



CONSERVATIVE ATTITUDES TO OLD-ESTABLISHED ORGANS:
OLIVER LODGE AND *PHILOSOPHICAL MAGAZINE*

by

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In 1921 Oliver Lodge defended *Philosophical Magazine* against charges of mismanagement from the National Union of Scientific Workers. They alleged that its editors performed little editorial work, the bulk being done by the publishers, Taylor & Francis. Lodge reassured *Nature's* readers that the journal did consult its editors, and suggested 'a conservative attitude towards old-established organs is wise; and that it is possible to over-organise things into lifelessness.' The paper explores Lodge's response by considering the editorial arrangements at *Philosophical Magazine*. Founded in 1798, it remained remarkably unchanged and so appeared old-fashioned when compared with its closest rivals, *Proceedings of the Royal Society* and *Proceedings of the Physical Society*. We argue that for Lodge the management of *Philosophical Magazine* gave it the flexibility and independence required to sustain the kind of physics, also open to accusations of obsolescence, in which he believed.

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On 1 September 1921 *Nature* published a short letter from Oliver Lodge entitled 'The "Philosophical Magazine"'.¹ In the letter, Lodge defended *Philosophical Magazine*, of which he was one of the editors, against a letter from the National Union of Scientific Workers (NUSW). This letter, which had been sent to 110 contributors to the journal, attacked the management of *Philosophical Magazine*, claiming that the editors named on its title page had little control over its contents.² In its defence, Lodge stated 'the referees mentioned on the title-page of that journal are frequently consulted' and suggested 'that their services are not so nominal as the writers of the circular suppose.' However, this was not all. In conclusion, Lodge maintained that 'the *Philosophical Magazine* is well managed' and warned the NUSW—and the readers of *Nature*—that 'a conservative attitude towards old-fashioned organs is wise; and that it is possible to over-organise things into lifelessness.'³

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Lodge's response to the NUSW was a defence of *Philosophical Magazine* and a particular mode of scientific publishing. *Philosophical Magazine* was founded by Alexander Tilloch in 1798 and had been published by the Taylor family (Taylor & Francis from 1852) since Richard Taylor had started on his own in 1803.⁴ After Taylor joined Tilloch as editor in 1822, there had always been a member of the family named among its editors. The Taylor & Francis family were themselves active in scientific circles but a series of mergers in the 1820s and 1830s had brought with them additional scientific expertise. From the 1850s onwards, Taylor & Francis began to appoint additional editors from among their scientific contacts. Lodge, along with George Carey Foster and J. J. Thomson, joined the existing editors, William Francis Jr and John Joly, after a recruitment drive in 1911.

Initially serving as a monthly miscellany, collating scientific news and information from around Britain and beyond, *Philosophical Magazine* had become increasingly specialized over the course of the nineteenth century, publishing original articles in mathematics and physics. Although the activities of the learned societies provided useful copy, the success of *Philosophical Magazine* was predicated on its independence: unaffiliated, its editors were free to reprint content wherever they found it and, without the bureaucracy of the societies, could get papers into print fairly quickly. For the NUSW, however, this independence was a liability. Their letter maintained that although *Philosophical Magazine* was 'the most important English physical periodical', its quality was inferior to *Transactions of the Royal Society* (1665–) and *Proceedings of the Royal Society* (1832–).⁵ As was well known, papers published by the Royal Society had first to be read at a meeting, either in person by the author (if a Fellow) or on their behalf by a communicator. The Society also had in place a system of referees to whom papers might be sent before publication. Although the members of the NUSW expressly distanced themselves from the system of refereeing in use for *Proceedings of the Royal Society*, they argued that a group of editors, serving fixed terms and deriving from an institution such as the Institute of Physics, was required so that *Philosophical Magazine* might live up to its reputation. It was the failure of this initiative that prompted their letter.

This paper is in three parts. In the first we describe the form of *Philosophical Magazine* and how it related to its two closest rivals, *Proceedings of the Royal Society* and *Proceedings of the Physical Society* (1874–). The origins of *Philosophical Magazine* lay in a very different publishing tradition from these other publications, and much of the controversy about its management was associated with the way in which its inherited form differed from what had become recognized as the scientific journal. In the second part we set out Lodge's long relationship with *Philosophical Magazine*. Finally, in the third, we consider the way in which Lodge associated *Philosophical Magazine* with a particular form of physics. Our argument is that for Lodge these allegations of mismanagement concerned more than questions of scientific communication. When James Jeans became Physical Secretary of the Royal Society in 1919, he began a campaign to increase the quality of its *Proceedings*.⁶ For Jeans, quality was to be found in what would become known as the new physics, and so it was research in these fields that he sought for *Proceedings*. However, Lodge's wariness towards many of these new developments was well known. In 1913, two years after joining the editorial team, Lodge had used his Presidential address to the British Association to argue for 'continuity' in the face of the new physics.⁷ Lodge criticized physicists for adopting new ideas too wholeheartedly because they risked the discipline's solid foundations. *Philosophical Magazine*'s long-established independence

and editorial policy could make space for new ideas as they arose while maintaining a link with the physics of the past. Lodge's reference to 'old-established organs' clearly underlined the venerable status of *Philosophical Magazine*, but it also described what might be lost should the new physics win the day.

PHILOSOPHICAL MAGAZINE

When Lodge called *Philosophical Magazine* 'old-established', he was not exaggerating. By September 1921 it had been in existence for 123 years, an impressive run in the competitive market for print. When founded, *Philosophical Magazine* established a readership as a monthly miscellany specializing in scientific news and information. Over the course of the century the periodical redefined itself, focusing on physics and mathematics and proudly displaying the names of the eminent scientists that served as editors. By the 1920s, however, it had had come under considerable pressure. In *Proceedings of the Royal Society* and *Proceedings of the Physical Society* it had two prestigious rivals. Also monthlies, these two journals drew upon their respective learned society for copy and then marked it with the society's imprimatur. *Philosophical Magazine's* market position was predicated on its independence: free of the bureaucracy that attended the learned society, as well as the strictures on having to present papers before publication, *Philosophical Magazine* was able to present itself as a nimble operator and rapid route to publication. However, the emergence of *Nature* (1869–), a weekly, meant that this position had become increasingly untenable. Caught between the rapid publication of the more newsy *Nature* and the institutionally warranted science of the other two monthlies, it was no longer clear where *Philosophical Magazine* belonged in the market. Nor was it clear what sort of periodical *Philosophical Magazine* was supposed to be.

