Science and Periodicals: Animal Instinct and Whispering Machines

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Abstract and Keywords

Periodicals offer a wonderful guide to the Victorian age, and to the ways in which science entered into the general culture of the time. This study considers a range of different kinds of periodicals, and the diverse ways in which they engaged with contemporary science. Although evolutionary theory was obviously a significant presence, it formed only one part of a complex picture. In the literary-oriented periodicals, for example, we find particular emphasis placed on the ways in which scientific thinking appeared to intersect with the interests of fiction and poetry, whether in theories of selfhood or personal responsibility, or the relations between science and religion. There was also, more generally, a fascination with new inventions, and the possibilities opened up by new technologies, such as the ingenious suggestion for a 'whispering machine'. Periodicals offer an intricate picture of a society grappling with rapid social and cultural change, charged with the immediacy which comes from their serial and time-bound nature. In their integration of cutting-edge science with the latest fiction or social commentary they established a model we could do well to emulate.

Keywords: Victorian, science, periodical, evolution, Darwin, Spalding, instinct, dreams, unconscious

IN a letter published in *Nature* (13 February 1873) on the subject of fears which are inherited, Charles Darwin referred the reader to 'an admirable article' on the subject by Mr Spalding, 'recently published in *Macmillan's Magazine*'.[1] The reference is at first glance rather startling, since *Macmillan's* was not a scientific journal, but a family magazine, with a literary orientation. Yet, Douglas Spalding had chosen to publish the results of his innovative experiments on animals in this vehicle; furthermore, Darwin had both read it and responded immediately. The Victorian textual economy appears to mirror Darwin's natural economy, in which things, seemingly 'most remote in the scale of nature, are bound together by a web of complex relations'.[2] To explore the role of science in the Victorian periodical is to uncover an intricate network of connections, a web of relations spun between leading scientists and family magazines, or novelists and popular science writing. This was an era when more strictly professional science journals were emerging,

but there were still no hard and fast distinctions or barriers. You could find major scientific figures writing in a range of periodicals, not just the 'highbrow' titles, and often on a dizzying array of topics, well beyond their acknowledged areas of expertise. Thus the physician Henry Maudsley wrote on *Hamlet*, and John Herschel, the astronomer, on Dante's *Inferno*, whilst the physician Henry Holland published articles on shooting stars and the physical geography of the sea.[3] Within the pages of the general periodical, science-based articles might sit side by side with the latest novel, political commentary, or household advice. Nor was the science content of periodicals confined (p. 417) to explicit articles. As the Science in the Nineteenth-Century Periodical Project (SciPer) showed, references to science could occur almost anywhere in a periodical's content, from serialized fiction to comic sketches.[4] By adopting a policy of inclusive reading, and thus moving beyond the realm of evident connections signalled in article titles, SciPer was able to trace the subtle and complex ways in which science entered into the general culture of the period, and the processes of interaction between literature and science.

We are now at a very exciting point in periodical research. In the 1960s, the *Wellesley Index to Victorian Periodicals* made it possible for the first time to identify the contributors to major titles, and the *Index* (now available online), with its clear listing of articles in each volume, became the chief guide and bible for researchers in the field. Yet, inevitably, it skewed research: there are an estimated 125,000 periodical titles published in the Victorian period, and the mammoth enterprise of the *Wellesley* was only able to encompass forty-five.[5] Those titles left in the cold, as it were, tended to be bypassed by researchers. With the advent of periodical digitization, and the possibilities of online searching, a new world is opening up. Searches reveal that well-known authors wrote for a wider range of periodicals than had previously been identified, while interesting authors, or journals, that have never received any critical attention come into view, reinforcing, in almost overwhelming detail, our previous abstract understanding that the *Wellesley* titles represented only the tip of the iceberg. In the coming decades we will gain a more profound, and nuanced, understanding of the ways in which science entered into Victorian literary culture, as researchers place all these new findings in a broader context.[6] There are of course dangers: searches can throw up a myriad of interesting references, but snippets or quotations, divorced from their immediate periodical context and understanding of their significance within that particular title, will be of limited scholarly value. The challenge will be to marry the depth of historical research (p. 418) represented by the *Wellesley*, and current scholarship in the history of the book, with the exciting possibilities opened up by an increasing range of digitized periodical titles.

For the majority of the Victorian reading public, the main way they encountered science was not through books, but periodicals; and periodicals, in their turn, helped nurture the careers of budding 'scientists'. For those who were not 'gentlemen of science', the periodical press offered both a welcome source of income and a public platform, enabling them to make a name for themselves.[7] T. H. Huxley, for example, at the beginning of his career, undertook science reviewing at the radical *Westminster Review*, then under the unofficial editorship of Marian Evans (the future George Eliot). Relations were to become rather strained, however, when he attacked a book on *Comte's Philosophy of the Sciences* by fel-

low contributor, G. H. Lewes, as a work by a mere bookman, who lacked practical experience of science.[8] Although Lewes (who was soon to become Eliot's partner), was devastated, the effect was an altogether positive one, leading him to devote himself to physiological studies for a time. Eliot assisted in the practical work which was to lead to the series of articles in *Blackwood's*, and subsequent book, *Sea-Side Studies* (1858). His important entry into human physiology and psychology, *The Physiology of Common Life* (1859–60), was also first published, in part, in article form in *Blackwood's*, while *Studies in Animal Life* (1862) first appeared in the opening issues of the *Cornhill*.[9] These works have a dual layer of inter-textuality: written to stand alongside the varied content of these periodicals, they also have a strong inter-textual relation with Eliot's novels, as both writers gradually developed their ideas through mutual reading and discussion.[10]

Although Lewes was somewhat unusual in moving from a position of actor and novelist to respected scientist, such shifts were by no means uncommon. Slightly later in the century, James Sully started his career writing on general and philosophical subjects in the periodical press in the early 1870s.[11] Whilst maintaining his broad focus, he developed his work in the domain of psychology, and after twenty years of writing in the periodical press (and poorly-paid part-time teaching), was rewarded by election to the Grote Chair of Philosophy of Mind and Logic at University College London in 1892.

(p. 419) The growth of universities in the later decades of the century brought new possibilities of professional careers, which would lead, for the next generation, to a diminution of the numbers of scientific figures who contributed to general periodical culture. With scientists like Huxley, John Tyndall, W. K. Clifford, and Francis Galton writing for the general press, and major literary figures such as Thackeray, John Morley, and Leslie Stephen at the editorial helm, the last four decades of the nineteenth century represented a high point for generalist periodical publishing, and for the integration of literary and scientific culture.[12] Figures like Grant Allen, novelist and popular science writer, moved with ease across disciplinary boundaries, whilst an army of now largely forgotten science writers, from James Hinton to Francis Anstie, David Ansted, and Richard Proctor, supplied regular science columns or articles. Women too participated in science writing, from Margaret Gatty on natural history to Agnes Clerke on astronomy.[13] Given the diversity and scale of science writing, and scientific forms of content, in the Victorian periodical press, it will not be possible in this essay to do more than offer an analysis of a few representative samples. Starting with a case study of an individual article, I will explore the role of science in a couple of 'heavyweight' periodicals, followed by more 'middlebrow' titles, before concluding with a study of an individual volume of *Macmillan's Magazine*.

'Instinct' and Douglas Spalding: A Case Study

The 'admirable article' singled out by Darwin in *Macmillan's Magazine* offers a fascinating example both of the cultural and scientific life of an article, and of a science writer. When 'Instinct: With Original Observations on Young Animals' was published in *Macmillan's* (February 1873), its author, Douglas A. Spalding, was virtually unknown. He

had given a paper at the British Association for the Advancement of Science the previous year, which had been published anonymously in short form in *Nature*, but this was his first major publication. 'Instinct' described various experiments Spalding had undertaken with ducklings and chicks. Although a (p. 420) follower of Herbert Spencer, Spalding felt that Spencer had not demonstrated his ideas of inherited acquisition, and was set to remedy that omission. Most educated men, Spalding remarks, had 'not yet escaped from the habit of regarding mind as independent of bodily organization'.[14] In order to show that instinct was inherited, and not acquired from early experience, Spalding designed a series of remarkable experiments: 'Taking eggs just when the little prisoners had begun to break their way out, I removed a piece of the shell, and before they had opened their eyes drew over their heads little hoods.'[15] He kept the chicks in blindness for one to three days, and when he released them, noted that they could invariably peck at insects straightaway. Other experiments included taping over their ears for a few days, and then noting that they were instantly able to respond to a mother's call. He also notes the chicks' tendency to follow him around, their instinctive fear of a sparrowhawk, and their tendency to lose instincts if they were not allowed to exercise them within the first ten days.

