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## An experiment with science for the nineteenth-century book trade: the International Scientific Series

LESLIE HOWSAM\*

**Abstract.** The theory, method and disciplinary foundations of ‘book history’ are addressed in the context of a close examination of the International Scientific Series, a set of monographs that appeared from 1871 to 1911 in Britain, France, Germany, Italy, Russia and the United States. Working closely with entrepreneurial publishers, most authors of ISS volumes were scientific professionals (T. H. Huxley, John Tyndall, Herbert Spencer and E. L. Youmans were among the founders) aiming to educate a broad popular audience. Commercial, scholarly and other pressures made the texts less fixed than they appear: revisions, appendices and other evidences of textual instability have been overlooked by previous commentators.

For an indication that the history of science has underestimated the importance of the contexts of publishing and of print culture within which scientific books emerged, the historian of the book need look no further than the notes to articles in the *BJHS*, where convention decrees that the publisher’s name need not appear: place and date are sufficient information for a citation. The assumptions inherent in this apparently trivial matter of form underlie much of the older work in the history of science. Even some more recent scholarship discusses scientific books as if they had emerged straight from the minds and consciousness of their authors, to be decanted on the page, unmediated by any influence from the publishing and printing trades.<sup>1</sup> Publishing does not work that way now, and it did not work that way in the past. The bland package of a printed and bound book may conceal a complex history of networking and power-broking among authors and publishers about the initial idea or first manuscript draft; it seldom hints at decisions to include or omit material, decisions that may have been negotiated between publisher and writer, but might equally well have been peremptory steps taken without consultation about the author’s intention. A title-page can falsify its own date of publication and its own publishing history, trumpeting as a new edition a text neither revised nor reset, or presenting dramatically altered material as a faithful reprinting of a trusted classic. Perhaps because the culture of science articulates a dual discourse with claims both to authority and innovation, a close examination of the publishing history of scientific books can be

\* Associate Professor of History, University of Windsor, Windsor, Ontario, N9B 3P4, Canada. I am grateful to James Secord and Jonathan Topham for many conversations about the relationship between the histories of science and of publishing, beginning with their invitation to attend the Edinburgh conference. Jonathan Topham has been a patient and tactful editor, helping me to communicate across the boundaries between the two disciplines. This article emerges from a bibliographical study of the International Scientific Series in all its national and linguistic variants, originally undertaken in collaboration with Michael Collie. His book on the series is currently under contract for publication with Ashgate Publishing Limited.

<sup>1</sup> An extreme case is John L. Thornton and R. I. J. Tully’s *Scientific Books, Libraries and Collectors* (London, 1971).

particularly fruitful for the scholar interested in how text and physical object combined to constitute the reader's experience at a given place and moment in time. In the last quarter of the nineteenth century, science in Britain, North America and continental Europe was concerned with reaching a wide popular readership, perhaps even an international audience, and book publishing was the medium of choice for that purpose. A history of scientific publishing written primarily from the perspective of the history of science is incomplete. The books have a history too.

A case in point is the International Scientific Series (ISS), whose 'familiar red covers' were described as 'a guarantee of sound material within' by A. S. Eve and C. H. Creasey, the biographers of John Tyndall.<sup>2</sup> That readily recognizable packaging, evoking the illusory but still compelling insurance of textual quality, is a triumph of nineteenth-century publishers' marketing that continues to resonate in antiquarian bookshops and rare-book collections today. Both private and institutional collectors of books in the history of late nineteenth-century science enjoy possessing copies of books in the attractive uniform dark red cloth binding. Some collections even include what appears to be a complete 'run' of the series, from the beginning in 1871 to the end – 1911 was the date of the last new title, the ninety-sixth, to be published in England. Roy MacLeod selected the ISS, with its apparently tidy bibliographical boundedness, as a suitable 'extended example' of the relevance of scientific books in series to an understanding of contemporary scientific culture, an understanding to be gained 'by a close study of the factors involved in its evolution'.<sup>3</sup> One copy of each title is not enough, however, for a close study of books as evidence of their own history: although MacLeod examined the archival and anecdotal evidence of the series's formation and existence, his 1980 essay failed to notice that many of the books had been revised, sometimes significantly and often more than once. The apparent stability and permanence of the books is as illusory as their claim to represent authoritative science: their contents are demonstrably unstable.

As MacLeod recognized, a set of nearly one hundred books directed to a popular reading audience, a number of which achieved bestseller status, raises some questions. What are historians of Victorian science to make of this collection of texts, most of which were written by scientific practitioners, and some by world-famous men of science – especially when three of them (T. H. Huxley, John Tyndall and Herbert Spencer) also formed an editorial committee of some sort? Can we construe the contributors as an ideological community in the scientific culture of the late nineteenth century? What are we to make of the publishers and promoters of the series? Can anything be found out about the people who read the books and what contribution they made to popular conceptions of what constituted the 'sound material' of science that prevailed in the closing decades of the nineteenth century?

These are questions that also interest the scholars who focus on the history of the book and print culture: the histories of authorship, of publishing and of reading in the Victorian era. But whereas the historian of science will focus on the way that professionals and

<sup>2</sup> A. S. Eve and C. H. Creasey, *Life and Work of John Tyndall*, London, 1945, 154.

<sup>3</sup> Roy M. MacLeod, 'Evolutionism, internationalism and commercial enterprise in science: the international scientific series 1871–1910', in A. J. Meadows (ed.), *The Development of Science Publishing in Europe*, Amsterdam, 1980, 63–93.

amateurs defined science in the International Scientific Series and examine the collective texts as well as public or private statements of intent about its purpose, the historian of the book will not take for granted the denotation 'book' as an unproblematic category. An alternative set of questions arises. Where and how did these works fit in the contemporary context of scientific publishing, and of publishing in general? Were the texts as fixed as they appear, or is there evidence of revision? When revisions occurred, were they announced to booksellers and the reading public, or were they concealed? Did publishers agree with the titans of science who gave them editorial advice about what constituted a saleable manuscript, and when they failed to agree, whose opinion prevailed? The historian of the book will seek out the publishers' archives, delve among the papers of authors and trace the series through the book trade press; he or she will also seek out the opinion of the reviewers whose task it was to evaluate each title on the occasion of its original appearance. In addition to these conventional sources, the historian of the book will also interrogate as evidence the surviving artefacts of the ISS, and analyse the books themselves as physical objects.

Taken together, the sources both conventional and unconventional reveal a great deal about the scientific culture of the period. Analysis of the series as a publishing event may prove just as useful, perhaps more useful, than the collective content of its several texts. The argument is in two parts: first, the editorial decisions about what titles to include in the series are evidence of contemporary definitions of science, particularly the inclusion of the social sciences with the natural sciences. Second, the production decisions about how to keep the series in print are evidence of how the contemporary culture of science interacted with the culture of publishing. Both authors and publishers assumed that authors could rightfully insist upon revisions of their books – revisions to correct errors, respond to critics and take account of new material. But this assumption was not communicated to readers, either through the book trade or in the popular science press. Instead, the reading public was offered the ISS as a finite series of titles both new and authoritative; the claim to innovation was bolstered by a practice of dating title-pages by the year they were printed, not the year of publication. Inside the publishing houses, moreover, the authors and publishers took for granted a further assumption of scientific culture: when a print run had sold out, the author was permitted to prepare an appendix, a new preface or sometimes even to revise the text, to reflect his latest contributions to knowledge. Because these revisions were concealed from the reader – or at least not advertised to the reader – they are only apparent on a close analysis of the physical construction of the books as books.