The move to have *Philosophical Magazine* taken over by the Institute of Physics suggests that, for the NUSW at least, *Philosophical Magazine* was understood to be a deficient version of the monthly scientific journal as represented by *Proceedings of the Royal Society* and *Proceedings of the Physical Society*. The NUSW claimed that the editors listed on the title page had little control over the content of the journal, noting instead that it was 'common knowledge that the editorial functions, so far as they are exercised at all, are exercised by the proprietors, who do not pretend to any special knowledge of physics.'⁸ The result was that *Philosophical Magazine* often published 'worthless' contributions, and that even the good papers suffered due to a lack of proper editing and review. For the NUSW, however, the quality of the journal was a question of ownership and editorial supervision, not refereeing. They advised against the adoption of a 'system of referees', believing that this practice caused 'delay, and sometimes injustice, in the publication of papers in the Proceedings of the Royal Society.' Instead of 'anonymous and irresponsible referees, selected afresh for each paper', the union proposed a 'small body of known editors, appointed for a definite period by some representative body.'⁹ Although *Philosophical Magazine* ostensibly fulfilled the former requirement, its editors were appointed by a publisher rather than a 'representative body', and so could not bring institutional authority to bear.

The editorial arrangement of *Philosophical Magazine* was a legacy of its long history and had its roots in a different moment in scientific publishing. Initially entitled *The Philosophical Magazine: comprehending the various branches of Science, the Liberal and*

Fine Arts, Geology, Agriculture, Manufactures, and Commerce, it was one of several London-based publications that specialized in gathering together and disseminating scientific intelligence.¹⁰ Based on Nicholson's *Journal of Natural Philosophy, Chemistry and the Arts* (1797–1813), itself largely inspired by John Wyatt's *Repertory of Arts and Manufactures* (1794–1862) and François Rozier's *Observations sur la physique* (f. 1771), *Philosophical Magazine* published articles on a range of scientific subjects, about two-thirds of which were reprinted from foreign publications.¹¹ Initially seven sheets folded octavo and selling at 2s., *Philosophical Magazine* was both cheaper and contained more matter than Nicholson's *Journal*, which appeared in lavish quarto. However, competition was fierce: *Philosophical Magazine* raised its price to 2s. 6d. in 1801; in the following year 1802 Nicholson's *Journal* adopted the format of *Philosophical Magazine* and began to appear in octavo. Although Tilloch's name was not in the title of *Philosophical Magazine*, his editorship was well known and he drew upon his connections for copy. As well as the papers, printed in a numbered sequence and stating the names of their authors, *Philosophical Magazine* also featured a department entitled 'Intelligence', in which Tilloch compiled news and gossip, including that derived from the proceedings of societies, in London and elsewhere.

Over the course of the nineteenth century *Philosophical Magazine* adapted to the changing publishing landscape. In 1813 it saw off Nicholson's *Journal*, absorbing it to become *Philosophical Magazine and Journal*. In 1822 Richard Taylor, whose firm had printed the journal since 1800, joined Tilloch as co-editor and co-proprietor. Tilloch died in 1825: in the following year, Taylor was able to absorb *Philosophical Magazine*'s other major rival, Thomas Thomson's *Annals of Natural Philosophy*, appointing its editor, Richard Phillips, as co-editor and renaming the journal *Philosophical Magazine and Annals of Philosophy*. Further changes came in 1832, when Taylor bought *Edinburgh Journal of Science*, its editor, Sir David Brewster, becoming an editor of the renamed *London and Edinburgh Philosophical Magazine and Journal*. When Robert Kane joined the editorial team in 1840, *Philosophical Magazine* became *London, Edinburgh and Dublin Philosophical Magazine and Journal of Science*, still its title when Lodge joined the journal in 1911.¹²

Philosophical Magazine's title harked back to a previous moment in scientific and publishing history, alluding to natural philosophy and 'magazine' evoking a kind of compendium or storehouse. Its form, too, had remained fairly constant into the twentieth century and, when Lodge joined in 1911, *Philosophical Magazine* looked very much as it had in 1798. Its contents had become increasingly specialized—Brock and Meadows claim that 80–90% of its contents were mathematics or physics by the late nineteenth century—but it was still 2s. 6d. and still published its articles one after the other in a sequence numbered in roman numerals with the authors and titles given in italics.¹³ Its regular departments—'Intelligence and Miscellaneous Articles', 'Notices Respecting New Books' and 'Proceedings of Learned Societies'—still appeared at the end of each issue, but in diminished form. The first, which had grown out of Tilloch's 'Intelligence', had become irregular by 1911, no longer needed given the flexibility afforded by *Philosophical Magazine*'s regular scientific content. The 'Proceedings of Learned Societies' had become both less frequent and narrower in scope, predominantly noting the Geological Society, with whom Taylor & Francis had a long relationship, but occasionally noting the Royal Society too. The major difference was in the journal's length. After its initial abundance, its pagination had settled at around 80 pages per issue

by 1810; by 1911 this ranged from 130 to 150 pages per issue, with the total pagination of a volume ranging between 800 and 900 pages. Given that the number of articles was fairly similar, this meant that the length of contributions had increased. In 1911 *Philosophical Magazine* was still set by hand—the demands of setting mathematical formulae meant the firm were late to invest in Monotype—and the paper size remained the same.¹⁴ The only significant formal difference was the reintroduction of the lamp motif in 1883.¹⁵

Forged to meet the demands of late eighteenth-century and early nineteenth-century scientific publishing, the form of *Philosophical Magazine* proved sufficiently flexible to accommodate the different demands of the early twentieth. Where previously *Philosophical Magazine* had scoured scientific societies and publications for intelligence in a wide range of disciplines, it now mainly published original articles in mathematics and physics. This shift was enabled by its illustrious editors: Brewster and Kane initially; then well-known physicists such as John Tyndall from 1854 to 1863, William Thomson from 1871 to 1907, and George Francis Fitzgerald from 1890 to 1901. As a commercial journal, unaffiliated with any scientific institution, *Philosophical Magazine* could publish content, without requiring it to be read, from wherever it derived. However, in the early twentieth century this independence began to look like a weakness. *Proceedings of the Royal Society* and *Proceedings of the Physical Society*, their status warranted by the prestige of their respective institutions and the mechanisms through which papers came to press, presented a challenge to the way in which *Philosophical Magazine* understood itself. Whereas previously it had served an important niche, getting material published rapidly and providing a conduit to that published overseas, it now found itself in a market for monthly scientific publications whose quality was guaranteed by their sponsoring institutions.

The division of *Proceedings of the Royal Society* into sections in 1905 created a specialist publication that was in direct competition with *Philosophical Magazine*.¹⁶ From 1919 this competition became even more fierce, as the Physical Secretary of the Royal Society, James Jeans, attempted to increase both the quality and the quantity of the papers published in *Proceedings*.¹⁷ Although *Philosophical Transactions* had been similarly divided in 1887, its bi-annual publication meant that it was more suited to a kind of archival publication, more akin to the monograph than the periodical. This was formally recognized in 1913, when the Sectional Committee for Physics revoked the ordinance specifying that publication in *Philosophical Transactions* ought to mark a distinct contribution to research. At the same time, submitted papers were now considered for both journals simultaneously, with referees being asked to give their view on the most suitable destination.¹⁸ This put the papers in *Transactions* and *Proceedings* on the same footing, making the distinction between them one of length rather than status.