The acclaim that this article received led to Spalding, then a private tutor, being given a reviewing slot for science books in *The Examiner*, but also gaining the prestigious role of primary reviewer of works on psychology for *Nature*, from 1873 until his early death in 1877. In *Nature*'s pages, he contributed critical, and sometimes scathing, reviews of major figures such as Bain, Ribot, Maudsley, Lewes, and Sully; even his hero, Herbert Spencer, came in for criticism.[16] These reviews, and a few articles he himself contributed, became the main vehicle for the development of his own arguments that 'animals and men are conscious automata'.[17] From a review in a popular family magazine, he moved into a position of significant scientific authority, with Darwin, Spencer, Lewes, George Romanes, Lloyd Morgan, and William James drawing on and responding to his work. He appears to have dropped from sight after the 1890s, only to be 'rediscovered' in the 1950s by J. B. S. Haldane who reprinted his *Macmillan's* article in the *British Journal of Animal Behaviour* (1954), and hailed him as one of the fathers of ethology.[18] Spalding was deemed to have anticipated Konrad Lorenz in discovering the phenomenon now (p. 421) known as imprinting.[19] Spalding has subsequently been recognized as 'the first experimental behaviorist'.[20]

All this is fairly remarkable, but it is even more so when Spalding's personal history is considered, since his life seems to embody a combination of Samuel Smiles's self-help and the dramatic excesses of sensation fiction—an intriguing instantiation of the union of literature and science. Born into poverty in 1841, Spalding first made his living as a slater, before he was granted leave to study for free at the University of Aberdeen, through the intervention of the eminent mental philosopher Alexander Bain. After a year's study he moved to London, supporting himself by teaching, and he also trained for the Bar. He had contracted tuberculosis, and whilst travelling on the Continent for his health encountered J. S. Mill, who was to open the doors for him to a new life, most notably through an introduction to Lord Amberley. A dinner held by Lord Amberley, in which the guests included J.

S. Mill, Alexander Bain, Ralph Waldo Emerson, John Tyndall, Robert Browning, and Douglas Spalding, suggests the intimate interaction between literary and scientific circles at the time.[21] Spalding was persuaded to move in with the Amberleys as tutor for their oldest son, although his primary duties seem to have been pursuing his behavioural experiments, which he did with the help of Lady Amberley. An article in *Nature* (August 1873), 'Flight Not an Acquisition', records how he had shut fledgling swallows in boxes, and reproduces Lady Amberley's notes on how, when released, they were instinctively able to fly.[22] Lady Amberley, or Katherine Russell, was an intriguing figure in her own right; close friends with J. S. Mill and his stepdaughter Helen Taylor, she actively campaigned for women's rights, and had published 'The Claims of Women' in the *Fortnightly Review* (1871). In this article she argued against male theories of the 'unsexing' of women and for higher education, suffrage, property rights, and the opening of all jobs to women on the grounds that 'natural selection' would operate, 'and what they are fitted for they will perform'.[23]

Drama erupted in the lives of Spalding and the Amberleys when Spalding declared his love for Kate, and Lord Amberley, not wishing to go against his radical principles, gave his consent to their relationship. Their son, Bertrand Russell, gives the following account of the affair:

> Apparently on grounds of pure theory, my father and mother decided that although he [Spalding] ought to remain childless on account of his tuberculosis, (p. 422) it was unfair to expect him to remain celibate. My mother therefore, allowed him to live with her, although I know of no evidence that she derived any pleasure from doing so.[24]

The arrangement was not to be long lasting. Kate was to die of diphtheria shortly after in June 1874, and Lord Amberley also died the following year. In a final dramatic twist, Lord Amberley left his two sons to the guardianship of Spalding and a fellow agnostic, T. J. Sanderson. A high-profile court case followed: Lord Amberley's father, Lord John Russell, the ex-prime minister, challenged the will and won custody of the children, Frank and Bertrand. Spalding himself fled to the south of France where he was to die in 1877.

The case is worth dwelling on in some detail since it brings into startling conjunction so many elements in Victorian culture, not least the intersection of science with intellectual, bohemian, and aristocratic circles. Through the intellectual patronage of two philosophers, Alexander Bain and J. S. Mill, a working-class young man is able to publish an article in a family magazine, which catches the attention of Darwin, leads him into a sexual liaison with a viscountess, a legal confrontation with an ex-prime minister, and temporary guardianship of a child who was to become England's greatest twentieth-century philosopher. The article also led to considerable scientific fame, and more recent acknowledgement of his role as 'father' of ethology or animal behaviourism.

For general readers of *Macmillan's*, Spalding's article did not stand out as anything unusual. Thus in its round-up of the 'Magazines for February', the *Birmingham Post* notes that

> In *Macmillan*, Mr Spalding chats very pleasantly on instinct in young animals. He enumerates a number of theories, and gives some curious illustrations of what is called instinct in animals, but what we may as well call reason. The paper, 'Thoughts on Government' deals, this month, with 'The Intercommunication of Public Departments;' an intricate dry subject, treated in an interesting way. 'Passages in the Life of a Bachelor' is pleasant reading, and betrays a practised hand.[25]

The report gives an excellent sense of the ways in which the eclectic contents of a magazine were consumed: little distinction was made between the forms of writing, and the science could be fully appreciated (if not fully understood).

(p. 423) The *Fortnightly Review* and the *Nineteenth Century*

The form and content of science coverage varied tremendously with each periodical as editors tried to tailor materials for their targeted readerships. The *Fortnightly Review* in its early volumes under G. H. Lewes's editorship (May 1865–December 1866), for example, had an extraordinary line-up of material and contributors, with the first volume featuring Lewes on the heart and brain, Eliot's now classic essay 'On the Influence of Rationalism', Herschel 'On Atoms' and 'On the Origin of Force', Herbert Spencer on 'Mill v Hamilton', and T. H. Huxley 'On the Methods and Results of Ethnology'.[26] Subsequent issues saw John Tyndall on 'The Constitution of the Universe', and 'Radiant Heat', Alexander Bain on 'The Feelings and the Will, Viewed Physiologically', Arthur Arnold on sanitary reform, George Bevan on the perils of underground mining, and Huxley 'On the Advisability of Improving Natural Knowledge'. The *Fortnightly* was liberal in orientation, pledging itself to becoming 'an organ for the unbiased expression of many and various minds on topics of general interest in Politics, Literature, Philosophy, Science and Art'.[27] Unusually, it was started by committee, with Anthony Trollope and the publisher Frederick Chapman overseeing the launch, and Huxley, Walter Bagehot, Eliot, and Lewes amongst those involved in its creation. For the first time in periodical publishing, it adopted a policy of signed articles, introducing a new era in journalism as other periodicals followed suit. Scientists writing in the *Fortnightly* were now openly identified, increasing prestige and public profile.

Although Lewes was to step down as editor in December 1866, his successor, John Morley, continued his policy of having excellent science coverage. Under Lewes, the new science of anthropology was given significant exposure. In 1865 E. B. Tylor and John McLennan had published their first works, *Researches into the Early History of Mankind and the Development of Civilisation* and *Primitive Marriage* respectively. Lewes brought both writers into the fold, with McLennan contributing 'Kinship in Ancient Greece' (15 April–1 May 1866), and Tylor 'On the Origin of Language' (15 April 1866), and even more significantly, 'The Religion of Savages' (15 August 1866) in which he outlined for the first time his theories of animism. McLennan offered a series on 'The Worship of Animals and Plants', in

1869–70, to which Herbert Spencer responded with ‘Origins of Animal Worship’ (May 1870). These articles were to be foundational elements in the discipline (and were to be influential for Freud when he was forming his own theories in *Totem and* (p. 424) *Taboo*).[28] In later years other science writers were to join, including the folklorist Andrew Lang, with ‘Mythology and Fairy Tales’ (May 1873), and the novelist and extraordinarily prolific science writer Grant Allen, who contributed a range of offerings in anthropology and other areas, including ‘Who Was Primitive Man?’ (September 1882).

