had the potential to lead to anticipated and unanticipated discoveries. While admitting that Reichenbach's claims had not been confirmed by "subsequent observation", Lodge still regarded it as one of the more "physical" aspects of psychical investigation that were accordingly fit subjects for physical enquiry.[122]

Reichenbach's claims had been the subject of many medical and scientific investigations since the late 1840s, but this work had not been conclusive and underpinned much scientific scepticism towards his claims.[123] By the early 1880s, a key effect associated with Reichenbach's work – the sensitivity of the human body to the magnetic field – was still deemed plausible by such scientific savants as William Thomson and George F. FitzGerald. The source of the "subsequent observation" to which Lodge referred, however, was undoubtedly the SPR's 'Reichenbach Committee'. Similar to other SPR committees, this was launched in

[121] Oliver Lodge, 'Presidential Address to the Liverpool Physical Society', *Proceedings of the Liverpool Physical Society*, vol. 1 (1889–92), pp. 1–8, pp. 3 and 5. On the Liverpool Physical Society see Rowlands, *Oliver Lodge*.

[122] Lodge, 'Presidential Address to the Liverpool Physical Society', p. 6. Lodge, 'Address', p. 555.

[123] See discussion of Stone in Chapter 3. In 1879, the British amateur astronomer John Rand Capron announced that his visual tests of magnetic luminosity had failed: J. Rand Capron, *Aurorae: Their Characters and Spectra* (London: E. and F. N. Spon, 1879), pp. 165–6.

January 1882, but unlike its siblings, it was dominated by physical–psychical scientists – Barrett, Stone and Walter Coffin – rather than Myers, Gurney and other members of the Sidgwick group. Published in the SPR's *Proceedings*, the Reichenbach Committee's work was one of the most conspicuous *collaborative* experimental initiatives pursued by physical–psychical scientists, and its trajectory and legacy is the focus of this section.

The Reichenbach Committee's main goal was to make conclusive tests of Reichenbach's claim that some "sensitive" persons experienced visual, thermal and other sensory responses to an unknown "external cause" present in magnets, crystals, the human body and other sources.[124] Although it deemed od to be no more acceptable than mesmeric fluids and other physical hypotheses from which the SPR tended to distance itself, and acknowledged objections that Reichenbach's results were probably due to fraud, the imagination and "hysterical illusion", the Committee maintained that there was sufficient evidence for some of the effects described by the German chemist to justify a "strenuous and exhaustive attempt at their reproduction".[125]

Another source of justification was the potential of Reichenbach's work to connect psychical research to physics. One aspect of his work – the luminosity of the magnetic field – seemed to represent an "actual physical phenomenon" that could be captured independently of potentially unreliable humans whose optical sensitivity enabled them to see the light, and this had a "high scientific interest" beyond the SPR.[126] The latter scientific audiences certainly included physicists. This is suggested by the fact that the Committee's reports included FitzGerald's tentative Maxwellian explanation of magnetic luminosity and William Huggins's suggestions regarding more successful ways of photographing the effect, but also from Barrett's distillation of the Committee's work for the leading British physics journal, the *Philosophical Magazine*, and his attempt to connect it to Rayleigh's recent study of the limits of vision in poor light.[127] Despite its hopes of showing that magnetic luminosity was physically objective, if invisible to most people, the Committee maintained an interest in broader and related issues of the magnetic sensitivity of the human

[124] [Anon.], 'Preliminary Report of the "Reichenbach" Committee', *PSPR*, vol. 1 (1882–3), pp. 99–100, p. 99.
[125] [Anon.], 'Preliminary Report', p. 100. [126] Barrett et al., 'First Report', p. 230.
[127] William F. Barrett, 'Note on the Alleged Luminosity of the Magnetic Field', *Philosophical Magazine*, vol. 15 (5th Series) (1883), pp. 270–5; William F. Barrett to Lord Rayleigh, 22 December 1883, Folder 2, Box #17, Series 4, MS 63, R-USAF. See also Lord Rayleigh, 'On the Invisibility of Small Objects in Bad Light', *Proceedings of the Cambridge Philosophical Society*, vol. 4 (1880–3), p. 324.

body, which inevitably raised questions about the direct effect of magnetism on human physiology rather than of light.

By leading the Committee, Barrett, Coffin and Stone were able to bring together a range of skills associated with the scientific study of magnetism, electricity and the human body. By the late 1870s, Barrett was convinced, from his own experiences of mesmerism and spiritualism, from Crookes's evidence of psychic force, and from other sources that living things exuded an obscure form of radiant energy, although it is not clear whether he (like Crookes) ever associated this with od.[128] Like many nineteenth-century scientists, Barrett was impressed by Reichenbach's 'sensitives', whose high social status and apparent soundness of mind justified the need for further scientific enquiries, which Barrett's friend Alfred Russel Wallace had encouraged him to initiate in 1876.[129] Barrett's interest in Reichenbach certainly dovetailed with his purely physical researches. In the 1860s, he had written much on invisible vibrations and the capacity of some individuals to perceive sounds and lights to which others were insensible, and, the following decade, studied the apparent non-effect of magnetism on the brain and popularised the researches of Faraday and others on the connections between magnetism and light.[130]

The origins of Walter Coffin's interest in Reichenbach are harder to trace, but the Committee's decision to mobilise physical instruments and measurements in the study of magnetic sensitivity was entirely consistent with the strategies he advocated for studying the human body and its relationship with known and unknown forces. Only a few months after the Committee was founded, he supported Stone's and Kilner's call for the use of physical instruments of measurement in clearing up mysteries surrounding electrical and magnetic therapies.[131] In 1874, he had championed Varley's electrical test of mediumship and two years later joined Varley, Harrison and Desmond Fitzgerald on the fledgling Experimental Research Committee of the leading spiritualist organisation of the day, the British National Association of Spiritualists, which staged its own (inconclusive) instrumental tests of the anticipated weight loss of mediums during

[128] Barrett, 'Phenomena of Spiritualism', p. 1019.
[129] Alfred R. Wallace to William F. Barrett, 18 December 1876, in James Marchant (ed.), *Alfred Russel Wallace: Letters and Reminiscences* (London: Cassell and Co., 1916), p. 197.
[130] Barrett, 'Light and Sound'; William F. Barrett, 'A Fragment of Faraday's Electrical Discoveries', in *Science Lectures for the People. Science Lectures Delivered in Manchester. Third and Fourth Series* (Manchester: John Heywood, 1873), pp. 286–303; William F. Barrett, 'On the Points of Contact between Magnetism and Light', *Telegraphic Journal*, vol. 4 (1876), pp. 301–2, 319–20.
[131] See Coffin's remarks in [Anon.], 'Discussion on Dr. Stone's Paper', *Journal of the Society of Telegraph Engineers*, vol. 11 (1882), pp. 118–28, pp. 123–4.

materialisation seances.[132] Coffin's connections with Varley and Harrison probably acquainted him with their unsuccessful attempt of 1875 to photograph "odic flames" near magnets.[133]

Barrett may have been the Reichenbach Committee's chairman and chief reporter but Stone was clearly its main inspiration. Its experiments were effectively continuations of those that Stone had conducted over the previous eight years. In the 1870s, he tried unsuccessfully to detect a physiological response to magnetism by placing his head between the poles of a powerful electromagnet situated in a darkened room.[134] He also reported no evidence of luminosity associated with magnetism, or of a magnetic effect on fluorescent materials and highly sensitive photographic plates.[135] In the early 1880s, Stone followed up these tests in St Thomas's Hospital, whose electrical department he headed. There, his investigations of the therapeutic effect of a powerful electromagnet on a neuralgia sufferer yielded no conclusive evidence for magnetic sensitivity.[136] Stone's interest in magnetic sensitivity survived these further disappointments. He was one of many physicists who considered magnetic sensitivity eminently plausible in light of the new relationships being elucidated between the human body and electricity and, like Barrett, did not dismiss seemingly "trivial" evidence for magnetism's genuine influence on the body.[137] Further investigations of magnetic sensitivity had the potential to bring such "trivial" facts into the realms of scientific knowledge and to curb what Stone and Barrett agreed was the circulation of erroneous ideas about the physiological effect of magnetism by professional and quack medical practitioners.[138] The moral objective of the Committee's leaders was entirely consistent with the SPR's general goal of policing knowledge of obscure phenomena.