Philosophical Magazine's other rival, *Proceedings of the Physical Society*, was also structured by its institutional affiliation. Oriented towards experimental physics and encompassing a much wider membership, the Physical Society was founded in 1874 as a response to the narrow form of physics represented by the Royal Society.¹⁹ Taylor & Francis had a close relationship with the Physical Society: William Francis, the illegitimate son of Richard Taylor, was a friend of the Physical Society's founders, and Taylor & Francis became the new society's printers.²⁰ Its *Proceedings* began with the formation of the Society, but were not conceived as a rapid mode of dissemination; instead, papers were first published in *Philosophical Magazine*, before being reprinted when volumes of *Proceedings* were ready to go to press.²¹ In 1905, however, the Physical Society's *Proceedings* became a monthly, in effect ending the informal arrangement with

Philosophical Magazine. In 1910 Taylor & Francis lost the contract to print the Physical Society's *Science Abstracts* and, given that the firm had lost the Royal Society's business in 1877, the decision to appoint Carey Foster and Lodge as editors in 1911, both of whom had been connected with the Physical Society from the outset and had served as its President, was an explicit attempt to keep the Society inside.²²

Each society had its own disciplinary and institutional interests and, as a result, each set of *Proceedings* occupied its own place in the market. Unaligned, *Philosophical Magazine* occupied the space between, its position justified by the scope of its contributions and the speed with which it could bring material to press. Although publication times varied, the informal nature of *Philosophical Magazine's* management allowed for certain papers to be rushed in as desired. For example, after a dispute with the Royal Society over its treatment of a paper he had submitted, the Cambridge mathematician Joseph Larmor wrote to Lodge in December, resulting in his paper being published in *Philosophical Magazine* the following month.²³ This independence proved precarious, however. All three publications were monthlies, but the very thing that gave *Philosophical Magazine* its edge, its freedom from institutional bureaucracy, became a liability. Both sets of *Proceedings* published research that had been institutionally ratified. Without the authority of an institution behind *Philosophical Magazine*, there was a danger that it would become a second-choice publication for both societies' constituencies.

Philosophical Magazine was originally designed to be a rapid clearing house for scientific information. Over the course of the nineteenth century it found a niche as a monthly periodical specializing in physics and mathematics, but this reorientation had little effect on the periodical's form, structure or editorial practices. With the emergence of *Nature* as the increasingly preferred venue for the rapid announcement of results, *Philosophical Magazine* could no longer compete on timeliness.²⁴ Instead, it found itself curiously anachronistic. Whereas the survival (and profitability) of *Philosophical Magazine* demonstrated that it served a purpose in early twentieth-century science publishing, there were other types of scientific journal that made this 'old-established organ' look old-fashioned.

OLIVER LODGE AND *PHILOSOPHICAL MAGAZINE*

The appointment of Lodge, Carey Foster and Thomson as editors in 1911 was an attempt to revivify *Philosophical Magazine*. The editorship had long combined members of the family with well-known scientists, but the death of Kelvin in 1907 reduced the editors to just two, William Francis Jr and John Joly. William Francis Jr had studied science at King's College London, leaving before finishing his degree to become a partner in the family firm in 1897. Like his father, he was a long-standing member of the Physical Society and, after his father's death in 1904, replaced him as an editor of *Philosophical Magazine*.²⁵ Offering expertise from outside the business was John Joly, Professor of Geology and Mineralogy at Trinity College Dublin. Appointed in 1901 after the death of Fitzgerald, Joly's interests in theoretical and applied physics meant he was well qualified to advise on the diverse content published in *Philosophical Magazine*, and his institutional position at Trinity College maintained the journal's link with Ireland.²⁶ The additional editors would ease the burden on Joly and Francis, but they would also bolster its reputation. When Joly approached Larmor to join him as editor in 1910, Larmor declined, citing the mixed quality of the journal's content.²⁷ Larmor suggested the creation of a more formal

editorial board, drawn from representatives of several learned societies and other institutions. Arguing that a more formal system of refereeing would ‘close the door too tight’, Larmor acknowledged the authority of scientific institutions in ratifying content but did not want to burden *Philosophical Magazine* with a bureaucracy that would restrict the diversity of its contents or delay material getting into print.²⁸

Taylor & Francis did not adopt Larmor’s suggestion. While they recognized that the quality of *Philosophical Magazine* needed to be addressed, they preferred to do this by approaching a new set of editors rather than sacrifice the independence of the journal. At the turn of the twentieth century, Taylor & Francis had the largest portfolio of print work from the learned societies, printed several prestigious publications such as *Annals of Natural History*, *Ibis* and *Observatory*, and were undertaking a range of job work from the City.²⁹ *Philosophical Magazine*—connected with Taylor & Francis since the firm’s foundation, with members of the family serving as its editors, and, perhaps most importantly, still profitable—had a special place in their list. Rather than seek support from learned societies and institutions, the company sought individuals who would increase its prestige. J. J. Thomson, Cavendish Professor at Cambridge, had recently won the Nobel Prize in Physics for his work on the electron and was knighted in 1908.³⁰ George Carey Foster, recently retired as Principal of University College London after a long career as Professor of Experimental Physics, had twice been Vice President of the Royal Society (1891–93; 1901–03), Treasurer of the British Association (1888–1904) and, as already mentioned, had been one of the founders of the Physical Society.³¹ Oliver Lodge, whose first formal post was as assistant to Carey Foster, was also closely connected with both the Physical Society and the British Association. After almost 20 years as Lyon James Professor of Experimental Physics at University College Liverpool, Lodge had been Principal of the University of Birmingham since 1900.³² All three were on good terms, had worked together in the past and, perhaps most importantly, had broadly sympathetic views; however, as Brock and Meadows wryly note, ‘they hardly injected young blood into the system.’³³ In 1911, Lodge was the youngest of the editors at 50 years of age: Joly was 54, Thomson 55, and Carey Foster 76.

