

## Introduction

The age in which we live, is unprecedented for the cheapness and abundant supply of its literature. The huge costly tomes which were within reach of comparatively few of our ancestors, have given place to the small and low-priced volume which is accessible to all. Speculations... are no longer confined to the upper and more refined classes of society; but they have descended through the many channels opened up by the prolific press, to the reading millions of the present time... The great competition in the press naturally tempts its conductors to minister to the public tastes whatever these be.

The Rev. Thomas Pearson, *Infidelity* (1853)<sup>1</sup>

The mass market in books began to develop in the middle of the nineteenth century.<sup>2</sup> Books became available at a quarter of their previous price, and print runs in the tens of thousands became increasingly common. There were social, commercial and legislative reasons underlying the change, but the most obvious cause was the introduction of mechanisation and steam power, particularly as embodied in the steam printing machine.<sup>3</sup> Simon Eliot's statistical work has pinpointed 1845-55 as the period of most rapid growth, and also the decade in which the annual production of cheap books first out-numbered that of mid-priced and expensive books.<sup>4</sup> These changes affected all areas of publishing.<sup>5</sup> In the sciences, the number of books produced per decade increased from just over 1,750 between 1801-10 to almost 6,000

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<sup>1</sup> Pearson, T., *Infidelity: its aspects, causes and agencies; being the prize essay of the British Organization of the Evangelical Alliance* (London, 1853), 478-9.

<sup>2</sup> The mass market is characterised by its inclusion of different social groups, as well as its size. The mid-century market was not as large as it would later become, but it did include the middle, lower-middle and working classes. On this audience, see Anderson, P., *The Printed Image and the Transformation of Popular Culture 1790-1860* (Oxford, 1991) 9; Klancher, J.P., *The Making of English Reading Audiences, 1790-1832* (Madison, 1987), Ch. 3.

<sup>3</sup> The changes in the nineteenth-century book trade are discussed in Feather, J., *A History of British Publishing* (London, 1988), 129-79.

<sup>4</sup> Eliot, S., *Some Patterns and Trends in British Publishing 1800-1919* (London, 1994); Eliot, S., 'Patterns and Trends and the NSTC: some initial observations, Part I' *Publishing History* **42** (1997): 79-104; and Eliot, S., 'Patterns and Trends and the NSTC: some initial observations, Part II' *Publishing History* **43** (1998): 71-112.

<sup>5</sup> Although original literary fiction (in the form of the three-decker novel) held out until the 1890s, Sutherland, J., *Victorian Novelists and Publishers*, (London, 1976), 11-19.

in the 1840s, and over 8,250 in the 1850s.<sup>6</sup> Around half of these mid-century works would have cost less than 3s. 6d., whereas in 1800, only a fifth would have been so cheap, and almost a half would have cost over 10s.<sup>7</sup> These changes in the book trade built on the success of steam-printed periodicals in the 1830s, and I shall use the term ‘popular science’ to refer to cheap, high circulation publishing in both formats.<sup>8</sup> Popular science publishing differs quantitatively from the introductory works which were available during the eighteenth century, because ‘popular’ science books were available to thousands of readers, not just a few hundreds.<sup>9</sup>

This transformation of the book trade was not unproblematic, as the second part of the Rev. Thomas Pearson’s observation reveals. By 1850, education and literature for the lower ranks of society were widely recommended, but they had to be properly controlled. While educated middle-class audiences were assumed to be able to distinguish between authoritative publications and those containing ‘speculations’, readers who had acquired their literacy in Sunday or charity schools were believed to lack that discrimination. The opportunities for making profit from this mass audience meant that respectable publishers did not have the market to themselves. Not all cheap literature was sound, wholesome or educational, and, what was worse, some of

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<sup>6</sup> Eliot, *Patterns and NSTC 2*, table E. These figures are based on Dewey classifications, and should be considered only as a rough guide. Science’s market share was 3.47% at the beginning of the century, and 4.36% in the 1840s; this change alone would only have increased the number of works on the sciences to around 2,250 in the 1840s.

<sup>7</sup> Eliot, S., ‘Some trends in British book production, 1800-1919’ in *Literature in the Market Place: nineteenth-century British publishing and reading practices*, eds. J.O. Jordan and R.L. Patten (Cambridge, 1995): 19-43, at 39, figure 2.6.

