Fyfe, A. (2005). Conscientious workmen or booksellers' hacks? the professional identities of science writers in the mid-nineteenth century. Isis, 96(2), 192-223

Conscientious workmen or booksellers' hacks?

the professional identities of science writers in the mid-nineteenth century

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ABSTRACT

The existing focus on the debates over expertise in mid-nineteenth century Britain has tended to conflate all non-specialist science writing as mere "popular" writing, and thus dismiss it. This ignores the varieties of popular writing, and disregards any motivations (beyond the financial) that these writers might have had. In the middle of the nineteenth century, there was no clear demarcation between the roles of "man of science" and "science writer". Being a scientific writer could be a route into the world of expert science, a way to support an ill-paid scientific career, or a rewarding vocation in itself, and not merely a life of miserable subsistence. In the same period as attempts were being made to turn science into a profession, authorship was also emerging as a possible career option, thanks to the recent expansion of the publishing trade. Scientific authorship now became a viable means of making a living, and might even offer more opportunities than science itself. This paper examines the careers of William Charles Linnaeus Martin (1798-1864) and Thomas Milner (1808-c1882), and places them in the context of others who made their living by writing works on the sciences for the general reader. Martin wrote on zoology and Milner moved between astronomy, geology and geography. The paper unravels the close but ambivalent relationship between the professions of authorship and of science, and highlights science writing as another aspect of scientific practice. Both men were moderately financially successful, but Martin's sense of failure, and Milner's satisfaction reflect their contrasting images of their professional identity.

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David Brewster stressed the difficulty of surviving as a scientific writer when he assured the young James David Forbes, in 1830, that "making up your income by your pen" was "the worst of all professions".[1] Brewster himself relied on writing for his income, so his advice came from hard experience.[2] From Forbes's position, as a Scottish baronet's youngest son who needed to find a role for himself, writing seemed to open up the prospectof making a name as a man of science while also generating an income. But Brewster's greater experience in the subtleties of the book trade led him to advise Forbes that the proposed introductory treatise on meteorology was not the sort of publication which would make his reputation.

In contrast, two decades later, the young Thomas Huxley did indeed make his name, and eventually his career, through his writing about science. It was his research papers, presented at the learned societies and published in scientific journals, which performed this role.[3] Huxley's other literary work, his book reviews, general periodical articles, and translations of foreign works, supplemented his naval half-pay and enabled him to pay his rent.[4] By the 1850s, an increasingly clear division had developed between writings which contributed to a scientific reputation (and usually paid little), and those which paid the bills (but did nothing for reputation). In the 1850s, therefore, Forbes's plan of an introductory treatise would not have made his name, but in the 1830s, it was not entirely inappropriate. Scientific reputation was not yet so tightly tied to the publication of original research. It was quite possible for men (and sometimes women) who had published little or nothing to be

highly regarded for their knowledge and expertise, demonstrated through their personal collections of natural objects or their learned conversation.[5] And for those who, for reasons of geography or social class, did not have direct access to the circles of polite society, the right sort of publication could draw attention and approbation. The right publication, in this context, would not be a closely-argued technical research paper, but a work promising rational amusement and information to a general readership. This was the manner in which those who already possessed reputations published their work (consider Charles Lyell's *Principles of Geology* (1830-33) or William Buckland's 1836 Bridgewater Treatise on *Geology and Mineralogy*), and in principle, writers who could match the style and content might be favourably received in the same circles.

That appropriate publications could indeed bring scientific reputations to those outside polite London society can be seen from the success of ornithologist John Gould, a gardener's son who started publishing in the mid-1830s and ended up as vice-president of the Zoological Society.[6] Similarly, an artist's son, Philip Henry Gosse won himself a reputation for accurate observational skills and a fellowship of the Royal Society with his publications from the late 1840s.[7] For both these men, from lower social backgrounds, generalist scientific writing had the appeal of drawing the attention of the learned, while also earning money. It is not difficult to see why it also appealed to Forbes.

For men of Forbes's social class, with a university education, the most obvious way to earn a living while pursuing the sciences was to enter one of the learned professions. Another possibility was to try for one of the few university professorships, or, a few years later, to seek a post in the Geological Survey.[8] Thus, although Forbes dreamed of a science professorship, he took the exams which would enable him to become an advocate, while

simultaneously consulting Brewster about the advisability of writing as an alternative to the law.[9] Scientific writing was a rare example of a genteel money-earning scientific occupation. For men of a lower social class, there were arguably more paid positions available in the sciences, since gentlemen and institutions frequently employed people to look after their specimens or instruments, or to collect new specimens. Hence, Gould stuffed birds for the Zoological Society, and Gosse travelled to Jamaica to collect insects and birds.[10] Writing appealed to these men, not simply as an alternative way of earning (or supplementing) a living, but because it offered an opportunity to transcend their subservient intellectual position by developing their own thoughts and ideas, and improve their social position by bringing them into the ranks of the genteel.

Writing on the sciences therefore appeared to offer literate men of all classes opportunities to pursue their interests, earn money, gain a reputation, and cross geographical and class divides. Of course, only a lucky few gained all of these rewards. The problem with Forbes's idea was that his choice of an introductory treatise was the wrong sort of generalist book for his purposes. As Brewster was aware, a wide variety of books existed for non-specialist readers, but not all of them were equally likely to gain the attention of polite society or the gentlemen of science. Learned and lengthy books, presenting the results of research in an attractive narrative for well-educated readers, would certainly gain attention, but, like the most authoritative textbooks, they were the fruits of years of scholarship. Essays in the many encyclopaedias of the day, from *Britannica* downwards, could also become the authoritative word in their subject, although those who wrote them tended either to have a university position or existing reputation, or to know the editor.

More attainable by novice writers, including Forbes, were translations, commentaries, introductions, lower-level textbooks, children's books, short introductory treatises, and articles in magazines. All of these would pay money, and few of them would harm the reputation of someone who was already well-known, but whether they could create a reputation for an unknown was ambiguous. Mary Somerville's translation of Laplace, for instance, made her quite renowned, while many other translators remained anonymous.[11] In general, while it was possible to make a living and a literary career from this second group of publications, it would be very difficult to built a scientific reputation on them alone, if one did not also produce some of the grander publications, or have access to the conversational circles of polite society. If, indeed, one became known primarily as a writer of these sorts of works, one might be seen as so closely linked to the commercial book trade that any claims to independent scientific expertise were prejudiced.

William Buckland clearly thought in this way, when, in 1842, he urged the Prime Minister, Robert Peel, to grant a civil list pension to the comparative anatomist, Richard Owen. Without this support, Buckland claimed that Owen would be "obliged to descend to the condition of a Bookseller's Hack", which would be incompatible with a continuation of his scientific career, and would be both "an irreparable loss to the world of science" and a matter for "national reproach".[12] Buckland was surely overstating his case for maximum effect, but his dismissiveness towards any writing other than the recording of research is indicative of the changing attitudes to scientific writing around mid-century. As is clear from the reactions to *Vestiges of the Natural History of Creation* (1844), those arguing for expertise in the sciences often gave the impression that there could be no middle-ground between scientific authority and hack-work. *Vestiges*, of course, neatly demonstrates the difficulty of such polar opposites, as contemporaries struggled to decide whether that work

could be dismissed as "popular", or should be engaged with as a piece of serious scholarship.[13]

Science writers, however, did not only belong to the scientific world, and in the contemporary literary world there was a well-recognised third category. As the *British Quarterly Review* explained in 1855, in addition to the original and creative works of "true, or high literature" and the "trash" which was produced by unprincipled copying, compilation and dilution, it was important to recognise the existence of "wholesome popular literature". Its writers were clear, precise and accurate, and performed a "useful and honorable" role in formal and informal education. According to the *Review*, "such authorship, in fact, is a species of industry greatly in request, and with which an intelligent and conscientious workman may respectably and honourably earn a livelihood."[14]

The fact that literary men acknowledged the existence of a wide range of writers is an indication that the debates about professionalization proceeded along different lines in literature and the sciences.[15] The key question for those commentators of the 1840s, who started to discuss whether authorship was now a profession, was one of money rather than demonstrable expertise.[16] There was a de facto acknowledgement that anyone who made up most or all of their income by being paid for the publication of their works was a professional writer, regardless of the quality of their prose, the possible immorality of their subject matter or the low social class of their audience. The writers who did not count as professionals were those who had other sources of income: in other words, "physicians with few patients, clergymen on small livings, idle women, [and] rich men".[17]

By the 1830s, and certainly by the 1840s, there was a group of scientific writers who were successful professionals, in literary terms, yet who remained on the fringes of the

scientific world. Most of the scientific writers who are familiar to historians are those who did build scientific reputations, but the existence of many others is clear from the growing number of articles and books on the sciences which were being published in these decades. All these works must have had writers, yet the common practice of anonymity for certain forms of publications means that their identities are often unknown. Even where their names are known, it is often the case that little other biographical information survives. These writers can, of course, be studied through their printed works, but deducing anything about personal motivations from such texts is difficult. This paper unravels some of the issues relating to the status and role of science writers at mid-century, and their connections to both literary and scientific communities. After a consideration of how science writers were affected by changes in the book trade, it focuses in particular on two writers about whose lives we do have some information, and places them in the context of others who were engaged in the same efforts.

The life-stories of William Charles Linnaeus Martin (1798-1864) and Thomas Milner (1808-c1883) can be recreated from their surviving letters and their publishers' archives.[18] Their experiences clearly demonstrate that science writing was a viable (if still difficult) career option by mid-century. Martin made his living from 1839 onwards by writing on zoology, producing at least twenty-five popular books and over six hundred periodical articles. Milner supported his family by writing on geology, geography, astronomy and history, from 1847 until his death. At least thirteen of his books were on the sciences, and many of his national histories included natural history.[19] Although both were moderately financially successful, Martin's sense of failure and Milner's satisfaction reflect their contrasting conceptions of their professional identity.

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In contrast to the stories told in the *Lives and Letters* of eminent Victorian gentlemen of science, Martin and Milner's letters reveal a great deal about their personal circumstances. The letters were written to the Royal Literary Fund, an institution founded in 1790 to provide relief to distressed writers.[20] Its committee (which at various times included Roderick Murchison and Richard Owen) made grants of around £20 to £50 to those with an established record of publications.[21] The Fund's secretary was also frequently consulted for advice on the granting of civil list pensions to deserving authors. Given the nature of the Fund, the archival correspondence reveals more about the problems of writing than its pleasures. Most letters cite illness, deaths in the family, or bankruptcies in the book trade in justification of their grant applications. Despite this, it would be misleading to cast applicants to the Literary Fund as the failures of the mid-nineteenth-century literary world, for many respected names sought assistance at some stage of their careers.[22] Thomas Milner applied successfully to the Fund on four occasions: twice in the 1850s, after a publisher's bankruptcy; once on his wife's death in 1868; and once after the stroke which eventually ended his life. These four applications at times of understandable crisis cannot undermine the fact that Milner was a successful professional writer for almost thirty-five years.

Amongst the tales of woe, the Literary Fund letters are suggestive of the everyday routine of the writer. Authorship, like science, is frequently imagined as an intellectual pursuit, yet the daily business of actually writing (and researching, and correcting) books and magazine articles involved physical activity. Historians have become increasingly aware that the sciences rely on particular practices, for instance, of observation and experimentation.[23] Writing, too, was a practical activity, that took place in particular locations, at particular times, and with particular rituals.[24] As professional writers, Martin and Milner would certainly have perfected the practices of researching, note-taking, writing (or dictating),

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correcting and re-drafting. Their example should remind us to consider writing as another of the practices in which virtually all men of science participated.