All three had previous relationships with *Philosophical Magazine*, but Lodge was particularly invested in both the journal and what it represented. Lodge’s first published article, ‘On the Flow of Electricity in a uniform plane conducting Surface’, written with Carey Foster, was published in two parts in *Philosophical Magazine* in 1875.³⁴ As an editor, Lodge was following in the footsteps of three of his scientific mentors, Tyndall, Kelvin and Fitzgerald. Both Tyndall and Kelvin were older than Lodge and it was through their work that he came to physics. Lodge had attended Tyndall’s lectures on heat at the School of Mines as a teenager; his early work on dust, which he presented to acclaim at the British Association meeting in Montreal in 1884 (and then published in *Philosophical Magazine*), derived from Tyndall’s research.³⁵ It was at this meeting, too, that Lodge debated with Kelvin (then William Thomson) about the seat of force in a voltaic cell, which produced another paper for *Philosophical Magazine* and a position as Physical Secretary on a British Association committee on electrolysis in 1885.³⁶ As with Tyndall, Lodge had closely followed Kelvin’s work as a young man and continued to do so throughout his career.³⁷

Whereas both Tyndall and Kelvin were of the previous generation, Lodge was the same age as Fitzgerald. They met at the British Association in Dublin in 1878 and remained friends until Fitzgerald’s death in 1901.³⁸ Lodge and Fitzgerald corresponded closely about electromagnetism; Fitzgerald’s suggestion that high-frequency oscillating current

might generate electromagnetic waves in 1883 led to Lodge's success in propagating waves along wires in 1888. After learning of Hertz's priority, both Lodge and Fitzgerald championed his work, Fitzgerald dedicating his Presidential Address to Section A in 1888 to its significance.³⁹ When Fitzgerald joined Kelvin and Francis as editor of *Philosophical Magazine* in 1890—the same year in which the Royal Society acknowledged Hertz's work, awarding him the Rumford Medal—it acknowledged the place of electromagnetism, informed by Maxwellian theory, at the cutting edge of British physics.⁴⁰

Lodge published extensively in *Philosophical Magazine* before becoming Principal at Birmingham. Between 1875, when his first paper appeared, co-written with Carey Foster, and 1900, when his Presidential Address to the Physical Society was published in two parts, Lodge published 35 papers in *Philosophical Magazine*, some in multiple parts.⁴¹ In this period, *Philosophical Magazine* was Lodge's preferred place for the publication of full papers. He published shorter notes and correspondence, but these he mostly directed to *Nature*, *Electrician* and *Electrical Review*. For instance, Lodge's 1888 paper, 'On the Theory of Lightning Conductors', containing his postscript crediting Hertz, was published in *Philosophical Magazine* in August, but he subsequently published 13 shorter pieces in *Electrician* discussing various issues concerning lightning conductors and electrical theory.⁴²

Lodge had little time for scientific research once he took up the post of Principal at Birmingham. From 1901 until 1910, he published only two papers in *Philosophical Magazine*, both in 1907 and both on the ether. Once an editor, Lodge began to publish more frequently but still only managed four papers between 1911 and 1918. He was still publishing, however. His position as Principal offered a platform from which to address a range of subjects, and he seized the opportunity. Lodge had been a member of the Society for Psychical Research since 1884, the Synthetic Society (a private discussion group founded in the wake of Balfour's *The foundations of belief*) since 1896, and was on good terms with Sidney and Beatrice Webb, publishing a Fabian tract in 1905.⁴³ As Principal, Lodge often spoke on educational matters, but his moderation, coupled with his willingness to discuss controversial topics, meant that he quickly found an audience for more speculative subjects. In 1904 he was one of the founders of *Hibbert Journal*, 'a quarterly review of religion, theology, and philosophy' edited by L. P. Jacks and G. Dawes Hicks and intended to offer 'religious thought a genuinely open field'.⁴⁴ His various addresses and their subsequent reporting in the press established Lodge as both one of the most famous scientists of his day and, to the frustration of some, the default spokesperson for science.⁴⁵ Lodge developed his speeches into longer articles and, eventually, a string of books: *The substance of faith* (1907), *Man and universe* (1908) and *The survival of man* (1909).⁴⁶ In these books Lodge attempted to weave together his science, spiritualism and wider philosophy: this was not merely 'popularization' but a process of intellectual synthesis, in which he integrated scientific research into a broader philosophical and ethical system. It was this that General Relativity, in particular, put at risk.

Lodge gave notice of his retirement from the University of Birmingham in 1918, leaving in February 1919. In the next three years he published 11 papers in *Philosophical Magazine* (including an obituary of Carey Foster). In retirement, Lodge's published output increased across the board: however, the return to *Philosophical Magazine* is particularly significant. In November 1919 the results of Eddington and Dyson's eclipse expedition were discussed at a joint meeting of the Royal Astronomical Society and the Royal Society, prompting *The Times* to announce 'A revolution in science'.⁴⁷ In retirement, Lodge had the time to respond to what he perceived as threat to the ether, and a publication at hand

in which to publish. It was in *Philosophical Magazine* of the 1880s and 1890s—the period when it was edited by Kelvin and, from 1890, Fitzgerald—that Lodge published the work on electromagnetism that seemed to lend the ether presence. It is no surprise that at the moment that the ether seemed most at risk Lodge should once again publish in *Philosophical Magazine*, now under his editorship.

LODGE, *PHILOSOPHICAL MAGAZINE* AND THE NEW PHYSICS

Lodge's 1911 appointment as an editor of *Philosophical Magazine* came during a turbulent time for physics, with investigations into quantum energy resulting in suggestions that long-held theories were no longer correct. That autumn, an international cohort of prestigious physicists gathered in Brussels to discuss the subject 'Radiation and the quanta'. During this inaugural Solvay Congress, Max Planck declared that the 'principles of classical mechanics' were no longer sufficient to describe observable phenomena.⁴⁸ Two years later, another large gathering of scientists took place, when the British Association for the Advancement of Science met in Lodge's Birmingham. In the unusual position of being that year's host (as Principal of the university) and President, Lodge had an enviably large platform with which to publicly respond to the recent changes in thought.⁴⁹

In front of the British Association audience, Lodge delivered an hour-and-a-half defence of 'continuity', attacking the tendency by many of his peers to 'atomise everything'. Lodge was here referring not only to the increasingly discontinuous nature of both matter and energy, and the threat to the continuous ether, but also to a broader intellectual approach to scientific change. He warned against the reckless abandonment of long-held theories, instead asserting that the latest developments in physics were not 'so revolutionary as to overturn Newtonian Mechanics'. Lodge advocated a 'conservative attitude', urging his peers to 'remain with, or go back to Newton . . . retaining all Newton's laws, discarding nothing, but supplementing them in the light of further knowledge.'⁵⁰

This view would become fundamental to his approach to 'modern' physics and his popular science writing throughout the subsequent decades. In the 1920s he wrote books discussing relativity theory, quantum physics and the nature of energy, but placed new developments within an ethereal framework.⁵¹ In 1929, writing about 'The new outlook in physics' for the popular science magazine *Discovery*, Lodge declared that the immediate problem was to 'weld together the newer and the older discoveries into an all-embracing system which shall include them all.'⁵² Through his work as an editor for *Philosophical Magazine*, Lodge built a home for both the new and the old, creating an environment in which they could coexist in a rough textual form of the much-sought-after final synthesis.