Perhaps the most telling indication of Stone's confidence in the future of Reichenbach research was that he allowed the Committee to borrow

[132] Minutes for 9 May 1876, British National Association of Spiritualists, Minute Book No. 1, College of Psychic Studies Archives; William H. Harrison, 'Weighing a Medium During the Production of Spiritual Manifestations', *Spiritualist*, vol. 12 (1878), pp. 210–16. For discussion see Richard Noakes, '"Instruments to Lay Hold of Spirits": Technologising the Bodies of Victorian Spiritualism', in Iwan Rhys Morus (ed.), *Bodies/Machines* (Oxford: Berg, 2002), pp. 125–63, esp. pp. 151–4.

[133] William H. Harrison, 'New Experiments on Odic Flames from Magnets', *Spiritualist*, vol. 7 (1875), pp. 97–8.

[134] Stone, 'On Hysteria and Hystero-Epilepsy', p. 100.

[135] Stone, 'Reichenbach's Experiments'.

[136] Stone, 'On Hysteria and Hystero-Epilepsy'.

[137] Stone, 'On Hysteria and Hystero-Epilepsy', p. 102.

[138] William F. Barret, 'Is There a "Magnetic Sense"?', *Dublin University Review*, vol. 1 (1886), pp. 23–34, p. 34; William H. Stone, 'The Physiological Bearing of Electricity on Health', *Journal of the Society of Telegraph Engineers*, vol. 13 (1884), pp. 415–32, esp. pp. 418–19.

one of his large electromagnets and to stage its experiments in his home in Dean's Yard, Westminster – the same place where, from 1882 to 1887, the SPR rented rooms for its administrative headquarters.[139] For all his enthusiasm, however, Stone was conspicuously absent from the Committee's work undoubtedly because, following a severe stroke in October 1882, he was mentally and physically incapacitated.[140] Stone's illness left him permanently weakened and this dealt the Committee a blow from which it never fully recovered.

Held in early January 1883, the Committee's experiments were similar to Stone's of 1874 in two important respects: first, they tested whether individuals could see luminosity near an electromagnet in a "perfectly darkened" room, the electromagnet being excited from a battery and commutator in an adjacent room whose entrance was covered with "darkening screens"; second, the individuals tested included trained scientific investigators, thus responding to criticisms that witnesses to Reichenbach's phenomena tended to be persons of unsound mental constitution.[141] Over 45 people were tested, including Committee and other SPR members, and each person sat in the darkened room for 2½ to 3 hours (partly to allow visual accommodation to the darkness). Of these, only three reported seeing "luminous appearances", but their performances in subsequent tests seemed equally impressive.[142] In these tests, Coffin and two other Committee members randomly and silently switched the electrical circuit and recorded anything said by the test subjects, whilst Barrett and three others sat in the darkened room. All three subjects claimed that from the upward-pointing poles of the electromagnet streamed an unsteady luminosity roughly in the shape of an inverted cone, and which could be deflected by the breath. One subject, George Albert Smith, whose mesmeric and thought-reading powers were being investigated by the SPR, particularly impressed the Committee because on 14 consecutive occasions his reports of luminosity were simultaneous with the electromagnet being excited.

The Committee was satisfied that this first round of experiments constituted a "*primâ facie* case" for magnetic luminosity "visible only to certain individuals".[143] Similar to the SPR's arguments for telepathy, its case for luminosity rested on a probabilistic argument against the effect being due to chance coincidence and on a general satisfaction with the

[139] [Anon.], 'Meeting of Council', *JSPR*, vol. 1 (1884), p. 33. The SPR relocated to rooms about one kilometre away in Buckingham Street in 1887: [Anon.], 'Meetings of Council', *JSPR*, vol. 3 (1887–8), pp. 149–50.
[140] William H. Stone, 'Some Effects of Brain Disturbance on the Handwriting', *Saint Thomas's Hospital Reports*, vol. 12 (1882), pp. 67–75.
[141] Barrett et al., 'First Report', pp. 230 and 232.
[142] Barrett et al., 'First Report', p. 231. [143] Barrett, 'First Report', p. 236.

experimental conditions. The Committee emphasised that the probability against Smith rightly guessing the state of the magnet on successive occasions was several million to one. It was also satisfied that it had eliminated sources of potential trickery and experimental error. Smith could not have determined the state of the magnet from magnetic materials secreted about his person because a search of his clothes revealed no such materials, which, even had they been found, would not have greatly assisted Smith at his distance from the electromagnet. It was also concluded that Smith was unlikely to have surreptitiously used a compass because he had entered the darkened room ignorant of the nature of the experiment and had persuaded the Committee of his "good faith".[144] Barrett also insisted that Smith could not have used the faint ticking sounds accompanying magnetisation because Smith was unlikely to have had knowledge of this effect and, even if he had, he would have been seen placing his ear against the magnet to make fraudulent use of it.[145] In this sense, knowledge of magnetism was thought to be no more useful in achieving deception in this trial than electrical knowledge in the Varley–Crookes tests.

The Committee was disappointed to report that they had not been able to repeat these performances under what they believed to be "identical circumstances", and suggested that this might be due to "physiological conditions" exceeding their knowledge and control.[146] Neither had Huggins succeeded in helping them to produce photographic evidence of luminosity.[147] These results would have severely weakened the Committee's hopes of capturing a purely physical effect, but they did not stop Barrett from investigating the less purely 'physical' and more physiological question of Smith's sensitivity to magnetism. In these studies, Smith claimed that the magnetism from an electromagnet affected his eyes and temples, and used this effect to correctly identify, on 21 successive occasions, when a current to an electromagnet was made or broken. Barrett invited Smith to help him repeat this in his physics laboratory in Dublin. There, Smith and "several others" failed to experience anything due to magnetism, but on 10 out of 12 occasions Smith correctly determined when the magnetism was excited, even though Barrett was convinced he could not have known this from visual or auditory clues.[148]

[144] Barrett, 'First Report', p. 233.
[145] Barrett, 'First Report', p. 233. Barrett had researched this effect in the 1870s: William F. Barrett, 'On the Molecular Changes That Accompany the Magnetisation of Iron, Nickel and Cobalt', *Philosophical Magazine*, vol. 47 (4th Series) (1874), pp. 51–6.
[146] Barrett, 'First Report', p. 235. [147] Barrett, 'First Report', p. 237.
[148] William F. Barrett, 'Note on the Existence of a "Magnetic Sense"', *PSPR*, vol. 2 (1883–4), pp. 56–60, p. 58.