<sup>8</sup> The term was coined around this time, with the OED’s first record of it in 1841, see ‘popular’ adj. meaning 4.a. On the changing definitions of ‘popular’, see Shiach, M., *Discourse on Popular Culture: class, gender and history in cultural analysis, 1730 to the present* (Cambridge, 1989), 1-34, and especially 32-3, on the development in the late eighteenth and early nineteenth centuries of the sense of ‘popular’ as ‘generally accessible’. This sense of ‘popular science’ should be differentiated from what has been termed ‘science in popular culture’, which relates to the practices of the sciences among people not usually accepted in the scientific elite, and particularly in working-class communities. Current usage of ‘popular science’ among historians frequently conflates these two senses. These issues are discussed in Cooter, R., and S. Pumfrey, ‘Separate spheres and public places: reflections on the history of science popularisation and science in popular culture’ *History of Science* **32** (1994): 237-67.

<sup>9</sup> On eighteenth-century science publications, see Secord, J.A., ‘Newton in the nursery: Tom Telescope and the philosophy of tops and balls, 1761-1838’ *History of Science* **23** (1985): 127-51; Shteir, A.B., *Cultivating Women, Cultivating Science: Flora’s daughters and botany in England 1760-1860* (London, 1996); Fyfe, A., ‘Reading children’s books in eighteenth-century dissenting families’ *Historical Journal* **43** (2000): 453-74. On commercialisation, see McKendrick, N., J. Brewer, and J.H. Plumb, eds. *The Birth of a Consumer Society: the commercialization of eighteenth-century England* (Bloomington, Indiana, 1982); Brewer, J., *The Pleasures of the Imagination: English culture in the eighteenth century* (London, 1997).

it was immoral, erroneous, or corrupting.<sup>10</sup> As Pearson continued, ‘Every diversity of sentiment and interest is represented by the press, and carried, by its cheap and rapid agency, throughout the length and breadth of the land; and the misfortune is, that so large a proportion of these sentiments and interests, thus spread abroad, are adverse to that interest which is the most noble and precious of all.’<sup>11</sup>

Although all forms of authority could be threatened by the growth of the cheap press, the prevailing influence of Christianity in all walks of Victorian life meant that the maintenance of spiritual authority was of particular concern. This was true for all genres from science to sensational fiction, as well as for explicitly theological works. It did not mean that religious priorities ought to direct investigations in the sciences, but that the sciences should be presented in their spiritual context, in a tone that was suitably Christian. Thus, the best-selling *Vestiges of the Natural History of Creation* (1844), was condemned by men of science for its lack of rigour and its unwarranted cosmic speculations, but also for its suspicious theological position.<sup>12</sup> When the Cambridge geologist Adam Sedgwick memorably condemned it as a ‘rank pill of asafetida and arsenic, covered with gold leaf’, he used an image of foul-smelling poison disguised in an attractive coating which could equally have referred to the Mormon propaganda of the period.<sup>13</sup>

Pearson particularly mentioned literature and the sciences as genres in which the spiritual was coming under increased pressure.<sup>14</sup> In some cases, the press was permitting ‘the demon of infidelity’ to stalk openly abroad.<sup>15</sup> In others, ‘Christian truths and principles are ignored when they might have been most fittingly introduced. Judging from many publications..., one could never infer that such a thing as Christianity existed among men.’<sup>16</sup> The first set of publications directly attacked Christianity, while the latter sinned by omission. That both were felt to be so

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<sup>10</sup> On these attitudes to cheap literature, see Shiach, *Discourse*, 73-4.

<sup>11</sup> Pearson, *Infidelity*, 479.

<sup>12</sup> On the responses to *Vestiges*, see Secord, J.A., *Victorian Sensation: the extraordinary publication, reception and secret authorship of Vestiges of the Natural History of Creation* (Chicago, 2000).

<sup>13</sup> Quoted in Secord, J.A., ‘Behind the veil: Robert Chambers and *Vestiges*’ in *History, Humanity, and Evolution*, ed. J.R. Moore (Cambridge, 1989): 165-94, at 187.

<sup>14</sup> Pearson, *Infidelity*, 480.

<sup>15</sup> Pearson, *Infidelity*, xiv.

<sup>16</sup> Pearson, *Infidelity*, 480.

dangerous is indicative of the power and influence that was attributed to the press, particularly over semi-educated readers. The question was, how could authority be exercised in the realm of the cheap press, or, how could faith be maintained through, or despite, industrial technology?