Lodge was able to use *Philosophical Magazine* in this way as a result of its relaxed style of management, but it was this that opened the journal up to reproach. What was for Lodge a relatively unfettered space, where material could be readily disseminated, was for the NUSW one recklessly unsupervised, in which material was published out of order and the good was mixed with the bad. Yet this arrangement suited Lodge. When William Francis Jr sent Lodge a contribution by Felix Ehrenhaft in 1924, he sent it neither for review nor for approval. Ehrenhaft was an Austrian physicist who some 14 years earlier had become embroiled in a dispute with Robert A. Millikan over the existence of sub-electrons.⁵³ Now, a year after Millikan had been awarded the Nobel Prize in Physics, Ehrenhaft had submitted to

Philosophical Magazine a paper that continued the debate, arguing again that the fundamental unit of electric charge was not indivisible. Lodge's critical response described the paper as 'either badly written or badly translated' and almost certainly incorrect from a scientific perspective. Indeed, Lodge noted that Ehrenhaft had rather unusually broken with orthodoxy and redefined the word 'quantum' to mean the charge of an electron. Lodge did not know whether Francis had sent the paper to a referee, but acknowledged that either way his publisher felt that it ought to be inserted in the journal. Lodge's only action, in the face of a paper he fundamentally disagreed with, was to append his own 'polemical note' in order to 'soothe Professor Millikan's susceptibilities.'⁵⁴

Lodge's diplomatic note, printed at the end of Ehrenhaft's paper, graciously acknowledged the difficulties of Austrian–American science communication in a postwar period, and conceded that it was 'only fair' to give space to the Viennese professor, before quoting a rather damning extract from Millikan's 1917 refutation of Ehrenhaft's position. This ended with the American physicist's conclusion: 'There has then appeared up to the present time no evidence whatever of the existence of a sub-electron.' Lodge's closing remarks again defended the publication of the paper, with the assertion that 'the fundamental importance of the atomic nature of electricity, and the size of its ultimate unit, is so great that no serious attack on the orthodox position can be ignored.'⁵⁵ Despite his criticisms, Lodge put his support behind the publication of this paper, and indeed when Ehrenhaft wrote to Lodge and Thomson the following year to complain that his paper had not yet appeared in print, Lodge informed his publishers, providing them with Ehrenhaft's address, and noting that they would 'no doubt take the matter up at once.'⁵⁶

It is not especially likely that Ehrenhaft's paper would have been published elsewhere, and the Royal Society's Physical Committee would almost certainly have rejected it as being of no worth to the progress of physics. The members of the NUSW would no doubt have included this paper under the category of content that stole space from more worthy contributions. Although Lodge also doubted the paper's value, he accepted his publisher's decision, and in turn was afforded the opportunity to publicly criticize Ehrenhaft's arguments. Lodge did not have complete control over the content and management of the journal, but neither did he seek it. It was important to him that space was given to all views, that both defences and challenges could be published, opening up debate.

Lodge benefited considerably from this approach, and used it to make *Philosophical Magazine* the unofficial home of ether physics in the 1920s.⁵⁷ Between 1911 and 1939, *Philosophical Magazine* published 13 articles on the ether; in the same period the Royal Society published none, and the Physical Society only one. However, *Philosophical Magazine* also continued to publish a significant amount of what we would now consider to be 'modern' physics. It was the home of Ernest Rutherford's 1911 paper outlining his nuclear structure of the atom, and Niels Bohr's three papers on the quantum atomic model.⁵⁸ Between 1911 and 1939, *Philosophical Magazine* published 48 articles on relativity and 56 on quantum theory. Indeed, in 1924, Charles Galton Darwin, a quantum physicist with no interest in nineteenth century theories, believed that *Philosophical Magazine* was one of only two British physics journals worth reading (the other being *Proceedings*).⁵⁹ Between 1911 and 1939, 15 of his papers appeared in the former, and 25 in the latter. In terms of sheer quantity of articles, *Proceedings* and *Philosophical Magazine* were certainly the most successful British physics journals of the 1920s. Whereas *Philosophical Magazine* had been publishing nearly three times as many articles as *Proceedings* in 1911, by 1929 this gap had closed considerably, with both journals

printing more than 200 papers that year.⁶⁰ The rapid increase in *Proceedings* articles was the result of James Jeans's strategy to reinvigorate the journal after his appointment as Physical Secretary of the Royal Society in 1919.⁶¹

Jeans's attitude towards science, and science publishing, differed drastically from Lodge's. Jeans, one of the delegates of the 1911 Solvay Congress, had been an advocate of quantum physics since 1912, led a debate on radiation at the same British Association meeting that housed Lodge's attack on discontinuity, and in the following year produced *Report on radiation and the quantum-theory* for the Physical Society.⁶² Jeans was committed to a scientific method that began with certain premises and from them deduced valid knowledge.⁶³ Unlike Lodge's 'wait and see' approach, once Jeans had been converted to a new theory, there was no reason to look elsewhere. Indeed, Lodge and Jeans rarely saw eye to eye. Privately, Lodge described Jeans as a 'difficult man to know, and too supercilious and superior to ordinary mortals.'⁶⁴ Publicly, after the publication of Jeans's best-selling popular science book *The mysterious universe*, and Lodge's criticisms of the content within, the two physicists debated modern physics in the pages of *Nature*. Their differences extended to publication practices, with both physicists seeming well suited for both the content and the management style of the particular journal that each was affiliated with in the 1920s. For Lodge, *Philosophical Magazine* provided a space for a hotchpotch of ideas, any of which might be included in the eventual synthesis of classical and modern; for Jeans, the Royal Society's *Proceedings* filtered out certain approaches, discarding old ideas made redundant by new theories.

Philosophical Magazine's style, enthusiastically preserved by Lodge throughout the 1920s and 1930s, continued to come under fire, even by its own editors. In 1931 Thomson, after much consideration over how one might go about 'raising the standard of the papers', proposed having submissions 'contributed' by a Professor or Fellow of the Royal Society. Notably, he raised this with Lodge, who then communicated it, with no mention of Thomson, to Taylor & Francis. In a letter that suggests that a considerable amount of authority was held by the owners of the journal, Lodge noted that he did not know whether his publishers would find this practice feasible, but suggested that it might help them when declining papers.⁶⁵ This practice does not seem to have been adopted, and Thomson continued to worry about the quality of *Philosophical Magazine*. In 1933 he wrote to Alfred William Porter, who had joined the editors of *Philosophical Magazine* as part of another recruitment drive the previous year.⁶⁶ Having heard that the Physical Society was to start producing annual reports of various branches of physics, Thomson proposed publishing these in *Philosophical Magazine*, an act that would supply the journal with both quality papers and an institutional affiliation.⁶⁷