Barrett pushed hard to gain scientific interest in the Committee's work. Apart from reports in the SPR's *Proceedings* and the *Philosophical Magazine*, he presented its findings in *Nature* and at the Royal Dublin Society.[149] He had limited success in persuading scientific audiences of the robustness of the Committee's methods and of the need for further enquiry. Some agreed that Reichenbach's claims now rested on a securer basis and warmly welcomed further results, but the editors of the *Philosophical Magazine* (who included William Thomson) seem to have expressed their doubts by strategically inserting, immediately before his paper, research by the Swiss biologist Emile Yung on the capacity of even healthy experimental subjects to experience visual, auditory and other forms of hallucination in response to subtle suggestions from experimenters.[150] *Philosophical Magazine* readers were thus being invited to question whether Barrett had eliminated the possibility that he, like Reichenbach before him, had unwittingly provided clues regarding the nature of the experiment which made his subjects only imagine what they claimed they could see.

A far weightier response came several years later in the form of new research by two American scientists – the psychologist Joseph Jastrow and the zoologist George Nuttall – working from the psycho-physical laboratory at Johns Hopkins University. In a paper eventually published by the American Society for Psychical Research, they expressed more widely shared misgivings about the quality of Reichenbach's original work, but also questioned whether the Reichenbach Committee's methods had really prevented experimental subjects knowing the condition of the magnet "by other means".[151] Once again, their experiments tested the physiological response of a subject near an electromagnet, with the source of electrical power (in this case, a hand-cranked Gramme dynamo) being in another room. A key difference was that the subject was asked to place their head between the electromagnet's poles and to record what they believed the magnetic state to be, whilst the distant circuit operator switched (or did not switch) the current according to a random sequence unknown to the subject. To eliminate any chance of tell-tale sounds from the dynamo being communicated along the connecting wires, mercury-filled cups

[149] William F. Barrett, 'On a "Magnetic Sense"', *Nature*, vol. 29 (1884), pp. 476–7; [Anon.], 'Societies and Academies', *Nature*, vol. 30 (1884), pp. 161–4, p. 163.

[150] Positive responses include [Anon], 'Reichenbach and the Psychical Research Society', *Journal of Science*, vol. 5 (1883), pp. 313–19; John T. Sprague, 'Luminosity of Magnets', *English Mechanic and World of Science*, vol. 37 (1883), p. 233. Emile Yung, 'On the Errors of Our Sensations: A Contribution to the Study of Illusion and Hallucination', *Philosophical Magazine*, vol. 15 (5th Series) (1883), pp. 259–70.

[151] Joseph Jastrow and George Nuttall, 'On the Existence of a Magnetic Sense', *Proceedings of the American Society for Psychical Research*, vol. 1 (1885–9), pp. 116–26, p. 118.

were interposed along the wires. To deal with the problem of coincidence, the experimenters devised a method in which pure guesswork would result in exactly half of the judgements being correct; significantly more than this would suggest a genuine magnetic sensitivity.

After putting themselves and eight healthy students through hundreds of tests, Jastrow and Nuttall concluded that, since the total number of incorrect judgements was close to what would have been achieved by guesswork, there was no satisfactory evidence for magnetic sensitivity. In terms of scale and robustness Jastrow and Nuttall's research was evidently intended as a significant challenge to the Committee's modest study of Smith's magnetic sensitivity. Countering the Committee's specific evidence for magnetic luminosity, Jastrow and Nuttall called on the services of one distinguished participant in their experiments: the American astronomer William H. Pickering. Having stared at the electromagnet in a dark room, Pickering failed to see any luminosity, and emphasised that as someone whose eyesight could distinguish faint stars he considered himself a "good subject".[152]

Pickering's conclusion highlighted one of Barrett's main problems: people of normal physical and mental constitution were relatively unproblematic as experimental subjects, but they failed to see magnetic luminosity or experience any physiological effect of magnetism; those with abnormal physical and mental constitutions were more problematic as experimental subjects, but they seemed to confirm Reichenbach's findings. As in the case of Crookes and psychic force, Barrett needed to demonstrate the capacity to perceive magnetic luminosity in a far wider range of people, rather than just those deemed medically abnormal. Smith certainly fell into this latter category because, as Barrett well knew, in the early 1880s he had impressed the SPR with his thought-reading abilities. But it was this very capacity that undermined his reliability as a subject for the Committee. Barrett may have denied that Smith could respond to his "unexpressed will", but there were many who surmised that his responses to magnetism might be the result of his genuine capacity to read the minds of Committee members.[153]

One person who may have shared this view was Myers, who, in his posthumous work on psychical research, upheld the SPR's evidence of Smith's telepathic powers, but drew the ambiguous conclusion that the

[152] William H. Pickering, 'A Research on the Reality of Reichenbach's Flames', *Proceedings of the American Society for Psychical Research*, vol. 1 (1885–9), p. 127.

[153] Barrett, 'Note on the Existence', p. 56; J. Brown, 'The Psychical Society's Experiments on Reichenbach's Phenomenon', *English Mechanic and World of Science*, vol. 37 (1883), p. 246; William H. Harrison, 'Recent Psychical Researches', *Medium and Daybreak*, vol. 14 (1883), pp. 310–11.

value of the Committee's experiments depended on "whether the subjects had any means, direct or indirect, of knowing when the current was made or broken".[154] Eleanor Sidgwick agreed because, in 1890, she privately doubted Barrett's reassurance that Smith could not have heard – consciously or unconsciously – the magnetic tick.[155] The enormous respect that Myers's and Sidgwick's opinion commanded in the SPR makes it easier to understand why the Committee was disbanded in 1884, long before other SPR committees were wound up.[156] For Myers, Gurney and the Sidgwicks, the other committees were simply proving more effective in delivering the kind of evidence for psychical effects that they believed the SPR needed to present in public. But the brevity of the Reichenbach Committee's life derived from the SPR leadership's ambivalence *and* from the changing circumstances of its main drivers: Stone was incapacitated; Coffin seems to have decided to devote himself more to dentistry than to psychical research; and, despite his private conviction of the existence of magnetic luminosity, Barrett's heavy professional commitments made it very difficult for him to pursue any SPR investigations, let alone produce fresh experimental evidence for the Reichenbach phenomena.[157]

Despite its limited short-term impact, the Reichenbach Committee seems to have had greater significance in the longer term. It inspired investigations made by French and Dutch psychical researchers between the 1880s and early 1900s yielding new evidence for sensitivity to magnetic luminosity.[158] A more telling impact, however, occurred in 1910 when Silvanus Thompson published a paper in the *Philosophical Transactions* presenting new evidence of the physiological effect of an alternating magnetic field.[159] The article partially achieved what one

[154] Myers, *Human Personality*, vol. 1, p. 483. In 1890, Myers had also derided the "dubious" belief of French occultists in the magnetic sense: Myers, 'Subliminal Consciousness', p. 340.

[155] Eleanor Sidgwick to William Bateson, 14 March 1890, MS Add. 8634/C.32, William Bateson Papers, Cambridge University Library.

[156] The Committee published only one full report and disappeared from the SPR's publications after 1884.

[157] In 1910, Barrett revealed that he had made "scores of additional experiments with much more elaborate apparatus & precautions" in a purpose-built dark room, but these seem to have been inconclusive: William F. Barrett to Silvanus P. Thompson, 13 April [1910], No. 24 in SPT-IC. By the early 1890s, Barrett was finding it so difficult to find time for original psychical investigations that Myers had to beg him to "start some *experimental* work!": Frederic W. H. Myers to William F. Barrett, 8 November 1891, SPR.MS 3/A4/78, WFB-SPR. Coffin's final contribution to the SPR was the donation of an electromagnet, although this does not appear to have been used: [Anon.], 'Meetings of Council', *JSPR*, vol. 3 (1887–8), pp. 65–8, p. 66.