This paper will use Martin and Milner's lives, along with those of Gosse, Gould, and some of their contemporaries, to discuss why science writing was an attractive career option, what was involved in earning an adequate income, and whether it was a fulfilling vocation. The moves towards professionalisation in the sciences provide part of the context, but there were equally important changes within the British book trade which affected all writers, including those on the sciences. The first section of the paper, therefore, outlines the key changes in the book trade over the late eighteenth and nineteenth centuries, and their impact upon science writers.

Scientific Authorship and the Book Trade

In eighteenth-century Britain, the audience for printed works on all subjects was limited by low literacy rates and the high prices of books. By the middle of the nineteenth century, those limitations were fading away, and print was becoming the first of the mass media.[25] It is because of these changes that truly "popular" science could emerge.[26] In the nineteenth-century literary world, "popular" was not opposed to "expert", as it is often now used when applied to the sciences. Rather, it described those works which, because of their lower prices or simpler language (or both), reached beyond the traditional book-buying audiences, into what was perceived as "the people".[27] Whereas "popular literature" had previously comprised little more than chapbooks, ballads and tracts, by mid-century, publishers were producing a wide range of magazines and books aimed at the lower-middle classes and even some of the working classes.[28] Rather than being read by a few hundred

people, some books were now reaching tens of thousands, and some magazines had hundreds of thousands of readers.[29]

In the late eighteenth century, it had been primarily the high price of print which restricted its circulation to the well-to-do ranks of society – the aristocracy, gentry and learned professionals.[30] Literacy did extend further into the middling ranks, but few could afford prices of ten shillings or more per volume. Meanwhile, the workers had neither money nor literacy. Things began to change at the very end of the eighteenth century and into the first decades of the nineteenth, when a greater range of books became available at a more moderate five or six shillings. These were reprints of older works which, thanks to changes in the copyright law in 1774, were now freely available for re-issue by enterprising publishers.[31] By the 1820s, these lower prices had enabled more of the middle classes to become book-buyers, though they did little to help the working classes. This expanded reading audience, however, created few new opportunities for writers. The books which were becoming more widely available were reprints, and had involved little or no new literary work in their production.[32] Equally, many of the cheap magazines of the day relied heavily upon reprinting extracts from other magazines.[33]

The sciences occupied only a small corner of the literary marketplace (less than 4% at the start of the nineteenth century), but they were nevertheless a distinct and recognisable sector.[34] From the mid-eighteenth century onwards, in addition to learned works on the sciences, there had been a regular output of less technical works, often addressed to women and children.[35] This sector clearly demonstrates a continuing interest in the sciences within the middle classes, which went far beyond the commercial men who had attended coffee-house lectures to learn about mechanics or navigation.[36] Many of these eighteenth- and early

nineteenth-century science books were written by women, for whom writing was one of the few acceptable means of participating in the sciences. We now know a great deal about such writers as Priscilla Wakefield,[37] Jane Marcet,[38] Charlotte Smith and Sarah Fitton.[39] Of the male science writers who were active between the 1790s and 1830s, many (including Jeremiah Joyce, Olinthus Gregory and Thomas Dick) appear to have combined writing with their role as professional educators, such as tutors and school-teachers.[40]

Few of these writers made writing their sole occupation, and it was almost always a supplement to their personal or family incomes. It would have been difficult to find enough literary work to live on. It has been estimated that barely 175 science books of any sort (including research monographs, astronomical tables, and school primers) were being published each year at the start of the nineteenth century, and only those which were first editions of original works had provided paid work for a writer.[41] Brewster was one of the few who did live entirely from his writings in the 1810s and 1820s, and he was referred to by an Edinburgh publisher as "Dr B., who is very clever, but who after all is starving".[42]

By 1871, census figures would reveal almost two and a half thousand people claiming to be writers, a five-fold increase from the start of the century which suggests a significant change in the attractiveness and viability of writing as a career.[43] By mid-century, adult literacy had climbed to around 60%, thanks to the increased efforts to educate the children of the poor.[44] Meanwhile, technical innovations in the book trade (particularly steam-printing and stereotyping) reduced the cost of print.[45] Publishers began to use these technologies to take print to the newly-literate reading audiences, experimenting with penny periodicals in the 1820s and 1830s, and with shilling books in the 1840s and 1850s. This enormous expansion of the reading audience could not be satisfied entirely by reprints.

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By mid-century, publishers were becoming increasingly aware of the different educational backgrounds of their various readers, and realised that the complex language of magazine excerpts or reprinted works originally intended for well-educated readers might not be attractive to those with little more than basic literacy. Commissioning new works, at a more appropriate level, was one solution. Moreover, even for better educated readers, newly-written works could be attractive, since recent extensions to copyright law meant that the books now available for reprint were at least forty years old, and thus increasingly likely to contain archaic language and out-of-date facts.[46] This was a particular issue in subject areas with many new discoveries and changing terminology, including the sciences. For both books and magazines, therefore, publishers increasingly needed the services of living writers.

Many of the earliest publishers to become aware of the possibilities and needs of the new reading audiences were philanthropically-motivated societies and firms, who wished to encourage working-class self-improvement. Such publishers as the Society for the Diffusion of Useful Knowledge,[47] W. & R. Chambers,[48] the Religious Tract Society[49] and the Society for Promoting Christian Knowledge[50] regarded the sciences as a key part of their programme of education. Their most successful early attempts were low-priced periodicals.[51] The monthly magazines of the major religious denominations typically cost several pennies, and sold twenty to thirty thousand copies, while the weekly penny magazines of the philanthropic societies could sell up to a hundred thousand copies.[52] The presumed non-political nature of the sciences made them appropriate content for many of these magazines, with the presentation varying from secular to Christian. These new magazines, with their high periodicity (compared to the older quarterlies) and emphasis on newly written material, created significant opportunities for writers. Those who could write in an appropriate style, and meet the tight deadlines time after time, found themselves in demand to keep the

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magazines stocked with articles. This was how William Martin began his writing career in the early 1830s [FIGURE 1]. There was sufficient demand for him to write and sell at least one article a week on natural history.

By the 1840s, entrepreneurial book-publishers were starting to adopt the new methods and technologies of the periodical publishers.[53] The output of the British book trade experienced its greatest rate of growth for the whole century in the 1840s and 1850s, and the opportunities for writers increased still further.[54] There were more than four times as many titles on the sciences being published annually, compared with the start of the century; and since steam-printing involved larger print runs, the actual number of copies of books available to readers increased perhaps eight-fold.[55] By 1850, there were plenty of books available at 2*s*.6*d.*, and a good number at just 1*s*., indicating that many of these books were intended for the new audiences. These developments meant that there was more literary work available, that writers commanded more respect from publishers, and they might hope for better pay.

For science writers, despite their subject matter, it was publishers who were the ultimate arbiters of authority and made the final decisions about which writers would get the opportunity to convey their thoughts to the world. Publishers who owned scientific journals or regularly issued research monographs (as John Murray did for Lyell and Darwin, among others), often had extensive contacts within the scientific world to help them make decisions based on both scientific and literary merit. And when these publishers issued more general works, they made use of their contacts to acquire the services of recognised men of science. Thus, Murray's "Family Library", and the "Cabinet Cyclopaedia" published by Longmans, both in the 1830s, contained volumes by such familiar names as John Herschel and David

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Brewster, and later in the century, the "International Scientific Series" featured T.H. Huxley and John Tyndall.[56]

The problem for publishers, though, was that men with reputations expected higher fees, and learned men of science were not always adept at writing in the appropriate style for a general audience. The *Westminster Review* in 1845 accused men of science of failing to write works which offered a "broad and beaten track on which the multitude can travel onward".[57] For publishers such as Murray, whose "general" publications were nevertheless intended for educated readers, this was an irrelevance.[58] But for publishers such as W. & R. Chambers, Charles Knight, or even George Routledge, who genuinely wanted to reach the working classes and who knew that cheapness and non-technical language were essential, eminent men of science were rarely the most appropriate writers. While members of the learned societies might debate who ought to be admitted to the Royal Society and on what grounds, large sections of the general population were learning about the sciences from writers who had little or no hope of meeting those criteria for authority.[59]

Among those science writers active at mid-century, we might note that the Rev. Charles A. Johns and the Rev. Ebeneezer C. Brewer both combined writing with school-teaching, while Charles Tomlinson and Thomas R. Jones taught at King's College London, and Richard Potter taught at University College.[60] None of these men had national scientific reputations, but all were competent writers of popular works, and were thus in demand from publishers. Their professional interests in education may have helped direct their writing into an appropriate style.[61] The female mid-century writers came from a variety of professional and commercial families. Margaret Gatty and Mary Ward were the daughters of clergymen, while Mary and Elizabeth Kirby and Rosina Zornlin were the daughters of businessmen or

merchants. Gatty and Elizabeth Payne (the wife of an industrial chemist) combined their writing with bringing up a family, which may be why they both specialised in children's books, although Zornlin, Ward and the Kirby sisters all began their writing careers while single.[62] Since most women lacked an advanced education, they were unlikely to become over-technical, and, like the ministers and teachers, they were relatively cheap. Unlike famous novelists or eminent scholars, these writers had no "name" (sometimes literally, with anonymous works) which added value to their work.[63]

Particularly attractive to publishers was the growing band of full-time writers. These people were often from the same sorts of social groups as the part-time writers mentioned above – indeed, some of them had retired from their first careers, tempted by greater success as a writer – but they occasionally came from lower down the social scale, and hoped for social advancement through literature.[64] These full-time writers had proven themselves skilled both at writing for popular audiences, and at such mundane things as meeting deadlines, producing exactly the required number of pages of text, and refraining from making extensive corrections in proof.[65] Such writers were in demand for their literary, not scientific, expertise, and were occasionally able to negotiate marginally better rates of pay as a consequence. It is difficult to say how many full-time science writers there were at mid-century, partly because of anonymity, and partly because the sciences were still a very small niche in which to specialise. Thomas Milner, for instance, wrote on geography and history as well as the sciences.

These full-time writers, together with their part-time colleagues (or competitors) – the ministers, teachers, journalists and doctors, and their wives and daughters – produced the science articles in magazines which reached a hundred thousand people each week, and the

books which sold fifteen or twenty thousand copies. They were far more influential in the popularisation of the sciences than such better-known writers as Brewster and Herschel, or Huxley and Tyndall. Yet, it is difficult to discover much about the lives or aspirations of these writers, particularly the full-time ones who did not have another profession in which to forge a reputation. The remaining sections of this paper tell the stories of William Martin and Thomas Milner's careers as full-time scientific writers, and uses their lives to provide rarely available insights into the experiences of professional science writers. Their examples tell us a great deal about the trials, tribulations and rewards of scientific writing amidst the new literary opportunities and the gathering debates about scientific expertise in the 1840s and 1850s.

Becoming a Science Writer

In 1847, George Henry Lewes argued that even writers who were only in the "ordinary current" were able to make "incomes *averaging* 300*l*. a-year, some less, of course, some more". Lewes estimated the range of realistic incomes for a writer at £200 to £1,000 a year.[66] If he was correct, it meant that full-time writing could be reasonably expected to produce a respectable middle-class income. Assistant clerks in the civil service earned £300 to £500 a year, while a parish of this value would enable a minister to marry and start a family. In contrast, a young minister in his very first parish, or a small-town school-teacher, might earn £100, which could only be considered respectable if he were frugal and single.[67] The upper range of Lewes's estimate was enjoyed mostly by a few successful novelists. Dickens and Thackeray, for instance, could earn several hundred or even a thousand pounds per novel and were able to become distinctly well-off.[68] They became prominent public figures in the "profession" of authorship, but in terms of earning power, they were exceptional.