Such scientific offerings were interwoven with outstanding literary contributions, as might be expected in a periodical overseen initially by Trollope. The first issue inaugurated the serialization of his novel *The Belton Estate* (May 1865–January 1866), with *The Eustace Diamonds* (July 1871–February 1873) and *Lady Anna* (April 1873–April 1874) to follow, while Meredith proved himself the most faithful of authors, publishing *Vittoria* (January 1866–December 1866), *Beauchamp’s Career* (August 1874–December 1875), *The Tragic Comedians* (October 1880–February 1881), *Diana of the Crossways* (June 1884–December 1884), and *One of Our Conquerors* (Oct 1890–May 1891) in a period spanning almost twenty years. The *Fortnightly* was a keen supporter of Swinburne and Pater, publishing their work from early on, while Edmund Gosse introduced English audiences to ‘Ibsen, the Norwegian satirist’ as early as January 1873. J. A. Symonds, Olive Schreiner, and Oscar Wilde also published in the *Fortnightly*’s pages.

Huxley and Tyndall remained stalwarts, publishing their last articles in the early 1890s. One can track a gradual ‘changing of the guard’, however, as figures such as Lewes and Bain are replaced by younger, rising stars—the psychologist James Sully, the mathematician W. K. Clifford, or Francis Galton. Inevitably, the relationship between science and religion remained a key component of debates, but taken in a new direction by Galton, who turned his fascination with statistical calculation to a highly contentious area in ‘Statistical Inquiries into the Efficacy of Prayer’ (August 1872). ‘The Ethics of Religion’ (July 1877) by the fiercely atheistic Clifford (which followed on from his ‘The Ethics of Belief’ in the *Contemporary Review* (January 1877)), further stirred controversy, with Clifford’s insistence that it was wrong to believe in anything with insufficient evidence.

Although Galton is remembered primarily for his work on eugenics, one can trace in the pages of the *Fortnightly* the development of his fertile, restless intelligence, as he plotted, for example, the hereditary factors involved in creating men of science (March 1873), the use of photography to create a chronicle of personal and family development (January 1882), how we construct mental imagery (September 1883), and the ways in which we can measure character (August 1884). In this latter piece, he draws upon Tennyson to show how the reflex signs of emotion can be tracked. The play of emotion, customarily seen as the domain of the novel and poetry, here provides the foundations for science. Galton concludes, ‘It is the statistics of each man’s conduct in small every-day affairs, that will probably be found to give the simplest and most precise measure of his character.’[29] The *Fortnightly* also gave him a platform to argue for the founding (p. 425) of an anthropometric laboratory (March 1882). He was to establish this laboratory at the International Health Exhibition in 1884, subjecting at least 10,000 subjects to a battery of mea-

surements.[30] Galton also instituted a regime of tests and measurements at numerous schools, ushering in a new statistical approach to human development, and thereby establishing the foundations for our current epistemic belief that all aspects of human life can be measured and quantified.

The *Fortnightly* coverage is interesting for what it leaves out, as well as what it includes. Technological advances receive little attention, compared to the 'higher' issues of the relations of mind and matter. Tyndall, for example, contributes 'The electric light' in February 1879, but there is far less attention to this major transformative development than one might expect until the 1890s, and even then it is not major figures in the field who are writing.[31] Medicine receives some coverage, although more limited in scope than that for the evolutionary sciences and psychology. Henry Maudsley contributes 'Heredity in Health and Disease' (May 1884), which in its discussions of family 'stock' and the emergence of child suicide, looked forward to Hardy's *Jude the Obscure* (1895).[32] He also contributed the now infamous 'Sex in Mind and in Education' (April 1874), in which he argued that there was indeed sex in mind as well as in body, and women were ill-fitted for either masculine forms of education, or careers: 'When Nature spends in one direction, she must economise in another direction.' The 'excessive mental drain' of education would be at the expense of the development of the reproductive organs.[33] To the *Fortnightly*'s credit, it gives space in the following issue for Elizabeth Garrett Anderson's forthright reply, in which she challenges both Maudsley's evidence and conclusions, suggesting that young women can indeed become 'languid and feeble' and even hysterical, yet not from education, but rather 'the depressing influence of dulness'.[34] Interestingly, she takes Maudsley's source, a work by American physician Edward Clarke, and uses the evidence against him, drawing on Clarke's arguments, for example, that girls' diets might be to blame for any health problems: 'We live in a zone of perpetual pie and doughnut.'[35] The observation sounds an eerily modern note, reminding us that a preoccupation with diets, and healthy eating, is not a twentieth- or twenty-first-century invention.

Although the *Fortnightly*'s science content was overwhelmingly from male pens, the review did publish contributions from an unusually high number of women. Thus **(p. 426)** Millicent Garrett Fawcett had written in support of 'The Medical and General Education of Women' in an early issue (November 1868), and Sophie Jex-Blake had followed this with 'The Practice of Medicine by Women' (March 1875). The Maudsley article notwithstanding, the *Fortnightly* was generally in the forefront of campaigning for female education and suffrage. Other leading female contributors included Frances Power Cobbe, both on the campaign against vivisection which she spearheaded (January 1882), and a range of other areas, from 'What Is Progress?' (March 1867), to 'The Education of the Emotions' (February 1888). Eliot's close friend and admirer, Edith Simcox, also wrote for the journal, contributing 'Custom and Sex' and 'Cause and Design' (March and December 1872). The *Fortnightly* moved with the times, inaugurating the 1890s with 'The Morality of Marriage' (March 1890), a polemic against marriage by the 'New Woman' writer Mona Caird.

The *Fortnightly* was rivalled in its engagement with science by the *Contemporary Review*, set up in partial emulation in 1866, and also the *Nineteenth Century*, established by the leading editor of the *Contemporary*, James Knowles, in 1877, when that journal ceased to support his policy of 'open platform' debate (with the controversy which had surrounded the publication of Clifford's 'The Ethics of Belief' as one of the precipitating causes of his move). Knowles, who was the founder of 'the Metaphysical Society' (1869–80) which brought together eminent figures in cultural, political, and scientific life to debate issues of science and philosophy, proved a formidable editor.[36] At the *Contemporary*, he shared many of the major scientific contributors with the *Fortnightly*, taking them with him when he founded the *Nineteenth Century*, which became Huxley's favoured outlet.

The first issue of the *Nineteenth Century* featured a round-up of 'Recent Science', written by Knowles, with advice from Huxley, which covered in considerable technical detail developments in chemistry, physics, astronomy, geology, and the biological sciences. Amidst the achievements of male scientists, one finds an account of the experiments of Fräulein Marie von Chauvin on the axolotl, the fascinating creature which possesses both gills and lungs, but also adult sexual organs, raising questions as to the relationship between the two forms. Her achievements in 'triumphantly evolv[ing]' '*Amblystoma* out of more than one axolotl' are set in explicit contrast with the failed, clumsily violent, means of her male predecessors: 'This she accomplished, not by any such violent measures as excision of the gills, but by gradually accustoming the animal to life on land, and by paying the greatest attention, through the whole process, to its health and diet.'[37] Marie von Chauvin is barely remembered now, and is usually mentioned—if at all—as an assistant of August Weismann, but by returning to the records of the age we find not only that her achievements were acclaimed but also that her success is subtly aligned (p. 427) with her femininity and domestic skills: it is her gentleness, and attention to food and welfare, which has led to her 'triumphant' success.

The *Nineteenth Century* offers a wonderful tour through the scientific preoccupations of the age; some surprising, others to be expected, but often introducing concepts which were novel at the time. As in the *Fortnightly*, many of the contributions were major scientific publications in their own right, such as George Romanes's 'The Darwinian Theory of Instinct' in September 1884, which contained unpublished material from Darwin's own notebooks. The journal attempted throughout to be even-handed in its coverage: the January 1878 volume contained both Tyndall's essay on 'Spontaneous Generation' and Ruskin's 'Oxford Lecture' which was an impassioned attack on the pretensions of science. Arnold's more measured 'Literature and Science', a response to Huxley's 1880 address to Josiah Mason College, Birmingham on 'Science and Culture', was published in August 1882.[38] In discussion of the 'two cultures' debate, Arnold has often been depicted rather unsympathetically as attempting to cling on to the Classics, as the only real base for education. Looked at in the light of our current 'crisis of the humanities', however, his article takes on new resonances: he is writing in concern at what he sees as 'the present movement for ousting letters from their old predominance and transferring the predominance in education to natural sciences'. It is not an attack on science education per se, but on a perceived move to separate science from a humanist base, so that the consequences for

human conduct, and what he terms the ‘instinct for beauty’, are not considered. In part it is a plea for the history of science; his definition of literature encompasses the works of ‘Copernicus, Galileo, Newton and Darwin’.[39] He argues for a thorough engagement with the discoveries of modern science, but that, additionally, these discoveries are themselves placed in the context established by man’s history, and aspirations. Although Arnold’s target is Huxley, both of them are writing in the pages of the same journal which, in bringing together science and cultural content within its pages, is enacting the vision of education articulated by Arnold.