[158] Nahm, 'Sorcerer of Cobenzl', pp. 398–401.

[159] Silvanus P. Thompson, 'A Physiological Effect of an Alternating Magnetic Field', *Philosophical Transactions of the Royal Society of London*, vol. 82B (1909–10), pp. 396–8.

early scientific commentator on the Committee's work had desired: to shift the question of magnetic sense from psychical to "physical" research.[160] Given Thompson's close friendship with Barrett and his armchair interest in the SPR's work, it was arguably more indebted to the Committee than he revealed.[161] The only prior investigation of the effect that Thompson cited was that of Varley and Lindsay, to which he referred in a biography of William Thomson that he was then finishing.[162]

For Thompson, it was the development of powerful new generators of magnetic fields that promised to yield stronger effects than those found by the Reichenbach Committee. Having observed a "faint visual effect" when experimenting with an alternating electromagnet in the mid-1890s, Thompson was evidently prompted by the Thomson biography to return to the question more systematically (Figure 4.4).[163] His experiment differed from the SPR's in several crucial respects. He employed a vastly more powerful magnetic field, he relied on his own judgement rather than those of potentially dubious subjects, and he examined the effect in the dark and daylight.[164] He concluded from a series of trials that on placing his head between the electromagnet's pole, a "faint flickering illumination, colourless, or of a bluish tint" could be seen in the dark and with the eyes closed, but that a definite flicker remained in daylight or with the eyes open.[165]

Just as Crookes shifted the discovery of the mechanical effect of radiation away from the od context that partly inspired it, so Thompson distanced his evidence of a magnetic sense from its psychical context, and this proved effective in attracting favourable attention from scientific and medical practitioners, many of whom shared with him other cases of the physiological effect of magnetism.[166] It certainly impressed fellow

[160] [Anon.], 'Reichenbach and the Psychical Research Society', p. 314.

[161] Barrett had used an alternating magnetic field in his Dublin experiments on Reichenbach: Barrett to Thompson, 13 April [1910].

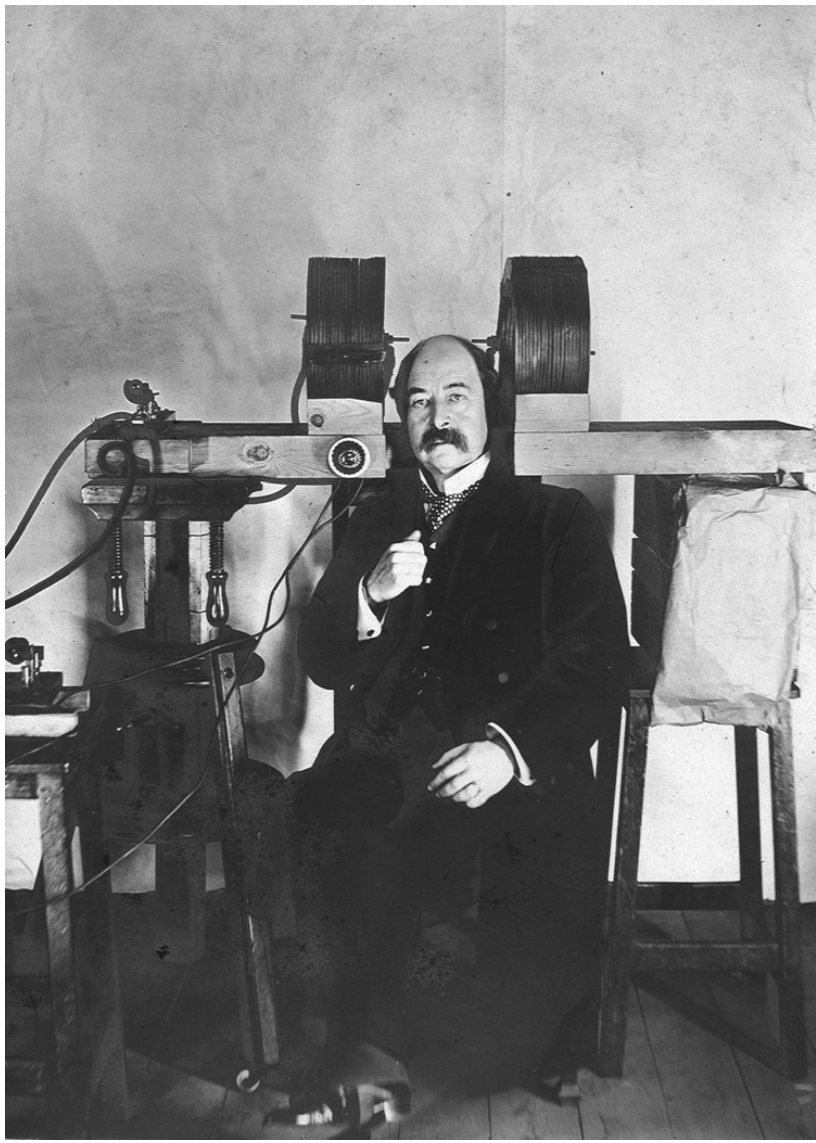
[162] Thompson, *Life of William Thomson*, vol. 2, p. 1104. Thompson was also aware of the enormous electromagnet that Lord Lindsay had built for this purpose: Andrew Jamieson to Silvanus P. Thompson, 12 April 1902, SPT/P/I/112/28, Silvanus Philips Thompson Papers, Institution of Engineering and Technology Archives.

[163] Thompson, 'Physiological Effect', p. 397. Thompson was studying the effect at least as early as 1906 when he tried unsuccessfully to persuade Lodge to follow suit: Silvanus P. Thompson to Oliver Lodge, 27 February 1906, MS Add. 89/104, OJL-UCL. Lodge declined on the grounds that the head might not have evolved a "protective sense of pain": Oliver Lodge to Silvanus P. Thompson, 3 March 1906, MS Add. 89/104, OJL-UCL.

[164] The quoted field strength at the centre of the coil was 1000 CGS units.

[165] Thompson, 'Physiological Effect', p. 397.

[166] He received letters on the subject from the Danish physicist Kristian Birkeland, the English psychiatrist James Crichton-Browne and the Scottish cardiologist James Mackenzie Davidson: letters no. 36, 63a and 94, SPT-IC.