More typical writers, and particularly those in non-fiction, could expect a few pounds for an article, some tens of pounds for a short book, or a hundred or so pounds for a longer book.[69] Making £300 a year from these sorts of payments was potentially possible, but it is also clear why, for many of its mid-century practitioners, scientific authorship continued to be best practised as a useful supplement to an existing profession. Writing science for a living was not the first-choice career option for either William Martin or Thomas Milner. After all, both had begun their careers in the late 1820s, when the expansion of the literary marketplace was still beginning, and authorship would certainly not have seemed a sound long-term prospect. But by the time they changed careers in the 1840s, authorship was looking increasingly attractive. It might still not have been the ideal long-term choice, but both Martin and Milner found themselves in situations where science writing seemed their best available option.

William Martin's father had been an actor, geologist and engraver, whose talents won him admission to the Linnean Society.[70] The younger Martin may have trained as an apothecary, and in 1830 he applied successfully for the post of superintendent at the museum of the Zoological Society of London, for a salary of £100.[71] The recently-founded society was building up its collections of living and dead animals, and Martin looked after its preserved specimens for the next eight years.[72] He was responsible for preparing and arranging the specimens, with occasional assistance from a then-little-known taxidermist named John Gould.[73] He was also expected to examine and dissect unusual specimens acquired by the museum, including recently deceased animals from the Zoological Gardens, and items donated by such travelling naturalists as Charles Darwin.[74] These dissections were routinely reported in the Society's *Proceedings*, and when Martin identified and named a new genus, his research was published in the *Transactions*.[75]

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In early 1836, Martin's natural historical career appeared to be blossoming. The Zoological Society had decided to move its museum to improved premises in Leicester Square, in the centre of London, and Martin spent his time worrying about locations, heating, ventilation, and the arrangement of specimens.[76] In keeping with the grander premises, however, the society decided to acquire a grander staff. The existing arrangement of superintendent and preserver was to be replaced with one involving six staff, including a curator and assistant curator.[77] The curator was to be "a competent Zoologist in all its branches; of agreeable manners and address".[78] Although John Gould described Martin shortly afterwards as "a very intelligent man and a very tolerable naturalist", he was not considered for the curatorship.[79] Although easily appointed assistant curator, his practical experience could not make up for the absence of the educational or social background that the Zoological Society desired for its new curator. The beetle-enthusiast George Waterhouse was appointed in April 1836.[80]

Although technically senior to Gould (who was now an employee), Martin found himself effectively demoted to being responsible for the "Fishes, Reptilia, Mollusca and Radiata".[81] And worse was to come. The Zoological Society rapidly realised that its new establishment was too expensive. Even though Gould resigned in January 1838 to collect birds in Australia, cutbacks were needed.[82] After receiving a report on expenditure, the Council resolved that "the situations of Assistant Zoological Secretary, and Assistant Curator, be abolished on the 15th of January 1839".[83] Martin would be out of a job.

When Martin considered his future prospects, he must have felt that he had a good chance of gaining another museum position. During his years at the Zoological Society, he had built up expertise in all areas of the animal kingdom. He had published in the society's

journals, and he had well-known naturalists willing to write references for him, including George Waterhouse and Richard Owen. Writing must have seemed like the obvious temporary solution until a museum job came along. Although Waterhouse managed to move from the Zoological Society to the British Museum in 1843 (with references from Owen and Darwin), museum jobs were scarce.[84] Fifteen years after leaving the Zoological Society, Martin was still dreaming of obtaining "some official situation, humble though the salary might be, in which my general acquirements + scientific knowledge would render my services advantageous".[85]

At the time of his dismissal from the Zoological Society, Martin had already been writing for at least five years, particularly for two of the major publishers of cheap instructive literature: the Society for the Diffusion of Useful Knowledge (and its publisher, Charles Knight), and the Religious Tract Society.[86] Both societies participated in the flood of cheap instructive periodicals of the early 1830s, and Martin contributed regular natural history articles to the *Penny Magazine* (1832-46) and the half-penny *Weekly Visitor* (1833-36) from their earliest issues, as well as writing occasional books.[87] The close link between his role at the Zoological Society and his writing career was particularly obvious in his volumes on *Menageries* (SDUK, early 1830s, 4*s*.6*d*.), which functioned as guides to the Zoological Gardens, and were granted permission to be sold inside the gardens by the "cakewoman at the Elephants' Stand".[88]

These experiences would have demonstrated the money which writing could produce, and provided Martin with ready-made connections in the book trade. Indeed, in late 1838, he had found little trouble securing a commission (with annual salary) from the publisher Whitehead to produce "an extensive work upon all the known species of Quadrupeds".[89] The

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firm unfortunately became insolvent soon afterwards, but Martin nevertheless managed to place enough books with publishers to survive, and writing became his way of life for the foreseeable future.

Thomas Milner's journey towards scientific authorship took a different path. The Derby-born Milner was convinced by the age of sixteen that his vocation was to serve God. After training for the Congregational ministry at Glasgow, he had a charge in Northampton by his late twenties.[90] But by his mid-thirties, Milner began suffering from ill-health and by the time he was forty, he felt unable to perform his duties. In 1847, he decided to resign his charge, move to London, and support his family by writing. As in Martin's case, this was an informed decision, based upon some years of experience as a writer.

Like many young ministers, Milner had published a few works of more worth than likely financial remuneration: on the history of the church, a biography of an eminent divine, and a volume of sermons.[91] In the early 1840s, however, he began to write on astronomy, and it was this which brought him to the attention of London publishers and would give him a publication so successful that science writing looked like a viable future. His first scientific work, *Astronomy and Scripture* (1843), had been published locally, and may have been derived from lectures to his congregation or Sunday school.[92] It was written for Christians (particularly those "young persons who revere the word of God") who were worried by apparent contradictions between the inspired word and what they knew of modern astronomy.[93] Milner was completely confident that there could be no true contradictions, since the heavens were made by the same deity who revealed himself in the Bible, and he justified this position through by explaining astronomy and its history.[94]

Shortly after this, Milner was asked by London publisher William Orr to write a much broader work, covering geology and geography as well as astronomy. It is unclear whether Orr knew that Milner was also interested in these additional subjects, or whether Milner's enthusiasm resulted from this commission. Originally issued in parts, *The Gallery of Nature; a pictorial and descriptive tour through creation, illustrative of the wonders of astronomy, physical geography, and geology* (1846) was lavishly illustrated with wood-engravings [FIGURE 2], and was revised and reprinted, demonstrating a longevity far beyond most popular illustrated works of its day.[95] The success of the *Gallery of Nature* may have been the reason that Milner was asked to write a short book for the Religious Tract Society. Milner now had several books to his name, one of which was very successful, and he had connections with two major London publishers. He thus had good reason to suppose that writing would provide a viable alternative career. His life as a writer would be marginally easier than Martin's, thanks to some property on which his wife had a life interest, and which provided a small but regular stream of income.[96]

Money and the Professional Science Writer

As scientific writers, Martin and Milner used different tactics, reflective of their personal areas of expertise and their religious convictions. Their decisions about what to write, in what format, and for which publishers or periodicals, had important implications for their earning potential and their literary and scientific reputations. This section concentrates primarily upon the financial aspects, while the final section will examine the less tangible rewards of writing. One of the main differences between them was that Martin wrote exclusively on zoology (from mammals to radiata), while Milner moved between astronomy, geology, geography, history and the occasional biography. Milner was college-trained, and, with access to a decent library, was able to work up his knowledge on a range of different

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subjects. Martin, however, had learned his zoology from practical experience in the museum (and perhaps from his father). He knew the animal world inside out, but he lacked a more general education, and the skills, or maybe the confidence, to venture into new subject areas. Thus, while Milner enterprisingly wrote about Australian geography and natural history shortly after the Victoria gold rush (FIGURE 3), and about the histories of Russia and Turkey during the Crimean War, Martin's works remained remarkably similar in content over his entire writing career.[97] In terms of religion, both men were evangelical Protestants (Martin was Anglican, Milner Congregationalist), and wrote regularly and frequently for the Religious Tract Society (RTS), whose rules insisted that all topics be treated in a Christian tone.[98] But whereas Milner wrote all his works in a Christian tone, and used the RTS as his major publisher, Martin saw the RTS as one publisher among many, and was happy to write in a secular tone for other publishers.

In the 1830s and 1840s, Martin's main publishers were the RTS, the Society for the Diffusion of Useful Knowledge, and (after the latter's demise), Charles Knight. Although these publishers disagreed on the role of the spiritual, they were all committed to the production of cheap instructive works. Martin's choice of publishers, therefore, meant that the majority of his output was periodical articles and short (cheap) introductory books. Milner did also write in these formats, but he was a less prolific periodical contributor than Martin, and when he did write articles, it was usually for the denominational monthly magazines rather than the cheap instructive magazines. In addition, he had his works with Orr, and became a textbook writer, moving from atlases to write school history texts for the RTS. By the mid-1850s, his new connection with the eminent house of Longman indicates an ability to write for the mainstream market as well as for the philanthropic publishers. Writing for Longman meant moderately better pay and more respect as a writer, though it

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also meant a more limited audience. Milner's books with Longman had print runs of just one thousand, whereas his sixpenny RTS books had runs of 15,000 copies.[99]

One of the disadvantages of working for the philanthropic publishers was that rates of pay were not generous – after all, the aim was to issue the publications as cheaply as possible. The RTS and the Society for Promoting Christian Knowledge rarely paid more than £100 or £120 for their very longest works, and for the short works that they issued in great numbers, the payment was much smaller. Martin and Milner were paid just £30 or £35 for the short volumes they both contributed to the RTS series of "Monthly Volumes" in the late 1840s.[100] Back in the 1830s, the SDUK had paid slightly better for its volumes (around the £180 mark), but it sought to attract well-known writers and, after all, was not a commercial success.[101] Textbooks were usually worth more than introductory treatises, and Milner received £160 for his RTS *History of Rome*.[102]

These sums were for the purchase of copyright, an arrangement by which the writer received a fee on publication and had no further rights to the work.[103] The publisher was free to produce as many editions, in whatever format, he wished, and to keep all profits. The clear disadvantage of such a deal was that, if the work happened to be successful enough to go into subsequent editions, the writer benefited only from an enhanced reputation, and not from any further income. Thomas Dick, therefore, who wrote on astronomy for the RTS and other publishers, later bemoaned his decision to sell his copyrights, for he derived "no pecuniary benefit whatsoever from the sale of my works however extensive it may be".[104] Yet, the clear advantage of such a deal was that the writer knew how much he would be paid, and did not have to wait for his money. Better-known writers, who could exert more bargaining power, often had a shared-profits agreement which gave the writer a third or a half share in the

eventual profits (or losses) of the publication. Yet, even once Martin and Milner became better known, they, like Dick, and like most writers of short, popular and instructive works, continued to sell their copyrights. They lived so close to the breadline that they needed immediate income, and could not afford to wait for the profits to be divided.

There was a third possible arrangement between writers and publishers, known as "author's risk". Milner may well have encountered it in his younger days as a writer of sermons. In this case, the publisher acted on commission, with the writer paying all bills and taking all profits. It was a highly risky strategy for a writer, especially as publishers were most likely to propose it for works which experience suggested were unlikely to be profitable. On the other hand, it could occasionally pay off.