Further engagement with the ‘two cultures’ can be found in Swinburne’s wonderful satirical piece, ‘Dethroning Tennyson: A contribution to the Tennyson–Darwin Controversy’ (January 1888). Taking off from renewed attempts to suggest that Shakespeare was not the author of the plays attributed to him, Swinburne shows, through a careful study of verbal similarities and other clues, that Darwin was actually the author of Tennyson’s verse. The article is artfully playful, but draws its strength precisely from the latent possibilities suggested by Tennyson’s engagement with proto-evolutionary theories in his ‘celebrated lines’, ‘so careful of the type, so careless of the single life’.[40]

(p. 428) As with the *Fortnightly*, the *Contemporary* engages less with technological developments than with the biological and psychological sciences. Through a concerted campaign of articles in the early 1880s against the proposed Channel Tunnel, however, it was credited with crushing the proposed British–French project, raising interesting questions for counterfactual history as to what would have happened if the project had gone ahead in the 1880s.[41] Would it have created greater economic and cultural union, and thus forestalled the two world wars, or, as its opponents feared, created greater bellicosity, and the need for larger standing armies?

One engineering invention the journal did support was that of ‘whispering machines’ (March 1885). Offering an interesting perspective on current proposals for ‘knowledge transfer’ and technology development, the article celebrates the fact that ‘invention’ is now ‘organised and working under the auspices of science, with the sanction of public sentiment and the bonuses of Government’. The author notes that projects of ‘submarine and aerial navigation are receiving support and encouragement from powerful governments’ and argues that the development of whispering, or reading machines, and ‘machine libraries’ should receive equal support.[42] Based on the development of the phonograph, the proposal, which involved a machine placed in a hat with the ‘sounds conveyed to the ears by wires’, would enable all books to be recorded and listened to aurally, thus defeating the increasing problems of myopia which were correlated with the rise in educational levels, and also the sedentary form of life of the student. No longer would people have to risk their sight trying to read in ‘dimly-lighted underground carriages’. In a wonderfully idealistic vision of what would be possible, the author suggests the machine ‘would accompany men to the office, to the factory, to the bench, to the field, to the ditch, down into the mines, whispering into their ears greater thoughts and imaginations, strengthening, ennobling, and refining the mind’.[43] As with the Channel Tunnel, the technological achievement of this Victorian project has taken a century, but its current incar-

nation in the form of an iPod and its general mode of use, would have severely disappointed the author, with his Arnoldian vision of the power of culture, when supported by scientific technology. His belief that the ready availability of books in other languages would lead rapidly to a tumbling down of national barriers and a new era of cultural understanding would also meet with decided frustration.

The *Review of Reviews*

The nineteenth-century periodical reveals the Victorians at their fertile, imaginative, and determined best, using the inclusive format of the journals to question, challenge, and (p. 429) think beyond their own culture. One of the most ambitious undertakings was W. T. Stead's *Review of Reviews*, established in 1890, which aimed, as its title suggests, to offer a review of all other reviews, from specialist scientific journals to more popular magazines, and to cover not only UK culture, but also that of the world. The first volume, for example, carried reports of material from American, French, Russian, Spanish, Portuguese, Belgian, Italian, and Dutch periodicals. Although its actual content could never match its ambition, it offers one of the best introductions to science within 1890s culture.[44] Stead's own predilections, including his interests in spiritualism, inevitably influence the choice of material, but even here he was not drastically out of line; the *Nineteenth Century*, for example, had carried various investigative articles on the topic, including 'Thought Reading' by W. F. Barrett, Edmund Gurney, and Frederic Myers (June 1882). Stead's more extreme interests he confined to his other publication, *Borderland* (1893–7), and to Christmas and New Year supplements to the *Review of Reviews* which featured ghost stories. The supplement to volume 5, for example, had a frontispiece with the noted astronomer, novelist, and spiritualist Camille Flammarion, standing at a huge telescope with the caption: 'The Psychical World, like the World of Astronomy, opens infinite avenues before us. Study, study without ceasing! Let no system stand in the way! Let us seek truth freely'.[45]

For Stead, as for the noted philosophers and physicists who joined the Society for Psychical Research (founded in 1882 with the Cambridge Professor of Moral Philosophy, Henry Sidgwick, as its president), the area of mind or spirit, like that of the physical universe, was one more domain to explore and to subject to scientific research, tracing its hidden inner workings.[46] Fact and fiction frequently seemed to meld into one, as in the reporting of Alfred Binet's account of double personalities in the *Revue des Deux Mondes*, which was entitled 'Jekyll and Hyde in Science: Have we more souls than one?' Binet's article, which in many ways was anticipated by Frederic Myers's account of 'Multiplex Personalities' in *Nineteenth Century* (November 1886), suggested that 'Several moral personalities, each having consciousness of itself, may rise side by side without mixing in the same organism'.[47] New scientific findings are interpreted here through the prism of recent fiction, suggesting how closely intertwined the two realms were in popular consciousness at the time.[48]

(p. 430) *The Argosy* and *Temple Bar*

In its aspirations, the *Review of Reviews* belonged with the more 'heavyweight' journals, such as the *Fortnightly*, the *Contemporary*, and the *Nineteenth Century* (although it roused the ire of those publications by offering 'easy' access to their content).[49] I would now like to turn to consider science content in more middlebrow, fiction-oriented magazines, *The Argosy* (1865–1901) and *Temple Bar* (1860–1906). Both were so-called 'shilling' monthlies, set up in the wake of the great success of *Macmillan's* (1859) and the *Cornhill* (1860). *The Argosy, a magazine of tales, travels, essays and poems* was established by the publisher Alexander Strahan, but after a strong start, with the serialization of Charles Reade's study of the pathologies of male jealousy, *Griffith Gaunt*, it started to decline and was taken over by Ellen (Mrs Henry) Wood in 1867, who made it a vehicle for her own fiction. In the early volumes there is a clear attempt to introduce science, but only as it might be thought to engage a novel-reading audience. Thus the first volume carried Matthew Browne's 'Apology for the Nerves' which is a defence of 'nerves' as a sign of capacity and sensitivity, rather than of derangement. The poet and essayist Alexander Smith contributes an article 'On Dreams and Dreaming', which is semi-humorously written; 'few men', he observes, 'have extracted such terrors from a pork chop as Fuselli'.[50] It addresses contemporary debates on dreaming, however, coming down firmly on the side of dreaming as the product of desires, and memories, when uncontrolled by the conscious will.[51] He suggests that 'out of the chaos of dreams a man may now and then extract a curious self-knowledge'. Examining a dream is like 'looking into the interior of a watch; you see the processes at work by which results are obtained. A man thus becomes his own eavesdropper, he plays the spy upon himself' (393). The images and language are both evocative and insightful, moving beyond materialist explanations to one that anticipates the interpretive strategies to be adopted by Freud. Memories, he suggests, are not destroyed, but like photographic negatives are laid aside, for possible future use. In another formulation he observes, 'There is a "Lost Office" in the memory, where all the waifs and strays of experience are taken care of' (391). He explores how literary reading can heighten the seeming creativity of a dream, by blending with fears, so that even a schoolboy can, in his dreams, take on the creative powers of a John Bunyan. It is an extraordinarily suggestive analysis of how our forms of reading can help to shape the unconscious processes of the mind. Smith sets himself firmly against any forms of supernatural interpretation of dreaming, observing that it 'is not in the least a matter for wonder', that dreams, 'working continually in the stuff of daily (p. 431) hope and fear, giving palpable shape and image to desire and dread, should sometimes be found to forestal the future fact' (394). In daylight hours, only those dreams which appear to have a prophetic role will be recalled; the rest will be quickly forgotten.