### **The new history of the book**

The book as a physical object has been the subject of scrutiny for almost as long as scholars have been concerned with the book as a literary text. For over one hundred years in British and North American libraries, scholarly bibliographers have pursued their craft. They single out the works they regard as most important and subject the published variants to a scrutiny that contributes greatly to an understanding of the authors' intentions. Most of the books (and texts) examined by bibliographers have been works of imaginative

literature, such as drama, novels or poetry, where problems of authorial intention and reader response – as well as publishers’ interference between the two – can be addressed by a close engagement with contemporary printing practices. Shakespeare’s plays provide the best example, and for many years bibliographical analysis was limited to books printed in the hand-press period, before the early nineteenth-century introduction of machine printing and other technical innovations.<sup>4</sup> More recently, attention has turned to the books printed in the Victorian years, especially since the novels that appeared first in serial form and later in volume form, almost always with revisions, exhibit such interesting and difficult problems of interpretation.<sup>5</sup> The development in the 1960s of Victorian studies, and the related devotion of some distinguished academic careers to the novels of Dickens, Thackeray and George Eliot, promoted a parallel interest in the publishers of those novels. John Sutherland called them the ‘shadowy accomplices’ of the great Victorian novelists.<sup>6</sup>

Now a new community of scholars is building upon the foundations laid by the literary bibliographers, writing and rewriting what amounts to a new history of the book. Historians of the book and print culture are taking an interdisciplinary and contextual approach to print that associates many of us with the theoretical concerns of cultural history. One of the marks of this approach is the way in which some of its practitioners choose to study works that are not conventionally literary: books like bibles and religious tracts, school primers and textbooks, cookery and household books, and political and scientific works.<sup>7</sup> A history of the book which is constituted as cultural history will be open to the experience of readers, as well as to the intentions of authors and the limitations of publishers. Such a history must also be open to genres of print previously overlooked by scholars whose main interests were literary. Books may emerge not from artistic motives or from a knack for story-telling, but rather from a desire to instruct, to inform or to persuade. Books have often been the product of the religious enthusiasm of their authors and publishers, as those individuals and organizations seek to convert ‘pagan’ readers to the Christian world-view.<sup>8</sup> Other conversion projects may be identified, and here we come closer to the experience of scientific authors, publishers and readers: the men and women of science of nineteenth-century Europe and North America were just as passionate evangelists, for science, as were their opposite numbers in the missionary societies. And they were equally as convinced as their neighbours among the novelists and poets that their own identification of reality should be made available to all who could read it. With these kinds of forces and motives in mind, scholars in the new history of the book recognize their field to be part of the history of science, just as they see it as part of the history of religion, of literature, of culture generally.

One of the best-known advocates, among historians, of the new cultural history of the book is Robert Darnton, who used the publishing history of the *Encyclopédie* to

4 Philip Gaskell, *A New Introduction to Bibliography*, Oxford, 1972.

5 John M. Robson (ed.), *Editing Nineteenth-Century Texts*, Toronto, 1967.

6 J. A. Sutherland, *Victorian Novelists and Publishers*, Chicago, 1976, 1. See also Leslie Howsam, ‘Victorian studies and the history of the book: opportunities for scholarly collaboration’, *Victorian Review* (1996), 22, 65.

7 The name of the international and interdisciplinary organization founded in 1993 sums up the contemporary approach: the Society for the History of Authorship, Reading and Publishing (SHARP).

8 Susan Pederson, ‘Hannah More meets Simple Simon: tracts, chapbooks, and popular culture in late eighteenth-century England’, *Journal of British Studies* (1986), 25, 84–5.

demonstrate aspects of the Enlightenment in Europe that could not have been appreciated in any other way; and one of the most respected of bibliographers is D. F. McKenzie, who used the page-layout of Congreve's plays to get inside the experience of the seventeenth-century reader.<sup>9</sup> In an influential article fifteen years ago, Darnton asked 'what is the history of books?', and sketched the development of what was then an innovative and promising field of study, one that seemed 'likely to win a place alongside fields like the history of science and the history of art in the canon of scholarly disciplines'. He sketched a 'communication circuit' in which the book circulated from author to typesetter, printer, binder, shipper and bookseller, and on to the reader, who 'completed the circuit' by being part of the culture that influenced authorship. Darnton concluded that 'historians can show that books do not merely recount history; they make it'.<sup>10</sup> Historians' histories of the book include James Raven's demonstration that novels and courtesy books in eighteenth-century Britain made history by transforming the way in which the acquisition of new wealth was represented, and by shaping the criteria by which it might be judged by contemporaries. William J. Gilmore made a similarly convincing argument that 'reading became a necessity of life' in the course of commercialization and industrialization in rural New England at the turn of the nineteenth century, building the social-history argument upon a solid bibliographical foundation. And my own work on the British and Foreign Bible Society illustrated how that organization's nineteenth-century project of disseminating cheap editions of the scriptures was grounded as much in contemporary realities of the printing, papermaking and bookbinding trades as it was in the evangelical religious impulse.<sup>11</sup>

McKenzie's historical approach to bibliography signals a shift 'from questions of authorial intention and textual authority to those of dissemination and readership as matters of economic and political motive and of the interaction of text and society as an important source of cultural history'. He interprets the relationship of literature to its culture in terms of a 'sociology of texts', including as printed texts worthy of scholarly attention 'everything from receipt blanks to bibles'.<sup>12</sup> He also incorporates in the definition texts both written and remembered, not just those set down by scribes and printers.

When McKenzie observes that 'it is...the bibliographer's job to show editors (and historians) how rich an account of human behaviour the physical elements of a book may yield to those who *can* read all its signs and so recreate the historical dynamics of its

9 Robert Darnton, *The Business of Enlightenment: A Publishing History of the Encyclopédie*, Cambridge, MA, 1979; D. F. McKenzie, 'Typography and meaning: the case of William Congreve', in G. Barber and B. Fabian (eds.), *The Book and the Book Trade in Eighteenth-Century Europe*, Hamburg, 1981.

10 Robert Darnton, 'What is the history of books?', *Daedalus* (1982), 67. See also his 'Histoire du livre – Geschichte des Buchwesens: an agenda for comparative history', *Publishing History* (1987), 22, 33–41.

11 James Raven, *Judging New Wealth: Popular Publishing and Responses to Commerce in England, 1750–1800*, Cambridge, 1992; William J. Gilmore, *Reading Becomes a Necessity of Life: Material and Cultural Life in Rural New England, 1780–1835*, Knoxville, TN, 1989; Leslie Howsam, *Cheap Bibles: Nineteenth-Century Publishing and the British and Foreign Bible Society*, Cambridge, 1991.

12 D. F. McKenzie, *Bibliography and the Sociology of Texts*, London, 1985, 6; see also his 'History of the book', in Peter Davison (ed.), *The Book Encompassed: Studies in Twentieth-Century Bibliography*, Cambridge, 1992. In McKenzie's work, not all texts are written or printed: the land itself can be a text, and so can a film or videotape.

making and reading', he points towards a new relationship between bibliography and cultural history, but it is one where some theoretical problems remain to be worked out.<sup>13</sup> The difficulty is illustrated in a recent article by Thomas Adams and Nicholas Barker, two bibliographers who propose 'a new model for the history of the book'. Adams and Barker argue that bibliography is already a historical discipline, but in opposition to Darnton, they insist that the physical object, not the human beings who wrote, published, distributed, conserved and read it, should be at the centre of enquiry.<sup>14</sup> Clearly a tension exists between bibliographical and historical approaches to the books of the past: what the former approach omits or downplays is the demonstration of how knowing about the physical object might be helpful in tackling the kinds of problem that interest professional academic historians. Historical bibliography tells book people what they already know, that old books are full of evidence about their own making; but it does not tell history people how the evidence embedded, often obscurely, in old books can contribute to scholarly debates about such issues as power and agency, social class, ethnicity and gender, about traditional and popular culture. A historians' history of the book will apply the bibliographical methodology to the intellectual problems with which their profession is concerned.