In the mid-1840s, Philip Henry Gosse was a school-teacher who wrote for the Society for Promoting Christian Knowledge (SPCK) on history and natural history. He was in a similar position to Milner, and was starting to realize that he could give up teaching and earn his living as a writer.[105] Yet, the success of his work on *The Ocean* (SPCK, 1845) also made him realise that selling copyright was not the best long-term strategy.[106] His first self-published book appeared in 1849, after his return from a collecting trip to Jamaica (and his marriage), and was about the birds of Jamaica. Its detailed observations and illustrations drew critical acclaim, and may have assisted his election to the Linnean Society. It did not bring Gosse a financial profit, but he was sufficiently encouraged to try again. Over the next decade, although he continued to offer books to the SPCK and the publisher Van Voorst, he also issued books at his own risk. He was fortunate to start a trend with his books about the seashore and marine biology. *The Aquarium* (1854) alone brought him a most impressive £818, and he made over £2,000 from the five books he published in the mid-1850s.[107] Such a

publishing strategy, however, was a huge gamble. It worked for Gosse because he was able to produce books on novel subjects, based on his personal observations in Jamaica and on the Devon coast. Martin and Milner's books, in contrast, were like Gosse's earlier publications: solid, worthy, but unlikely to make enough of a splash to bring in a huge profit.

Ascertaining exactly how much Martin and Milner published is not straightforward, since their periodical articles and some of their short books appeared anonymously. Fortunately, in their applications to the Royal Literary Fund, they listed all their major books, most of their short books, and gave some indication of their output for the periodicals [FIGURE 4]. For some of the books, the publishers' archives survive and reveal the payments, but for others, there are no records, and with periodicals, the archives frequently do not record payments for individual articles. Despite these problems, rough estimates of their total annual incomes can be made based on the known rates paid by some publishers and periodicals.[108]

Martin wrote, on average, one periodical article a week over his entire writing career. At a conservative estimate of a pound or two per article, that could bring in £100 a year.[109] In addition, he wrote a variety of short books: for instance, two introductory treatises for Charles Knight in 1845, followed by another four in 1849. Those would add around £50 to his income each year. In the late 1840s, there was usually also one short RTS volume each year, paying him £35. He may, therefore, have earned around £185 a year. In turn, Milner wrote two of the RTS volumes each year, and also produced three textbooks in three years, bringing him a total of around £210 a year in the late 1840s. He would also have written a few periodical articles, and in some years there was also a major work, such as an atlas. Writers'

incomes were clearly highly variable from year to year, but we can reasonably suggest that Martin and Milner were earning between £150 and £250 a year on average.

While not quite up to the amounts suggested by Lewes, but they were not dissimilar to what the men had earned in their former careers. Martin had been able to support himself, his wife and his aged mother on his £100 museum salary plus whatever he made from writing.[110] Becoming a professional writer may have marginally improved his standard of living. Milner told the Royal Literary Fund that his average income while a minister had never been over £150.[111] That he had been able to support his wife and three children on this amount was probably possible only because of his wife's income of £100-£120. Since this continued until his wife's death (by which time the children were self-supporting), his income as a writer would seem to have matched, and sometimes improved upon, his income as a minister.

Martin and Milner were, however, earning only enough to subsist, and were never able to accumulate substantial savings. This not only made it impossible to retire, but could be awkward at times of family illness, or if the book trade slowed. As Martin wrote in 1853, such times could be difficult indeed:

> I could explain to you how, for months + months, I have received no order of any great importance from any publisher – how my days have been spent in restless anxiety, + my nights in mental agony, - until, the body sympathizing with the mind, a terrible malady (spasmodic Asthma) has laid me prostrate.[112]

At times of particular crisis, they both sought grants from the Royal Literary Fund, and it is from their letters on these occasions that so much of their lives can be reconstructed. Martin's wife, Mary Jane, particularly appreciated the grants, and her comment about "ready

money in hand giving great advantage in every kind of purchase" hints at the otherwise unpaid bills.[113]

Martin and Milner's letters to the RLF reveal that the equilibrium of a writer's life could be easily disrupted, and they point particularly to publishers' bankruptcies and illness. Bankruptcy was not uncommon in the mid-nineteenth century, and Martin suffered from it twice, and Milner three times.[114] Writers were usually paid on completion of the manuscript, which left them vulnerable in situations where they had devoted much time to the creation of a work for which no payment was forthcoming. As Milner remarked after Orr's bankruptcy in 1854, "I spent eight months upon the work [an introductory volume to "The British Naturalist" series] – never received a sixpence in advance upon it – contracted a heavy debt for books", and then, "that house failed, and I was ruinously impoverished".[115] Instead of being paid an impressive £250, Milner received nothing. He had no savings on which to fall back, and the only way he could hope to pay his bills and feed his family was by working ever harder.

Fortunately, he had just completed his first book for Longmans (on the Baltic), and had the security of two more books commissioned by the firm.[116] He also proposed an ambitious plan to the RTS for four volumes on the natural history and industries of the British Isles, to be followed by four more on the Empire.[117] By the middle of the following year, he moved his family to a cheaper house.[118] But by this time, the combination of stress and overwork was taking its toll, and his surgeon described him as "suffering from a right hand disabled by incessant activity, and great nervous debility".[119] He continued to write, and in the winter of 1855-56, he had a breakdown "which incapacitated him for literary work".[120] Fortunately, both of his publishers were willing to grant him small cash advances on his

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copyright payments, which enabled him to rest his writing hand and regain his health. By 1856, his health and finances appear to have been perfectly recovered. It is, however, significant that Milner was already relatively well-known in the trade by this point in time. Publishers did not give advances freely or automatically, and it was crucial that Milner was regarded as reliable and trustworthy.

For a writer with few savings, illness was a serious matter, as it prevented him from working and produced medical bills to be paid. Milner's amicable relations with his publishers helped him through his brief period of difficulty. Martin, on the other hand, suffered continual health problems from the mid-1850s until his death in 1864, and although he attempted to work from his sickbed (his wife took dictation), he repeatedly applied to the Literary Fund for financial aid. By 1860, his "complicated disorders" included "heart disease" and asthma, as well as a "gouty affection of the whole system, the head and stomach alternately with the limbs".[121] He was often unable to hold a pen, since his hands "discharge[d] portions of chalk attended with ulceration".[122] Despite Mary Jane Martin's "earnest but weak and most inadequate struggles", she told the Royal Literary Fund that she feared she and her husband "must end in utter destitution".[123] This was not a case of a small advance to tide a struggling writer over until better times, but regular grants to pay the medical bills for a terminal condition, and a final payment to cover funeral bills and make a small provision for the widow.[124] Again, however, the fact that Martin was able to secure these grants was a mark that he was known and respected in the literary world, thanks to his previous three decades of publications.

Unexpected crises, such as illness and publishers' bankruptcies, could cause serious problems for writers. These problems were particularly likely to occur in old age, when it

was difficult to maintain the pace of work that had seemed straightforward in more youthful days. Martin and Milner had little hope of being able to retire, and it is not clear whether even Gosse would have been able to do so. (Gosse's second wife inherited a substantial amount of money in 1864, which distorts the picture.)[125] Tempting though it may be to dwell on the problems of Martin and Milner, the real lesson to be learned from their careers is that it *was* possible to make a sufficient, though never generous, living by science writing in the mid-nineteenth century.

The Fulfilment of Vocation

Writing science might produce a respectable income, but whether it was personally fulfilling depends very much on what each writer believed his vocation to be.[126] Even after retiring from the ministry, Milner remained committed to serving God. He regarded his new life as an alternative method of fulfilling this vocation. He saw his work in much the same terms as a writer in the nonconformist *North British Review* in 1850, who emphasised the potential of popular writing, not merely for earning money, but for helping others. The reviewer reminded his readers that "It is no small thing to influence public opinion – to guide men to light from darkness, to truth from error – to inform the ignorant, to solace the unhappy, to afford high intellectual enjoyment to the few, or healthy recreation to the many." The enlightenment that writers could bring to their readers made authorship a highly responsible undertaking, and, "of all professions, worthily pursued, it is the least selfish".[127] Martin at least partly shared this educational vocation, as we can see from his description of his mission "to impart some degree of information relative to the laws of organic structure and the thence-deduced rules on which the system of Zoology as a science is founded", while "avoiding the 'clap-trap' style" of monotonous repetition of facts.[128] A writer who had this talent for explaining difficult materials was a valuable asset to the cause of popular education.

Some writers might enlighten their readers only in matters of secular knowledge, but the *North British* reviewer implied that they also had an important opportunity to contribute to readers' spiritual development. Writing could be seen as a "literary labour in the cause of Christian truth" or a "ministry of the press".[129] Ideally, a Christian writer was like a minister, sharing the vocation for spreading the gospel but using different media in their work. This combination of factual and spiritual educator was what appealed to Milner. As another nonconformist minister, Thomas Pearson, pointed out, the numerous attempts to supply the masses with "acceptable and yet wholesome and elevating reading" by providing "purely religious publications, in the form of tracts or biographies" had largely failed.[130] Such subject matter was not sufficiently attractive or interesting to appeal to any but committed Christians – and even they might sometimes wish for alternative reading matter. Pearson's recommendation was that a Christian spirit should be blended into popular works on all subjects.[131] Thus, Christians could read about history and science from the safety of a theological worldview; and the unconverted might be tempted to pick up one of Milner's book on caves and caverns, or Australian gold fields, without realising that they would also be exposed to the message of salvation.[132] The expansion of Milner's subject areas, from his early devotional works to his later geology and geography, was a way of carrying out this design, allowing him to bring the Christian message to a much wider variety of readers. Milner was not alone in wishing to combine informative and educational writing on the sciences with a life dedicated to God: Thomas Dick, John George Wood and Charles A. Johns had all been ordained, and Philip Henry Gosse was a Brethren pastor.[133]

Even though he wrote on some of the more controversial scientific subjects of his day, Milner was always confident that there were no contradictions between the findings of science and the teachings of religion, although there could easily be temporary

misconceptions. Writing of the nebular hypothesis in 1843, he assured his readers that "there is nothing […] in the hypothesis, if it were proved to be true, that need disquiet the religious mind".[134] He maintained that it involved "no new principle under the sun", and that the action of God was as obvious in a gradual developmental scheme of creation as in the older idea of instant creation.[135] The same argument appeared in the *Gallery of Nature*, despite the notoriety that the nebular hypothesis had gained in the intervening years through its inclusion in the *Vestiges of the Natural History of Creation* (1844).[136] Similarly, Milner's geological writings accepted the evidence for progressive development of the earth, and saw no problem in reconciling that with faith.[137] Acceptance of gradual progressive development would not involve a rejection of the God of the Bible, but a re-imagining of his creative acts as recorded in Genesis. Some popular works might present the latest scientific discoveries as evidence of atheism and materialism, but Milner's approach placed the sciences firmly in a Christian framework.[138]

The manner in which Milner constructed that Christian framework depended upon the publisher for whom he was working and the intended audience. With RTS books, he was quite explicit in the introduction and conclusion that the earth was God's creation and should be studied as such. He also carefully inserted a religious moral at the end of each chapter of his RTS work on *Caves of the Earth* (1847, 6*d*.). In the *Gallery of Nature*, on the other hand, the Christianity was far more muted, and limited to occasional passing references to Providence and the Creator. True to his vocation, however, the Christian tone was always present.[139] In contrast, although Martin was clearly comfortable writing in a Christian tone (his RTS works often used the Bible as a source of useful information about the early domestication of animals, or primitive methods of catching fish[140]), he was also happy to write for Charles Knight, with no mention of religion whatsoever.