As a companion piece to nerves, and dreams, John McLennan contributed an article on 'Bride Catching' to the second volume, thus completing the triumvirate of areas which preoccupied the sensation fiction writers of the 1860s. Unlike the anthropological articles in the *Fortnightly*, which were frequently the first publication of major research, this is a piece written explicitly for a popular audience, and drawing on his *Primitive Marriage*

published the previous year. McLennan opens with an invitation to the reader, 'to inspect my show of marriage knick-knacks. It embraces oddities from all the ends of the earth'.[52] He archly adopts the patter of a travelling showman, downgrading his findings to household 'knick-knacks' while nonetheless offering, in the numerous examples of the rituals of 'bride capture' from across the world, a compelling study in anthropology, which links practices of marriage in 'primitive' tribes to those still evident amidst the 'higher races of men'. The conclusion offers the pious suggestion that, while humbly viewing our origins, we can nonetheless look hopefully to the future 'as holding in store for our species forms of life purer and higher than the present, by as much as the present are purer and higher than the past'.[53] Readers of sensation fiction, however, were well used to the moral homilies of the narrator, as in Ellen Wood's *East Lynne* (serialized in the *New Monthly Magazine*, January 1860–August 1861), which were at odds with the real energies of a narrative that suggested a more subversive message. Trained up in the barbarities of marriage practices addressed in such fiction, they would need little urging to read beyond such consoling flummery, and to link McLennan's primitive marriage practices to those of Victorian England.

Darwin, in concluding *Origin of Species*, sought to make his findings more palatable by extolling the 'grandeur' of 'this view of life' by which 'all corporeal and mental endowments will tend to progress towards perfection'.[54] He was not convincing. McLennan adopts a similar rhetorical ploy, packaging his material in the conventional structures deemed necessary for 'light' reading in a family journal, whilst taking his readers on a journey into the darker heart of contemporary life, where 'primitive' structures still flourished. Sensation fiction is at heart an anthropological enterprise. Under the editorship of Ellen Wood, the magazine carried less overt science content, although there were occasional articles on themes such as dreaming.[55] For alert readers, however, the content was there in the fiction itself, whether in anthropological investigations of primitive desires and practices, or engagements with medical theories of nervous disorders and insanity.[56]

(p. 432) *Temple Bar*, edited initially by Augustus Sala and Edmund Yates, addressed questions of insanity in its very first issue, with an article on 'Criminal Lunatics' which was both supportive of the genuine 'criminal lunatic' and highly critical of court procedures that sought to distinguish the sane from the insane.[57] The journal itself adopted a wider remit than *The Argosy*. While still placing fiction at its heart (it serialized Braddon's *Aurora Floyd*, January 1862–January 1863), it also offered more explicit scientific content, particularly in the contributions of the geologist David Ansted. First published in the year following Darwin's *Origin*, but with an avowed editorial policy of avoiding politics, *Temple Bar* offers an interesting insight into the ways in which a middle- to low-brow journal approached such potentially explosive material.[58] Ansted was a geologist and mining engineer, and had been professor of geology at Kings College London, 1840–53 (a post that had previously been held by the eminent geologist Charles Lyell). He contributed many articles in the opening numbers, from 'What Our Coals Cost Us' (March 1861), which moves in from a domestic frame to explore the potential depletion of coal reserves, through to a discussion of 'Giants and Dwarves' (March 1861), the formation of clouds (May 1861) and of chalk (July 1861), and 'The Pre-Adamite World' (October 1861).[59] He

does not address Darwinian theory directly, but crabwise, building up gradually in ‘Giants and Dwarves’ with descriptive accounts of extinction, and the development of new forms in the animal and human kingdom, before finally addressing possible explanations. Here he suggests, mildly, that external circumstances might produce variations, as argued by Darwin, or the Creator might intervene with sudden acts of creation. It is clear where his sympathies lie, particularly in his final rhetorical question, where he laments the forms of personal attack expressed in the debates:

> Why, then, should an endeavour to trace the method, to discover the wonderful mechanism of that mysterious contrivance which governs the phenomena of life, and the constant adaptation of species to changing circumstances, be made the subject of personal attack, because the particular law that seems to be suggested by observation does not quite agree with our preconceived notions of what it ought to be?

While never openly asserting his own allegiances, his use of Darwinian language to defend the cause of open enquiry is designed to engineer readers’ support for the wider Darwinian framework. His subsequent pieces on ‘Chalk’ and ‘The Pre-Adamite World’ (p. 433) adopt similar strategies, sheering away from explicit consideration of Darwinian theory, but building arguments which tacitly demand assent to various evolutionary principles.

Perhaps the best engagement with Darwinian principles in these early volumes of *Temple Bar* comes in an anonymous, comic article, ‘With Mr Gorilla’s Compliments’ (November 1861), written as if by a gorilla, which challenges the claims of Du Chaillu, who was exhibiting stuffed gorillas around England that year. While the ‘gorilla’ targets the charlatanry of Du Chaillu, and aims to set the record straight about gorilla behaviour, he takes for granted an acceptance by his readers of a shared ancestry with the ape family. Although comic in mode, his discourse is scientifically informed, cutting through many of the myths which had started to accrue around the figure of the gorilla (while delicately reframing those associated with the gorilla’s assumed sexual rapacity).[60]

As the foregoing suggests, the engagement with science in the Victorian periodical press took multiple forms. One of the best guides to the scientific issues of the moment is to be found in *Punch* which took satirical delight in unpacking the comic potential of the latest discoveries or grandiose scientific claims.[61] While some periodicals had columns dedicated to reviewing developments in science, more commonly science formed part of the mix of general content, which was itself targeted to specific audiences. Content was carefully tailored for journals oriented to particular religious networks, or political constituencies, while the growing number of magazines for women, and for children, all called for new forms of science writing. Frequently these audiences would overlap, as in the Religious Tract Society’s publications *The Boy’s Own Paper* (1879) and *The Girl’s Own Paper* (1880), or *Aunt Judy’s Magazine* (1866–85), edited initially by the naturalist Margaret Gatty (and subsequently by her daughters, Juliana Ewing and Horatia Eden), which offered a mixture of fiction and natural history for children, within a liberal, but religious,

frame.[62] In its diversity, the periodical press created space for numerous female science writers to make their mark.[63] Female novelists also moved into editorial roles, with Mary Braddon presiding over *Belgravia* (from 1867 to 1876), and Ellen Wood over *The Argosy* from 1867 to 1887, while Charlotte Yonge edited the religious children's magazine, the *Monthly Packet*, for an astonishing forty-three years, from 1851 to 1894. For researchers exploring the intersection of literary and scientific culture, periodicals run by novelist-editors, such as Braddon and Wood, or Thackeray, Trollope, and Dickens, offer a peculiarly rich field of study, with the editor selecting and commissioning articles (p. 434) which would stand side by side with their own fiction.[64] This was particularly true for Dickens, who, with the medically trained Henry Morley at his side, commissioned an extraordinary range of science-related articles during his time at the helm of *Household Words* (1850–9) and *All the Year Round* (1859–70), which stand in very interesting inter-textual relations to his own fictional productions during the period.[65]

To give some sense of the vibrancy and range of scientific coverage in the periodical press, I conclude with a brief overview of one volume of *Macmillan's Magazine*, which ran from November 1870 to April 1871, and included the final part of Trollope's 'Sir Harry Hotspur of Humblethwaite'. At this point, *Macmillan's* (then under the editorship of George Grove) was much preoccupied with the Franco-Prussian War, and volume 23 opens with an article on 'The Navy'. Its opening lament captures the drama and immediacy of history, which can only be communicated in newspapers or periodicals. 'It is no longer possible', the writer exclaims, 'to take up one's pen to write upon "The Navy" without pain and humiliation.' A brand new man of war had simply keeled over, with the loss of 500 lives, due to a miscalculation of the laws of physics. Other content includes Sir James Paget, surgeon extraordinary to Queen Victoria, on attending a bullfight, which leads on to a whole discussion of field sports, and the controversy raging across the periodical press between Anthony Trollope and Edward Freeman, as to whether it could be right to inflict pain on animals.[66] A sense of contemporary relevance and of strong continuity between the nineteenth century and our postmodern age is further sustained by a letter from Charles Kingsley, defending the countryside against encroachment. He harangues the government:

> Will they prevent a penny-wise and pound-foolish policy, which is now at work, from destroying these spaces by selling off all that is saleable to villa-projectors, and planting the rest with worthless fir-trees enclosed with impassable wire and iron-bound fences making the country hideous?

All is not as it seems, however; Kingsley cannot be claimed as a direct forerunner of contemporary countryside campaigners, since the letter then demands that the countryside is left free, not for people to enjoy, or the preservation of habitats, but for the exercise of (p. 435) troops, and a 'national training ground for the army'.[67] (Ironically, the desired setting aside of great swathes of English countryside for use by the army has in fact been an inadvertent agent in the preservation of biodiversity in recent decades.)