More specifically, the approach of a historian of late Victorian science will be to work out how the new cheaper and more productive print technologies available in those years were used to make books that both nourished and fed upon the contemporary secular and professionalized culture of science. Before historians of science consider turning their formidable scholarly attention to the bibliography of science, however, they will have to be convinced of its utility for coming to new understandings of intellectual cultures. The important early contribution of *The Development of Science Publishing in Europe*, the book edited by A. J. Meadows and published in 1980, is now, after many years, being built upon by other historians of science. This special section of the *British Journal for the History of Science* is the most recent contribution, and earlier work by Jonathan Topham and others is also promising.<sup>15</sup> Adrian Johns has observed 'the simultaneous arrival over the last generation of both a new history of the book and a new history of science', and suggests 'that a *rapprochement* might be highly beneficial to both camps'.<sup>16</sup>

As MacLeod recognized in his contribution to the Meadows volume, the ISS was a departure from the contemporary pattern of scientific publishing in Britain, for which Murchison's and Darwin's relationships with John Murray serve as examples. We shall see that Henry S. King was not prepared (as Murray had been) to wait for the scientists to finalize their masterworks and then offer them to the public in short print-runs at high prices and small profit margins. More importantly, Huxley and his colleagues wished to revolutionize the dissemination of science in society, to create a much broader audience

13 D. F. McKenzie, 'The sociology of a text: orality, literacy and print in early New Zealand', *The Library* (1984), Sixth Series, 4, 335.

14 Thomas R. Adams and Nicolas Barker, 'A new model for the study of the book', in Nicolas Barker (ed.), *A Potencie of Life: Books in Society*, London, 1993, 10–15.

15 Jonathan Topham, 'Science and popular education in the 1830s: the role of the *Bridgewater Treatises*', *BJHS* (1992), 25, 397–430; see also James Secord's study, now in progress, of Robert Chambers' *Vestiges* as a publishing phenomenon as well as an event in the history of natural science.

16 Adrian Johns, 'History, science, and the history of the book: the making of natural philosophy in Early Modern England', *Publishing History* (1994), 35, 5.

than before, an audience of readers who could afford no more than five shillings a volume. To do this, they undertook to create texts where no text would otherwise have existed, not by writing themselves, but by attracting other scientific professionals with the promises of prestige, a wide audience and substantial financial remuneration. The publishing format of the ISS imposed certain constraints on the scientific authors and their texts. And, as we shall see, the series as it was conceptualized, designed and executed, by its publishers as much as by its authors, disseminated a collective image of science that was complex and sometimes contradictory, and which brought together in an uneasy partnership both natural-science and social-science interpretations of the world.

### **Production of the ISS: publication and revision**

A complete historical study of the ISS will have to give equal weight to the words ‘international’, ‘scientific’ and ‘series’ in its title. The series was international: six publishers in six countries were involved, and contributors were recruited not only from Britain but also from continental Europe and from North America. Some books appeared in four or five languages, whereas others were never translated, and in a few cases the translation was corrupt. Even the transfer of texts from one English-language publisher to the other, via stereotype plates shipped between London and New York, was not always straightforward. The series was scientific, but the period from the 1870s until the First World War was a time when definitions of science were under intense discussion and debate, in publishing houses as well as in laboratories and studies and around intellectual dinner-tables. One key question was the extent to which the social sciences could coexist with the natural sciences: would readers and, for that matter, practitioners perceive, as the founders did, the commonalities between the two approaches to modern secular knowledge?<sup>17</sup> And although it called itself a ‘series’ it was really more like a hypertext than an orderly and sequential progression. The ISS was an interlocking set of six lists of books, emanating from separate publishers in six countries. The ninety-six books (not counting revised editions) in the British series dating from 1871 to 1911 (although reissue dates reached into the mid-twentieth century) were only one facet of the whole. Some of those books existed in as many as four additional languages, and emanated from five different publishers, whereas others were restricted to a British readership. Although the principle of the series called for overlapping titles created by translation where necessary and immediate re-publication, its achievement was much more complex. In some cases the text remained unchanged, although the publishers made reissues look new by putting contemporary dates on their title-pages and proclaiming them ‘second edition’, ‘third edition’ and so on, every time an arbitrary number of copies was exhausted. In other cases, the author chose to revise or augment his original manuscript, although changes were sometimes concealed by the uniform format of the series. Translation, revision and reissue are the complicating factors, and in order to answer questions about the scientific culture,

<sup>17</sup> Theodore M. Porter, ‘Natural science and social theory’, in R. C. Olby *et al.* (eds.), *Companion to the History of Modern Science*, London, 1990. For an overview of the way in which the social sciences were constructed in natural-science terms, see Roger Smith, *The Fontana History of the Human Sciences*, London, 1997, 537–44 and bibliographical essay 968–70.



or cultures, experienced by contributors and readers, it is necessary to ask how these factors were dealt with by the publishers.

Although the negotiations for founding the series occurred in London, and in the end the great majority of contributors were European, the idea for the ISS came from the United States. Originally conceived as an Anglo-American series, it was the invention of Edward Livingston Youmans, an American writer who kept in touch with a network of powerful colleagues in Britain. Youmans was on the staff of the New York publishing firm of D. Appleton and Company, then under the direction of William Henry Appleton. Appleton was a general publisher, with a wide range of scientific titles on his list along with the usual works of fiction, travel writing, biography, memoirs and politics.<sup>18</sup> Youmans was a remarkable scientific amateur and popularizer: his biographer, John Fiske, called him ‘an interpreter of science for the people’.<sup>19</sup> In 1871, at the age of fifty, Youmans had already introduced several British scientific writers to Appleton and secured them for his publisher’s list. Among this group were John Tyndall, T. H. Huxley and Youmans’s close friend Herbert Spencer. At that time United States law did not recognize the copyrights associated with books published outside its borders, and as a result it was commonplace for British authors to find their works ‘pirated’ by American publishers who were not legally compelled to pay royalties. By undertaking to compensate British scientific writers justly for their work, Appleton had secured the loyalty and appreciation of several well-known scholars, and they were prepared to listen to his agent. Youmans travelled to Britain early in the summer of 1871, with a mission to expand this goodwill on both sides and make it systematic.

What Youmans wanted was to develop a series of new books, ‘covering the entire field of modern science’, as Fiske reports, ‘to be simultaneously issued on both sides of the Atlantic’. Youmans was dissatisfied with what he had read so far of popular scientific works; he identified the problem in terms of hack authorship. ‘He realized’, Fiske goes on, ‘that popular scientific books adapted to the general reader are apt to be written by third-rate men who do not well understand their subject; they are apt to be dry or superficial, or both’. Instead Youmans argued that

no one can write so good a popular book as the master of a subject, if he only has a fair gift of expressing himself and keeps in mind the public for which he is writing. The master knows what to tell and what to omit, and can thus tell much in a short compass and still make it interesting;

18 See Grant Overton, *Portrait of a Publisher: The First Hundred Years of the House of Appleton, 1825–1925*, New York, 1925. Unfortunately most of the Appleton archives have not survived; the material in the Lilly Library at the University of Indiana does not include documents about the ISS.