Whereas Martin had contacts in the learned world of natural history, and clearly wished to be more closely involved, Milner's letters give no such hint of dissatisfaction with his role as a writer. Indeed, he seems to have cultivated literary (and probably religious) contacts, rather than scientific ones. His only known connection to more learned circles came with his election to the Royal Geographical Society in 1849.[141] This was probably a consequence of his most recent work, the *Descriptive Atlas of Astronomy and Physical and Political Geography* (Orr, 1849), which, although covering similar ground to the *Gallery of Nature*, made more of an impression on scholarly critics. By the early 1850s, Milner's longer works typically carried not only his name but also the credentials, "MA, FRGS" (FIGURE 5). Although the *Gallery* and the *Descriptive Atlas* had carried his name, his earlier RTS works had been anonymous. The change suggests that he had acquired a reputation as a sound writer of reference works and textbooks, and that his name might now carry some authority on the title-page. Gosse had a similar experience after his election to the Royal Society in 1856, which gave him a status that he (as a writer with no university affiliation) had previously lacked.[142] However, as Martin had already discovered (at the Linnean Society), such an election was not a simple recognition of achievement.[143] The credentials were welcome, but they were an expensive luxury, and were quick to go in times of financial need. Milner commented in 1855 that, "Though I append FRGS to my name, I am not strictly entitled to it, as my subscription is in arrears for that space of time which disqualifies me."[144]

Although Martin shared Milner's evangelical faith, he was less satisfied with a vocation solely as a popular educator. He cherished an ambition to join the circles of learned natural history. While at the Zoological Society, he had been able to do some original research and contribute to taxonomic debates, and throughout his life, he hoped to return to that world. His lower social class was always going to make this difficult, just as it had

prevented him getting the curatorship at the museum, but the barriers were not insuperable. This was clearly illustrated by the success of his former assistant, John Gould, who went on to become a Fellow of the Royal Society, and twice Vice-President of the Zoological Society.

Gould and Martin were both from lowly social backgrounds, although Martin seems to have had a better education than Gould, who needed the services of a secretary all his life.[145] Both had wives who assisted their careers, with Mary Jane Martin's writing and Elizabeth Gould's illustrations. Both were helped by acquaintances at the Zoological Society, including Nicholas Vigors (who shared Gould's enthusiasm for birds, and introduced Martin to both the SDUK and the Linnean Society).[146] And both entered the publishing world in the early 1830s, and hoped to use it to further their careers. While Martin secured commissions from publishers for introductory treatises and textbooks, Gould self-published ambitious, lavishly-illustrated works on hitherto unknown bird species.[147] Gould was fortunate, for his daring strategy worked incredibly well, and funded the trip to Australia which made his name. In contrast, Martin took the safer option, perhaps hoping that his position as superintendent of the museum would ultimately lead to better things.

When Martin's museum prospects fell through, writing was his only remaining hope for achieving his ambition. The knowledge he had acquired during his years at the Zoological Society served him well, but writing became such a time-consuming occupation that he had no opportunity for original research. (Contrast Gosse, whose first wife's small inheritance meant he did not need to be constantly writing.[148]) By the early 1850s, Martin found himself hanging on to Gould's coat-tails, as he tried to interest publishers in articles or books on humming birds to coincide with the display of Gould's magnificent collection at the Zoological Gardens.[149] The tone of the references which his former associates from the

Zoological Society, including Owen, Waterhouse and Gould, continued to write for him make it clear that, while they respected his work, they did not regard Martin as one of themselves. Gould explained that his works were "duly estimated by Professor Owen, Dr. Gray, and indeed everyone in the same walk of science who may be considered competent judges of their merit."[150] Owen wrote that Martin "has been most industriously and honorably occupied in diffusing sound scientific information, in Zoology".[151] Those solid adjectives were mirrored by Martin himself, when he referred to his works as "not brilliant" but having a "plain utility".[152]

From the beginning of his writing career, Martin had worked for publishers whose aim was to educate and improve the working classes. Writing for such periodicals as the SDUK's *Penny Magazine* and the RTS's *Leisure Hour*, Martin was well-aware that he was writing educational material for a popular audience, and not the sort of works which would gain him recognition by the learned elites. His *A general introduction to the natural history of mammiferous animals* (1841), commissioned by Whitehead but ultimately published by Wright & Co, had been a different matter and aimed at a far more educated audience.[153] But although it was based on his firsthand experience in the museum, it did not incorporate significantly new findings. As far as is known, Martin never travelled outside England, so he could not produce anything similar to Gould's works on Australian birds, or Gosse's on Jamaican birds. Nor did he ever have the luxury of enforced idleness which enabled a recuperating Gosse to discover the tiny creatures of the sea-shore. Martin's expertise was in museum-based taxonomy – which Gosse found to be a dry and distorted study[154] – and not in the close observation of living creatures which was becoming so desirable. Certainly, the *Introduction to… mammiferous animals* does not appear to have brought Martin much attention from the learned. His grandest book, in terms of scope, was *The Pictorial Museum*

of Animated Nature (anon., Knight, 1848-49), whose two thick quarto volumes covered the entire animal kingdom. [FIGURE 6] Yet this was an illustrated three-penny part-work issued by Charles Knight, and firmly in the vein of popular education.[155] Many of Martin's other works re-used material from these two synoptic works: he wrote histories of the dog and the horse for Charles Knight's "Weekly Volume" series (both 1845) and histories of the ox, sheep and hog for Knight's "Farmer's Library" series (1849); as well as short works on song birds, domestic fowl and fish for the RTS "Monthly Series" (1846, 1847, 1849); and on the farmyard animals for George Routledge's "Books for the Country" (1852).

By working for these publishers, and writing these sorts of publications, Martin was praised by his referees for producing "wholesome popular literature" – but not for making original contributions to natural history. Martin showed that he was aware of this when he described his aim as being "to teach the principles of zoology popularly yet on a truthful basis".[156] As his health declined and he became more depressed about his financial situation and the difficulty of gaining a scientific reputation, it was some comfort to discover "that my labours were not unappreciated, even by the learned".[157] Nevertheless, while clearly disappointed, Martin did keep going and made a success of his new career, in contrast to another former employee of the Zoological Society, the veterinary writer William Youatt, who sought the solution to his financial difficulties in prussic acid.[158] Martin had achieved a sound reputation in the book trade, and was known as a reliable writer of introductory works. He was also respected by more learned scholars, who appreciated that he wrote popular works from a basis of practical hands-on experience, unlike those writers who gained all their knowledge second-hand from books. For Milner, such as acknowledgement would have been enough, but for Martin, it was not equivalent to the reputation he had once hoped for as a man of science.

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The existing accounts of the activities of scientific writers have been focused more upon the works produced than upon the experiences of those who wrote them, largely because of the availability of historical evidence. Where we do have some evidence for the rewards and pleasures of scientific authorship, it tends to be for the well-known men of science who found it a useful supplementary income, or, in the later nineteenth century, for successful professional popularisers. The letters of William Martin and Thomas Milner open a window on a different set of mid-century writers, revealing the standard of living it was possible to achieve, as well as the pitfalls that lay in the way. The emphasis on everyday life reminds us that science writing, as much as science itself, had its practical side. Equally, the emphasis on vocation reminds us that, although men of science might dismiss popular writers as "booksellers' hacks", the writers themselves had different opinions about the value of their work. It is important not to take at face-value the assessment of men of science who had a vested interest in claiming to be able to make a clear distinction between themselves and popular writers. We need to consider the writers' own accounts of themselves, and remember that they could see themselves as "conscientious workmen" in the cause of science, education, and perhaps religion.

In the early nineteenth century, William Martin's dream that natural history writing for a general audience might be a route to a museum job, recognition from other learned men of science, and perhaps even an FRS, was a possibility, albeit not very likely. But by the middle of the century and beyond, the changing situation with regard to expertise and professionalisation in the sciences made Martin's dreams well-nigh impossible. Rather than some vaguely defined "recognition" and an FRS, the goal for young men of a scientific bent

had become a job in a university or government institution, and it was to be achieved through the publication of original research, and, ideally, a scientific university education. The kinds of writings produced by Martin remained an acceptable means of paying bills until a proper job came along, but they were not going to help secure such a job. Lacking in social status and education, and lacking in time and opportunity to pursue original research, Martin did well to gain a reputation as a producer of wholesome popular science literature, even though – with the example of John Gould in mind – Martin himself found it difficult to see things that way.

William Martin and Thomas Milner were writing at a time when the professions of science and of literature (let alone of science populariser) were still being negotiated. They are typical of a group of relatively unknown writers of cheap, introductory informative works, who worked for publishers committed to the cause of education and self-improvement. Working for such publishers did not pay lavishly, but it could mean regular work, and it could also mean a chance to educate large numbers of lower-middle and working class readers. Books written by well-known men of science and published by respected literary publishing houses might be talked about more in society, and reviewed far more widely in the periodical press, but it was the writers for the popular press who had the real opportunity to influence. Men of science might fear that these writers would mislead, due to their presumed lack of scientific expertise, but in so doing, they failed to appreciate that a different sort of expertise was required.

In the terms of their day, Martin and Milner were both professionals. Whether being a professional writer on the sciences was a respectable or high-status occupation depended on your perspective. Both men were well-respected for their literary expertise, though their

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claims to scientific expertise were much weaker. Yet, despite the rhetoric associated with *Vestiges*, which would dismiss all generalist writings as being "merely popular", there are hints that, underneath, men of science did recognise the existence of "wholesome popular literature", and respected its writers. Martin's works could be praised as well-written, and based on his firsthand experiences in the museum; while Milner's showed a respect for scientific authority and a careful, rather than slap-dash, use of secondary sources. Particularly in the way that Martin's works were described by his referees, it is apparent that there was respect in the scientific community for those who could convey the facts of science intelligently and conscientiously, which the violent outbursts over *Vestiges* have hidden. Later in the century, these "conscientious workmen" would be more widely recognised and their usefulness praised, when the scientific community started to take for granted the existence of scientific popularisers. By that time, however, attitudes to the functions of research writing as against generalist writing had changed so much from Forbes's youthful days, that the sort of transformation Martin had hoped to achieve through his writings was no longer conceivable. Rather, the successful populariser was one who shared Milner's enthusiasm and conviction that being an educator was in itself a worthy vocation.

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Figure Captions

Figure 1. This illustrated article on the puma was one of many written by William Martin for the Religious Tract Society's half-penny *Weekly Visitor*, in his early years as a writer (16 July 1833, p.257). It was signed "M". In the text (p.258), he notes that the Zoological Society (his employers) possessed a breeding pair of pumas, which could be viewed at their Menageries.

Figure 2. The Trolhetta Falls, Sweden, one of the wood-engravings in the chapter on rivers in Thomas Milner's *Gallery of Nature* (1846), p. 285.

Figure 3. Milner wrote a series of articles on Australia in autumn 1852, for the Religious Tract Society's *Leisure Hour* (weekly, 1*d*.). After dealing with the critical issues of the voyage and the gold diggings, he went on in this article, to describe the agricultural prospects of the country (19 August 1852, p. 529). Articles in a later series described the flora and fauna.

Figure 4. Applicants to the Royal Literary Fund had to fill out a standard form, write a covering letter, and ask referees to send letters directly to the Fund's secretary. This form is from the occasion of Martin's first application to the Fund, in April 1853. Notice his description of his profession as "zoologist"; his admission that his cause of distress was having "no permanent source of income"; and the list of his works. On this application form, Martin listed only his books, but on later forms, he added periodical articles. (Royal Literary Fund archives, file 1315, item 1.)