Questions of authority were problematic in the sciences, and there was a developing rift between ordained men of science, and the younger, lay, generation, who thought science ought to be secularised as well as professionalised.<sup>17</sup> Even had there been a consensus, men of science had little experience of making their point to a wider audience, let alone of convincing the enormous audiences that industrialised printing had opened up. The development of a 'public science' in the eighteenth century had brought the sciences to more lay-people than before, but the audience reached by public lectures and small runs of books was tiny compared with that of the nineteenth century.<sup>18</sup> Nor were there many organisations to assist in the promotion of the sciences, with the British Association for the Advancement of Science (f.1831) meeting for one week in one town each year, and the Society for the Diffusion of Useful Knowledge (f.1826) in perpetual financial crisis.<sup>19</sup>

In contrast, Protestant Christianity had been dealing with the press since the Reformation, as the churches attempted to control interpretations of the Bible not just among the learned but among entire populations. Ideally, every Protestant should have read and understood the Bible. A successful reading would involve the development of faith, and that faith would ensure that the Bible remained a privileged authority against any competitors, printed or oral. The system of churches, ministers

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<sup>17</sup> Yeo, R., 'Science and intellectual authority in mid-nineteenth century Britain: Robert Chambers and *Vestiges of the Natural History of Creation*' *Victorian Studies* **28** (1984): 5-31; Morrell, J., and A. Thackray, *Gentlemen of Science: early years of the British Association for the Advancement of Science* (Oxford, 1981); Turner, F.M., 'The Victorian conflict between science and religion: a professional dimension' *Isis* **69** (1978): 356-76; Desmond, A., *Huxley: the Devil's disciple* (London, 1994).

<sup>18</sup> Schaffer, S., 'Natural philosophy and public spectacle in the eighteenth century,' *History of Science* **21** (1983): 1-43; Stewart, L., *The Rise of Public Science: rhetoric, technology and natural philosophy in Newtonian Britain, 1660-1750* (Cambridge, 1992); Golinski, J., *Science as Public Culture: chemistry and Enlightenment in Britain, 1760-1820* (Cambridge, 1992); Shapin, S., 'The audience for science in eighteenth-century Edinburgh' *History of Science* **12** (1974): 95-117; Porter, R., 'Science, provincial culture and public opinion in Enlightenment England' *British Journal for Eighteenth-century Studies* **3** (1980): 20-41.

<sup>19</sup> Morrell and Thackray, *Gentlemen of Science*; Bennett, S., 'Revolutions in thought: serial publication and the mass market for reading' in *The Victorian Periodical Press*, eds. J. Shattock and M. Wolff (Leicester, 1982): 225-57.

and theological writers assisted individuals in the difficult interpretation of the Bible, so that the range of personal interpretations stayed within the existing denominations, rather than venturing into heresy. The system also provided avenues of support if faith wavered, and authority figures whose opinion could be trusted. During the evangelical revival, British Protestants developed a complementary system to target those, particularly the industrial working classes, who seemed beyond the reach of the churches. This included Sunday Schools (and later, day schools) to teach literacy, home missionary societies to take the Christian message to people's doors, and publishing societies to supply cheap religious reading material, including Bibles.<sup>20</sup>

In mid-nineteenth century Britain, the ubiquity of ministers, missionaries and tracts meant that a basic religious education was widespread. Those who became (or remained) Christians ought to have been able to encounter dangerous reading material, and escape with their souls intact. Ideally, they would dismiss the contents as contrary to Christian faith, but failing that, respect for the opinion of a church leader ought to have the same effect. In the absence of systems to promulgate scientific authority, it was a more open question whether the same reader would be as safe with a cheap edition of William Lawrence's *Lectures on Comparative Anatomy* (1816) or George Combe's *Constitution of Man* (1828).<sup>21</sup> The churches and religious organisations were much more experienced with material where the theological implications were explicit, rather than subtly hidden as they could be in works of science. But as publishers began to produce large numbers of cheap popular science works, and to do so with a concern for profit rather than for faith (or, indeed, scientific accuracy), the problem of protecting the souls of readers became pressing. So too did the need to counter the separation of the sciences from faith which could be found among the infidel and secular publications.

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<sup>20</sup> On these organisations, see Laquer, T.W., *Religion and Respectability: Sunday schools and working-class culture, 1780-1850* (New Haven, 1976); Lewis, D.M., *Lighten their Darkness: the evangelical mission to working-class London, 1828-1860* (London, 1986); Howsam, L., *Cheap Bibles: nineteenth-century publishing and the British and Foreign Bible Society* (Cambridge, 1991).

<sup>21</sup> Jacyna, L.S., 'Immanence and transcendence: theories of life and organisation in Britain, 1790-1835' *Isis* **74** (1983): 311-29; Desmond, A., 'Artisan resistance and evolution in Britain 1819-1848' *Osiris* **ns 3** (1987): 72-110; Cooter, R., *The Cultural Meaning of Popular Science: phrenology and the organization of consent in nineteenth-century Britain* (Cambridge, 1984).