4.4 Silvanus Thompson's photograph of himself inside the powerful apparatus that he built to study the effect of an alternating magnetic field on vision. From James Crichton-Browne to Silvanus P. Thompson, 14 April 1910, 63a, SPT-IC. Reproduced by permission of Archives of Imperial College London.

physicist and Thomson hagiographer Joseph Larmor, who, from a Maxwellian analysis of the optical impact of alternating magnetic fields on the electrically conducting material in the eyes, concluded that there was "nothing very surprising" about the effect.[167] Yet, as the Dutch and French investigations into magnetic sensitivity suggest, Thompson's publication did not persuade everybody that the question of the magnetic sensitivity with less powerful magnetic fields and with individuals possessing abnormal sensory powers – on which Reichenbach and the SPR had focussed – had been settled. Indeed, the Dutch investigations bolstered the final appeal that Barrett made for further Reichenbach studies the year before he died.[168]

Physical as Psychical Laboratories

The Dean's Yard rooms where the SPR's Reichenbach Committee staged its investigations were the closest the SPR got to having specific sites for the experimental investigation of the more physical aspects of psychical phenomena. The Society's sites of investigation tended to be domestic spaces bereft of the kind of physical apparatus that we have explored in this chapter, partly because its leading figures had concentrated mainly on telepathy and other more purely psychological aspects of psychical phenomena that did not require elaborate testing apparatus. It was also because the SPR's leadership was, in the wake of many inconclusive test seances and evidence of mediumistic trickery, losing faith in the physical phenomena of spiritualism as a fruitful line of enquiry. In the absence of mediums as powerful or apparently reliable as Home, there seemed little need to build on the example of Crookes and others and establish a "psychical laboratory".[169] Yet that is exactly what Lodge called for in a paper privately circulated to SPR members in 1894.

The director of an academic teaching and research laboratory since 1881 and, more recently, the supporter of the idea of a national laboratory for pursuing the routine quantitative work of physics, Lodge's choice of topic would not have surprised some readers. More than most SPR members, Lodge understood the enormous significance that laboratories now commanded in the sciences, whether as spaces for researching

[167] Joseph Larmor to Silvanus P. Thompson, 5 April 1910, No. 189 in SPT-IC.
[168] William F. Barrett, 'Sur la luminosité du champ magnétique et de certaines personnes qui, d'après le baron Reichenbach, serait perçue par les sensitifs', in *L'état actuel des recherches psychique d'après le travaux du II^me Congrès International tenu à Varsovie en 1923* (Paris: Les Presses Universitaires de France, 1924), 169–73. Barrett was referring partly to the work of Floris Jansen: see Nahm, 'Sorcerer of Cobenzl', pp. 399–400.
[169] Lodge, 'Experience of Unusual Physical Phenomena', p. 357.

natural phenomena, for developing standards of measurement and testing instruments, or for inculcating the skills of experimental investigation. The critically important role that laboratories had in the production of reliable scientific knowledge was the reason why, in 1902, he judged them to be essential to making the "physical aspect" of psychical research part of "orthodox physics".[170]

Lodge's proposals for a psychical laboratory recognised the fact that the prime "instrument" of psychical research was a human being and so required a "humane and cautious treatment" of a "kind quite different" from that commonly adopted with physical and chemical apparatus.[171] Yet the non-living instruments did not have to differ radically from those in scientific laboratories, and especially in the relatively new laboratories of human physiology and experimental psychology. For example, one major requirement was a large self-registering balance which, by placing the medium on a chair at one end, could illuminate the puzzle of the mechanical reaction experienced by the medium during telekinetic phenomena. Measurements of such bodily properties as weight, temperature and pulse could be automatically recorded on electrical apparatus outside the laboratory. To bring the laboratory closer to the kind of domestic environment within which most mediums preferred to perform, most apparatus could be carefully "concealed under a superficial aspect of comfort and ordinary homeliness".[172] Cameras hidden in walls could continuously take images while the laboratory was lit by ultra-violet light – which was less harmful to spirit manifestations than visible light. And the seance table could be inconspicuously adapted to probe the question of mechanical reaction by resting it on an array of wooden blocks, the forces on which could be measured via changes in the electrical resistance of carbon paper placed beneath them.

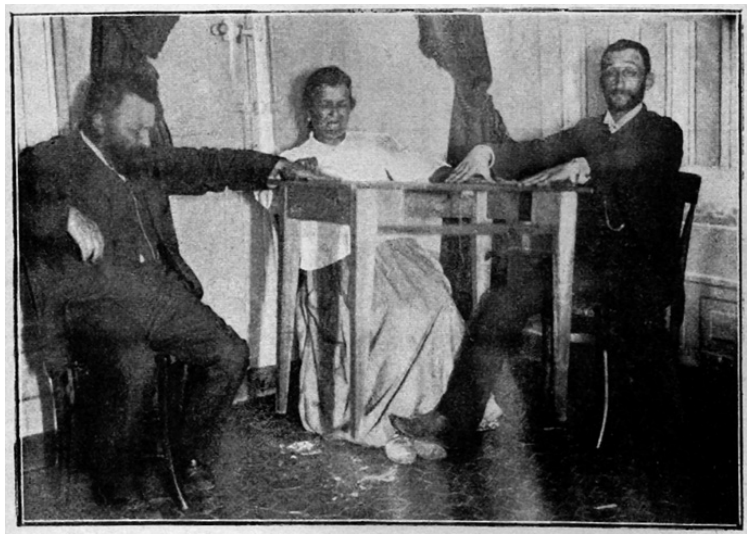
There were two significant contexts for Lodge's paper on a psychical laboratory. The first was that it was an appendix to his report on investigations undertaken in July and August of 1894 into the most powerful physical medium since Home: Eusapia Palladino.[173] Born in Bari in 1854, Palladino had come to the attention of European scientists in the late 1880s. In test seances staged with her in 1892–4, individuals of such intellectual weight as the aristocratic physiologist Charles Richet, the

[170] Lodge, 'Address by the President', p. 47.
[171] Lodge, 'Experience of Unusual Physical Phenomena', p. 357.
[172] Lodge, 'Experience of Unusual Physical Phenomena', p. 359.
[173] On Palladino and the SPR see Gauld, *Founders of Psychical Research*, pp. 221–45. For other investigations into her mediumship see Christine Blondel, 'Eusapia Palladino: la méthode experimentale et la "diva des savants"', in Bensaude-Vincent and Blondel, *Savants face à l'occulte*, pp. 143–71; and Sommer, 'Psychical Research'.

psychologist Cesare Lombroso and the astronomer Giovanni Schiaparelli were strongly impressed by her abilities, when entranced, to alter her own weight, move untouched objects and create a host of other acoustical, mechanical and optical effects.

Richet's conviction that these phenomena could not be put down to trickery prompted him to invite Myers, Lodge and his wife, the Sidgwicks and others to test seances with Palladino at his Mediterranean retreat on Île Roubaud. Participants in these seances were struck by the fact that Palladino managed to produce these effects under conditions that seemed to preclude fraud: the seance room was thoroughly searched, Lodge's wife carefully examined the medium's clothes and, crucially, Palladino's hands and feet were firmly held during the sittings.

Lodge was especially impressed by Palladino's ability to wind up, play and swing a musical box suspended from the ceiling beyond her reach, and by what appeared to be a temporary vital "prolongation" from her body (a manifestation of what Richet christened 'ectoplasm') that



4.5 Two of Lodge's fellow psychical investigators, the Polish psychologist Julien Ochorowicz and the French medical doctor Charles Ségard, experience Eusapia Palladino's power of levitating tables at the Carqueiranne seances in 1894. Detail from Albert De Rochas, *L'extériorisation de la motricé* (Paris: Bibliothèque Chacornac, 1906), plate V, p. 191. Reproduced by permission of Universal History Archive/ Universal Images Group via Getty Images.

touched him and other participants.[174] These effects underpinned his measured verdict that, having treated her as somebody who was "liable to deceive" both consciously and unconsciously, he had repeatedly seen, heard and touched objects moving by means other than "normal" (which included the fraudulent).[175] Lodge's conclusion about the genuineness of the telekinetic effects was only shared by Myers and Richet (and not the Sidgwicks), and it was partly for this reason that he confined his report to the SPR's *Journal* rather than its public-facing *Proceedings*. Nevertheless, his claim to have made a "*primâ facie* case for investigation" was evidently shared by all investigators, since they joined up for a further series of seances with Palladino in Richet's chateau in the Provençal town of Carquieranne and in Myers's house in Cambridge (Figure 4.5).[176]