More explicit scientific content is contributed by Francis Galton, in his wonderfully titled ‘Gregariousness in Cattle and in Men’, which anticipates discussions of the herd instinct, normally dated only from an article by Wilfrid Trotter in 1908.[68] Galton vividly depicts the ‘passionate terror’ of oxen at separation, suggesting that the gregarious instincts which are necessary for cattle become a ‘hereditary taint’ for men, turning us into ‘a mob of slaves, clinging together, incapable of self-government and begging to be led’.[69] Biological principles are swiftly subsumed under the Victorian social and political ideologies of self-determination and control, making evident, to the historically trained eye, the ideological premises of such forms of assertion which are often occluded in the sociobiology of our own day.

Loss of self-control also features in very different guise, in ‘Louise Lateau, a Biological Study’, an account by physician George Day of a contemporary Belgian girl who, every Friday, produced stigmata, and fell into ecstatic fits.[70] Her case was viewed as a challenge to the interpretative authority of both medicine and the Church, and she was subjected to a whole barrage of tests, led by Professor Lefebvre from Louvain, a physician who had also worked in a lunatic asylum, and an army of medics and clerics, all determined to prove that the signs were either frauds, or of physiological origin. The whole episode offers a perfect symbolic instance of the female mind and body being subjected to masculine science. She was pricked with needles and knives, treated with electromagnetism, and her skin tested with caustic. Although she was bound up in a very elaborate manner, her blood still continued to flow, before an array of over 100 witnesses. The article is written in great clinical detail, with the author concluding finally that she must be suffering from some very rare disease; he refuses to allow the possibility that her state could elude classification.

To set against the passivity of Louise Lateau, however, women are given a strong voice in this issue of *Macmillan’s*, most notably in two articles by Frances Power Cobbe on ‘Unconscious Cerebration’ and ‘Dreams as Illustrations of Unconscious Cerebration’.[71] **(p. 436)** The articles, which were cited approvingly by W. B. Carpenter in his two *Contemporary Review* articles, ‘The Physiology of the Will’ (May 1871), and ‘On Mind and Will in Nature’ (October 1872) (and subsequently in *The Principles of Mental Physiology*, 1874), address, from a very different angle to that of Galton or other contributors, the issue of self-control which so preoccupied the Victorians. Cobbe offers convincing, frequently amusing, accounts of the ways in which our unconscious minds operate, often leading to what Freud was to term the psychopathology of everyday life. In dreams, and involuntary social gaffes, the mind functions outside any conscious control. In her second article, she draws on a large postbag of accounts of dreams from readers, giving a strong sense of the community of exchange established with the reading public. The dreams are full of violence; ‘the woman who never yet voluntarily hurt a fly, chops a baby into mincemeat’.[72] While Alexander Smith had argued that dreams enable a man to become ‘a spy upon himself’, Cobbe adopts the opposite explanatory strategy. Faced with evidence of such violent disjunctions between the conscious mind and its unconscious processes, she insists it is proof that we are all exempt from moral responsibility for our dreams, and that our self-

hood is governed by an inner unifying principle which cannot be reduced to the material workings of the brain. Our ‘dreaming brain-self’, she pronounces, is not our ‘true self’.[73]

In their multiplicity and diversity, periodicals offer a wonderful guide to the Victorian age, and to the ways in which science entered into the general culture of the time. As the case studies suggest, the engagement with science operated on many levels, and in multiple areas. Although evolutionary theory was obviously a significant presence, it formed only one part of a complex picture. In the literary-oriented periodicals, for example, we find particular emphasis placed on the ways in which scientific thinking appeared to intersect with the interests of fiction and poetry, whether in theories of selfhood or personal responsibility, or the relations between science and religion. There was also, more generally, a fascination with new inventions, and the possibilities opened up by new technologies, such as the ingenious suggestion for a ‘whispering machine’, which was clearly an idea before its time.

Periodicals offer an intricate picture of a society grappling with rapid social and cultural change, charged with the immediacy which comes from their serial and time-bound nature. In their integration of cutting-edge science with the latest fiction or social commentary they established a model we could do well to emulate. Such integration was not without challenge, however. Like us, the Victorians underwent a crisis of confidence with reference to education. J. S. Mill, in his Rector’s address to the University of St Andrews in 1867, came down heavily on the side of an integrated curriculum:

> Can anything deserve the name of a good education which does not include literature and science too? If there were no more to be said than that scientific education (p. 437) teaches us to think, and literary education to express our thoughts, do we not require both? and is not any one a poor, maimed, lopsided fragment of humanity who is deficient in either?[74]

There is indeed much more to be said, but Mill’s vision of an essential partnership between science and the humanities is as relevant today as it was for the Victorian age.

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Select Bibliography

Brake, Laurel, and Marysa Demoor (eds), *Dictionary of Nineteenth-Century Journalism* (London: British Library, 2009).

Cantor, Geoffrey, et al., *Science in the Nineteenth-Century Periodical* (Cambridge: Cambridge University Press, 2004).

Cantor, Geoffrey, and Sally Shuttleworth (eds), *Science Serialized: Representations of the Sciences in Nineteenth-Century Periodicals* (Cambridge, Mass.: MIT Press, 2004).

Ellegård, Alvar, *Darwin and the General Reader: The Reception of Darwin's Theory of Evolution in the British Periodical Press, 1859–1872* (2nd edn., Chicago: University of Chicago Press, 1990).

Henson, Louise, et al. (eds), *Culture and Science in the Nineteenth-Century Media* (Aldershot: Ashgate, 2004).

Houghton, Walter E., et al. (eds), *The Wellesley Index to Victorian Periodicals, 1824–1900*, 5 vols. (Toronto: University of Toronto Press, 1966–89).

Lightman, Bernard, *Victorian Popularizers of Science: Designing Nature for New Audiences* (Chicago: Chicago University Press, 2007).

Lightman, Bernard, and Aileen Fyfe (eds), *Science in the Marketplace: Nineteenth-Century Sites and Experiences* (Chicago: Chicago University Press, 2007).

Mussell, James, *Science, Time and Space in the Late Nineteenth-Century Periodical Press* (Aldershot: Ashgate, 2007).

Secord, James, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of 'Vestiges of the Natural History of Creation'* (Chicago: Chicago University Press, 2000).

Notes:

([1]) Charles Darwin, 'Letters to the Editor: Inherited Instinct', *Nature* (13 February 1873), 281–282.

([2]) Charles Darwin, *The Origin of Species*, ed. Gillian Beer (Oxford: Oxford University Press, 1996), 61.

([3]) Henry Maudsley, '*Hamlet*', *Westminster Review*, 27 (January 1865); John F. W. Herschel, '*L'Inferno* of Dante, Canto 1', *Cornhill Magazine*, 18 (July 1868), 38–42; Henry Holland, 'Physical Geography of the Sea', *Edinburgh Review*, 105 (April 1857), 360–390, and 'Meteors, Aerolites, Shooting Stars', *Quarterly Review*, 92 (December 1852), 77–106. Herschel also contributed 'Notes on science', a review of recent work, to the *Cornhill Magazine*, under G. H. Lewes's editorship, between January 1862 and March 1863.

([4]) The project produced a database which tracks the presence of science within given years of a range of different forms of periodicals, targeted at a variety of audiences, from the *Wesleyan Methodist Magazine* to *Punch* and the *Boy's Own Paper*. See www.sciper.org The project also produced three books: Geoffrey Cantor et al., *Science in the Nineteenth-Century Periodical* (Cambridge: Cambridge University Press, 2004); Geoffrey Cantor and Sally Shuttleworth (eds), *Science Serialized: Representations of the Sciences in Nineteenth-Century Periodicals* (Cambridge, Mass.: MIT Press, 2004); and Louise Henson et

al. (eds), *Culture and Science in the Nineteenth-Century Media* (Aldershot: Ashgate, 2004).

([5]) Walter E. Houghton et al. (eds), *The Wellesley Index to Victorian Periodicals, 1824–1900*, 5 vols. (Toronto: University of Toronto Press, 1966–89), now available from Pro Quest as an online resource). For an extraordinary guide to around half of those 125,000 periodicals, see John S. North, *The Waterloo Directory of English Newspapers and Periodicals, 1800–1900*, 50 vols. (Waterloo, Ont.: North Waterloo Academic Press, 1994–), now available online.