The mid-nineteenth century has traditionally been presented as the time when natural theology was supposed to be on the wane, and the beginnings of secularisation in science appeared. Both these assumptions, as well as the link between them, are misleading. Historians focussed on the problems of science and religion have, perhaps, been slower than others in the field to move away from a historiography dominated by intellectuals, theories and doctrines.<sup>22</sup> Religious faith has become an essential feature to be mentioned in discussions of men of science, but we know very little about the interactions between science and faith outside that small group. One of the consequences of this is that it has been left to historians of popular science to point out that certain sorts of science remained imbued with religious sentiment long after expert science was supposed to have been secularised.<sup>23</sup> A publisher of popular science who remained committed to a Christian presentation was, therefore, far from atypical.

The emphasis on natural theology has also been unfortunate. It has too often been presented as a monolith into which all relations between science and religion ought to be fitted. Recent work has emphasised that natural theology came in ‘an infinite variety’ of versions, and if the definition were restricted to the demonstrative proof of God’s existence, so often labelled ‘Paley’s’, then natural theology was already on the wane when Paley published.<sup>24</sup> The emphasis on natural theology has also obscured the reactions to the sciences of religious groups, such as evangelicals, who could not accept the privileging of nature over revelation it implied.<sup>25</sup> However, the revised

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<sup>22</sup> See, for instance, the predominance of Galileo, Boyle, Newton and Darwin in Brooke, J.H., *Science and Religion: some historical perspectives* (Cambridge, 1991), especially Chs. 2-4, 8. This focus is also true of science and religion studies undertaken from outside history of science, as is clear from the work of Boyd Hilton, see Hilton, B., *The Age of Atonement: the influence of evangelicalism on social and economic thought, 1795-1865* (Oxford, 1988).

<sup>23</sup> Lightman, B., ‘The voices of nature’: popularising Victorian science’ in *Victorian Science in Context*, ed. B. Lightman (Chicago and London, 1997): 187-211; Lightman, B., ‘The story of nature: Victorian popularizers and scientific narrative’ *Victorian Review* 25 (1999): 1-29.

<sup>24</sup> On the varieties of ‘natural theology’ in the 1830s, see Topham, J.R., ‘An Infinite Variety of Arguments’: the *Bridgewater Treatises* and British natural theology in the 1830s’ (Ph.D., University of Lancaster, 1993). On the reception of Paley, see Fyfe, A., ‘The reception of William Paley’s *Natural Theology* in the University of Cambridge’ *British Journal for the History of Science* 30 (1997): 321-35.

<sup>25</sup> Some of the more extreme evangelicals have received historical attention for their opposition to the sciences, particularly the scriptural geologists, see Brooke, J.H., ‘The natural theology of the geologists’ in *Images of the Earth*, eds. L. Jordanova and R. Porter (Chalfont St. Giles, 1979): 39-64; Brooke, J.H., ‘The history of science and religion: some evangelical dimensions’ in *Evangelicals and Science in Historical Perspective*, eds. D.N. Livingstone, D. Hart and M.A. Noll (Oxford, 1998): 17-40, especially 20-1.

picture of the early nineteenth century, which puts a non-demonstrative ‘theology of nature’ in place of a Paleyan natural theology, leaves plenty of space for evangelicals.<sup>26</sup> The essays in *Evangelicals and Science in Historical Perspective* (1998) provide a first step towards filling this space.<sup>27</sup> However, such studies will have to be careful not to repeat the focus on intellectual elites. Analyses of the evangelicalism of the geologist Hugh Miller, or of the scientific interests of the famous preacher Thomas Chalmers, cannot be typical of the vast numbers of middle-class evangelicals who were experts on neither science nor theology. One way to surmount this problem is to study some of the many evangelical organisations, in particular those concerned with publishing, which provide rich resources for attitudes to many contemporary issues.

The evangelical revival, which began in the mid-eighteenth century with the preaching of John Wesley and George Whitefield, had become an influential force in British society by the first half of the nineteenth century and remained so until the 1880s.<sup>28</sup> Evangelicals included most of the Baptists, Congregationalists and Methodists, as well as large parties within the Established Churches of England and Scotland.<sup>29</sup> Evangelicalism was also influential among non-evangelicals, due to the extensive efforts in tract distribution and missionary work, and high-profile campaigns for Sabbath observance, temperance and restrictions on fairs and races. Although all evangelicals shared the belief in the centrality of Christ’s atonement, and faith in this (and faith alone) as the route to salvation, the differences between denominations made pan-evangelical co-operation tricky.<sup>30</sup> Church structure was a particularly thorny issue which lay behind arguments over establishments, the extent of episcopal authority, the importance of the parochial system and the use of lay agency in church work. Then there were doctrinal issues (especially baptismal regeneration, in the late 1840s) and political issues (since Anglicans typically took a

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<sup>26</sup> On ‘theology of nature’, see Brooke, J.H., and R. Hooykaas, *New Interactions between Theology and Natural Science: natural theology in Britain from Boyle to Paley* (Milton Keynes, 1974).

