

## INTRODUCTION

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“Reviews are a substitute for all other kinds of reading—a new and royal road to knowledge,” trumpeted Josiah Conder in 1811.<sup>1</sup> Conder, who subsequently became proprietor and editor of the *Eclectic Review*, recognized that periodicals were proliferating, rapidly increasing in popularity, and becoming a major sector in the market for print. Although this process had barely begun at the time Conder was writing, the number of periodical publications accelerated considerably over the ensuing decades. According to John North, who is currently cataloguing the wonderfully rich variety of British newspapers and periodicals, some 125,000 titles were published in the nineteenth century.<sup>2</sup> Many were short-lived, but others, including the *Edinburgh Review* (1802–1929) and *Punch* (1841 on), possess long and honorable histories. Not only did titles proliferate, but, as publishers, editors, and proprietors realized, the often-buoyant market for periodicals could be highly profitable and open to entrepreneurial exploitation. A new title might tap—or create—a previously unexploited niche in the market.

Although the expensive quarterly reviews, such as the *Edinburgh Review* and the *Quarterly*, have attracted much scholarly attention, their circulation figures were small (they generally sold only a few thousand copies), and their readership was predominantly upper middle class. By contrast, the tuppenny weekly *Mirror of Literature* is claimed to have achieved an unprecedented circulation of 150,000 when it was launched in 1822. A few later titles that were likewise cheap and aimed at a mass readership also achieved circulation figures of this magnitude. The vast majority of periodical publications, however, were directed to highly specific audiences. Thus, almost every religious sect and denomination had its own periodical(s), as did local interest groups from Aberdeen to Yorkshire. The working-class press also mushroomed.<sup>3</sup> Although women formed a sizable section of the general readership, they were also bombarded with their own periodicals, ranging from the *Lady’s Magazine; or Entertaining Companion for the Fair Sex* (1770–1832) to *Women’s Suffrage Journal* (1870–1890).

Juveniles constituted another large potential audience, which was often further differentiated by gender.

The nineteenth century witnessed not only the substantial growth and differentiation of the general periodical press, but also profound changes in the nature and practice of all aspects of science. It is tempting to concentrate on such major innovations in scientific theory as Darwin's theory of evolution and the conservation of energy; however, by so doing we are likely to overlook the crucial changes that were occurring in conceptions of science and in the way science was constructed for non-expert readerships. One indicator of this process was William Whewell's coining of the word "scientist" in the mid 1830s to identify an increasingly self-conscious group who studied the natural world but sought to distance themselves from the outmoded term "natural philosopher," with its connotations of dilettantism.<sup>4</sup> Throughout the century science also underwent a slow process of increasing specialization and professionalization, although, as Jack Morrell rightly insists, we must recognize that in many areas, such as natural history and geology, the gentleman amateur still flourished.<sup>5</sup> The specialist scientific press, which barely existed at the start of the century but had burgeoned and diversified by the century's end, provides an indicator of the growth of scientific knowledge and of increasing specialization. However, by concentrating on specialist publications, which were mainly written both by and for members of the scientific elite, we ignore the main routes by which science was disseminated to the wider public. Although there were other paths, such as books and the scientific lectures delivered at both Mechanics' Institutes and Philosophical Societies, the general periodical press was perhaps the most influential medium for spreading views and information about science. Not only did many general periodicals carry a significant proportion of articles specifically on science, but science often informed and infiltrated articles ostensibly devoted to other topics. For example, an article on political economy might appeal to organic evolution as the natural process for development. Again, writers of serialized fiction often incorporated contemporary theories of mind or exploited metaphors derived from botanical taxonomy or energy physics.

Although each periodical had its own targeted audience and cultural agenda, where science might rank high (as in the *Fortnightly Review*) or low (as in the fiction-oriented *Cornhill Magazine* and *Macmillan's Magazine*), one could still find articles devoted to science sitting side by side with the latest political report or serial fiction. Thus, in Graeme Gooday's example, Balfour Stewart and Norman Lockyer's speculations on energetic