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Figure 5. Although Milner's earlier Religious Tract Society works had been anonymous, by the time that the *Universal Geography* was published in 1850, his reputation as a reliable geographical writer had developed to the extent that his name and credentials appeared on the title-page of his works. This particular work appeared as part of the series of school textbooks issued by the Society, for which Milner also wrote histories of Rome and England.

Figure 6. Although published anonymously by Charles Knight, the *Pictorial Museum of Animated Nature* (1848-49) was claimed by Martin in his applications to the Royal Literary Fund (see Figure 1), and attributed to him in Knight's own memoirs. It was the grandest of Martin's works, in terms of scope and illustrations. No fewer than half of the pages were filled with images. As the text of the title-page announcement makes clear, however, it was a cheap part-work aimed at educating children and the lower-middle classes, and enhanced his reputation as a popular writer rather than a man of science.

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[1] Brewster to Forbes, 11 February 1830, quoted in John Campbell Shairp, Peter Guthrie Tait, and A. Adams-Reilly, *Life and Letters of James David Forbes, FRS*, (London: Macmillan, 1873), p. 59.

[2] William H. Brock, "Brewster as Scientific Journalist", in Alison Morison-Low and John R. R. Christie (eds.), *'Martyr of Science': Sir David Brewster, 1781-1863; Proceedings of a Bicentennial Symposium*, (Edinburgh: Royal Scottish Museum, 1984), pp. 37-44.

[3] On writing as a way of communicating research to other specialists, see Alan G. Gross, Joseph E. Harmon, and Michael S. Reidy, *Communicating Science: The Scientific Article from the Seventeenth Century to the Present*, (New York: Oxford University Press, 2002); Greg Myers, *Writing Biology: Texts in the Social Construction of Scientific Knowledge*, (Madison, WI: University of Wisconsin Press, 1990); Jan Golinski, *Making Natural Knowledge: Constructivism and the History of Science*, (Cambridge: Cambridge University Press, 1998), Ch. 4; Charles Bazerman, *Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science*, (Madison: University of Wisconsin Press, 1988).

[4] On Huxley's writing at this time, see Adrian Desmond, *Huxley: The Devil's Disciple*, (London: Michael Joseph, 1994), Chs. 9-10.

[5] I thank Jim Secord for sharing his thoughts on science, conversation and polite society.

[6] Gould's rise is described in Isabella Tree, *The Ruling Passion of John Gould: A Biography of the Bird Man*, (London: Barrie and Jenkins, 1991). See also Gordon C. Sauer, *John Gould, the Bird Man: A Chronology and Bibliography*, (London: Henry Sotheran, 1982).

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[7] Gosse's reputation later suffered from his publication of *Omphalos* (1857). Ann Thwaite, *Glimpses of the Wonderful: The Life of Philip Henry Gosse 1810-1888*, (London: Faber, 2002).

[8] The frustrations of trying to make a living from science in the 1840s and 1850s are apparent in the case of the Geological Survey men, in James A. Secord, *Victorian Sensation: The Extraordinary Publication, Reception and Secret Authorship of Vestiges of the Natural History of Creation*, (Chicago: University of Chicago Press, 2000), Ch. 14.

[9] Forbes's choice of a profession is discussed in Shairp, Tait, and Adams-Reilly, *Life and Letters of Forbes*, Ch. 4.

[10] Gosse was self-employed during his trip to Jamaica, but he had an arrangement with a London dealer for the purchase of his specimens, see Thwaite, *Glimpses of the Wonderful*, pp. 121-43.

[11] On Somerville, see James A. Secord, (ed.) *The Collected Works of Mary Somerville*. 9 vols, (Bristol: Thoemmes, 2004), introductions to vols 1-3.

[12] Buckland to Peel, 12 January 1842, quoted in Nicolaas Rupke, *Richard Owen: Victorian Naturalist*, (New Haven: Yale University Press, 1994), p. 52. The role of patronage in Owen's social rise is charted by Rupke, Chs. 1-2.

[13] For instance, Richard Yeo, "Science and Intellectual Authority in Mid-Nineteenth Century Britain: Robert Chambers and *Vestiges of the Natural History of Creation*", *Victorian Studies*, 1984, *28*: 5-31; Secord, *Victorian Sensation*, esp. Chs. 7 & 12. I am here using "popular science" to refer to a genre of scientific publications, and not, for instance, to

science as practised by members of the working classes (on the various meanings of "popular science", see Roger Cooter, and Stephen Pumfrey, "Separate Spheres and Public Places: Reflections on the History of Science Popularisation and Science in Popular Culture", *History of Science*, 1994, *32*: 237-267).

[14] [David Masson], "Present Aspects and Tendencies of Literature", *British Quarterly Review*, 1855, *21*: 157-181, at p.167.

[15] On professionalisation, see Harold Perkin, *The Origins of Modern English Society, 1780-1880*, (London: Routledge, 1969); T. W. Heyck, *The Transformation of Intellectual Life in Victorian England*, (London: Croom Helm, 1982). In science, see Roy Porter, "Gentlemen and Geology: The Emergence of a Scientific Career, 1860-1920", *Historical Journal*, 1978, *21*: 809-836; Joseph Ben-David, *The Scientist's Role in Society: A Comparative Study*, Reprint ed, (London: University of Chicago Press, 1984). In authorship, see John Sutherland, *Victorian Novelists and Publishers*, (London: Athlone Press, 1976); Victor Bonham-Carter, *Authors by Profession*, (London: Society of Authors, 1978); Nigel Cross, *The Common Writer: Life in Nineteenth-Century Grub Street*, (Cambridge: Cambridge University Press, 1985).

[16] For instance, [George Henry Lewes], "The Condition of Authors in England, Germany and France", *Fraser's Magazine*, 1847, *35*: 285-295; [J. W. Kaye], "Pendennis: The Literary Profession", *North British Review*, 1850, *13*: 335-372; "Authors and Publishers [1]", *New Quarterly Review*, 1854, *3*: 9-17.

[17] [Lewes], "Condition of Authors", p. 285. Having defined a literary professional as one who lived by his writing, the next issue was whether authorship was a profession like other

professions, given that it lacked entry qualifications, and its practitioners had no shared group identity.

[18] A list of the surviving British publishers' archives can be found in Alexis Weedon, and Michael Bott, *British Book Trade Archives 1830-1939*, (History of the Book - on Demand Series, 1996).

[19] Full bibliographies for both writers can be found in Ch. 6 of Aileen Fyfe, *Science and Salvation: Evangelicals and Popular Science Publishing in Victorian Britain*, (Chicago: University of Chicago Press, 2004), which discusses their religious motivations in detail.

[20] Cross, *Common Writer*, Ch. 1. The archive has been published by World Microfilms; see Nigel Cross, *The Royal Literary Fund 1790-1918: An Introduction to the Fund's History and Archives, with an Index of Applicants*, (London: World Microfilms Publications, 1984).

[21] On scientific involvement in the RLF, particularly before the foundation of the Scientific Relief Fund in 1859, see Cross, *Common Writer*, 55-58.

[22] The question of the representativeness of the RLF applicants is discussed in Cross, *Common Writer*, pp. 3-4.

[23] For example, Andrew Pickering, (ed.) *Science as Practice and Culture*, (Chicago: University of Chicago Press, 1992).

[24] This argument has been made more extensively in Fyfe, *Science and Salvation*, Ch. 5.

[25] On the transformation of the book trade, see John Feather, *A History of British Publishing*, (London: Routledge, 1988), Ch. 11; Simon Eliot, *Some Patterns and Trends in British Publishing 1800-1919*, (London: The Bibliographic Society, 1994); Aled Jones, (ed.) *Powers*

of the Press: Newspapers, Power and the Public in Nineteenth-Century England, (Aldershot: Scolar, 1996); Alexis Weedon, *Victorian Publishing: The Economics of Book Production for a Mass Market, 1836-1916*, (Aldershot: Ashgate, 2003). On the mass media, see James Curran, and Jean Seaton, *Power without Responsibility: The Press and Broadcasting in Britain*, Fourth ed, (London: Routledge, 1991). American literacy followed different patterns from British literacy; but the American book trade benefited from the same changes in printing technologies in the first half of the nineteenth-century. Higher literacy rates meant that the impact of these new technologies was more immediate than in Britain. See Richard D. Brown, *Knowledge Is Power: The Diffusion of Information in Early America, 1700-1865*, (New York: Oxford University Press, 1990); Ronald J. Zboray, *A Fictive People: Antebellum Economic Development and the American Reading Public*, (New York: Oxford University Press, 1993).

[26] I would hardly deny that non-technical expository works on the sciences existed before the mid-nineteenth century; but I would argue that these works were not "popular" in the full sense of the word (and could not be until the eighteenth-century public sphere was transformed into the nineteenth-century mass audience).

[27] On the etymology of "popular" and "popular science", see the *Oxford English Dictionary*, "popular", meaning 4.a). The OED's first recorded usage of "popular science" is from 1841. On changing meanings of "popular" and "the people", see Morag Shiach, *Discourse on Popular Culture: Class, Gender and History in Cultural Analysis, 1730 to the Present*, (Cambridge: Polity Press, 1989) pp.1-34.

[28] Victor E. Neuburg, *Popular Literature: A History and a Guide*, (Harmondsworth: Penguin, 1977), Chs. 3 and 4.

[29] Contemporaries were slow to realise that the lower-middle classes (rather than the working classes) were the key beneficiaries of cheaper print. Although the working classes began to form part of the reading audience from mid-century, print cannot be considered universally available until the very late nineteenth century. On working-class reading audiences, see R. K. Webb, *The British Working Class Reader, 1790-1848: Literacy and Social Tension*, (London, 1955); Richard D. Altick, *The English Common Reader; a Social History of the Mass Reading Public, 1800-1900*, (London: University of Chicago Press, 1957); Jon P. Klancher, *The Making of English Reading Audiences, 1790-1832*, (Madison: University of Wisconsin Press, 1987), Ch. 3; Patrick Joyce, *Visions of the People: Industrial England and the Question of Class, 1848-1918*, (Cambridge: Cambridge University Press, 1991), Chs. 10-11.

[30] John Brewer, *The Pleasures of the Imagination: English Culture in the Eighteenth Century*, (London: Harper Collins, 1997), Chs. 3-4.

[31] Before 1774, books in England remained perpetually in copyright, despite a 1710 Act to the contrary. John Feather, "The Publishers and the Pirates: British Copyright-Law in Theory and Practice, 1710-1775", *Publishing History*, 1987, *22*: 5-32; John Feather, *Publishing, Piracy and Politics*, (London: Mansell, 1995), Ch. 3; Richard D. Altick, "From Aldine to Everyman: Cheap Reprint Series of the English Classics, 1830-1906", *Studies in Bibliography*, 1958, *11*: 3-25. On reading in the late eighteenth and early nineteenth centuries, see William St Clair, *The Reading Nation in the Romantic Period*, (Cambridge: Cambridge University Press, 2004).

[32] Publishers sometimes employed an editor to abridge or update a reprinted work.

[33] Jonathan R. Topham, "John Limbird, Thomas Byerley, and the Production of Cheap Periodicals in Regency Britain", forthcoming.