<sup>27</sup> Livingstone, D.N., D. Hart, and M.A. Noll, eds. *Evangelicals and Science in Historical Perspective* (Oxford, 1998). Most of the chapters are concerned with America, but for the British situation, see those by Bebbington and Topham.

<sup>28</sup> Bebbington, D.W., *Evangelicalism in Modern Britain: a history from the 1730s to the 1980s* (London, 1989); Hilton, *Age of atonement*.

<sup>29</sup> After 1843, Church of Scotland evangelicals formed the Free Church.

<sup>30</sup> Evangelical theology and piety are outlined in Hilton, *Age of atonement*, 1-25.

Tory line, and dissenters a Whig one). The success of pan-evangelical societies was dependent upon the magnitude of the friction amongst their membership. R.H. Martin has argued that although the British and Foreign Bible Society (f.1804) often appeared to be the exemplar of evangelical unity, the Religious Tract Society (f.1799) was actually more successful, due in part to its exclusion of the more theologically distinct Unitarians and Roman Catholics.<sup>31</sup> The 1840s were a good time for evangelical union, however, as the political climate around Peel's repeal of the Corn Laws led most evangelicals to unite on a Whig political line. They were also able to unite in opposition to common foes, firstly Tractarianism and then Roman Catholicism itself. The united evangelical opposition to the Maynooth Grant (1845) was such that the Evangelical Alliance was formed in 1846, and it gained greater support during Papal Aggression and the opposition to the re-establishment of the Roman Catholic hierarchy in Britain (1851).<sup>32</sup>

Evangelicals stressed the importance of an explicit personal acceptance of Christ's offer of salvation, and were determined to help other people to convert, with the ultimate goal of hastening the millennium.<sup>33</sup> Although faith was the way to salvation, works were also important – not as a way of gaining grace, but as a consequence of grace. Part of the effect of being converted was the desire to convert others, and this led to the extensive evangelical involvement in mission work, at home and overseas. In both mission fields, the printing press was an essential instrument, for printed materials could get into more homes than missionaries could visit personally, and could be read long after a missionary had left. While the centrality of evangelicalism makes a study of its relationships with the sciences worthwhile, this connection with popular publishing organisations makes it doubly so.

Although the printing machine was the most obvious symbol of the transformation of the book trade at mid-century, it had been in use since 1814. Paper making machines, (which produced more, and larger, sheets) and stereotyping (which produced replica

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<sup>31</sup> Martin, R.H., *Evangelicals United: ecumenical stirrings in pre-Victorian Britain 1795-1830* (Metuchen NJ, 1983), Ch.8. For conflict in the Bible Society, see Howsam, *Cheap Bibles*, e.g. 13-15.

<sup>32</sup> On evangelical union, see Martin, *Evangelicals united* (pp.199-200 deal with the post-1830 period); Lewis, *Lighten their darkness*, Chs. 1 and 8.

<sup>33</sup> Hilton divides evangelicals into 'extreme' (pre-millenarian) and 'moderate' (post-millenarian) camps; the evangelicals of the RTS and similar organisations fall into his 'moderate' group, Hilton, *Age of atonement*, 10-17.

casts of composed type, which could be used for printing) had also been available for several decades. Edition bindings, which were machine-made in advance and attached before publication, allowing books to be sold 'ready-to-read', came into limited use in the 1830s.<sup>34</sup> What changed in the 1840s was not the invention of new technologies, but the decision by publishers to use them. Steam-powered printing and stereotyping was economical only for large (or multiple) production runs, so it was first used on the newspapers from the 1810s, on periodicals in the 1830s, and applied to books only in the 1840s and later. Edition bindings had been of little interest while most publishers were still producing expensive books, but they became a crucial part of cheap industrialised books.

At the beginning of the century, a standard octavo volume of an original work would cost at least 10s., which was almost 80% of a rural labourer's weekly wage, and still a quarter of a week's income for a curate. But from the 1770s, reprinted works had started to become available at cheaper prices, and by the 1820s, the 'cheap' reprint was widely available in almost all genres.<sup>35</sup> These works were 'cheap' only in comparison to the gentlemanly octavo, for they typically cost around five or six shillings. Such mid-priced works found a market among the middle classes, for whom books had previously been expensive luxuries, but failed to affect either the lower-middle or the working classes. However, producing very cheap works was a commercially risky business, since questions of literacy and education came into play in addition to price. By the beginning of the nineteenth century, religious organisations believed that the spread of the Sunday school system (from the 1780s) was already paying off, and that bodies like the Religious Tract Society were needed to provide cheap reading material for the 'thousands who would [otherwise] have

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<sup>34</sup> A detailed explanation of printing technologies can be found in Gaskell, P., *A New Introduction to Bibliography* (Oxford, 1972); an overview is presented in Twyman, M., *Printing 1770-1970: an illustrated history of its development and uses in England* (1970; London, 1999).