relations between sunspots and terrestrial weather are set alongside the latest novel by Charlotte Yonge and a review of George Eliot's verse drama *The Spanish Gypsy* in the pages of *Macmillan's Magazine*. It should not be assumed, however, that such articles are merely examples of lesser-order, "popular" science writing. As Cooter and Pumfrey have shown, the "diffusionist model," which views science as the product of a discrete community of experts whose findings trickle down to the untutored hoi polloi via the popular press, is deeply flawed.<sup>6</sup> The audience is portrayed as passive, merely receiving the truths generated by the scientific elite. The only active reshaping is assumed to be that of the journalist who simplifies and thereby distorts science in the process of molding it for the scientifically uneducated reader. Such a model fails to provide an adequate account of the active agencies involved in popularization; it ignores the engagement between reader, writer, and publisher, and the role of the scientific community itself, in the construction of science within the pages of the generalist nineteenth-century periodical press. This is not to deny, of course, the prevalence of the diffusionist principle within nineteenth-century culture.

In witnessing the increasing popularity, proliferation, and diversity of periodicals in the early 1810s, Josiah Conder also expressed concern about their impact on the book trade. Instead of reading books, he complained, most people seemed to be satisfied with reading only reviews—a habit (not unknown in our own day) "of which the indolent and the superficial are glad to avail themselves."<sup>7</sup> Conder's comments are particularly applicable to science, since the non-scientific reader could glean, from summaries published in the general periodical press, as much science as an individual might require. Indeed, many nineteenth-century periodicals carried regular science columns for just this purpose. For example, the *Athenaeum* and the *Literary Gazette* carried reports of Friday evening discourses delivered at the Royal Institution. In his contribution to this book, Frank A. J. L. James argues that these two widely distributed weeklies further extended the general audience for science well beyond the relatively small numbers who crowded the lecture theater at the Royal Institution. Faraday, in particular, recognized the importance of spreading science through these press reports. The Royal Institution, which was often in financial difficulties, also benefited by gaining a higher public profile, which, in turn, helped boost the membership. Scientists were clearly not slow to appreciate the benefits of periodical publications in furthering their cause, but their involvement was more complex than the diffusionist model suggests.

A more sophisticated variant on the diffusionist model is the “conduit model,” which takes account of the highly differentiated nature of the general periodical press and replaces the vague notion of downward diffusion by a process in which periodicals transmit science to specific audiences. According to this model, each periodical fashions its response to science in the light of the intended readership. Two periodicals may then offer contrasting reactions to what appears to be the same scientific development. This approach was brilliantly utilized by Alvar Ellegård in *Darwin and the General Reader* (1958), in which he surveyed the variety of responses to Darwin’s theory of evolution by periodicals that differed in their social, political, and religious orientations. Thus, for example, the evangelical press generally rejected Darwin’s theory as incompatible with the biblical narrative, whereas Unitarian periodicals considered that the theory offered further evidence of divine design.<sup>8</sup>

Whereas Ellegård’s approach laid the foundations for much subsequent work on periodicals and science, recent scholarship has introduced a more complex agenda and a further range of questions to consider. In undertaking his research, Ellegård examined only those articles that explicitly addressed Darwinism. If we are to understand how scientific ideas were woven into the texture of nineteenth-century cultural life, then we need to examine how scientific language and concepts permeated the entire range of periodical content, from glancing asides to elaborate fictional conceits. We also need to explore the effects of placement and to consider how reading and interpretation might have been affected by the interdisciplinary structure of each periodical. Articles, once restored to their original publishing context amidst a miscellany of other material, can often take on very different meanings. Furthermore, as Gillian Beer’s study of the founding of the *Academy* shows, the boundaries between the arts and the sciences were far more flexible in the nineteenth century. We must be careful not to impose anachronistic divisions in our analysis, but to accept actors’ categories. In the case of the *Academy*, for example, philology figured alongside physics and biology as an area of contemporary scientific development.

Periodicals themselves also played a crucial role in the development of scientific thought itself. As Roger Smith reveals, the discipline of psychology was actively shaped in the public arena of debate offered by periodicals. The conduit model must be revised to take account of the ways in which science was not simply “transmitted” but was also given definition, to a greater or lesser degree, in the pages of the periodical press. Psychology was not the only field in which debate was informed by moral

and epistemological issues that spread across the cultural spectrum. As the chapters by Bernard Lightman, Helen Small, and Gowan Dawson reveal, the physicist John Tyndall and the mathematician William Kingdon Clifford courted public notoriety in their attempts to place their subject fields within the wider frames of reference more commonly associated now with literature or philosophy.