19 The following account is taken from John Fiske, *Edward Livingston Youmans, Interpreter of Science for the People: A Sketch of his Life*, New York, 1894, Chapter 13. Documents on the foundation of the series are also to be found in the Kegan Paul Archives at University College London (published on microfilm by Chadwyck Healey). The archives of Henry S. King, and later of Kegan Paul, Trench, Trübner and Company Limited, record the details of print quantities, payments to authors and translators, revisions to plates, review copies sent to journal editors, postal and shipping charges for proofs and plates, bindings, repairs to bindings and even, in a few cases, complimentary copies distributed by author and publisher. For guides to these archives see Gillian Furlong (comp.), *The Archives of Routledge & Kegan Paul Ltd. (1853–1973) Publishers*, London, 1978; Brian Maidment, ‘Introduction’, *The Archives of Kegan Paul, Trench, Trübner and Henry S. King 1858–1912*, Bishop’s Stortford, 1974; Sandy Merrick, *Index of Authors and Titles of Kegan Paul, Trench, Trübner & Henry S. King 1858–1912*, Bishop’s Stortford, 1974.

moreover, he avoids the inaccuracies which are sure to occur in second-hand work. Masters of subjects are apt, however, to be too much occupied with original research to write popular books. It was Youmans's plan to induce the leading men of science in Europe and America to contribute small volumes on their special subjects to a series to be published simultaneously in several countries and languages. Furthermore, by special contract with publishing houses of high reputation, the author was to receive the ordinary royalty on every copy of his book sold in every one of the countries in question, thus anticipating international copyright upon a very wide scale, and giving the author a much more adequate compensation for his labour.

As Fiske concluded, 'To put this scheme into operation was a task of great difficulty, so many conflicting interests had to be considered'.

The problem of copyright was solved, by mutual agreement between the American and British publishers, but it became clear that Youmans had been remarkably optimistic about two potential problems that to a literary person would have loomed very large: he believed that at least several 'masters of subjects' could be found, each at the cutting edge of their research field, who were not only willing but also able to translate their views and their findings into a popular idiom. All they would need was the financial lure to draw them from laboratory to writing table for a few weeks. And neither, anticipating contracts with scientists on the European continent, did he foresee any difficulty with translation from one language to another. For Youmans, apparently, a scientific book was the abstract embodiment of its author's knowledge, a document that was susceptible to commercial exploitation and textual as well as linguistic manipulation.

Fiske's biography traces Youmans's trajectory across the Atlantic, into London and later that summer to the meetings of British Association meeting in Edinburgh. His prospectus for the series, circulated at that conference, announced that

the attention of English scientific writers is asked to a project of international publication which has both public and personal claims to their consideration. It is in contemplation to prepare a series of monographs or elaborate essays on selected scientific topics, and in a form suited for wide circulation. The general aim of the series will be to give authentic, popular expression to the latest advances of thought on the leading subjects of progressive inquiry. The recent and more important steps of physical investigation will come within its scope, and those interpretations of nature which have undergone marked revision within a recent period. Yet it is desired to give especial prominence to those branches of biological, psychological, and social science which help to a better understanding of human nature and the economy of human life.

For Youmans, at least, science included the social sciences and also psychology. The prospectus went on to stress the 'explanatory and expository' tone of the envisioned texts, and their proposed format and illustrations. The vast and lucrative market of readers in the United States was dangled in front of the British writers: the series 'would have an extensive American patronage, and would become a powerful agency of public education'.<sup>20</sup> Significantly, Darwin was induced to endorse the project at Edinburgh and in letters to his colleagues.<sup>21</sup>

When Youmans returned from Edinburgh to London, Appleton joined him from New York and they entered into contract with a London publisher for the new series. This was

<sup>20</sup> Printed slip, enclosed in letter from Youmans to Huxley dated August 1871, Huxley Papers, Imperial College.

<sup>21</sup> Letter from Darwin to an unknown correspondent, 19 July 1871, cited in *A Calendar of the Correspondence of Charles Darwin, 1821–1882* (ed. F. Burkhardt and S. Smith), New York, 1985, 343.

to be Henry S. King and Company. King was a banker and East India agent with experience of the book trade, who had recently set himself up with his own imprint and was developing a spectacular list of fiction as well as non-fiction works.<sup>22</sup> Youmans told his sister that ‘King proves to be our man – a wide-awake, whole-hearted fellow’ – wide enough awake to see that a contract with Appleton could secure him some British authors otherwise unavailable, as well as an entrée into the enormous United States market. This was a period of transition in the London book trade: after decades of agreement on a trade policy of high prices and small quantities, some publishers were beginning to move towards a more commercialized and heavily capitalized approach to their business. They were becoming more like their opposite numbers in the United States, where large quantities of books could be sold at low prices in a large market. They were increasingly aware of an expanded reading public, not only the substantial middle-class market for periodicals as well as books, but also a vast working-class readership, with both groups interested in entertainment as well as instruction. With the financial backing available from his own banking connections, and with his previous book trade experience in a firm that invested the profits of a global business in their publishing interests (Smith, Elder and Company), King was perhaps more prepared than some of his colleagues among the London publishers to embrace the Youmans-Appleton plan whole-heartedly.

Before returning to New York, Youmans travelled to France and to Germany, making arrangements in Paris and Leipzig with publishers and scientists for the corresponding series there. These were Germer Baillière and F. A. Brockhaus respectively. Arrangements with publishers in Milan (Fratelli Dumolard) and St Petersburg (the periodical *Znanie*) were made by correspondence, with King’s Cornhill office serving as the centre of communications, at least at this early stage. Although it seems that *Znanie*’s sole effort was a translation (censored by the authorities) of Herbert Spencer’s *The Study of Sociology*, each of the other three national series flourished. The Paris series included about 111 titles, exclusive of revisions, and ran from 1871 to at least 1909; the Leipzig series numbered from 1 to 68, again not counting revised editions, and was published between 1871 and 1889. Books emerging from Milan began in 1875 and ended in 1891, with number 49. It was the books originating in London and New York, however, that most often included the social sciences and psychology as part of their definition of science.

Youmans finally sailed home from London to New York in December of 1871, and by the autumn of 1872 the first title was available in both cities, and the second in production. These were, judging from their titles, to be examples of the series’s dual nature: Tyndall’s *The Forms of Water* would explain the physics of ice and other forms of water to amateurs; and Walter Bagehot’s *Physics and Politics* would, in the words of its subtitle, be ‘thoughts on the application of the principles of “natural selection” and “inheritance” to political society’. Advertised to succeed them were a book by Edward Smith, whom Youmans at least regarded as ‘the authority on diet’, entitled simply *Foods*; one by Alexander Bain on *Mind and Body: The Theories of their Relation*; and then Herbert Spencer himself, with the book that Youmans ‘bullied him to write’, *The Study of*

<sup>22</sup> Leslie Howsam, *Kegan Paul – a Victorian Imprint: Publishers, Books and Cultural History*, Toronto and London, 1997, Chapter 1.

*Sociology*. Seven books had appeared by the end of 1873, three of which were social and four natural science. Four more appeared in 1874, two of each; 1875 saw a remarkable seven titles appear, three social and four natural science. One of the former was John William Draper's *The History of the Conflict Between Religion and Science*, among the most popular works in the entire series. Four more books, all natural-science titles, appeared in 1876.

Youmans and King were not the only people concerned with the initiation of the International Scientific Series in Britain. Huxley, Tyndall and Spencer formed an advisory body, charged with helping the publisher decide which books should be included in the series, and to some extent with soliciting further titles from their powerful network of acquaintances. Surviving letters and other documents suggest that their motives were very strongly financial: they wanted to receive ample recompense for their own personal efforts, and they wanted scientific books generally to be published at significant royalties. If the state and society still reserved its plummiest appointments for clergymen, perhaps the book trade and the reading public could be called upon to compensate scientific writers the way they deserved to be. A second important motive was political: they envisioned the series as a tool in their campaign for a more secular approach to public policy. The series would transform readers' ideas both directly, in Spencer's call for a study of society unbiased by dogmatic and superstitious prejudices as well as in Draper's attack on the Roman Catholic Church when he posited a conflict between religion and science, and indirectly, in its format and collective public presence. Finally, they also honestly wanted the books to do what Youmans had said they would do, to educate the non-professional reader about the latest developments in the physical and social sciences. Although they seldom used the word encyclopaedia, their vision of the series can be identified as a sort of virtual encyclopaedia, in that all the best knowledge might exist within its covers. That knowledge was not, however, to be organized or structured in a conventionally encyclopaedic way: the reader would be his or her own indexer, critic and summarizer. The contributing authors were free to present their own definitions of science, focused on their own specific interests and projects, each in his own way.