Once again, this went no further. After the death of John Robinson Airey in 1937, who had joined as an editor of *Philosophical Magazine* in the year after Porter, P. M. S. Blackett was invited to join the board. Blackett, the experimental physicist who had worked with Rutherford at the Cavendish Laboratory, had a lengthy discussion with the manager of Taylor & Francis, G. A. Courtney Coffey. Unlike earlier critics, Blackett believed that a strong process of refereeing was crucial, but suggested that affiliation with a scientific society was necessary to persuade prestigious scientists to perform this reviewing work for no reward. Courtney Coffey, however, confided that he did not believe that the Francis family would be willing to part with the journal, for family, historic and financial reasons.⁶⁸ Roughly 15 years previously, the Institute of Physics also rejected the NUSW's suggestion to approach the publishing company, on the basis that they did not believe they could hold any influence over the proprietors.⁶⁹

But the general perception was not one of a commercial publisher holding a scientific journal to ransom. The Institute also objected to the NUSW's proposal on the basis that "official" editing might lead to the exclusion of papers which were valuable on account of their heterodoxy.⁷⁰ Although the NUSW argued that *Philosophical Magazine* never published anything that was both valuable and subversive, Lodge would no doubt have countered that it was not the editor's place to assess value. In Lodge's publishing utopia, all ideas were born equal and all physicists deserved a platform. Lodge saw the relativity and quantum theories as useful tools for the accumulation of data but did not believe they could supersede that which had gone before. He was waiting for a new Newton to provide a full explanation of the physical world, one of continuity in both nature and scientific progress.⁷¹ Through his work on *Philosophical Magazine*, he was preparing physics for the future as he saw it.

CONCLUSION

Speaking in 1913, Lodge attempted to 'summarise the main trend of physical controversy' at that time, venturing that 'it largely turns on the question as to which way ultimate victory lies in the fight between Continuity and Discontinuity.'⁷² Lodge, of course, was in Continuity's corner. This concept underpinned his views on matter and energy, on life and death, on the nature of scientific progress. Fundamental to all of this was the ether, the medium that filled the empty space between atomic particles, that formed a bridge to the spiritual world, that he was sure would continue to play a fundamental role in the future of his discipline.

Lodge's undying support of the ether was not the desperate act of an old man trying to cling to the foregone Victorian era. He was not a hopeless conservative. Indeed, in the year of his British Association continuity address, he had also become embroiled in debate concerning this very attitude with the curmudgeonly chemist Henry Edward Armstrong. Opposing Armstrong's views on radium, Lodge confessed 'a good deal of sympathy' with the chemist's conservatism, but noted that such sympathy had a limit, and this limit was 'transgressed when facts are ignored and hypotheses wildly manufactured in order to retain some old and superseded exclusive and negative generalisation.'⁷³ Instead, Lodge's conservatism was of a more progressive nature. His celebration of continuity was not a call for stasis, but for a particular model of progress. Jeans inserted discontinuity into the content of *Proceedings of the Royal Society*, drawing a line under the past; Lodge, in contrast, turned to formal continuity to make the ether new.

Although concerns were raised over the quality of *Philosophical Magazine*, there was little enthusiasm for systematic refereeing. For Larmor in 1910 the answer was to recruit editors from the learned societies, the authority of the societies underpinning the editorial work. In 1921 the NUSW suggested something similar, although for them the Institute of Physics was the appropriate institutional home for *Philosophical Magazine* and should oversee its editing. Taylor & Francis's response to such suggestions was to continue what they had always done: recruit editors whose scientific reputations would bolster that of the periodical. For Lodge, the editorial arrangements were not the problem. By passing on J. J. Thomson's suggestion that papers be communicated in 1931, he attempted to raise the quality of submissions while also providing a further tool with which to select content for publication. Tellingly, this was a suggestion that left both editorial and ownership arrangements of the journal intact.

The continuity of *Philosophical Magazine*, protected by a cadre of editors with its best interests at heart, was, for Lodge, the best means of prolonging the life of the ether, giving it a range of speculative forms in which it could survive. He was deeply invested in *Philosophical Magazine* and the way in which it was run. In his obituary for Carey Foster, for instance, Lodge noted approvingly that Carey Foster ‘regarded the Magazine as one of the bulwarks of serious Physics in this Country, and exerted himself to preserve it practically in its ancient form.’⁷⁴ All periodicals establish continuity through discontinuity, as the publication asserts its identity despite the differing content of individual issues. *Philosophical Magazine*, which had been in existence for well over a century before Lodge joined as an editor, provided a good example of periodical continuity that could stand for continuity in physics. In encouraging new work on the ether Lodge did not hark backwards but instead made it into something new; equally, the editorial arrangements of *Philosophical Magazine* were not an anachronism, ossifying the periodical, but rather maintained its flexibility. The editorial policy of this ‘old-established organ’ had allowed it to accommodate new scientific ideas in the past and, for Lodge, could continue to do so in the future.

NOTES

- 1 Oliver Lodge, ‘The “Philosophical Magazine”’, *Nature* **108**, 12 (1921).
- 2 ‘*Philosophical Magazine*: Report by Research Committee’, *Scientific Worker* (11 March), 29–30 (1922), at p. 29. Records of the Association of Scientific Workers (AScW), MSS.79/ASW/4/1/1, University of Warwick Modern Records Centre.
- 3 Lodge, *op. cit.* (note 1), p. 12.
- 4 See W. H. Brock and A. J. Meadows, *The lamp of learning: two centuries of publishing and Taylor and Francis*, pp. 89–90 (1984; Taylor & Francis, London, 1998).
- 5 ‘*Philosophical Magazine*’, *op. cit.* (note 2), p. 29.
- 6 Brock and Meadows, *op. cit.* (note 4), p. 144.
- 7 Oliver Lodge, *Continuity: the Presidential Address to the British Association for 1913* (J. M. Dent & Sons, 1913).
- 8 ‘*Philosophical Magazine*: Report by Research Committee’, *op. cit.* (note 2), p. 29.
- 9 *Ibid.*, p. 29.
- 10 See Jonathan R. Topham, ‘Anthologizing the book of nature: the circulation of knowledge and the origins of the scientific journal in late Georgian Britain’, in *The circulation of knowledge between Britain, India and China: the early-modern world to the twentieth century* (ed. Bernard Lightman, Gordon McOuat and Larry Stewart), pp. 119–152 (Brill, Leiden, 2013).
- 11 Topham, *op. cit.* (note 10), p. 139, and Brock and Meadows, *op. cit.* (note 4). For Nicholson’s *Journal* see Iain P. Watts, ‘“We want no authors”: William Nicholson and the contested role of the scientific journal in Britain, 1797–1813’, *Br. J. Hist. Sci.* **47**, 397–419 (2014), and Topham, *op. cit.* (note 10).
- 12 See Brock and Meadows, *op. cit.* (note 4), pp. 90–99 and 244.
- 13 *Ibid.*, p. 248.
- 14 *Ibid.*, p. 164.
- 15 For the lamp motif, see Brock and Meadows, *op. cit.* (note 4), pp. 246–247.
- 16 See Imogen Clarke, ‘The gatekeepers of modern physics: periodicals and peer review in 1920s Britain’, *Isis* **106**, 74 (2015).
- 17 See Brock and Meadows, *op. cit.* (note 4), p. 163.
- 18 ‘Physics and Chemistry Sectional Committee Minutes’, 22 May 1913, Royal Society Archives.