At the opposite end of the spectrum from diffusionist or conduit models lies the model of “textual economy,” which, drawing on Foucauldian ideas, allows scholars to trace the play of ideas and meanings across disciplinary frameworks.<sup>9</sup> In many ways it would appear to offer an ideal critical framework for dealing with the multi-disciplinary structure of the periodical. Like the other models, however, it also has its drawbacks, most noticeably a general looseness and lack of a theory of transmission. The unstated notion of economy that seems to underpin the model is that of the free-market economy: free linguistic circulation is assumed between texts, and no thought is given to differential access or to limited circulation. The sheer diversity of the periodical press, however, militates against accepting such a general model. As the chapters in this volume show, we need to be highly sensitive to the politics of placement: to look at the target audience of each title with regard to political, intellectual, or religious orientation, and gender and class marketing. Furthermore, we need to take into account the individual predilections of editors, authors, and proprietors. At times these can coincide, but not always. As Small shows in her study of the publication history of Clifford’s essay “The ethics of belief,” there can be crucial interplay between intellectual argument and the very material politics of publication. Crosbie Smith and Ian Higginson’s study of the *North American Review* under the editorship of Henry Adams reveals how decisively an editor can shift the direction of a periodical: Adams sought to harness the review and its cultural and scientific coverage to his own agenda of progressive social and legislative reform. He was defeated, like so many editors, by the pressures of the marketplace and the literal economics of publication.

As many of the chapters in this volume reveal, it is unsafe to assume that a periodical retained a uniform identity across its lifetime. The *Academy*, for example, witnessed a marked decline in the twentieth century, and its succession of editors during that period suggests that it lacked a sense of direction. Similarly, the *North American Review* carried a very different form of science article as soon as Adams resigned his editorship (although the proprietors felt compelled to publish the final volume he commissioned, while adding a disclaimer with regard to the views

expressed). Publishers, writers, and editors could work in harmony—as when Macmillan offered Norman Lockyer and Balfour Stewart space to pursue their unorthodox theories of energy—but these relations were often characterized by conflict. Editors exercised a greater or lesser degree of control over the articles they published, but, even when one can trace an evident “party line,” there was still room for conflict, or divergence of opinion. Jonathan Topham, for example, compares attitudes to natural theology across a range of High Anglican, Evangelical, and Unitarian periodicals. Although, like Ellegård, he is crucially concerned with the religious positions adopted by these periodicals, he also rightly insists that we should not seek too much coherence within a single denominational periodical but rather should appreciate the range of positions articulated. Even within a particular denomination there may be considerable diversity of belief, thus engendering debate and controversy. Topham also shows that an analysis that focuses on the transmission of ideas might miss core elements in responses to science: in the religious magazines he examines, writers were interested in both the rational and the affective aspects of science—in the consequences for religious *practice* as much as for the structures of belief.

The diffusionist and conduit models both assume relatively passive, pre-formed audiences, whereas theories of textual economy often leave the reader entirely out of account. The agendas of some of the periodicals examined here, however, actively set out to create their audience. Appleton, in founding the *Academy*, attempted to create a new kind of readership: European intellectuals in the land of John Bull. A readerly interest in the development of all aspects of science and culture, across the breadth of Europe, was simply taken for granted in the initial organization of the periodical (although the first publisher, Murray, had judged such ambitions suicidal). Very different assumptions were in place in the women’s magazines examined by Ann Shteir, each of which sought to tailor its representations of botany for a female audience. Did such magazines succeed, however, in constructing the audiences they desired?

One can trace the rise and fall of periodicals themselves, but the nature of reception remains far more elusive. It seems unlikely that all readers read from cover to cover, so did they all construct their own forms of text? And were there many “resisting readers” who refused the steer offered by editorial construction of the text?<sup>10</sup> As Harriet Ritvo’s exploration of audience misunderstandings of science reveals, the same words could have very different implications for different categories of audience. Even when James Cossar Ewart had managed to create widespread

newspaper and periodical coverage of his experiments in hybridity, often based on his own press releases, reading and interpretation were still governed by individual expectation and interests. Virtually identical blocks of texts created different effects, according to whether they were placed, for example, in *Polo Magazine* or in the *Lancet*. Yet amidst all this variation of coverage, very few readers appear to have fully understood the scientific implications of Ewart's work. Authorial or editorial intention cannot necessarily control readerly practice.