The appeal to authors, as Youmans had foretold, was both intellectual and financial, and initially it was very strong. Several distinguished contributors signed up on the spot at the Edinburgh meeting of the British Association: Bain, Lubbock, W. B. Carpenter and W. Kingdon Clifford, as well as W. Thistleton Dyer, whose promised book on 'Later Aspects of Botanical Science' never appeared. As men of science, these writers were perhaps more likely than novelists and poets to have other sources of income than the royalties from their books. But like literary authors, they were concerned about receiving appropriate remuneration and a wide distribution, in the United States as well as in the home and colonial British markets. The series promised to pay them £50 on publication of the first edition (that is, the first printing of 1250 copies) of their books in Britain, which worked out to 20 per cent. In addition they would receive a royalty of 10 per cent on United States sales, and 7.5 per cent on sales in the series published on the continent. These rates compared favourably with those of all but the most successful novelists.

Booksellers were most likely first made aware of the ISS through advertisements in their trade publication *The Publisher's Circular*, which called King's 'that most enterprising of

modern firms'.<sup>23</sup> Simon Eliot has documented a sharp increase in quantities for the British book-publishing industry in the last quarter of the nineteenth century: at least twice as many new titles were published in 1899 as in 1875. Science was compiled among a number of genres grouped arbitrarily by contemporary statisticians (art, science, mathematics and illustrated books) that averaged from 6 to 10 per cent of the total output of the trade. This means that Tyndall's *Forms of Water* was one of some 4500 new books that came out in 1872, of which roughly two hundred were works of science.<sup>24</sup> The booksellers of Britain's towns and cities would therefore have been more concerned with religious works and with fiction. The novels were quickly overtaking the sermons and tracts in numbers and importance: together these two groups took up more than 50 per cent of the total output of the trade. They would, nevertheless, have had a niche on their shelves for scientific works, especially works by respected professional names that were aimed at a non-specialist audience.

The best way to approach the problem of how booksellers experienced the series is by examining the sales figures, which were remarkable. Of the first five books of the series, Tyndall's book on glaciers generated 14,750 copies, and Bagehot's on politics 12,500, both in 1872. In 1873, Smith's book on food and Bain's on education were smaller but still respectable sellers at 6500 and 9250 respectively; then came Spencer's *The Study of Sociology*, which sold 26,330 copies in Britain alone. This last was the series record, but two books published in 1875 hovered around the twenty thousand mark, Draper's *History of the Conflict between Religion and Science* and Jevons's *Money and the Mechanism of Exchange*. These figures were achieved because the books were all kept in print over a period of forty years, with reprints being called for as supplies were exhausted. Booksellers could count on being able to keep their supplies of the ISS in stock. Librarians, too, placed standing orders. The catalogues of subscription libraries, such as the Newcastle Literary and Philosophical Society and the Leeds Library, show apparently complete (or nearly complete) runs of ISS titles, although the books are not normally found shelved together as a series: each was catalogued according to the scientific speciality with which the author was engaged. Nor did textual revisions appear systematically on library shelves.<sup>25</sup> Although no evidence has survived of a bookseller's comment on the series as it appeared in his or her shop window, it can be surmised that people in the retail trade grew accustomed to having 'science' mediated to their customers in this form, and depended upon a steady flow of new titles.

The first five years of the British series were its most productive; the introduction of new titles faltered and declined during the second and third decade, but the series remarkably survived a full forty years despite numerous vicissitudes in its management. In 1877, when King retired because of illness and turned over his business to his assistant, the former rural clergyman and now London free-thinker Charles Kegan Paul, no books appeared. They resumed in 1878 with numbers 23 and 24, and continued through the 1880s and the 1890s,

<sup>23</sup> *The Publisher's Circular* (9 December 1872), 793.

<sup>24</sup> Simon Eliot, *Some Patterns and Trends in British Publishing, 1800–1919*, London, 1994, 12–13; 46–53; 127. The exact figures for 1872 are a total of 4516, with 487, or 10.8 per cent, in the combined category of Arts, Science, Mathematics and Illustrated Books.

<sup>25</sup> I am grateful for assistance from Geoff Forster, the Librarian of the Leeds Library.

under the direction of Paul and his partner Alfred Chenevix Trench. By the early 1880s Youmans had died, and none of the three original advisers remained involved. The British series survived a major financial crisis in the company in 1889, when the name changed to Kegan Paul, Trench, Trübner and Company. Paul and Trench departed and were replaced as directors, first by George Redway, later by Spencer Blackett and finally by Basil Willett. Under the leadership of these three publishing managers and a board of directors, the rate of publication declined in the 1890s, although two or three new titles were published almost every year, and the last title, number 98, appeared in 1911. This was the year when the firm was taken over by George Routledge and Sons, which continued to use the old imprint and to reissue popular titles in the series without further revision. Similarly, since 1899 only reissues of existing titles in the Appleton series had been published in New York. Changes in the American copyright law that occurred in 1891 made its premise less necessary than it had been earlier.<sup>26</sup> The strong German and Italian series were now long finished (in 1889 and 1891 respectively), and the last new books were emerging from the house of Felix Alcan in Paris, the publisher who had replaced Baillière in 1883.

The attempt to combine innovation in science with innovation in publishing resulted in a complex pattern of shared stereotype plates in the case of the two English-language publishers, and an exchange of texts for translation and of illustrations for reproduction with (and among) the continental partners. And although for the majority of titles the London and New York texts were identical, the exceptions sharply illuminate some points of conflict that would benefit from further exploration. One example is the seventh book in the London series, published in 1874, *The Conservation of Energy* by Balfour Stewart. When Appleton brought out their edition the same year, they added two appendices. A preface explained that ‘Professor Stewart having confined himself mainly to the physical aspects of the subject, it was desirable that his views should be supplemented by a statement of the operation of the principle in the spheres of life and mind’. Two appendices are added: ‘Correlation of vital with chemical and physical forces’, by Joseph Le Conte, Professor of Geology and Natural History in the University of California; and ‘Correlation of nervous and mental forces’, by Alexander Bain, Professor of Logic and Mental Philosophy in the University of Aberdeen. In the absence of documentary evidence from the Appleton offices, this decision may tentatively be attributed to Edward Livingston Youmans, who presumably took it without consulting either Stewart or King. Even when differences of language meant that separate texts were unavoidable, illustrations could still be shared. Both chromolithograph plates and electrotypes of woodblock line drawings were transported intact from French to German to Italian to English versions of the same work. Whatever the politics of science within and between their respective countries, readers of several nationalities were being exposed to the same illustrations and to similar texts, because a group of publishers had agreed on a joint venture.

A more subtle signal of vitality than the shelves of booksellers and the catalogues of library collectors, and one that leads into the experience of readers, is the fact that many of the volumes were revised for new editions. A new edition, in bibliographical terminology, means that the book was manufactured from a new, or a substantially

<sup>26</sup> James L. W. West, ‘The Chace Act and Anglo-American literary relations’, *Studies in Bibliography* (1992), 45, 303–311.

altered, setting of type. It is necessary to make this distinction because nineteenth-century publishers often advertised a mere reprinting as a new edition and Henry S. King was no exception. When he and his successors printed on the title-page of a book in the ISS the words ‘second edition’, ‘third edition’ and so on, they were no doubt anxious to signal to booksellers and readers that the book was a success. MacLeod duly reports that various titles went into multiple editions, taking these figures as evidence of publishing achievement. King’s idiosyncratic use of the word ‘edition’ can be specified very precisely, however, and moreover it conceals, or at least confuses, the existence of true new editions where type has been changed or augmented. The series agreement was for a payment of £50 for each edition – that is for each 1250 copies undertaken (printings were not necessarily made in blocks of 1250). Each title-page edition number, therefore, represents a multiple of 1250 copies. By the bibliographical definition, these King ‘editions’ were merely reissues.