- 19 For the Physical Society, see John L. Lewis, *125 years: the Physical Society and the Institute of Physics* (Institute of Physics, Bristol, 1999) and Russell Moseley, 'Tadpoles and frogs: some aspects of the professionalization of British physics, 1870–1939', *Social Stud. Sci.* **7**, 423–446 (1977).
- 20 See Brock and Meadows, *op. cit.* (note 4), p. 139.
- 21 Lewis, *op. cit.* (note 19), p. 17.
- 22 See Brock and Meadows, *op. cit.* (note 4), p. 151.
- 23 Clarke, *op. cit.* (note 16), p. 90.
- 24 Melinda Baldwin, "'Keeping in the race": physics, publication speed and national publishing strategies in *Nature*, 1895–1939', *Br. J. Hist. Sci.* **47**, 257–279 (2014).
- 25 Brock and Meadows, *op. cit.* (note 4), p. 143, 150. See also 'Obituary notice', *Phil. Mag.* **14**, 727–728 (1932).
- 26 Brock and Meadows, *op. cit.* (note 4), pp. 147–148. See also 'John Joly 1857–1933', *Obit. Not. Fell. R. Soc.* **1**, 258–286 (1934); Oliver Lodge, 'Obituary notice: Professor Joly', *Phil. Mag.* **17**, 198–200 (1934).
- 27 See Clarke, *op. cit.* (note 16), p. 76.
- 28 Joseph Larmor to John Joly, 6 November 1910, papers of John Joly, Manuscripts and Archives Research Library, Trinity College, Dublin.
- 29 Brock and Meadows, *op. cit.* (note 4), p. 142.
- 30 He would receive the Order of Merit in 1912. Isobel Falconer, 'Thomson, Sir Joseph John (1858–1895)', *Dictionary of National Biography* (2004) (see <http://www.oxforddnb.com/view/article/36506>).
- 31 Graeme Gooday and Colin A. Hempstead, 'Foster, George Carey (1835–1919)', *Dictionary of National Biography* (2004) (see <http://www.oxforddnb.com/view/article/39488>). See also Oliver Lodge, 'George Carey Foster', *Phil. Mag.* **37**, 317–320 (1919).
- 32 See W. P. Jolly, *Oliver Lodge* (Constable, London, 1984).
- 33 Brock and Meadows, *op. cit.* (note 4), p. 150.
- 34 George Carey Foster and Oliver Lodge, 'On the Flow of Electricity in a uniform plane conducting Surface. Part I', *Phil. Mag.* **49**, 385–400 (1875); 'On the Flow of Electricity in a uniform plane conducting Surface. Part II', *Phil. Mag.* **49**, 475–489 (1875). This paper was recorded as having been read before the Physical Society on 27 February 1875, and it appeared in *Proc. Phys. Soc.* **1**, 113–149 (1874–75).
- 35 For Tyndall's influence in his early life, see Oliver Lodge, *Past years: an autobiography of Sir Oliver Lodge* (Hodder & Stoughton, London, 1931), pp. 65–66 and 75–77; Jolly, *op. cit.* (note 32), p. 22. For Lodge's work on dust, see *Past years*, pp. 174–175. It was published as Oliver Lodge and J. W. Clark, 'On the phenomena exhibited by dusty air in the neighbourhood of strongly illuminated bodies', *Phil. Mag.* **17**, 214–239 (1884). Tyndall's legacy was complex for Lodge: his entry on Tyndall for the 10th edition of *Encyclopedia Britannica* (1902–03) enraged Tyndall's widow. See Jolly, *op. cit.* (note 32), pp. 180–181.
- 36 Jolly, *op. cit.* (note 32), pp. 62–65. Lodge's paper was published in five parts: the first three were published as 'On the seat of the electromotive forces in the voltaic cell', *Phil. Mag.* **19**, 153–190, 254–280 and 340–365 (1885), followed by an appendix, 'On the paths of electric energy in voltaic circuits. Appendix to paper on the seat of the electromotive forces in the voltaic cell', *Phil. Mag.* **19**, 487–494 (1885), and a sequel, 'Sequel to paper on the seat of the electromotive forces in a voltaic cell. Theories of Wiedemann and of Helmholtz', *Phil. Mag.* **20**, 372–384 (1885). Details of the electrolysis committee are recorded in Lodge's scrapbooks, Book II, OJL/4, Cadbury Research Library, University of Birmingham.
- 37 Lodge did not always see eye to eye with Thomson. See, for instance, their disagreement about radium, which was played out publicly in *The Times* in August 1906. See Kelvin, 'Radium', *The Times* (9 August), 3 (1906), Oliver Lodge, 'Radium', *The Times* (15 August), 4 (1906), Kelvin, 'Radium', *The Times* (20 August), 6 (1906), and Oliver Lodge, 'Radium', *The Times* (22