It was in the Carquieranne seances that Lodge began exploring the effectiveness of instruments in understanding Palladino's powers, and particularly the extent to which she might be the source of the energy and seat of mechanical reaction of the telekinetic effects. This was hardly innovative, because in 1892 Richet and other scientists had convened test seances in Milan where they used large balances to measure Palladino's capacity to change her own weight and that of other bodies, although the results were inconclusive.[177] Lodge was predictably interested in Richet's use of a hand dynamometer in the Carquieranne seances, which showed that on one occasion when Palladino was under the influence of her spirit control (the ubiquitous 'John King'), she managed to exert nearly four times her "normal" strength of about fifty pounds, which was also far more than the maximum of the strongest participant (Lodge).[178] Lodge accepted that this was not significant given Richet's experiences of the abnormal strength shown by hysterics, but he certainly did not abandon the idea of instrumental ways of solving the critical question of where the force and energy of telekinetic effects originated.

The Palladino seances dramatised many of the critical investigative problems faced by students of the physical phenomena of spiritualism, and these constituted the second significant context for Lodge's paper on the psychical laboratory. By the 1890s, leading SPR figures had been

[174] Lodge, 'Experience of Unusual Physical Phenomena', p. 334. For Richet and ectoplasm see Robert M. Brain, 'Materialising the Medium: Ectoplasm and the Quest for Supra-Normal Biology in *Fin-de-Siècle* Science and Art', in Anthony Enns and Shelley Trower (eds.), *Vibratory Modernism* (Basingstoke: Palgrave Macmillan, 2013), pp. 115–44.
[175] Lodge, 'Experience of Unusual Physical Phenomena', pp. 325 and 334.
[176] Lodge, 'Experience of Unusual Physical Phenomena', p. 336.
[177] Hereward Carrington, *Eusapia Palladino and Her Phenomena* (London: T. Werner Laurie, 1910), pp. 29–33. The scientists also included the physicist Giovanni Ermacora and the astronomer Giovanni Schiaparelli.
[178] Lodge, 'Experience of Unusual Phenomena', p. 327.

arguing for some time that the evidence for these kinds of phenomena was severely weakened by the strong possibilities of observational error, memory lapses and mediumistic trickery. The problems had been powerfully articulated in a paper by Eleanor Sidgwick in the May 1886 number of the SPR's *Proceedings*.[179] Based partly on critical reflections on her own extensive but largely disappointing experiences of seances, the paper doubted that satisfactory safeguards against fraud had been taken in the "vast majority of recorded cases" of such phenomena, which included the means to compensate for the difficulty of achieving the "power of continuous observation".[180] Powerful empirical support for Sidgwick's warnings came later in 1886, when SPR members Richard Hodgson and S. J. Davey showed how easy it was to persuade people of the genuineness of 'slate-writing' using sleight of hand.[181] With self-registering instruments, Lodge sought to tackle the lapses in observational continuity that such trickery exploited.

Lodge's confidence in an instrumental solution owed a great deal to the widespread belief that mechanical devices were not susceptible to the subjectivities and other defects of human judgement.[182] He may have known about earlier attempts, notably by Crookes and the British National Association of Spiritualists, to create automatic registers of psychical phenomena. But the main source of inspiration was undoubtedly one that Lodge never mentioned in public but which spectacularly illustrates the convergence that many physical–psychical scientists sought between psychical research and experimental physics. This was a series of experimental seances held in April 1894 in University College Liverpool's laboratory for teaching advanced undergraduates in physics. Designed to determine whether mediums could levitate or move a table without touching it, these seances were directed by Lodge but principally the work of his private laboratory assistant Benjamin Davies.[183]

Bereft of a formal academic education, Davies received scientific training from Lodge and thereby rose from the lowly position of an assistant in the Liverpool teaching laboratory to someone to whom Lodge could easily delegate complex research and pedagogical tasks while he was away from the laboratory.[184] Davies's experimental skill proved especially

[179] Sidgwick, 'Results of a Personal Investigation'.
[180] Sidgwick, 'Results of a Personal Investigation', pp. 64 and 70.
[181] Richard Hodgson and S. J. Davey, 'The Possibilities of Mal-Observation and Lapse of Memory from a Practical Point of View', *PSPR*, vol. 4 (1886–7), pp. 381–495.
[182] On this belief see Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), chapter 3.
[183] Benjamin Davies, 'Experiments on Levitation', *Light*, vol. 36 (1916), pp. 186–7, 194–5 and 202–3, p. 186.
[184] Clow, 'Laboratory of Victorian Culture', chapter 4; Roberts, 'Training of an Industrial Physicist', chapter 2.

invaluable in the early–mid-1890s when he contributed significantly to Lodge's painstaking attempts to determine whether the ether of space was dragged by matter moving rapidly past it.[185] Staged in a room not far from where Davies would hold the experimental seances, the ether-drag experiments bordered the levitation trials in more than an architectural sense. As we saw in Chapter 3, by the early 1890s Lodge was entertaining the possibility that the apparent power of mediums to move untouched objects might involve some kind of energy transfer through the ether but that this might require the ether to have properties very different from those of gross matter. This latter possibility was strongly suggested by the ether-drag experiments, which had failed to find any viscosity between ether and matter. The results of levitation experiments would not, therefore, have been seen as irrelevant to those on the ether, even if they did not provide clues to the ether's possible constitution.

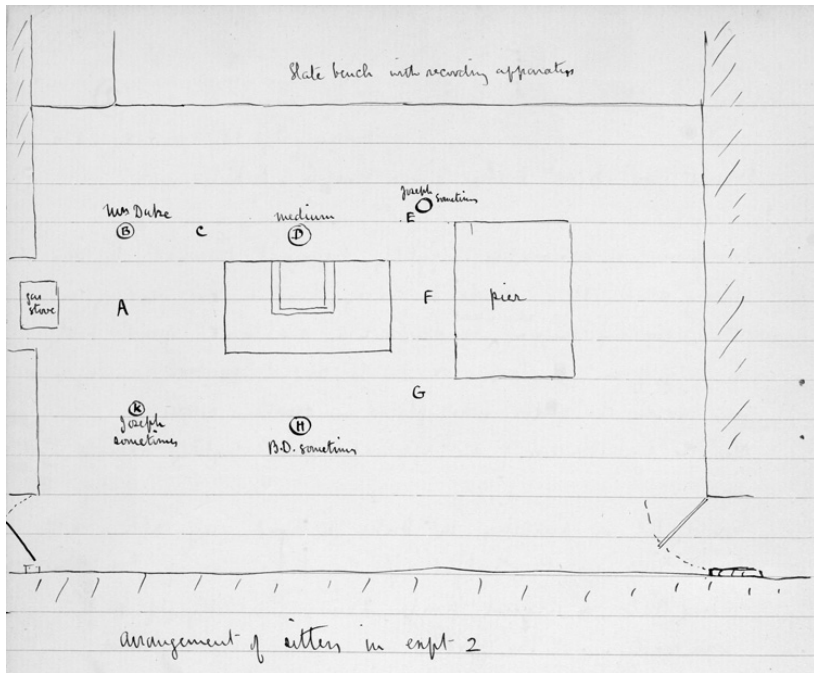
The levitation experiments were partly inspired by Davies's personal interest in psychical research which, undoubtedly stimulated by Lodge, led to private seances at the home of a Liverpool medium called Mr Duke.[186] Davies was impressed by Duke's apparent ability to repeatedly tilt a heavy table without appearing to exert any effort. Duke achieved the result when sitting at the end furthest from the tilting end and sometimes with his mediumistic daughter sitting on the tilting end. Keen to help Davies investigate the effect (and in particular to study the source of the mechanical reaction), Duke and his daughter agreed to give further seances in the Liverpool laboratory surrounded by instruments devised by Davies to continuously measure and register the forces on a table when one end tilted (Figure 4.6).