On some occasions, however, substantial changes were introduced that can be identified as true revised editions. The signal is often as simple as an increased number of pages, occasioned by the addition of an appendix. Sometimes it is more subtle, when the type on one or more stereotype plates has been disturbed to make a correction. Only close examination and analysis reveal these changes and suggest the reasons behind them. In at least one embarrassing instance, Vogel’s book on *The Chemistry of Light and Photography* (1875), a new edition was called for to replace a translation from the German that was full of problems that ranged from awkwardness to downright error. Although Paul claimed in his memoirs that ‘the whole edition of 1250 copies had to be condemned as waste-paper, and a new translation to be made by a careful chemist’, copies of both the original 1875 and retranslated 1876 edition have survived, under the King and subsequent Kegan Paul imprints.<sup>27</sup> Although Youmans saw fit to add a one-page appendix to the New York edition of 1875, in which he noted that Vogel had overlooked some American contributions to photographic chemistry, the otherwise unrevised first translation was distributed in the United States from 1875 until 1882.

Some authors changed their texts to incorporate new knowledge or to respond to critics, as the Harvard chemist J. P. Cooke did in his 1884 revision of *The New Chemistry*, which had first appeared a decade earlier. The 1884 preface alludes to changes ‘since this work was first published and stereotyped. ... the distinction between elementary substances and materials consisting of isolated elementary atoms has become clear’. Furthermore, ‘the study of the thermal changes accompanying chemical processes ... has proved that the law of the conservation of energy is a directing principle in chemistry as important as it is in physics’. However ‘the author ... has endeavoured to make the new edition, like the first, a popular exposition of the actual state of the science’. The text of this revision includes both extra chapters and revisions within existing chapters.

Similarly, the social statistics on European trends in suicide in Enrico Morselli’s *Il Suicidio: Saggio di Statistica Morale Comparata* were enhanced, when it was translated from Italian to English and German in 1881, with maps and more specific information on suicide in each country. The London and New York versions rejoiced in the authorship of

<sup>27</sup> Charles Kegan Paul, *Memories*, London, 1889, 280–1. The firm’s archives show that a Mrs Morrel received £30 for the first effort, and D. Pike £15 for correcting it.

‘Henry’ Morselli, while the author of *Der Selbstmord* was ‘Heinrich’ Morselli. In the introduction to the English translation Morselli expressed his admiration for British science and for the series, saying in his preface that ‘if it had not been that the offer of the Committee of the “International Scientific Series” honoured me greatly by placing mine amongst the great names of Tyndall, Bain, Maudsley, Stewart and Herbert Spencer, I should perhaps have refused permission for this translation’. Close examination of the several editions reveals that the translation was also an abridgement. The book in Italian was 528 pages long, only 388 in Britain and America and 338 in Germany. Moreover, the books themselves, together with the British publishing records, show that Morselli, with his publishers and translators, modified the text of each version to highlight the suicide statistics for the country in question. For example, tables in the Leipzig edition provide the same basic data as the London edition, but there are figures for later years. The Appendix in the English edition consists of a note on method, while in the German it is a bibliographical note. It is interesting that there was no separate study of American suicide. The co-operative agreement between the only two publishers who shared a language served, in this case, to limit the appeal of a book to one national audience.

Kegan Paul’s publishing records show how the English version of this hybrid text was constructed: the Dumolard firm was paid £18 15 s for the first ‘edition’ in English, from which it was their responsibility to recompense the author. Translation was undertaken by a Miss Rintoul for £25. 1500 copies were composed and printed in August 1880. There were charges for the drawing and engraving of blocks and for the lithography of the four maps. An extra set of plates was made for America and the first copies were bound for the booksellers. The book had a long but unspectacular life in England. From 1883 to 1898, an average of only thirty-two copies per year were sold. And yet a further 250 were printed in 1898. Why? One reason would have been to keep the series intact, without the embarrassing ‘out of print’ notices to booksellers. Another was that the costs were minimal. The plates were still in existence. Morselli had introduced no changes. Indeed, there is no sign of any payment to Dumolard for this edition. Entrenched as it was in the International Scientific Series, Morselli’s work endured. He influenced the great French sociologist Emile Durkheim, who used the Italian’s work (the original Italian edition; it never appeared in the Paris series) to build up his own analysis of suicide.<sup>28</sup> Morselli’s is one of several complex narratives of translation, production, revision and distribution.

More common was the authorial practice of adding new prefaces or appendices to bring their books up to date without changing the core text: the American physicist Charles Augustus Young’s *The Sun* first appeared in 1881; a second Appleton edition with notes and corrections the next year was followed by a third, with a dated supplementary note and an appendix by a colleague, in 1886. Young’s preface to the fourth edition of 1895 referred to earlier attempts to

keep the book measurably up to date by the addition of appendices and notes. The time has come, however, when such expedients are no longer adequate, and the author has therefore thoroughly revised the work, rewriting portions, embodying notes in the text, and adding whatever seemed necessary to make the book fairly representative of the solar science of today.

<sup>28</sup> Emile Durkheim, *Suicide: A Study in Sociology*, New York, 1951 (originally published in Paris by F. Alcan, 1897).



Remarkably, two further substantial revisions with variant notes and appendices appeared the same year, and a seventh edition can be identified in 1897, with a new preface that sought 'to take account of certain new and interesting results in solar physics which have been arrived at during the last year and a half'. Only three or four of these New York revisions appeared in the London series, and the Milan (1882), Leipzig and Paris (both 1883) publishers appear not to have attempted to keep the book up to date in the wake of their New York counterparts.

Meanwhile in the London series Herbert Spencer took advantage of the frequent reprintings of his popular sociology book during its first couple of years to carry on an endnote battle with William Ewart Gladstone, who had objected in a public lecture and later in print to a slur on Christianity in the concluding chapter.

The evidence in the publisher's records of continual activity, as the series developed, flourished, evolved and survived, speaks to its reputation among readers. Although the series must have found its place on the bookshelves of many collections both public and private, few collectors were aware of the fluidity of the texts enclosed inside the uniform red bindings. It is only by approaching the series as a problem in the history of the book, and subjecting it to bibliographical analysis and description, that its evidence about the culture of science can be discovered. The authors wished to keep their books alive, revising them to address changes in their own understanding, and to engage in debates with their peers, and the publishers were prepared to respect their wishes. Although this attitude on the part of publishers is important evidence of the respect they had for science and for the authority of science, it must also be taken as evidence that there was a market for the International Scientific Series – that it was being purchased, reviewed, and read.

#### **Reception of the ISS: readership and reviews**

However much the researcher might wish to enter into the consciousness of nineteenth-century readers of popular scientific works, only the most fragmentary of evidence has survived, normally from the journals, letters and autobiographies of people who may occasionally have recorded responses to their current reading material along with other experiences. Some tentative conclusions can be drawn from the acquisition decisions made by publishers, who can be presumed to have had their fingers more or less on the pulse of contemporary tastes and interests. What definitions of science were these publishers delivering to their market of potential readers, and how did either group identify the distinction between natural science and social science that seems so evident to the modern observer? Further evidence of reader response comes from the published commentaries of book reviewers, people who were assigned to read the book, and perhaps paid for describing and assessing it. A useful sample of both specialist and generalist opinion can be gleaned from the book review columns of *Nature* and the *Westminster Review* from 1871 to 1885, the years of the first fifty volumes in the British manifestation of the series. *Nature* had been founded in 1869, and by the 1870s was the highly regarded journal of record for contributions to a broad range of scientific disciplines. The *Westminster Review* was a quarterly, founded in 1824, which continued during the last decades of the century in its tradition of political and intellectual radicalism.