Periodicals, as scholars in the field have recently argued, are by nature more open and multi-vocal than books.<sup>11</sup> Readers engage more directly in dialogue with the overall text, in some cases quite explicitly. When invited by the *British Ladies Magazine* to vote on whether needlework patterns should be included as a part of the monthly format, nine readers confounded expectations by demanding instead a critique of "Corneille, Racine, Voltaire, and Moliere's plays" (Shteir). Later in the century, Frances Power Cobbe's *Macmillan's Magazine* essay "Unconscious Cerebration: A Psychological Study" included a direct request to readers to send the author examples of their dreams. Cobbe's next essay, "Dreams as Illustrations of Unconscious Cerebration," draws on the contents of a capacious postbag, organizing analysis around readers' own dreams.<sup>12</sup> Readers and journalist here come together in the construction of science. Although Cobbe had no scientific training, it should be noted that her work was nonetheless taken seriously by major figures in the field. W. B. Carpenter cited Cobbe's articles approvingly in his subsequent *Contemporary Review* articles "The Physiology of the Will" (May 1871) and "On Mind and Will in Nature" (October 1872), which then were incorporated into his major work, *Principles of Mental Physiology* (1874).<sup>13</sup> As the essays in this collection demonstrate, there was often no sharp distinction between "serious" science and periodical publication during this period. Major figures such as Carpenter, or Henry Maudsley, as well as the better-known popularizers John Tyndall and T. H. Huxley, often chose to publish their scientific contributions first in the general periodical press. Likewise, as Gooday notes, Stewart chose to publish in *Macmillan's Magazine*, rather than a more specialist technical periodical, when he wished to introduce a new theologically significant interpretation of his work with Lockyer.

One can trace a clear targeting of audiences in science writers' choice of publication outlet. Huxley chose to publish his notorious materialist lecture "On the Physical Basis of Life" in the radical *Fortnightly Review* (1869), but then answered the critical storm evoked in the more respectable and family-oriented *Macmillan's Magazine* (1870).<sup>14</sup>

Although each periodical tended to have its own stable of writers, they also ranged more widely, choosing to respond to articles in other periodicals and frequently fitting their materials to the particular format of each publication. Debates ranged within individual periodicals, but also across titles. Herbert Spencer opened his article “Morals and moral sentiments” in the *Fortnightly Review* with the observation that his attitude to morality had been grossly misrepresented by R. H. Hutton in *Macmillan’s Magazine*. He had ignored this misrepresentation until it had been repeated across a whole range of other periodicals, and then finally expressed, to his disgust, in the *Fortnightly Review* itself.<sup>15</sup>

Periodicals, as Shteir notes, are able to register changing cultural conversations more clearly than books. They also operate according to different temporal patterns and in response to a different range of external pressures. Editors must fill each issue, publish it on time, keep the periodical financially profitable, publish material that will attract readers, and yet be careful not to offend them too much by disseminating unacceptable opinions. A hard-fought controversy on a prominent issue could only boost sales. The early success of the *Edinburgh Review*, which was started by a group of young men keen to gain reputations in the wider world, was due primarily to the high level of critical analysis, which contrasted with the insipid reviews published in most contemporary periodicals.<sup>16</sup> Although Josiah Conder, writing a decade later, undervalued the importance of hard-hitting criticism, it was one of the most important functions performed by the periodical press throughout the nineteenth century. Periodicals were often in conflict, the battle lines reflecting their social, political and religious alignments. Paradigmatically, the *Edinburgh Review* took up the Whig cause and opposed the Tory *Quarterly*. Periodicals not only published controversial articles but also participated actively in the affray.

Although criticism and controversy were evident in many areas—most obviously politics—they possess particular relevance for science. As the philosopher Karl Popper has argued, criticism is essential for the growth of knowledge, especially scientific knowledge.<sup>17</sup> In the nineteenth century, much of the criticism that provided the engine for progressive scientific change occurred in the periodical press. Although Popper was concerned primarily with the improvement of scientific theory by critical exchange between members of the scientific community, we should adopt a broader perspective and appreciate how general periodicals established both the platforms and necessary conditions for debate. Whereas historians have tended to highlight developments in science, technology

and industry as causes and indicators of the sense of accelerating progress during the nineteenth century, we must also acknowledge the equally important role played by criticism in the general periodical press.