It is not clear how much Lodge was involved in the design of these experiments, but it had two features that would resurface in his ideas about a psychical laboratory. The first was an electrical "pressure apparatus" attached to one end of the seance table, and on which the mediums were asked to place their hands.[187] The apparatus comprised a wooden board resting on four springs within a trough, and between the springs and the bottom of the trough was a piece of carbonised cloth through which an electric current was passed. Pressure on the board caused changes in the electrical resistance of the cloth and, consequently,

[185] Oliver Lodge, 'Aberration Problems: A Discussion Concerning the Motion of Ether Near the Earth, and Concerning the Connection Between Ether and Gross Matter; with Some New Experiments', *Philosophical Transactions of the Royal Society of London*, vol. 184 (1893), pp. 727–804. For discussion see Hunt, 'Experimenting on the Ether'.

[186] Davies's interest by this time is evident in Benjamin Davies, 'Unusual Physical Phenomena', *Liverpool Daily Post*, 10 January 1895, p. 3.

[187] Davies, 'Experiments', p. 186.



4.6 Benjamin Davies's drawing of the practical physics laboratory in University College Liverpool where he staged his experimental seances. It shows the positions of Davies ('B. D.'), the medium Mr Duke, and Duke's wife and son Joseph around the seance table; Davies's pressure table; and the slate bench where the recording apparatus was placed. From Benjamin Davies, 'SPR' notebook, item 8, Box 17, BD-NLW. Reproduced by permission of the National Library of Wales.

changes in current strength. The second feature was "in common use in all laboratories", and comprised an electromechanical device that automatically recorded the current changes as continuous curves on a sheet of moving smoked paper fed from a rotating cylinder.[188] Similar to Crookes's approach to one of his psychic force devices Davies calibrated and tested his apparatus by determining the effect on the instrument of a known mechanical force: in this case, he produced a "standard curve" representing his deliberate tilting of the table via the pressure board and to which he compared subsequent curves.[189]

[188] Davies, 'Experiments', p. 187. [189] Davies, 'Experiments', p. 194.

https://doi.org/10.1017/9781316882436.005 Published online by Cambridge University Press

Several experimental seances were held with Duke and his daughter, all of which witnessed the mediums tilting the table under the gaze of Davies, his wife and Lodge's private secretary Alfred Briscoe, who closely watched for any suspicious bodily movements. What particularly impressed Davies was that the tilts occurred during moments when, according to the curves, "no appreciable force" had been exerted on the pressure apparatus, or at least only fractions of those signified by the standard curve.[190] In the absence of convincing evidence for a direct force on the pressure apparatus, Davies concluded that the forces producing the tilts, whether they were among the known mechanical or other physical forces or some unknown force, had to act directly on the table and independently of the mediums' bodies. It was not impossible for the mediums to have acted directly on the table: just as two magnets could repel each other through non-magnetised material, so some kind of force exuded by the mediums' hands could have bypassed the pressure apparatus and pushed the table. However, Davies judged that this was "extremely unlikely" given the difficulty of achieving it without some tell-tale sign being recorded on the pressure apparatus.[191]

Like the ether-drag experiments that Lodge and Davies were pursuing nearby, the table-tilting experiments were difficult to interpret in terms of what Lodge called "simple mechanics".[192] But by mid-1894, exploring the exciting question of a more complex mechanics via psychical research seemed far less promising than via the ether. Davies's plans to repeat the table-tilting experiments and remove unspecified "doubts" that he had about them were thwarted because Duke's departure from Britain and subsequent premature death deprived him (as Home's death had deprived Crookes) of a powerful and cooperative experimental subject.[193]

An obvious question is why Lodge and Davies did not try to repeat the experiments with another medium, notably Palladino, whose powers had so impressed Lodge in the months after the Duke trials. One reason was clearly lack of time. From the spring of 1894, they directed most of their experimental efforts to the question of electromagnetic wave propagation and detection, work that resulted in the invention of a new form of detector (the 'coherer') and, eventually, new clues about the complex mechanics of the ether.[194]

[190] Davies, 'Experiments', p. 195. [191] Davies, 'Experiments', p. 202.
[192] Lodge, 'Interstellar Ether', p. 862.
[193] Davies, 'Experiments', p. 202. He and Lodge believed these doubts would be partly addressed by having a medium sit in a swing suspended from the ceiling, thus reducing disturbances from vibrations.
[194] This is apparent from Lodge's laboratory notebooks from the mid-to late 1890s: Oliver Lodge, Research Notebooks, nos. 8–9, MS.3.17–18, Oliver Lodge Papers, University of Liverpool Library.

Even without these demands on their time, Palladino's behaviour would have made her a difficult choice of experimental subject. Given her stringent demands about performing in homely environments, she is unlikely to have agreed to hold seances in a physical laboratory.[195] Even had she agreed to this, by late 1895 she would have caused Lodge much professional embarrassment. The credibility of his evidence for her genuineness was virtually destroyed by the sensational discovery, in the Cambridge seances of July and August 1895, that she had consciously resorted to trickery. Privately, Lodge maintained that fraudulence could not satisfactorily explain what he and others had seen in Île Roubaud and that it was not wise to assume that she had always duped her sitters.[196] Two other physicists who participated in the Cambridge seances – Rayleigh and J. J. Thomson – privately agreed that the case against her was not decisive, but they, as well as Lodge, accepted the SPR's decision to distance itself from Palladino.[197] This was a decision reflecting the SPR's policy of dissociating itself from mediums proven to be deceptive, and whose trickery "tainted" all the evidence for their genuineness.[198] As a physicist whose ongoing goals included building his professional reputation and the scientific profile of psychical research, Lodge could not afford to present his evidence for Palladino in public, however promising she had been as a way of extending experimental physics into the seance.

Wanting Opportunities?

By the late 1890s, physical–psychical scientists had achieved only a limited success in mobilising the resources of experimental physics in studying the more physical aspects of psychical phenomena. They had persuaded themselves and some others (including some fellow scientists) that their approaches had yielded positive evidence for the genuineness of certain effects and demonstrated the need for further enquiries. The longer-term impacts of their experimental investigations were figural and literal. The most widely debated of these investigations – Crookes's

[195] This is discussed in Hamilton, *Immortal Longings*, pp. 213–21.

[196] See Lodge's contribution to [Anon.], 'General Meeting', *JSPR*, vol. 7 (1895–6), pp. 131–8, pp. 134–5.

[197] Rayleigh, 'Presidential Address', p. 282; Thomson, *Recollections and Reflections*, pp. 151–2. However, later investigations of Palladino in Genoa, Turin and Paris yielded more positive results and informed the SPR's decision in 1908 to stage new tests of her.