Both periodicals were disappointed in the first number in the series, Tyndall's *The Forms of Water*; their reaction suggests that both reviewers had been inundated, in the weeks preceding the book's appearance, with H. S. King & Co. advertisements touting the quality of the forthcoming series. When it arrived, they both discerned what *Nature* called 'wearing the aspect of a piece of book-making' and the *Westminster Review* referred to it as being 'clearly "made up" in a hurry for publication'. The *Westminster* reviewer added that 'we feel almost convinced that it will be the worst, as it is the first, of the whole series'.<sup>29</sup> Tyndall's text is published in numbered paragraphs, addressed to a youthful readership, an imagined audience of boys, climbing with him about the Alpine glaciers. In fact he had offered King as a manuscript the more or less unrevised text of his juvenile lectures to the Royal Institution, and there had been some correspondence about the inappropriateness of an early preface. King, mindful of his investment, had taken steps to prevent the author from referring to the book in the preface as his 'boys' book of the glaciers'. King expressed great concern that it would harm the series's reputation: 'It will be most injurious I fear to the International Series. ... I fear it will give an erroneous idea of the volumes to follow. They are not "milk for babes" – but very strong meat, & I am apprehensive that an unfounded idea will grow up of the series being intended for boys.'<sup>30</sup>

Subsequent reviews in both periodicals, however, routinely referred to 'the high character of the International series'.<sup>31</sup> Of the first fifty books published, *Nature* reviewed thirty-three and the *Westminster Review* forty, with the latter being distributed between the 'science' section and 'politics, sociology, voyages and travels' as appropriate, with a few making their way into 'theology and philosophy'. Neither set of reviews makes any comment on the juxtaposition of social-political with natural-science themes. In July of 1874 it fell to the *Westminster Review*'s politics editor, Sheldon Amos, to review anonymously his own latest contribution to the series, *The Science of Law*. Avoiding direct praise for his own work, Amos instead made an explicit statement of what he regarded as the purpose of the series, which was

to provide a set of treatises from the hands of competent authorities in all countries on a great variety of scientific topics with the view of coordinating the different branches of Science by common methods of treatment, and of making students conversant, as far as may be, with one another's work. Most of the topics hitherto handled have, naturally enough, been connected with the strictly physical sciences, but Professor Sheldon Amos, following Mr. Walter Bagehot and Mr. Herbert Spencer, has added to the series a work on a branch of moral science.

Reviewing his own book, Amos observed that he 'had done his best to redeem Law by establishing it, once for all, on its platform of Science, and compelling it by the use of exact conceptions, accurate terminology, and precise classificatory divisions to rival all other sciences in its method as it yields to none in its importance and its interest'.<sup>32</sup> With the tenth book in the series, its public profile, offering a rational and secular world-view, was

<sup>29</sup> *Nature* (27 March 1873), 7, 400–1; *Westminster Review* (1 January 1873), new series, 43, 287.

<sup>30</sup> Autograph letter, signed King, to Huxley, 12 April 1872, in Huxley papers at Imperial College.

<sup>31</sup> *Westminster Review* (1 July 1874), new series, 46, 261, review of Henry Maudsley, *Responsibility in Mental Disease*.

<sup>32</sup> *Westminster Review* (1 July 1874), new series, 46, 233; Amos is identified as the reviewer in the *Wellesley Index of Victorian Periodicals*.

firmly in place. And behind the scenes the publication of new books and reissuing of older ones was now well established.

Although Tyndall's, Bagehot's and Spencer's books all appeared early in the lives of the French and German series (and somewhat later in Italy), no book in translation from one of those languages appeared in London until 1874 and 1875, when numbers 11, 12, 15 and 18 were published in London. The anonymous reviewer in *Nature* of Etienne Jules Marey's *Animal Mechanism* was clearly already familiar with 'a small French physiological treatise ... entitled "La Machine Animale"'. Now, fortunately, it was available in English. A respectful review ended with the observation that 'the translation, as far as we have had the opportunity of judging, seems a good one, except in one or two cases, where improvement would not be impossible' (the King archives do not record the name of the translator, who may have been engaged by Appleton since the British publisher paid £15 for a 'proportion of translation'). Later translations did not always fare so well. Vogel's *Chemistry of Light and Photography* was apparently the only text in the British series to be retranslated and reissued to overcome egregious translator's errors, both technical and linguistic. But the reviewers found problems with many translations from French, German and Italian. Even the title of Pierre Joseph van Beneden's book on *Animal Parasites and Messmates* (1876) was a particularly unfortunate attempt to express the author's terminology of 'commensal' as distinct from 'parasite' (in French, *Les Commensaux et les parasites dans le règne animal*). The translations may have improved over time: in 1880 and 1881 two translations were praised by the reviewers; *Nature* even commended the way the translation of Adolphe Wurtz's *The Atomic Theory* 'maintained the clearness and crispness of the French style', and Karl Semper's *The Natural Conditions of Existence as they Affect Animal Life* showed no trace of 'that awkward diction which sometimes inflects a translation from the German'.<sup>33</sup> It is also worthwhile to observe that whether the translations are scorned, ignored or praised, none of the reviews in either periodical examined shows any consciousness of the fact that the text emerged from a series published in France, Germany or Italy: in each case it is regarded as a monograph now available in English from the London publisher in the International Scientific Series.

The reviews provide evidence of what the reviewers, and beyond them readers, thought of how the series was achieving its objectives. W. H. Brewer, reviewing in *Nature* Spencer's *The Study of Sociology*, warned that 'a desire to popularise the work as far as possible' must not supersede 'the necessity to maintain the character which should appertain to it as one of a scientific series'.<sup>34</sup> Good books were worthy of the series, because they were readable and the reviewer could imagine an untutored reader making his or her way through them. Bad books were disappointing, because they were badly structured and therefore useless for students. Whitney's *The Life and Growth of Language* (1875) was

33 Marey: *Nature* (22 and 29 October 1874), 10, 498, 519. Vogel: *Nature* (10 June 1875), 12, 105–6. Beneden: *Westminster Review* (1 April 1876), new series, 49, 539–40. Wurtz: *Nature* (4 November 1880), 23, 5–6; *Westminster Review* (1 January 1881), new series, 59, 308–9. Semper: *Nature* (3 March 1881), 24, 409.

34 *Nature* (23 April 1874), 9, 479. See also the anonymous review of Balfour Stewart's *The Conservation of Energy in Nature* (15 January 1874), 19, 200, which generally praised the clarity of Stewart's expression, but nevertheless expressed the hope that a subsequent edition will revise 'one of the very few passages which remind us of what is called the popular scientific style'.

disappointing to both periodicals – it did not live up to the series; it was inaccurate, the data was old – in fact both reviewers found it to be remarkably tedious.<sup>35</sup>

Especially in *Nature*, the reviewers tended to be suspicious when they perceived a scientific specialist attempting to be popular, or to appeal to a general readership. They wanted the books they reviewed to be of interest to the specialists who formed the bulk of their subscription list, even when those books were part of a series designed for a broader audience. The *Westminster Review*'s politics column had similar ambitions. Sheldon Amos, reviewing Stanley Jevons's *Money and the Mechanism of Exchange*, commented on the discrepancy:

It is the custom in noticing such books to dwell rather on what is debatable, and therefore held in many quarters to be heretical, than on the large mass of matter which owes its merit to clearness, fairness, and fulness of statement. It is curious that varieties of view in economical matters stir up almost as angry passions as are raised in medical disputations; and the cause of popular instruction suffers grievously in consequence, many a book of the highest educational value being practically suppressed by the critics, simply because the writer, in some out-of-the-way corner of it, intimates an opinion which, for the time, is not in the ascendancy.<sup>36</sup>

Youmans had not perhaps anticipated, when he asked acknowledged experts to write for a popular audience, that the experts would be reviewed by their peers as experts, not as expositors and teachers.