<sup>35</sup> The cheapening of reprints resulted from a 1774 decision in the House of Lords, which definitively ended the London booksellers' claims to perpetual copyright, see Feather, J., 'The publishers and the pirates: British copyright-law in theory and practice, 1710-1775' *Publishing History* **22** (1987): 5-32; Feather, J., *Publishing, Piracy and Politics* (London, 1995); Amory, H., 'De facto copyright?: Fielding's 'Works' in partnership, 1769-1821' *Eighteenth-Century Studies* **17** (1984): 449-76. On the genres which were affected, see Altick, R.D., 'From Aldine to Everyman: cheap reprint series of the English classics, 1830-1906' *Studies in Bibliography* **11** (1958): 3-25. Compare Erickson, L., *The Economy of Literary Form: English literature and the industrialisation of publishing, 1800-1850* (Baltimore and London, 1996) on the popularity of different genres according to the economic situation.

remained grossly illiterate'.<sup>36</sup> But even with the foundation of day school societies in the 1810s, commercial publishers remained wary of the working classes as potential book-buyers. This was not simply because very cheap publications would need enormous circulations to break even.<sup>37</sup> However, the provision of profane education, in contrast to Bible-reading or religious education, was perceived as politically dangerous in the Britain of the Revolutionary and Napoleonic Wars and their aftermath. The introduction or increase of the various 'taxes on knowledge' (on paper, advertisements, and political content), along with a strict adherence to the blasphemy and sedition laws, meant that cheap publishing was economically difficult and legally risky. This remained true until the gradual repeal of the taxes between 1833 and 1861, and the reduction in political tension, particularly after 1848.<sup>38</sup>

Despite the difficulties involved, religious organisations were not the only publishers before mid-century who tried to provide for the growing numbers of working-class readers, and Figure I.1 gives an overview of the attempts. The 'perfect deluge' of philanthropically motivated projects in the late 1820s and early 1830s, of which the series of Archibald Constable and John Murray are the best known, were not commercially successful.<sup>39</sup> Constable and Murray both wished to make original works available to the same audience which was buying mid-priced reprints, but they discovered that this audience was not large enough to cover the increased costs of producing original works. Constable went bankrupt in 1826, and his series was continued with limited success by George Whitaker. Murray remaindered over 140,000 volumes of his series in the mid-1830s.<sup>40</sup> When publishers made another attempt at cheap non-fiction, in the 1840s, most of them used reprints to keep costs down.

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<sup>36</sup> 'Address of the Religious Tract Society' *Evangelical Magazine* 7 (1799): 307. Given the difficulty of finding a measure of literacy (as opposed to the ability to sign a marriage register), coupled with regional variations, actual figures for literacy are hard to estimate. Contemporaries clearly believed that working-class literacy was increasing.

<sup>37</sup> Finding those larger sales involved more effort from the publisher, which was one reason some publishers were less than keen, see Chapman, J., 'The commerce of literature' *Westminster Review* ns 1 (1852): 511-54, at 519.

<sup>38</sup> On the taxes, see Twyman, *Printing*, 52.

<sup>39</sup> Chambers, W., *Memoir of Robert Chambers with Autobiographical Reminiscences* (New York, 1872), 207. For the economics of the 'Family Library', see Bennett, S., 'John Murray's Family Library and the cheapening of books in early nineteenth-century Britain' *Studies in Bibliography* 29 (1976): 139-66.

<sup>40</sup> Bennett, 'John Murray's Family Library', 166.

Another way of selling literature cheaply was to sell it in parts, so that although a completed work would cost the same as a mid-priced work, the unit price would be cheap enough to reach a much wider audience. This was what the SDUK attempted to do, and why the penny periodicals of the early 1830s were so successful. The SDUK's 'Library of Useful Knowledge' was sold in fortnightly parts of thirty-two closely printed pages, at three ha'pennies each, putting it in the same price-bracket as the Society's weekly *Penny Magazine*. The periodical had an incredible circulation of around 200,000 in its first few years, but it later dropped off to 40,000, while the volumes of the SDUK libraries were still being sold, now at half price, in the late 1840s.<sup>41</sup> The problem faced by the SDUK's publications was the high level of technical literacy they assumed from their readers, which limited their market more than the price. This also became an issue with reprinted works, since they had been written with an educated middle-class audience in mind. In the 1820s, the price of such reprints had kept them within educated circles, but by the 1840s, the reduction in prices made it theoretically possible for such reprints to get much wider circulations. Knight's Weekly Volumes, for instance, did sell well, but a peak of 5,000 sales shows that they were not managing to reach the audience of the penny periodicals.