[198] Oliver Lodge, 'Address by Professor Lodge', *Light*, vol. 17 (1897), pp. 162–8, p. 166. On this policy see Henry Sidgwick, 'Eusapia Palladino', *JSPR*, vol. 7 (1895–7), pp. 230–1. This policy forced Barrett to suspend publication of his first book on spiritualism until the publication of the stronger evidence of the later Palladino tests: Barrett, *Threshold of a New World of Thought*, pp. v–ix.

experiments on psychic force – was praised as much for symbolising a definite shift towards a thoroughly scientific phase in spiritualism as directly inspiring new instrumental approaches to psychical phenomena.[199] The latter included attempts by several French psychologists in the 1890s and early 1900s to build apparatus purporting to register the mechanical effect of "magnetic" fluids exuded by the human body.[200] Lodge's partially realised ideas about a psychical laboratory also symbolised psychical researchers' ambitions for scientific credibility and may have inspired American physicist Robert W. Wood's idea of taking X-ray photographs of Palladino's ectoplasmic extrusions in dark seances of 1910.[201] Countering these champions of early attempts to merge experimental physics and psychical investigation were scientists such as Stokes and William Thomson, whose grave misgivings about 'borderland' phenomena were evidently unaffected by what Crookes, Varley and Barrett had done because in the 1890s they were still ascribing most psychical effects to mediumistic deception and self-delusion.

Many physical–psychical scientists accepted much criticism of their experimental strategies and in response tried to improve their methods and instruments. This criticism did not weaken their belief in the importance of studying the more physical kinds of psychical phenomena and of the potential of new tools in the physical sciences to succeed where older instruments had failed or proved inconclusive. Not surprisingly, many of their reflections on the prospects of further investigations focussed on the difficulty of finding powerful and reliable 'physical' mediums, of whom Home was exemplary. This is what Crookes meant when, in 1884, he told an ailing Home that "[m]y belief is the same as ever, but opportunities are wanting".[202] He was being somewhat disingenuous. He was indeed steadfast in his belief about psychic force, but was unable to reinforce his position more because of brightening "opportunities" outside spiritualism than dwindling ones inside. By the 1880s, he had decided that these outside opportunities – which included researches on radiant matter,

[199] Myers, *Human Personality*, vol. 1, p. 6; Charles Richet, *Traité de métapsychique* (Paris: Libraire Félix Alcan, 1922), pp. 34–42.

[200] For example, Hipployte Baraduc, *La force vitale: Notre corps vitale fluidique. Sa formule biométrique* (Paris: Georges Carré, 1893), pp. 65–73; [Ernest] Bonnaymé, *La force psychique. L'agent magnétique* (Paris: Libraire du Magnétisme, 1908). Crookes's approach was being emulated well into the 1920s: see Fritz Grunewald, *Physicalisch-mediumistische Untersuchungen* (Pfullingen: Johannes Baum, 1920).

[201] Hereward Carrington, *Personal Experiences in Spiritualism* (London: T. Werner Laurie, 1913), pp. 257–69; Hereward Carrington, *The American Seances with Eusapia Palladino* (New York: Garrett Publications, 1954), pp. 40–2, 191–5. Carrington suggested in the latter work that Wood was unable to fully implement his ideas, partly because Palladino disliked the scientific apparatus.

[202] Crookes quoted in Home, *D. D. Home*, p. 218.

commercial ventures in electric lighting and government-sponsored studies of London's water supply – had to be prioritised for meeting intellectual, professional, financial and moral objectives.[203]

Crookes was certainly not alone in thinking that exploiting opportunities for making new discoveries in physics was a more effective way of building a scientific reputation and therefore raising the confidence of others in statements on psychical phenomena.[204] To better understand why the experimental projects discussed in this chapter had such a limited success, we cannot treat them in isolation from the often competing and reinforcing commitments that physical–psychical scientists were juggling in their lives and careers.

***

This chapter has effectively extended the argument of the last one: psychical experimentation as well as psychical theorising preoccupied late-nineteenth-century physical scientists, and inspired creative uses of physical science, to a greater extent than we have assumed. These efforts were primarily directed towards producing evidence in favour of psychical phenomena, but not exclusively. To raise the confidence of scientific and other critics that they had the skills and resources to draw these positive conclusions, physical–psychical scientists often engaged in experimental work to debunk claims made about psychical phenomena. In the 1870s, Harrison deployed his considerable photographic skill in the exposure of fake spirit photographs, while Varley exploited the electrical resources of his private telegraphic consultancy to rubbish spiritualists' claims that the body exuded electricity and magnetism, and that these forces explained seance manifestations.[205]

More spectacularly, in 1888, Crookes seized on an opportunity to reassure scientific audiences that, irrespective of their thoughts on psychic force, he still knew how to distinguish genuine from bogus forces. The opportunity was a paper by the French chemist Jules Thore, who claimed evidence of a new force associated with the human body and which caused the rotation of "delicately suspended" ivory cylinders shielded from convection currents.[206] In a paper for the Royal Society's *Philosophical Transactions*, Crookes explained that with a "more accurate"

[203] Brock, *William Crookes*, chapters 14–15 and 17.
[204] See Oliver Lodge to Frederic W. H. Myers, 21 October 1890, SPR.MS 35/1309, OJL-SPR.
[205] [William H. Harrison], 'Real and Sham Spirit Photographs', *Spiritualist*, vol. 2 (1872), pp. 75–6; Cromwell F. Varley, 'Electricity, Magnetism and the Human Body', *Spiritualist*, vol. 1 (1869–71), pp. 137–8.
[206] William Crookes, 'On the Supposed "New Force" of M. J. Thore', *Philosophical Transactions of the Royal Society of London*, vol. 178 (1888), pp. 451–69, p. 451.

version of Thore's apparatus he had reproduced all the effects with inorganic sources of heat.[207] Crookes's conclusion, and the example he set of deploying his experimental skills in distinguishing fact and fancy, certainly impressed two SPR scientists assessing one of a plethora of instruments purporting to register a new bodily force.[208]

The need for physical–psychical scientists to be seen distinguishing fact from fancy became increasingly pressing in the 1890s, when the discoveries of X-rays and radium emanations seemed to lend plausibility to old and new claims about the existence of rays, fluids and forces associated with the mind and body. Disputes about the reality and nature of these latter entities focussed heavily on the extent to which their discoverers – including some physical scientists – had only imagined what they claimed was real. For physical–psychical scientists, these disputes raised painfully familiar questions about whether physical scientists were fit to study physical phenomena entangled with life and mind. Crookes was not alone in believing that they were fit. The apparatus that he had built to replicate Thore's results sometimes failed to show the subtle movements he claimed for it and reminded him that the difficulty of demonstrating obscure effects at will plagued experimental physics as well as psychical investigation.[209] As we shall see in Chapter 5, he joined other physical–psychical scientists in arguing that experience coping with troublesome physical instruments furnished an understanding of scientific approaches to the more difficult human instruments of psychical research.

[207] Crookes, 'Supposed "New Force"', p. 453. Cf. Crookes's verdict on od in 1875.
[208] Frederick J. M. Stratton and P. Phillips, 'Some Experiments with the Sthenometer', *JSPR*, vol. 12 (1905–6), pp. 335–9.
[209] In 1888, he grumbled to the Assistant Secretary of the Royal Society that he had a "most signal failure" showing the movements at a crowded Royal Society soirée because of the heat emitted by attendees: William Crookes to [Herbert] Rix, 10 April 1888, WMS Autograph Letters Series, Box 11, Wellcome Collection.