With respect to the problem of popular instruction in technical matters, it is instructive to examine the way the two periodicals reviewed a book by a technologist. The American engineer Robert Henry Thurston's book *A History of the Growth of the Steam-Engine* was published in 1878. The *Westminster Review* commentator identified it as 'essentially popular', but praised its clarity and detail, locating the text 'on the borderland of literature and science'. *Nature*, on the other hand, was fiercely critical, finding that 'the author's physics are not what they should be', that he had 'misapprehended the second law of thermo-dynamics', and that when Thurston began to try to predict the steam engineering of the future, 'we have page after page of perfect nonsense, which not only shows that the author does not understand what he is writing about, but also shows that his erroneous views...have led him into absurd errors from which the earlier inventors...had emancipated themselves'.<sup>37</sup> To technical non-specialists like Charles Kegan Paul as publisher, and the anonymous *Westminster* reviewer as reader, Thurston's book must have seemed to fill the ISS mandate exactly. No doubt Paul and Appleton (with whom the book originated) might have subjected it to further scrutiny. But such scrutiny would have driven up their costs, and delayed the publication of a steadily appearing series. And could even someone with the special talents of an Edward Youmans always judge equally of professional quality and popular appeal?

Immediately after Thurston's in the series came one which both periodicals identified as a bad book. This was Alexander Bain's *Education as a Science*. The *Westminster Review*

<sup>35</sup> An anonymous review in *Nature* (15 April 1875), 11, 463, of M. C. Cooke's *Fungi* expressed a 'fear that the junior student will be repelled rather than attracted by the hosts of scientific names of genera and species which crowd many of the pages with italics'. For Whitney see *Nature* (22 July 1875), 12, 225–8 and *Westminster Review* (1 July 1875), new series, 48, 271–2.

<sup>36</sup> *Westminster Review* (1 January 1876), new series, 49, 245.

<sup>37</sup> *Westminster Review* (1 January 1879), new series, 55, 567; *Nature* (27 February 1879), 19, 381.

began by noting that ‘Professor Bain is so great an authority in all discussions concerning the mind that it may appear outrageous to suggest that his study of mind in children must have been pursued under singular circumstances. He rests upon malevolence as an elemental factor in children, and as one which is to be recognised and utilised’. Perceptively, the reviewer wondered if Bain had ever been bullied by schoolboys; in any case ‘his style is certainly so verbose as to be obscure beyond the power of the bulk of teachers to penetrate through, and profit by his thought’. As for *Nature*, this book of Bain’s was the only one in the series they reviewed by satirically quoting passages of the book against itself. It was in the series, so ‘naturally [called] for some notice in our columns’, but they found it full of obscurity, inaccuracy and absurdity.<sup>38</sup> Bain was one of those contributors first identified by Youmans and his British colleagues as an acknowledged expert whose name and reputation would add lustre to their series. That function was perhaps better filled in the early months, when it was not attached to a text that readers could criticize and take issue with.

The International Scientific Series was a series, what the Victorians called ‘a sustained literary venture’, whose collective identity conveyed a message just as powerful as the texts composed by its individual contributors.<sup>39</sup> At the beginning, in the hands of Youmans, King and Appleton, and Huxley, Tyndall and Spencer, it was a vision of modern secular science. In its cautious, judicious approach to the problem of popularization it conveyed the anxieties of scientific professionals about their educational responsibilities. And its multiplicity of revisions, reissues, translations and appendices testify eloquently to the faith that the scientific writers and serious publishers of the late nineteenth and early twentieth centuries still placed in the book as a medium of scientific communication.

Yet that message has to be read with caution, because control of the series’s content was not solely in the hands of the scientific authors who severally produced the texts. It was the publishers who made the ultimate publishing decisions, and just as King and his advisers felt sure that Spencer’s *The Science of Sociology* belonged in the series despite its social-science themes, so too did Charles Kegan Paul feel free to add Bain’s book on education, and even one by Hutcheson Macaulay Posnett on *Comparative Literature*. Paul’s successors in the 1890s were even more capricious, adding titles like M. C. Cooke’s *Introduction to Fresh-Water Algae* and R. H. Vincent’s *The Elements of Hypnotism*, that neither Appleton nor any of the continental partners was inclined to reproduce. It must be recognized that the ISS was a publishing phenomenon, as well as a phenomenon in the history of science. Some egregiously loose and contradictory definitions of science, evidenced in titles and texts which the original four founding scientists would undoubtedly have rejected out of hand, none the less entered the public domain. Because the series survived, even flourished, without direction from scientific professionals, a progressively less professional, less academic series of titles appeared in Britain, issued on the judgement of King, Paul, Trench, Redway, Blackett and Willett. These publishers were men of business and men of letters; they were prepared to make use of the expertise and

<sup>38</sup> *Westminster Review* (1 April 1879), new series, 55, 559; *Nature* (20 March 1879), 19, 457, review signed P.G.T.

<sup>39</sup> Leslie Howsam, ‘Sustained literary ventures: the series in Victorian book publishing’, *Publishing History* (1992), 32, 5–26.

reputations of the men of science, but not to let these experts interfere with their own visions of what the reading public might purchase.

The way the ISS was imagined raises questions about the way that it was realized, questions that are of intense interest to students of scientific culture. Although scientific authors could apparently be induced to harness themselves to Youmans's and the series's populist vision, problems appeared when their manuscripts fell short of the ideal. As we have seen, the translations were by no means as unproblematically accurate as had been expected. Indeed, the shape the series took in the United States, Germany, France, Italy and (briefly) Russia was very different in each case from the series reviewed in *Nature* and in the *Westminster Review*. Although the first contracts were drafted in Britain, and the first manuscripts set in type there, the multiple facets of the series reflected the several publishing, as well as scientific, cultures of their places of origin.

The question of readership, of who bought and borrowed the volumes, remains largely a matter for speculation, but speculation can be informed by a knowledge of how the series worked. Perhaps some purchasers collected the books, unread, enjoying whatever satisfactions might be associated with mere possession, whereas others may have bought single titles, or the whole series, as gifts for youthful and ambitious future scientists. Other bookshop customers and library patrons bought or borrowed the books, read and reread them, and incorporated the texts into their individual and shared patterns of knowledge. But how? Did these readers use the books the way author or publisher expected them to, and if not, what use did they make of this diverse agglomeration of subjects and approaches? These are research problems that are within the purview of the history of science, but they only emerge as problems when the complexity of the series is unveiled by a close examination of its history.

'What we much too readily call "the book"', D. F. Mackenzie has observed, 'is a friskier and therefore more elusive animal than the words "physical object" will allow'.<sup>40</sup> Historians of the book are learning to recognize the malleable text lurking below the deceptively bland leather or cloth-bound skin of the apparently torpid beast, and to demonstrate that books produced in the past had a recoverable dynamic existence in that past culture. The dual nature of the book, which exists as text as well as physical object, with both aspects capable of being easily changed, has a complexity that reveals evidence for understanding the motivations not only of the men and women who wrote and published them, but also of the booksellers who distributed them and the readers who consumed them. The International Scientific Series reveals the duality of definitions of science in the late nineteenth century, when social and religious, as well as physical, chemical and biological problems, were addressed within the authority of crisp red-cloth bindings and a powerful initial idea.

<sup>40</sup> McKenzie, op. cit. (13), 334.