([6]) For an excellent account of popular science writing, see Bernard Lightman, *Victorian Popularizers of Science: Designing Nature for New Audiences* (Chicago: Chicago University Press, 2007). See also Bernard Lightman and Aileen Fyfe (eds), *Science in the Marketplace: Nineteenth-Century Sites and Experiences* (Chicago: Chicago University Press, 2007); James Mussell, *Science, Time and Space in the Late Nineteenth-Century Periodical Press* (Aldershot: Ashgate, 2007). Two outstanding works on particular areas are Alvar Ellegård, *Darwin and the General Reader: The Reception of Darwin's Theory of Evolution in the British Periodical Press, 1859–1872* (2nd edn., Chicago: University of Chicago Press, 1990); and James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of 'Vestiges of the Natural History of Creation'* (Chicago: Chicago University Press, 2000).

([7]) See Jack Morrell and Arnold Thackray, *Gentlemen of Science: The Early Years of the British Association for the Advancement of Science* (Oxford: Clarendon Press, 1981).

([8]) T. H. Huxley, *Westminster Review*, NS 5 (1854), 254–256.

([9]) *Cornhill Magazine* was launched in 1860 under the editorship of Thackeray. When Thackeray stepped down in 1862, Lewes was one of a committee of three who edited it for the next two years.

([10]) See, for example, 'Recollections of Ilfracombe' and 'Recollections of the Scilly Isles and Jersey', in *The Journals of George Eliot*, ed. Margaret Harris and Judith Johnston (Cambridge: University of Cambridge Press, 1998), 259–282. Lewes's description of the impact of the mill wheel on the subconscious mind in *The Physiology of Common Life* was written whilst Eliot was working on *The Mill on the Floss*. See Jenny Bourne Taylor and Sally Shuttleworth (eds), *Embodied Selves: An Anthology of Psychological Texts, 1830–1890* (Oxford: Clarendon Press, 1998), 87–88.

([11]) His first book, *Sensation and Intuition* (1874) was drawn from his early periodical essays. In 1871 he became John Morley's assistant at the *Fortnightly*; and a few years later became part of Leslie Stephen's stable of writers at the *Cornhill*.

([12]) John Morley edited the *Fortnightly* from 1867 to 1882; he also edited the daily *Pall Mall Gazette* between 1880 and 1882, and *Macmillan's* between 1883 and 1885 (even though he had entered Parliament in 1883). Leslie Stephen edited the *Cornhill* from 1871

until 1882, when he embarked on the ambitious project of the *Dictionary of National Biography*.

([13]) All of these writers (with the exception of James Hinton) have entries in the invaluable Laurel Brake and Marysa Demoor (eds), *Dictionary of Nineteenth-Century Journalism* (London: British Library, 2009) (which also includes the most extensive bibliography of secondary sources in the field). Hinton was a surgeon who contributed, amongst other offerings, thirteen articles on physiology and other scientific areas in the first volumes of the *Cornhill* (1860–3). Lightman looks in depth at Proctor, Agnes Clerke, and Grant Allen in *Victorian Popularizers*. Even this major work has only been able to cover a small but representative selection of science writers of the period.

([14]) Douglas A. Spalding, 'Instinct: With Original Observations on Young Animals', *Macmillan's Magazine*, 27 (February 1873), 282–293, at 290.

([15]) 'Instinct', 283.

([16]) See *Nature*, 7 (20 February 1873), 298–300 for his review of Spencer's *Principles of Psychology*. See also the reviews of Alexander Bain's *Mind and Body* (8 January 1874), 178–179; Sully's *Sensation and Intuition* (19 November 1874), 44–45; Maudsley's *Physiology of Mind* (19 October 1876), 541–543; and Lewes's *Physical Basis of Mind* (2 August 1877), 261–263.

([17]) [Anon.], 'Obituary: Douglas A. Spalding', *Nature* (8 November 1877), 36. The obituary in *Mind* was less positive, suggesting that in his conclusion that 'animals and men are conscious automata' he 'became a warning example of a certain tendency to premature and hasty speculation'; 'News', *Mind*, 3 (January 1878), 153–154. Given Spalding's aggressive reviewing style, particularly of more philosophical psychological works, one can see an element of disciplinary protectionism in this response. When Huxley published his article 'On the hypothesis that animals are automata, and its history' in the *Fortnightly* (November 1874), Spalding took this as a vindication of his own work. See his response to A. R. Wallace in *Nature* (29 October 1874), 520.

([18]) J. B. S. Haldane, 'Introducing Douglas Spalding', *British Journal of Animal Behaviour*, 2 (1954), 1.

([19]) For the complex politics around Haldane's championing of Spalding, in his battles with Lorenz, see P. E. Griffiths, 'Instinct in the '50s: The British Reception of Konrad Lorenz's Theory of Instinctive Behavior', *Biology and Philosophy*, 19 (2004), 609–631.

([20]) P. H. Gray, 'Douglas Alexander Spalding: The First Experimental Behaviorist', *Journal of General Psychology*, 67 (1962), 299–307. See also P. H. Gray, 'Spalding and His Influence on Research in Developmental Behaviour', *Journal of the Behavioral Sciences*, 3 (1967), 168–179, and 'Prerequisite to an Analysis of Behaviorism: The Conscious Automaton Theory from Spalding to William James', *Journal of the Behavioral Sciences*, 4 (1968), 365–376.

([21]) Gray, ‘Douglas Alexander Spalding’, 304.

([22]) Douglas Spalding, ‘Flight Not an Acquisition’, *Nature* (August 1873), 289.

([23]) K. Amberley, ‘The Claims of Women’, *Fortnightly Review*, 9 (January 1871), 95–110, at 109.

([24]) Bertrand Russell, *The Autobiography of Bertrand Russell* (1967), i. 17, cited in Ann P. Robson, ‘Russell, Katharine Louisa, Viscountess Amberley (1842–1874)’, *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004), http://ezproxy.ouls.ox.ac.uk:2117/view/article/41338 [last accessed 25 September 2012].

([25]) [Anon.], ‘The Magazines for February’, *Birmingham Daily Post*, 4 February 1873.

([26]) Although first published in 1939, E. M. Everett, *The Party of Humanity: the* Fortnightly Review *and Its Contributors, 1865–1874* (Chapel Hill: University of North Carolina Press, 1939) remains a very helpful guide to the *Fortnightly*.

([27]) Introduction to the *Fortnightly Review*, in Houghton et al. (eds), *Wellesley Index*, vol. ii. Although the *Fortnightly* retained its name, it became a monthly in November 1866.

([28]) See Sigmund Freud, *Totem and Taboo and Other Works, 1913–1914*, vol. xiii of the Standard Edition of *The Complete Psychological Works of Sigmund Freud*, gen. ed. James Strachey (London: Vintage, 2001), 3, 75, 79, 107–110.

([29]) Francis Galton, ‘Measurement of Character’, *Fortnightly Review*, 36 (August 1884), 179–185, at 183, 185.

([30]) Francis Galton, *Memoirs of My Life* (London: Methuen, 1909), ch. 17, ‘Anthropometric Laboratories’.

([31]) For a discussion of the 1890s coverage, see Graeme Gooday, ‘Profit and Prophecy: Electricity in the Late-Victorian Periodical’, in Cantor et al. (eds), *Science in the Nineteenth-Century Periodical*, 238–254.

([32]) For a discussion of this topic, see Shuttleworth, *The Mind of the Child: Child Development in Literature, Science and Medicine, 1840–1900* (Oxford: Oxford University Press, 2010), ch. 18. Hardy made frequent notes from the science content of the *Fortnightly*: see *The Literary Notebooks of Thomas Hardy*, ed. L. Björk, 2 vols. (London: Macmillan, 1985).

([33]) H. Maudsley, ‘Sex in Mind and in Education’, *Fortnightly Review*, 15 (April 1874), 466–483, at 467.

([34]) Elizabeth Garrett Anderson, ‘Sex in Mind and Education: A Reply’, *Fortnightly Review*, 15 (May 1874), 582–594, at 590.

([35]) Anderson, ‘Sex in Mind and Education: A Reply’, 592.

([36]) For a study of the society, see Alan Willard Brown, *The Metaphysical Society: Victorian Minds in Crisis, 1869–1880* (New York: Columbia University Press, 1947). James Knowles edited the *Contemporary Review* from April 1870 to January 1877, and the *Nineteenth Century* from its beginnings in March 1877 until his death in 1908. In 1901 he renamed it the *Nineteenth Century and After*.

([37]) 'Recent Science', *Nineteenth Century*, 1 (March 1877), 174.

([38]) Matthew Arnold, 'Literature and Science', *Nineteenth Century*, 12 (August 1882), 216–230. The article was a publication of his 'Rede lecture' delivered to the University of Cambridge. T. H. Huxley's 'Science and Culture' address of 1880 was published in his *Collected Essays*, 9 vols. (London: Macmillan, 1893–94), iii. 134–159.