[34] Figures for 1801-10 suggest that the sciences comprised 3.47% of all titles published by the British book trade, rising to 4.36% by the 1840s, see Simon Eliot, "*Patterns and Trends* and the *NSTC*: Some Initial Observations, Part II", *Publishing History*, 1998, *43*: 71-112, table E. Weedon, *Victorian Publishing*, pp.90-93, discusses the change in market share of science and other subjects, and compares the typical print runs in the various categories. A very rough subject analysis for the eighteenth century may be found in John Feather, "British Publishing in the Eighteenth Century: A Preliminary Subject Analysis", *Library*, 1986, *6th series, 8*: 32-46. For the early-nineteenth century scientific book trade, see Jonathan R. Topham, "Scientific Publishing and the Reading of Science in Early Nineteenth-Century Britain: An Historiographical Survey and Guide to Sources", *Studies in History and Philosophy of Science*, 2000, *31A*: 559-612.

[35] On science for women, see Marina Benjamin, "Elbow Room: Women Writers on Science, 1790-1840", in Marina Benjamin (ed.), *Science and Sensibility: Gender and Scientific Enquiry, 1780-1945*, (Oxford, 1991), pp. 27-69; Ann B. Shteir, *Cultivating Women, Cultivating Science: Flora's Daughters and Botany in England 1760-1860*, (London: John Hopkins University Press, 1996), Chs. 1-3; Bernard Lightman, Introduction to Bernard Lightman, *Science Writing by Women*, (Bristol: Thoemmes Press, 2004). On science for children, see James A. Secord, "Newton in the Nursery: Tom Telescope and the Philosophy of Tops and Balls, 1761-1838", *History of Science*, 1985, *23*: 127-151; Aileen Fyfe, "Reading Children's Books in Eighteenth-Century Dissenting Families", *Historical Journal*, 2000, *43*: 453-474; Aileen Fyfe, "Young Readers and the Sciences", in Marina Frasca-Spada and

Nicholas Jardine (eds.), *Books and the Sciences in History*, (Cambridge: Cambridge University Press, 2000), pp. 276-290; Aileen Fyfe, Introduction, *Science for Children*, (Bristol: Thoemmes Press, 2003). On the growth of the scientific book trade, see Meadows, (ed.) *Development of Science Publishing*; Andrew Hunter, (ed.) *Thornton and Tully's Scientific Books, Libraries and Collectors: A Study of Bibliography and the Book Trade in Relation to the History of Science*. 4th ed, (Aldershot: Ashgate, 2000).

[36] On audiences for science in the early-mid eighteenth century, see Simon Schaffer, "Natural Philosophy and Public Spectacle in the Eighteenth Century", *History of Science*, 1983, *21*: 1-43; Larry Stewart, "Public Lectures and Private Patronage in Newtonian England", *Isis*, 1986, *77*: 47-58.

[37] Ann B. Shteir, Introduction to Priscilla Wakefield, *Mental Improvement: or, the beauties and wonders of nature and art*, (1794-97, repr. East Lancing, MI: Colleagues Press, 1995); Shteir, *Cultivating Women*, Ch. 4.

[38] David Knight, "Accomplishment or Dogma: Chemistry in the Introductory Works of Jane Marcet and Samuel Parkes", *Ambix*, 1986, *33*: 94-98; M Susan Lindee, "The American Career of Jane Marcet's *Conversations on Chemistry*, 1806-1853", *Isis*, 1991, *82*: 8-23; Shteir, *Cultivating Women*, Ch. 4; Greg Myers, "Fictionality, Demonstration, and a Forum for Popular Science: Jane Marcet's *Conversations on Chemistry*", in Barbara T. Gates and Ann B. Shteir (eds.), *Natural Eloquence: Women Reinscribe Science*, (Madison WI: University of Wisconsin Press, 1997), pp. 43-60; Saba Bahar, "Jane Marcet and the Limits to Public Science", *British Journal for the History of Science*, 2001, *34*: 29-49; Aileen Fyfe, Introduction to Jane Marcet, *Conversations on Chemistry*, (1806, repr. Bristol: Thoemmes Press, 2004).

[39] On Smith and Fitton, see Shteir, *Cultivating Women*, Chs. 3-4.

[40] Joyce was unusual, at this time, in earning his living solely from writing (but not just on the sciences) for the final fifteen years of his life, see John R. Issitt, "The Life and Work of Jeremiah Joyce", PhD, The Open University, 2000. On Dick, see William J. Astore, *Observing God: Thomas Dick, Evangelicalism, and Popular Science in Victorian Britain and America*, (Aldershot: Ashgate, 2001). For Gregory, see his entry in Bernard Lightman, (ed.) *Biographical Dictionary of Nineteenth-Century British Scientists*. 4 vols, (Bristol: Thoemmes, 2004).

[41] 1,750 science books were published in the decade 1801-10, according to Eliot, "Patterns and NSTC 2", table E. This estimate is based upon Dewey decimal classifications, and must be considered a very approximate estimate.

[42] The identification is a guess, but seems probable. Adam Black to W. L. Alexander c.1831, quoted in James Ross, *W. Lindsay Alexander, DD, LLD: His Life and Work, with Illustrations of His Teaching*, (London: James Nisbet & Co, 1887), 43. On Brewster, see Brock, "Brewster as Scientific Journalist"; Mrs Gordon, *The Home Life of Sir David Brewster*, (Edinburgh, 1869).

[43] Cross, *Common Writer*, p.3.

[44] On literacy statistics, see R. S. Schofield, "Dimensions of Illiteracy in England, 1750-1850", in Harvey J. Graff (ed.), *Literacy and Social Development in the West: A Reader*, (Cambridge: Cambridge University Press, 1981), pp. 201-213; also Weedon, *Victorian Publishing*, pp.50-51. On literacy, see Schofield, "Dimensions of Illiteracy"; David Vincent, *Literacy and Popular Culture: England 1750-1914*, (Cambridge: Cambridge University

Press, 1989); David F. Mitch, *The Rise of Popular Literacy in Victorian England: The Influence of Private Choice and Public Policy*, (Philadelphia: University of Pennsylvania Press, 1992); David Vincent, *The Rise of Mass Literacy: Reading and Writing in Modern Europe*, (Oxford: Polity Press, 2000). On school education, see W. Stewart, and W. P. McCann, *The Educational Innovators 1750-1880*, (London, 1967); T. W. Laquer, *Religion and Respectability: Sunday Schools and Working-Class Culture, 1780-1850*, (New Haven, 1976).

[45] For a general overview, see Feather, *British Publishing*, pp. 129-79. On the specific cost implications of these changes, see Weedon, *Victorian Publishing*, Ch. 3. On the technologies, see Philip Gaskell, *A New Introduction to Bibliography*, (Oxford: Clarendon, 1972); Michael Twyman, *Printing 1770-1970: An Illustrated History of Its Development and Uses in England*, (London: British Library, 1999).

[46] Copyright protection had become 42 years, or the life of the author, in 1842. Mark Rose, *Authors and Owners: The Invention of Copyright*, (London: Harvard University Press, 1993); Feather, *Publishing, Piracy and Politics*, Chs. 5-6.

[47] J. N. Hays, "Science and Brougham's Society", *Annals of Science*, 1964, *20*: 227-241; Harold Smith, *The Society for the Diffusion of Useful Knowledge, 1826-46*, (Halifax, NS: Dalhousie University Press, 1974); Scott Bennett, "Revolutions in Thought: Serial Publication and the Mass Market for Reading", in J. Shattock and M. Wolff (eds.), *The Victorian Periodical Press*, (Leicester, 1982); David Vincent, *Bread, Knowledge and Freedom: A Study of Nineteenth-Century Working Class Autobiography*, (London: Methuen, 1982), Ch. 7; Patricia Anderson, *The Printed Image and the Transformation of Popular Culture 1790-1860*, (Oxford: Clarendon Press, 1991), Ch. 2; Jonathan R. Topham, "Science

and Popular Education in the 1830s: The Role of the *Bridgewater Treatises*", *British Journal for the History of Science*, 1992, *25*: 397-430

[48] Sondra Miley Cooney, "Publishers for the People: W. & R. Chambers - the Early Years, 1832-50", Ph.D., Ohio State University, 1970; Robert Scholnick, "'The Fiery Cross of Knowledge': *Chambers's Edinburgh Journal*, 1832-43", *Victorian Periodicals Review*, 1999, *32*: 324-358.

[49] Aileen Fyfe, "Commerce and Philanthropy: The Religious Tract Society and the Business of Publishing", *Journal of Victorian Culture*, 2004, *9*: 164-188.

[50] Little has yet been written on the science works of the SPCK, but see Topham, "Science and Popular Education"; William K. L. Clarke, *A History of the SPCK*, (London: SPCK, 1959).

[51] Geoffrey Cantor, Gowan Dawson, Graeme Gooday, Richard Noakes, Sally Shuttleworth, and Jonathan R. Topham, *Science in the Nineteenth-Century Periodical*, (Cambridge: Cambridge University Press, 2004), introduction.

[52] On religious magazines, and their science content, see Jonathan R. Topham, "Science, Natural Theology and the Practice of Christian Piety in Early Nineteenth-Century Religious Magazines", in Geoffrey Cantor and Sally Shuttleworth (eds.), *Science Serialized: Representations of the Sciences in Nineteenth-Century Periodicals*, (Cambridge MA: MIT Press, 2004), pp. 37-66; Jonathan R. Topham, "The *Wesleyan-Methodist Magazine* and Religious Monthlies in Early Nineteenth-Century Britain", in Geoffrey Cantor, Gowan Dawson, Graeme Gooday, et al. (eds.), *Science in the Nineteenth-Century Periodical*, (Cambridge: Cambridge University Press, 2004), pp. 67-90. On the penny magazines, see

Anderson, *Printed Image*, Chs. 2, 3 & 5. By mid-century, some penny magazines reached circulations of half a million a week.

[53] These changes are discussed in Secord, *Victorian Sensation*, Ch. 2; Fyfe, *Science and Salvation*, Ch. 1.

[54] For statistical analysis of the British book trade, see the work of Simon Eliot: Eliot, *Patterns and Trends*; Simon Eliot, "Some Trends in British Book Production, 1800-1919", in John O. Jordan and Robert L. Patten (eds.), *Literature in the Market Place: Nineteenth-Century British Publishing and Reading Practices*, (Cambridge: Cambridge University Press, 1995), pp. 19-43; Simon Eliot, "*Patterns and Trends* and the *NSTC*: Some Initial Observations, Part I", *Publishing History*, 1997, *42*: 79-104; Eliot, "Patterns and NSTC 2". See also Weedon, *Victorian Publishing*. For a comparison between periodical and book output, see Cantor, Dawson, Gooday, Noakes, Shuttleworth, and Topham, *Science in the Nineteenth-Century Periodical*, p.10, figure 1.2.

[55] For the increase in numbers of titles, see Eliot's works already mentioned. Weedon provides print-run data, but her first figures are only from 1836. Average print runs at mid-century were over 2500, compared with the run of 1000 usually assumed to be typical prior to the introduction of steam-printing. Weedon, *Victorian Publishing*, 49.

[56] On the "Family Library", see Scott Bennett, "John Murray's Family Library and the Cheapening of Books in Early Nineteenth-Century Britain", *Studies in Bibliography*, 1976, *29*: 139-166. On the ISS, see Roy M. MacLeod, "Evolutionism, Internationalism and Commercial Enterprise in Victorian Britain: The International Scientific Series 1871-1910", in A. J. Meadows (ed.), *The Development of Science Publishing in Europe*, (Amsterdam:

Elsevier, 1980), pp. 63-93; Leslie Howsam, "An Experiment with Science for the Nineteenth-Century Book Trade: The International Scientific Series", *British Journal for the History of Science*, 2000, *33*: 187-207.