In his study of the controversies provoked by John Tyndall's 1874 Belfast address, Lightman highlights the centrality of periodicals to both the construction and the maintenance of debate. In the view of some of Tyndall's opponents, the periodical press not only provided a platform for his uncongenial opinions, but also aided the spread of atheism and increased hostility to Christianity. Periodicals were responsible, in the words of one particularly vociferous critic, for propagating an "intellectual Black Death." They had taken on the status of "sacred texts," but they were unable to offer truth. Perceiving themselves outmaneuvered, however, opponents of scientific naturalism recognized that they would have to reclaim the periodical press if they were to win the battle with irreligion. Many of the main public skirmishes between the scientific naturalists and their Christian opponents thus occurred in the Victorian periodical press. Nonetheless, it is important to bear in mind that the relations between science and religion in the nineteenth century cannot simply be characterized as unmitigated conflict. As Topham and Roger Smith show, with reference to natural theology and psychology the controversies were not aligned neatly according to a straightforward division between supporters of religion and those of science. The overall picture of debate is both more subtle and more complex.

Questions concerning the nature and operations of the human mind aroused intense controversy at this period. Firmly rejecting the internalist historiography that attributes the beginning of "psychology" to Wilhelm Wundt's experimental program in the late 1870s, Smith turns instead to the British periodical literature of the previous 20 years to explore the ways in which psychology emerged as a specific subject, a scientific discipline, and a category in terms of which people make sense of their lives. At the heart of these debates lay the question of whether the workings of the mind could be approached using the methods and insights of physiology. Idealism clashed with empiricism, yet writers across the spectrum were divided on how far theology remained relevant in addressing these issues. Through the flux and collision of viewpoints expressed in the periodical press, the discourse of psychology started to take shape.

Religion and psychology were not the only controversial subjects affecting science. In examining the diffusion of Darwinism within the public domain, James Paradis locates another axis of controversy. The Darwinian hegemony was attacked by Samuel Butler in a book in which

he sought to demonstrate that Darwin's ideas were not original but had been derived from his grandfather, Erasmus Darwin. In the ensuing David-and-Goliath confrontation, Butler—a sheep farmer turned popular writer—weighed in against the authority of the scientific elite who lionized Darwin. This controversy soon spilled onto the pages of the periodical press, where Butler could operate effectively and with impunity, scoring some telling points against Darwin. As Paradis's case study suggests, the authority of the emergent scientific community remained a controversial issue throughout the nineteenth century and was particularly pertinent to the periodical press, which often functioned as an interface between the scientific community and a lay readership. Indeed, as Lightman notes, many of the periodicals that criticized Tyndall's Belfast address considered that he had misused his position of president of the British Association by vesting the questionable philosophy of materialism with the authority of science.

Controversy on scientific issues was not confined to scientific periodicals but permeated the general periodical press, ranging from the mainstream *Edinburgh Review* and *Quarterly Review* to the populist *Leisure Hour*, and from *Punch* to the strait-laced religious weeklies. Between the overtly scientific titles and those with more general coverage stood an extraordinary number of special-interest journals, as revealed in Ritvo's exploration of the reception of Ewart's experiments in breeding. In addition to general newspaper reports, journals as diverse as *Field*, *Sketch*, *Live Stock Journal*, and *Land and Water* covered Ewart's 1899 Royal Institution lecture. Every significant development in science in the nineteenth century was aired in the periodical press, often drawing fire both from established scientists and from critics who, like Butler, possessed no recognized scientific credentials.

Not only were there public controversies between periodicals; there were also intense struggles behind the scenes. Rivalries and overt clashes between authors, editors, and publishers—however permuted—were very common. Such disputes could affect a periodical's scientific content, since scientists of standing often not only contributed to general periodicals but also played significant roles in their production. Gooday demonstrates the close personal connections between Balfour Stewart, Norman Lockyer, and the publisher Alexander Macmillan. Macmillan not only brought the two scientists together and encouraged their collaboration but also recruited them to his stable of writers. They contributed to *Macmillan's Magazine*, to his textbook series, and to his new and important venture into science journalism: *Nature*. In collaborating and writing

for Macmillan, Stewart and Lockyer advanced their own careers through publishing; in particular, Lockyer became editor of *Nature*. Moreover, having received Macmillan's imprimatur, they published their own idiosyncratic and controversial views on the subject of energy in *Macmillan's Magazine*. Keen to oppose the materialist and anti-religious ethos that was gathering around Huxley and others, they used their contributions to *Macmillan's Magazine* to place before a wider public an anti-materialist and broadly Christian version of energy physics.