- August), 4 (1906). The various letters were collected by Lodge in his scrapbooks; see Book XII, OJL/4, Cadbury Research Library, University of Birmingham.
- 38 See Lodge, *op. cit.* (note 35), pp. 140 and 143.
- 39 Jolly, *op. cit.* (note 32), p. 87. Iwan Morus, *When physics became king* (Chicago University Press, 2005), pp. 168–169.
- 40 For Fitzgerald, Lodge and Maxwellian theory, see Bruce Hunt, *The Maxwellians* (Cornell University Press, Ithaca, NY, 1991), and Bruce Hunt, “‘Our friend of brilliant ideas’: G. F. Fitzgerald and the Maxwellian circle”, *Eur. Rev.* **15**, 531–541 (2007).
- 41 If each part is counted as a separate article, the total is 43. The back issues of *Philosophical Magazine* have been published as part of *Taylor and Francis Online* (2011–) (<http://www.tandfonline.com> (registration required)). For Lodge’s publications, see *A bibliography of Sir Oliver Lodge FRS* (compiled by Theodore Besterman) (Oxford University Press, 1935).
- 42 Oliver Lodge, ‘On the theory of lightning-conductors’, *Phil. Mag.* **26**, 217–230 (1888). For his publications in the *Electrician*, see Besterman, *op. cit.* (note 41), pp. 18–21.
- 43 For Lodge and the Society for Psychical Research see Lodge, *op. cit.* (note 35), pp. 270–281. For the Synthetic Society, see Lodge, *op. cit.* (note 35), pp. 172–173, and Jolly, *op. cit.* (note 32), pp. 115–116. For Lodge and the Fabians, see Jolly, *op. cit.* (note 32), pp. 98–100. For Lodge’s reminiscences on social questions more broadly, see Lodge, *op. cit.* (note 35), pp. 265–267.
- 44 L. P. Jacks and G. Dawes Hicks, ‘Editorial’, *Hibbert J.* **1**, 1–4 (1902), 3.
- 45 See for instance H. E. Armstrong’s complaint that the public think Lodge ‘the mouthpiece of the scientific fraternity’, reported in ‘The Midland Sage’, *Birmingham Daily Mail* (19 January), 3 (1914).
- 46 The books are *The substance of faith allied with science. A catechism for parents and teachers* (Methuen, London, 1907), *Man and universe: a study of the influence of the advance in scientific knowledge upon our understanding of Christianity* (Methuen, London, 1908) and *The survival of man: a study in unrecognized human faculty* (Methuen, London, 1909). See Jolly, *op. cit.* (note 32), pp. 175–179. In 1909 Lodge also published *Life and matter* (Williams & Norgate, London, 1909) and *The ether of space* (Harpers, London, 1909).
- 47 ‘Revolution in science’, *The Times* (7 November), 12 (1919).
- 48 On the Solvay Congress, see Richard Staley, ‘On the co-creation of classical and modern physics’, *Isis* **96**, 530–558 (2005).
- 49 Lodge had become President after the unexpected death of Sir William White. See Lodge, *op. cit.* (note 7), p. 1.
- 50 *Report of the British Association for the Advancement of Science*, pp. 7, 18, 19 (1913).
- 51 For example, Oliver Lodge, *Atoms and rays: an introduction to modern views on atomic structure and radiation* (Benn, London, 1924); *idem*, *Relativity: a very elementary exposition* (Methuen, London, 1925); *idem*, *Modern scientific ideas, especially the idea of discontinuity: being the substance of the talks on ‘atoms and worlds’ broadcast during October and November, 1926* (Benn, London, 1927).
- 52 Oliver Lodge, ‘The new outlook in physics’, *Discovery* **10**, 109–112 (1929), at p. 109.
- 53 On the Millikan–Ehrenhaft dispute, see Gerald Holton, ‘Subelectrons, presuppositions, and the Millikan–Ehrenhaft dispute’, *Hist. Stud. Phys. Sci.* **9**, 161–224 (1978), and Barry Barnes, David Bloor and John Henry, *Scientific knowledge: a sociological analysis* (A.&C. Black, London, 1996), ch. 2.
- 54 Oliver Lodge to William Francis, 3 March 1924. OJL/1/395/1, Cadbury Research Library, University of Birmingham.
- 55 Felix Ehrenhaft, ‘The electrical behaviour of radioactive colloidal particles of the order of 10^{-5} cm. as observed separately in a gas’, *Phil. Mag.* **49**, 633–648 (1925), at p. 648.
- 56 Oliver Lodge to Taylor & Francis, 19 November 1924, OJL/1/395/3, Cadbury Research Library, University of Birmingham.
- 57 Clarke, *op. cit.* (note 16), p. 77.

- 58 Ernest Rutherford, 'The scattering of alpha and beta particles by matter and the structure of the atom', *Phil. Mag.* **21**, 669–688 (1911); Niels Bohr, 'On the constitution of atoms and molecules, part I', *Phil. Mag.* **26**, 1–24 (1913); Niels Bohr, 'On the constitution of atoms and molecules, part II. Systems containing only a single nucleus', *Phil. Mag.* **26**, 476–502 (1913); Niels Bohr, 'On the constitution of atoms and molecules, part III. Systems containing several nuclei', *Phil. Mag.* **26**, 857–875 (1913). It is likely that Bohr, who collaborated with Rutherford in Manchester, was influenced in his choice of publication by his colleague.
- 59 C. G. Darwin to Richardson, 29 April 1924, papers of Owen Willans Richardson, Archive for the History of Quantum Physics [microfilm]. Darwin noted that he read 'practically no other papers' beyond those in *Philosophical Magazine*, *Proceedings*, the German *Zeitschrift für Physik* and the American *Physical Review*. On Darwin, see Jaume Navarro, "'A dedicated missionary": Charles Galton Darwin and the new quantum mechanics in Britain', *Stud. Hist. Phil. Mod. Phys.* **40**, 316–326 (2009).
- 60 *Proceedings* published 66 articles in 1911, and 213 in 1929. *Philosophical Magazine* published 186 articles in 1911, and 251 in 1929. *Philosophical Transactions* published 10 articles in 1929, and *Proceedings of the Physical Society* published 60.
- 61 Brock and Meadows, *op. cit.* (note 4), p. 144.
- 62 Helge Kragh, 'Resisting the Bohr atom: the early British opposition', *Phys. Perspect.* **13**, 4–35 (2011), at p. 6; James Hopwood Jeans, *Report on radiation and the quantum-theory* ('The Electrician' Printing & Publishing Co. Ltd., London, 1914).
- 63 Matthew Stanley, 'So simple a thing as a star: the Eddington–Jeans debate over astrophysical phenomenology', *Br. J. Hist. Sci.* **40**, 53–82 (2007).
- 64 Oliver Lodge to Joseph Larmor, 18 September 1922, Larmor Papers, Royal Society Archives.
- 65 J. J. Thomson to Oliver Lodge, 11 July 1931 and Oliver Lodge to Taylor & Francis, 18 July 1931, OJL1/404/40 and OJL/1/395/5, Cadbury Research Library, University of Birmingham.
- 66 See Brock and Meadows, *op. cit.* (note 4), p. 171. Porter was joined by J. R. Airey in 1932.
- 67 J. J. Thomson to Professor A. W. Porter, 5 January 1933, MM/9/39, Royal Society Archives.
- 68 P. M. S. Blackett to W. H. Bragg, 8 November 1937, the papers of Professor A. V. Hill, Churchill Archives Centre, University of Cambridge.
- 69 '*Philosophical Magazine . . .*', *op. cit.* (note 2), p. 29.
- 70 *Ibid.*, p. 29.
- 71 A new Newton is referred to in Lodge, *Modern scientific ideas*, *op. cit.* (note 51).
- 72 *Report of the British Association*, *op. cit.* (note 50), p. 10.
- 73 Oliver Lodge, 'Atomic theory and radioactivity', *Sci. Prog.* **8**, 197–201 (1913), at p. 197.
- 74 Lodge, *op. cit.* (note 31), p. 320.