The penny periodicals were the most successful of the early attempts at cheap publishing, due to their low unit price and their miscellaneous contents, which made them easier reading than the books and meant that missing an instalment was not such a disaster. The first generation of these periodicals were of the 'instructive and amusing' genre, combining articles on history, biography and the natural sciences with an absence of any current political discussion and (except for *Chambers's Edinburgh Journal*) no fiction. In the 1840s, with the benefit of a more relaxed political situation, a second generation of penny periodicals introduced sensational serialised fiction, current affairs and letters to correspondents. These periodicals regularly sold over 250,000 copies a week by the mid-1850s.<sup>42</sup> The success of these periodicals was essential in demonstrating to book publishers that there really was a

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<sup>41</sup> On *Penny Magazine*, see Bennett, 'Revolutions in thought'; Anderson, *Printed image*, Ch. 2. The fortunes of the SDUK libraries can be deduced from the entry in Appendix B, of Low, S., ed. *The English Catalogue of Books published from January 1835 to January 1863: comprising the contents of the 'London' and the 'British' catalogues* (London, 1864).

<sup>42</sup> Anderson, *Printed image*, 14, 182.

large audience of literate consumers who would purchase if the prices came down low enough. With that assurance, some publishers in the 1840s began to try reaching the periodical audience with cheap books, and using the industrial technologies of periodical printing to do so.

Since it was publishers who were responsible for the development of cheap popular science publishing, this thesis concentrates on them. This is a much tighter focus than the theses by Guy Kitteringham and David Hinton, which between them dealt with popular science in England between 1800 and 1870, and were unable to do more than provide descriptive overviews.<sup>43</sup> It is also a different focus from most of the studies occasioned by the recent interest in popular science.<sup>44</sup> A few have been text-based, building on the growing recognition of the role of literary techniques in scientific writings.<sup>45</sup> A few have attempted to discover who the readers were, and how they interpreted and appropriated the works.<sup>46</sup> More common are author-based studies, which have the advantage of providing a clear focus for the historical narrative, and offer opportunities to recover the scientific involvement of little-known figures, particularly, though not only, women.<sup>47</sup> Yet the focus on authors tends to accentuate the image of the heroic author with absolute control over their work, and to disguise the power of the publisher, without whose mediation, acceptance of risk and energetic

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<sup>43</sup> These studies dealt with long periods of time, with a range of media from books to lectures, and used very inclusive definitions of popular science. Kitteringham, G.S., 'Studies in the Popularisation of Science in England, 1800-1830' (Ph.D., University of Kent, 1981); Hinton, D.A., 'Popular Science in England, 1830-1870' (Ph.D., Bath University, 1979).

<sup>44</sup> There have been studies of publishing carried out by Topham, *An infinite variety of arguments*; Sheets-Pyenson, S., 'War and peace in natural history publishing: *The Naturalist's Library, 1833-43*' *Isis* 72 (1981): 50-72; MacLeod, R.M., 'Evolutionism, internationalism and commercial enterprise in Victorian Britain: the International Scientific Series 1871-1910' in *The Development of Science Publishing in Europe*, ed. A.J. Meadows (Amsterdam, 1980): 63-93. Although these dealt with science publishing for the non-specialist, they are more akin to studies of 'public science' than of 'popular science'. For studies of publishing for scientific specialists, see most of the other essays in Meadows, A.J., ed. *The Development of Science Publishing in Europe* (Amsterdam, 1980).

<sup>45</sup> For example, Myers, G., 'Science for women and children: the dialogue of popular science in the nineteenth century' in *Nature Transfigured: science and literature, 1700-1900*, eds. J. Christie and S. Shuttleworth (Manchester, 1989): 171-200; Myers, G., 'Fictions for facts: the form and authority of the scientific dialogue' *History of Science* 30 (1992): 221-47; Lightman, 'Story of nature'.

<sup>46</sup> For example, Topham, J.R., 'Beyond the 'common context': the production and reading of the *Bridgewater Treatises*' *Isis* 89 (1998): 233-62; Fyfe, 'Reading children's books'; Secord, *Victorian Sensation*.

<sup>47</sup> Shteir, *Cultivating Women*; Shteir, A.B., 'Elegant recreations? configuring science writing for women' in *Victorian Science in Context*, ed. B. Lightman (Chicago and London, 1997): 236-55; Astore, W.J., 'Observing God: Thomas Dick (1774-1857), evangelicalism and popular science in Victorian Britain and Antebellum America' (D.Phil., University of Oxford, 1995); Lightman, 'Voices of nature'.

management, the work would never see the light of day. The few studies we do have of publishers of popular science have helped illuminate the constraints placed on both authors and readers by the materiality of books and the processes of their production, and suggest that a study of the crucial mid-century period would be especially rewarding.