In the cases of Lockyer, Stewart, and Macmillan, scientists worked in harmony with their publisher. Small's chapter, by contrast, demonstrates how extraordinarily complex the politics of science publishing could become, leading to a prominent court case between two periodical publishers—a case in which editors, publishers, and financial backers became embroiled. At the heart of this controversy lay William Kingdon Clifford's provocative 1877 essay "The ethics of belief," published in the *Contemporary Review* (to the outrage of the new financial backer of the periodical, an ardent Evangelical). Clifford's attempts to extend scientific method to the realms of philosophy and religion led to tempestuous debates in the periodical press. James Knowles, a progressive assistant editor who had been dismissed before the article's publication, immediately set out to found a more liberal and explicitly non-sectarian organ, the *Nineteenth Century*. Scientific rationalism not only provided subject matter for periodical debate, but became closely woven into the material conditions of publication.

Closely related to these questions of the cultural politics of publication are questions of language. How writers on science framed their arguments was as important as where they placed them. Lightman highlights the anger that was directed at John Tyndall for appropriating the language of the soul, while William Mallock objected to Tyndall's and William Clifford's use of language that was aglow with ethical fervor. In the rhetorical wars that framed scientific debate in the periodicals, opponents sought to police each other's language. Literary texts themselves also became weapons in these battles; Shakespeare and Tennyson were often invoked by scientific writers to give cultural weight and dignity to their arguments. But, as Dawson shows, quotation of the wrong literary text—in this case Clifford's quotation of Swinburne—could evoke moral opprobrium that might outlast a lifetime. Such swift and indignant connections demonstrate again how friable were the boundaries between the literary and scientific domains. Jonathan Smith, in tracking Ruskin's outrage as he came to terms with the implications of Darwinian theory for his own aesthetic vision,

similarly unveils a close connection between the two spheres. Not only did nineteenth-century science draw on the language and rhetoric of the literary sphere; in the writings of Grant Allen we find literary language deployed, in the service of physiological aesthetics, to undermine the visionary idealism that sustained much aesthetic writing.

It is tempting to view Grant Allen, a prolific journalist and novelist, as an eminent example of the species “scientific popularizer.” We should be careful in this designation, however, since he also wrote, and published in the general periodical press, scientific articles that Darwin acknowledged as contributions to the field. The openness of the periodical form encouraged movement across what are now viewed as professional boundaries. One can trace the same openness in the willingness of scientists to write outside their field of expertise. The medical psychologist Henry Maudsley wrote on *Hamlet*, the astronomer Herschel on Dante’s *Inferno*. The physician Henry Holland produced articles on shooting stars and the physical geography of the sea.<sup>18</sup> The career of George Eliot’s partner, G. H. Lewes, which embraced popular journalism, novel writing, and experimental work on physiological psychology, was not as unusual as is often assumed. In an era when the foundations of scientific status were still unclear, the willingness of scientists to move across disciplinary borders was mirrored in the work of non-scientific writers whose prose was permeated by the language and issues of scientific debate. Such flexibility raises interesting questions. Where writers offer articles on the same subject to a range of periodicals, from technical through to lowbrow, does their language vary? If so, in what ways? And does the article for the more technical or specialist press always precede the version designed for a more popular audience? As Jonathan Smith points out, Grant Allen’s technical article on color sense was published in *Nature* at the same time as his more popular version in the *Cornhill Magazine*, and indeed Darwin responded as positively to Allen’s *Cornhill* work as to his scientific texts. When Samuel Butler took advantage of the open format of the periodical press to challenge Darwin, Allen came to his defense, securing in the process a level of scientific recognition for himself.

The flexibility of the periodical press made it possible for a writer to establish a scientific reputation irrespective of his previous career trajectory, although this pathway became harder as the century progressed. Yet, as Beer notes, in the 1870s it was actually easier for amateurs to write for *Nature*, than for the intellectually elitist *Academy*. For potential and established scientists, the periodical press offered a way of reaching a widespread audience, thus consolidating their intellectual and cultural standing. Tyndall, Huxley, and Clifford became household names as their

contributions and the controversies they created fanned out across the press. As Dawson's chapter on Clifford illustrates, the process of shaping and reshaping the image of the scientist could continue for decades after an individual's death.