([39]) Arnold, 'Literature and Science', 221.

([40]) Algernon Charles Swinburne, 'Dethroning Tennyson: A Contribution to the Tennyson–Darwin Controversy', *Nineteenth Century*, 23 (January 1888), 127–129, at 129.

([41]) See, for example, the articles in the issues of February and March 1882. Introduction to *The Nineteenth Century*, in Houghton et al. (eds), *Wellesley Index*, ii. 673.

([42]) R. Balmer, 'Whispering Machines', *Nineteenth Century*, 17 (March 1885), 496–499, at 496.

([43]) Balmer, 'Whispering Machines', 497.

([44]) See Gowan Dawson, 'New Journalism: The *Review of Reviews*', in Cantor et al., *Science in the Nineteenth-Century Periodical*, 172–198. See also the database entries in the *SciPer Index*, www.sciper.org

([45]) 'More Ghost Stories: A Sequel to Real Ghost Stories', Being a New Year's extra number of the *Review of Reviews*, collated and edited by W. T. Stead (1892) (commonly bound in with volume 5).

([46]) For a discussion of the intersection of science and spiritualism see Richard Noakes, '"The Bridge which is between Physical and Psychical Research": William Fletcher Barrett, Sensitive Flames and Spiritualism', *History of Science*, 42 (2004), 419–464, and 'The Sciences of Spiritualism in Victorian Britain: Possibilities and Problems', in Tatiana Kontou and Sarah Wilburn (eds), *Ashgate Research Companion to Nineteenth-Century Spiritualism and the Occult* (Aldershot: Ashgate, 2012), 25–54.

([47]) 'Jekyll and Hyde in Science: Have We More Souls than One?', *Review of Reviews*, 3 (January–June 1891), 245; Frederic Myers, 'Multiplex Personality', *Nineteenth Century*, 20 (November 1886), 648–656.

([48]) For a discussion of the possible psychological sources for *The Strange Case of Dr Jekyll and Mr Hyde*, which was published in the same year as 'Multiplex Personality', see

Julia Reid, *Robert Louis Stevenson, Science, and the* Fin de Siècle (Basingstoke: Palgrave Macmillan, 2006), 96.

([49]) Dawson, 'New Journalism', 175–189.

([50]) Alexander Smith, 'On Dreams and Dreaming', *The Argosy*, 1 (April 1866), 390–394, at 390. Further page references will be given in the text.

([51]) There are strong similarities with G. H. Lewes's account of dreaming in *The Physiology of Common Life* (1859–60) which had been part serialized in *Blackwood's Edinburgh Magazine* in 1858, but Smith places greater emphasis on the possibilities of self-understanding to be gleaned from dreams.

([52]) John McLennan, 'Bride-Catching', *The Argosy*, 2 (June 1866), 31–42, at 31.

([53]) McLennan, 'Bride-Catching', 42.

([54]) Darwin, *The Origin of Species*, 395.

([55]) See, for example, Joseph Hatton, 'On Some Notable Dreams' (May 1868), 462–466.

([56]) See Andrew Mangham, *Violent Women and Sensation Fiction: Crime, Medicine and Victorian Popular Culture* (Basingstoke: Palgrave Macmillan, 2007); Jenny Bourne Taylor, *In the Secret Theatre of Home: Wilkie Collins, Sensation Narrative, and Nineteenth-Century Psychology* (London: Routledge, 1988); and Sally Shuttleworth, 'Preaching to the Nerves": Psychological Disorder in Sensation Fiction', in Marina Benjamin (ed.), *A Question of Identity: Women, Science and Literature* (New Brunswick, NJ: Rutgers University Press, 1993), 192–222.

([57]) Charles Thomas Browne, 'Criminal Lunatics', *Temple Bar*, 1 (December 1860), 135–43. Browne was both a barrister and journalist.

([58]) For a detailed study of Darwin's reception across the range of periodicals, see Ellegård, *Darwin and the General Reader*.

([59]) The article on 'Chalk' is probably a model for T. H. Huxley's famous piece in *Macmillan's* 'On a Piece of Chalk' (September 1868). In the pressured world of Victorian journalism, there was frequent borrowing and recycling, as writers, who were usually juggling numerous forms of other commitments, struggled to find new areas or angles to meet their deadlines.

([60]) For a discussion of some of these popular myths, see Janet Browne, 'Constructing Darwinism in Popular Culture', in Anne-Julia Zwierlein (ed.), *Unmapped Countries: Biological Visions in Nineteenth-Century Literature and Culture* (London; Anthem Press, 2005), 55–70; and Gowan Dawson, *Darwin, Literature and Victorian Respectability* (Cambridge: Cambridge University Press, 2007), ch. 2.

([61]) See Richard Noakes, ‘Punch and Comic Journalism in Mid-Victorian Britain’, in Cantor et al., *Science in the Nineteenth-Century Periodical*, 91–122; and Suzanne Le-May Sheffield, ‘The “Empty-Headed Beauty” and the “Sweet Girl Graduate”: Women’s Science Education in *Punch*, 1860–1890’, in Henson et al. *Culture and Science in the Nineteenth-Century Media*, 15–28.

([62]) For a discussion of the role of female naturalists in nineteenth-century publishing, see Barbara Gates, *Kindred Nature: Victorian and Edwardian Women Embrace the Living World* (Chicago: University of Chicago Press, 1998).

([63]) See Lightman, *Victorian Popularizers of Science*, particularly chapters 3 and 8.

([64]) Anthony Trollope was on the founding board of the *Fortnightly* and also established and edited his own periodical, *St Paul’s Magazine*, from 1867 to 1870. *Phineas Finn* was serialized in the opening numbers. William Thackeray had been a prolific contributor to *Punch* as well as the first editor of the *Cornhill* (January 1860–May 1862).

([65]) For digitized versions of the original journals, see the excellent ‘Dickens Journals Online’, www.djo.org.uk led by John Drew. For guides to the contents of the journals, see Anne Lohrli (ed.), *Household Words: A Weekly Journal Conducted by Charles Dickens: Table of Contents, List of Contributors and Their Contributions* (Toronto: University of Toronto Press, 1973); and Ella Ann Oppenlander, *Dickens’ ‘All the Year Round’: Descriptive Index and Contributor List* (Troy, NY: Whitston, 1984).

([66]) The controversy began with the publication by Edward A. Freeman of ‘The Morality of Field Sports’ in the *Fortnightly* (October 1869) to which Trollope responded with a defence of hunting in the December issue, ‘Mr Freeman and the Morality of Hunting’. The controversy spread across the periodical press and continued into 1872.

([67]) ‘Letter from Canon Kingsley’, *Macmillan’s Magazine*, 23 (November 1870), 71–72.

([68]) Wilfrid Trotter, ‘Herd Instinct and Its Bearing on the Psychology of Civilised Man’, *Sociological Review*, 1, no. 3 (1908), 227–248.

([69]) Francis Galton, ‘Gregariousness in Cattle and in Men’, *Macmillan’s Magazine*, 23 (February 1871), 354–357, at 354, 357.

([70]) George E. Day, ‘Louise Lateau, a Biological Study’, *Macmillan’s Magazine*, 23 (April 1871), 488–498. The case was a very recent one, only commencing in 1868, with Dr Lefebvre’s report published in 1870. It would continue to attract medical attention until 1883. See Sophie Lachapelle, ‘Between Miracle and Sickness: Louise Lateau and the Experience of Stigmata and Ecstasy’, *Configurations: A Journal of Literature, Science and Technology*, 12, no. 1 (2004), 77–105.

([71]) The volume also contained an article by Millicent Garrett Fawcett on proportional representation, and Eliza Lynn Linton’s decidedly unfeminist attack on ‘The modern revolt’ of women. The preceding and following volumes published George Eliot’s lengthy

poems, ‘The Legend of Jubal’ (May 1870), 1–18, and ‘Armgart’ (July 1871), 161–187, which, extraordinarily, are not listed in the *Wellesley Index* due to their policy of not listing poems.

([72]) Frances Power Cobbe, ‘Dreams as Illustrations of Unconscious Cerebration’, *Macmillan’s Magazine*, 23 (April 1871), 512–523, at 522.

([73]) ‘Dreams’, 523.

([74]) J. S. Mill, *Inaugural Address, Delivered to the University of St Andrews* (London: Longmans, Green, Reader and Dyer, 1867), 12.

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