Chapter One of this thesis explains how the Religious Tract Society, a volunteer-run charitable society which published small pamphlets for converting the working classes, became a major publisher of cheap non-fiction books at mid-century. It then considers the organisation of the Society, and the apparent tension between the Society's role as commercial publisher and its continuing commitment to evangelical mission and philanthropy. In Chapter Two, I examine the strategies used by the Society to give its new secular publications the best possible chance of reaching working-class readers, and of ousting the competing infidel and secular publications. This involved physical issues of pricing, advertising and distribution, but all this would have been to no effect if the works were bought but not read, or not read in the manner the Society intended. Thus, rhetorical and narrative strategies were an equally necessary part of the package, and these are discussed in Chapter Three, through a close examination of one of the natural history works. This chapter also considers how the balance was managed between mimicking a secular popular science work and providing the essential Christian tone. While the Society could keep a fairly tight control on most of the strategies discussed in Chapter Two, those in Chapter Three were largely the responsibility of the writers. The Society did exercise editorial control, but tended to do so through rejection or acceptance, not revisions, so careful selection of writers was crucial. As Chapter Four shows, despite the Society's image of its writers as possessed of spiritual vocations, money was always an important reason for writing. The ideal image of the Christian writer also disguised the discipline and physical work involved in writing. Finally, in the Conclusion, I consider the importance of the Religious Tract Society's new programme of publishing in the 1840s for the Society and for us, by drawing out the implications my study poses for the historiography of popular science and 'science and religion'.

This thesis is the first study of popular science to take seriously the publishing transformation in the 1840s and 1850s.<sup>48</sup> Popular science is closely linked to the verb ‘to popularise’ and to ‘the people’, both of which were acquiring new meanings around mid-century.<sup>49</sup> Although popularisation is still frequently linked with the concept of passive diffusion of information from the scientific community to the public, the inadequacy of this model has been convincingly shown.<sup>50</sup> Popularisation is not a passive process which happens to some idealised universal knowledge discovered in laboratories, perhaps with a little help from men of science or those working on their behalf. Popularisation involves active engagement, particularly from publishers and journalists, who need not be primarily concerned with increasing public understanding of a scientifically-sanctioned version of natural knowledge, nor need they be assumed to write only about that version of science.<sup>51</sup> This thesis analyses one particular publisher’s efforts to produce and market popular science, and considers why and how these efforts were prosecuted.

However, my study goes deeper than that. Evangelical organisations were originally founded to spread Christianity, and to control readers’ interpretations of theological doctrine. In the 1840s, they turned their expertise in promulgating sacred knowledge to the cause of promoting Christianised profane knowledge. Although all the works continued to contain a call for conversion to evangelical Christianity, the new programme of so-called ‘secular’ publishing was intended to convert readers to a view of the sciences which was in harmony with evangelical faith, to counteract the secular

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<sup>48</sup> Secord, *Victorian Sensation* will also consider this period, but concentrates almost entirely on the upper end of the market, and on readers rather than publishers. Previously, historians of science have focused on the 1820s and 1830s, for example, Topham, J.R., ‘Science and popular education in the 1830s: the role of the *Bridgewater Treatises*,’ *British Journal for the History of Science* **25** (1992): 397-430; Topham, *An infinite variety of arguments*; Sheets-Pyenson, ‘War and peace’.

<sup>49</sup> ‘Popularise’ (with reference to the sciences) came into use in the 1830s, see OED, ‘popularize’ meaning 2.c (1833). See also ‘popularizer’ (1848) and ‘popularization’ (which apparently came into common use only in the 1860s). On the development of the concept of ‘the people’, see Joyce, P., *Visions of the People: industrial England and the question of class, 1848-1918* (Cambridge, 1991), 1-23.

<sup>50</sup> Hilgartner, S., ‘The dominant view of popularization: conceptual problems, political uses’ *Social Studies of Science* **20** (1990): 519-39; Cooter and Pumfrey, ‘Separate spheres’, 247-51.

<sup>51</sup> This is particularly clear in studies of late twentieth-century science popularisation, for example, Nelkin, D., *Selling Science: how the press covers science and technology* (1987; Revised ed. New York, 1995); Silverstone, R., *Framing Science: the making of a BBC documentary* (London, 1985).

and infidel tendency to separate the two areas. This thesis therefore illustrates not only how industrial popular science publishing developed, but the range of physical and rhetorical techniques that had to be employed in the attempt to promote a particular, Christianised, version of natural knowledge.