As scientific publication and practice becomes ever more specialized, technical, and remote, it is refreshing to look back to an era when science writing, and scientists themselves, appeared culturally accessible. Although Darwin chose to write *On the Origin of Species* in book form, it would not have appeared out of place in the higher reaches of the periodical press. Dailies, weeklies, and monthlies, whether targeted at women, at religious audiences, or at liberal male readers, all assumed an appetite for science and an eager interest in its implications. At times such assumptions of interest could perhaps be stretched too far, as in the case of the *Academy*, and, as Ritvo reminds us, scientists could not always control how periodicals presented their work, or how readers chose to interpret and understand it. Yet the ensuing debates often fueled the development of science itself. Periodicals were not passive conveyers of scientific information but active ingredients in the ferment of science.

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#### NOTES

1. J. C. O'Reid [Josiah Conder], *Reviewers Reviewed; including an Enquiry into the Moral and Intellectual Effects of Habits of Criticism, and the Influence on the General Interests of Literature* (J. Bartlett, 1811): 7.

2. John S. North, *The Waterloo Directory of English Newspapers and Periodicals, 1800–1900* (North Waterloo Academic Press, 1997–).
3. See, e.g., Josef L. Altholz, *The Religious Press in Britain, 1760–1900* (Greenwood, 1989); Royden Harrison, Gillian B. Woolven, and Robert Duncan, *The Warwick Guide to British Labour Periodicals, 1790–1970: A Check-List* (Humanities Press, 1977).
4. S. Ross, “Scientist: The Story of a Word,” *Annals of Science* 18 (1962): 65–85.
5. J. B. Morrell, “Professionalisation,” in *Companion to the History of Modern Science*, ed. R. Olby et al. (Routledge, 1990).
6. Roger Cooter and Stephen Pumphrey, “Separate Spheres and Public Places: Reflections on the History of Science Popularisation and Science In Popular Culture,” *History of Science* 32 (1994): 237–267.
7. [Conder], *Reviewers Reviewed*, p. 7.
8. Alvar Ellegård, *Darwin and the General Reader: The Reception of Darwin’s Theory of Evolution in the British Periodical Press, 1859–1872* (University of Gothenburg Press, 1958; revised edition, University of Chicago Press, 1990).
9. The terms “textual economy” and “symbolic economy” are employed across a range of post-structuralist and new historicist approaches to literary texts. For an early usage that avoids some of the subsequent looseness of application, see Steve McCaffery, “Writing as a general economy,” in McCaffery, *North of Intention: Critical Writings, 1973–1986* (Roof Books, 1986).
10. See Judith Fetterley, *The Resisting Reader: A Feminist Approach to American Fiction* (Indiana University Press, 1978).
11. Margaret Beetham, “Towards a Theory of the Periodical as a Publishing Genre,” in *Investigating Victorian Journalism*, ed. L. Brake et al. (Macmillan, 1990). See also Laurel Brake, “Writing, Cultural Production and the Periodical Press in the Nineteenth Century,” in *Writing and Victorianism*, ed. J. Bullen (Longman, 1997).
12. Francis Power Cobbe, “Unconscious Cerebration: A Psychological Study,” *Macmillan’s Magazine* 23 (1870): 24–37; idem., “Dreams as Illustrations of Unconscious Cerebration,” *Macmillan’s Magazine* 24 (1871): 512–523.
13. William B. Carpenter, “The Physiology of the Will,” *Contemporary Review* 17 (1871): 192–217; idem., “On Mind and Will in Nature,” *Contemporary Review* 20 (1872): 738–762; idem., *Principles of Mental Physiology, with Their Applications to the Training and Discipline of the Mind, and the Study of its Morbid Conditions* (Henry S. King, 1874).
14. Thomas H. Huxley, “On the Physical Basis of Life,” *Fortnightly Review* 5, n.s. (1869): 129–145. Huxley’s second article carried the disarming title of “On Descartes’ Discourse Touching the Method of Using One’s Reason Rightly, and of Seeking Scientific Truth,” *Macmillan’s Magazine* 22 (1870): 69–80. See pp. 24–25 of Gowan Dawson’s Ph.D. dissertation, *Walter Pater, Aestheticism and Victorian Science* (University of Sheffield, 1999).

15. Herbert Spencer, "Morals and Moral Sentiments," *Fortnightly Review* 52 (1871): 419–432.
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