[57] [John Crosse], "Review of *Kosmos* and *Vestiges*", *Westminster Review*, 1845, *44*: 152-202, p.153 (which accuses Mary Somerville, as well as John Herschel and William Whewell).

[58] Murray's "Family Library" (1830s) and "Home and Colonial Library" (1840s) were both mid-priced series. His "Reading for the Rail" (1851-3) did offer shilling volumes, but was even more short-lived than the other series.

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

[60] More details on these writers can be found in their entries in Lightman, (ed.) *Biographical Dictionary*.

[61] On the prevalence of minister-writers at the Religious Tract Society, see Fyfe, *Science and Salvation*, Chs. 5-6. On school-teacher-writers at Chambers, see Cooney, "Publishers for the People", pp.175-81.

[62] More details on these writers can be found in their entries in Lightman, (ed.) *Biographical Dictionary*.

[63] On anonymous writing, see Robert J. Griffin, "Anonymity and Authorship", *New Literary History*, 1999, *30*: 877-895; Robert J. Griffin, (ed.) *The Faces of Anonymity: Anonymous and Pseudonymous Publication from the Sixteenth to the Twentieth Century*, (London: Palgrave, 2003).

[64] On writing as a possible route for social mobility, see Cross, *Common Writer*, Ch. 4; Fyfe, *Science and Salvation*, Ch. 5.

[65] This group of full-time science writers expanded in the later nineteenth-century, and their names became more well-known than those of the mid-century group. See Bernard Lightman, "'The Voices of Nature': Popularising Victorian Science", in Bernard Lightman (ed.), *Victorian Science in Context*, (Chicago: University of Chicago Press, 1997), pp. 187-211; Bernard Lightman, "The Story of Nature: Victorian Popularizers and Scientific Narrative", *Victorian Review*, 1999, *25*: 1-29; Bernard Lightman, "The Visual Theology of Victorian Popularizers of Science: From Reverent Eye to Chemical Retina", *Isis*, 2000, *91*: 651-680.

[66] [Lewes], "Condition of Authors", p. 286.

[67] For clerical earnings, with comparisons to other professions, see Frances Knight, *The Nineteenth-Century Church and English Society*, (Cambridge: Cambridge University Press, 1995), Ch. 4.

[68] On Trollope, see Victoria Glendinning, *Trollope*, (London: Pimlico, 1992). On other authors, see Sutherland, *Victorian Novelists*.

[69] See Fyfe, *Science and Salvation*, pp.212-13.

[70] For Martin (senior), see H. S. Torrens, 'Martin, William (1767-1810)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004 [http://www.oxforddnb.com/view/article/18216, accessed 18 Jan 2005]. For biographical details on Martin (junior), the new DNB article is very brief. Rather, see the details he

himself provided to the Royal Literary Fund, available in their archive (published by World Microfilms, 1984; hereafter RLF), file 1315.1, W. Martin's application form, 9 April 1853 and 1315.53, M. J. Martin's application form, 1 March 1864.

[71] On one of his applications to the Royal Literary Fund, he claimed to be a licentiate of the "Apothecaries's Company" (see RLF 1315.46, Martin's application form, 30 October 1863). There is, however, no record of him at Apothecaries Hall. My thanks to Anna Simmons for this information. On his appointment to the Zoological Society, see Zoological Society archive (Zoological Society, London; hereafter ZS), Minutes of Council, 20 October 1830, p. 44; also 20 April 1836, p. 418, and ZS Minutes of the Museum Committee (hereafter MMC) 25 April 1836 (where Martin is allowed to continue at £100, despite the official salary for assistant curator being set at £80).

[72] Henry Scherren, *The Zoological Society of London: A Sketch of Its Foundation and Development*, (London: Cassell, 1905); P. Chalmers Mitchell, *Centenary History of the Zoological Society of London*, (London: Zoological Society, 1929).

[73] The only surviving volume of the ZS Museum Report Book (1833) contains Martin's daily reports on his and Gould's activities. Both institutional histories claim Gould was in charge of the museum pre-1836, but they appear to have been blinded by his subsequent rise to fame. See Mitchell, *Centenary History*, p. 98, based on Scherren, *Zoological Society*, pp. 33, 53-4.

[74] *Beagle* specimens were frequently discussed in January 1837. Martin's description of a new *Felis* specimen appeared next to Gould's description of an unusual series of finches from the Galapagos islands. See *Proceedings of Zoological Society*, 1837, *5*: 3-4. Also Adrian Desmond, and James Moore, *Darwin*, (London: Penguin, 1991), pp. 208-11.

[75] W. C. L. Martin, 'On a new Genus of Insectivorous Mammalia', *Transactions of Zoological Society*, 1838, *2:* 249-56.

[76] ZS MMC, 16 February and 4 April 1836.

[77] ZS MMC, 10 March and 9 April 1836

[78] ZS MMC, 18 March 1836.

[79] Gould to William Jardine, 30 April 1838, quoted in Sauer, *Gould the Bird Man*, p. 98.

[80] ZS MMC, 25 April 1836. See also Desmond, and Moore, *Darwin*, pp. 208-09.

[81] ZS MMC, 29 December 1837. Gould had originally been paid per skin stuffed, see ZS MMC, 5 March 1836. He was subsequently paid a salary of £50, with extra for stuffing, and tight restrictions were placed on his use of the Society's time and resources, see ZS MMC, 20 April and 28 April 1836.

[82] ZS MMC, 26 January 1838.

[83] ZS, Minutes of Council, 1 August 1838.

[84] Desmond, and Moore, *Darwin*, pp. 309-10. Waterhouse was replaced at the Zoological Society by Louis Fraser, who had previously been appointed clerk to the curator in 1836 (ZS MMC, 16 April 1836). He was probably the other person who lost his position in the 1838/39 cutbacks, and since then, had acted as naturalist on the Niger expedition (1841-42). This presumably made him more attractive as Curator than Martin.

[85] RLF 1315.11, Martin to RLF, 16 April 1853.

[86] The identification of Martin's anonymous works for the RTS is straightforward (*Popular Introduction to the study of Quadrupeds*, 1833; *Introduction to the study of Birds*, 1835). His claim to have written three volumes of the Library of Entertaining Knowledge (RLF 1315.8, List of Works 1833-, n.d. [c.1853]) is more difficult, since he is not mentioned in the SDUK archives. Given his field of expertise, I believe he wrote three of the four *Menageries* volumes. These have no attributed author in the archives, and were supervised by Charles Knight, the editor of the *Penny Magazine*. SDUK archives (University College, London; hereafter SDUK), Entertaining Knowledge Committee Minutes, 1831-33 (especially 6 May 1831); and Publications Committee Minutes, 1833-38 (especially 28 February and 4 March 1833, and 23 March 1836).

[87] On penny periodicals, see Anderson, *Printed Image*, Ch. 2; Bennett, "Revolutions in Thought". The *Weekly Visitor* became the *Visitor* (monthly, 6*d*.), and Martin continued to write for it until its closure in 1851; he then wrote for its successor, the *Leisure Hour* (penny weekly) until his death.

[88] ZS, Minutes of Council, 7 September 1831. That this was a rare privilege is indicated by Sofia Akerberg, "Knowledge and Pleasure at Regent's Park: The Gardens of the Zoological Society of London During the Nineteenth Century", PhD, Umea, 2001, Ch. 4. The dates of the *Menageries* volumes are uncertain because I am not 100% certain which of the volumes were the three written by Martin.

[89] RLF 1315.7, Waterhouse to RLF, 13 April 1853. Identification of the publisher is based on RLF 1315.3, Martin to RLF, 11 April 1853.

[90] For biographical details, see *Congregational Year Book* (1859), RLF 1385.1, Milner's application form, 7 July 1855 and 1385.2, Milner to RLF, 7 July 1855.

[91] *History of the Seven Churches of Asia* (Derby, 1830); *Life, Times and Correspondence of Isaac Watts* (London, 1834); *Sermons on Special Occasions* (Northampton, 1837); *Sanctuary and Oratory* (London, 1837).

[92] It is unclear how or when Milner became interested in the sciences, but he might have attended the lectures of the natural science professors while studying at Glasgow.

[93] Thomas Milner, *Astronomy and Scripture; or, Some Illustrations of That Science, and of the Solar, Lunar and Terrestrial Phenomena of Holy Writ*, (London: John Snow, 1843), p. v.

[94] On evangelicals and the sciences, see David W. Bebbington, "Science and Evangelical Theology in Britain from Wesley to Orr", in David N. Livingstone, D. G. Hart and Mark A. Noll (eds.), *Evangelicals and Science in Historical Perspective*, (Oxford: Oxford University Press, 1999), pp. 120-141. On science and religion more generally, see John Hedley Brooke, *Science and Religion: Some Historical Perspectives*, (Cambridge: Cambridge University Press, 1991); and John H. Brooke, and Geoffrey Cantor, *Reconstructing Nature: The Engagement of Science and Religion, The Glasgow Gifford Lectures*, (Edinburgh: T&T Clark, 1998).

[95] The *Gallery* was re-issued in 1848, 1852, 1855, 1860 and 1880.

[96] RLF 1385.1, Milner's application form, 7 July 1855; compare RLF 1385.16, Milner's application form, 25 June 1868 (Mrs Milner died in 1868).

[97] The RTS published *Australia: its scenery, natural history and resources* (1853). *The Crimea, its ancient and modern history: the Khans, the Sultans and the Czars* (1855), *Russia: its rise and progress, tragedies and revolutions* (1856), and *The Ottoman Empire* (1856) were all published by Longman.

[98] Other evangelical science writers are mentioned in Secord, *Victorian Sensation*, pp. 452-455; and Fyfe, *Science and Salvation*, Ch. 5. On evangelicals and the sciences, see David N. Livingstone, D. G. Hart, and Mark A. Noll, (eds.), *Evangelicals and Science in Historical Perspective*, (Oxford: Oxford University Press, 1999).

[99] The Longman print runs are listed under the titles, in the Miscellaneous Expenses ledger (A3) from 1854-56, Longman Archives, Reading University Library (thanks to Michael Bott for this information). The RTS Monthly Series, in which Milner and Martin's volumes appeared, was initially 10,000 (as recorded in RTS Annual Report 1846, 102), but was soon raised to 15,000 (see letter Jones to Copley, 12 December 1846, in RTS Correspondence, RTS Archives, School of Oriental and African Studies, London).

[100] See, for instance, Religious Tract Society Copyright Committee Minutes (hereafter RTS CCM), 9 July 1845, 21 January 1846, 17 November 1847, 20 February 1850.

[101] Bennett, "Revolutions in Thought", 160-61.

[102] He was originally to be paid £120, but he requested an increase. RTS CCM, 23 February and 19 April 1848.

[103] For a contemporary account of the different methods of publishing, see "Authors and Publishers [1]", and "Authors and Publishers [2]", *New Quarterly Review*, 1854, *3*: 143-150.

[104] RLF 1241.2, Dick to RLF, n.d. [1850]. On Dick, see Astore, *Observing God*.

[105] Gosse's literary earnings are given in incredible detail in Richard Broke Freeman, and Douglas Wertheimer, (eds.), *Philip Henry Gosse: A Bibliography*, (Folkestone: Dawson, 1980). For his life, see Thwaite, *Glimpses of the Wonderful*, which corrects the dour impression given by Gosse's son: Edmund Gosse, *Father and Son: A Study of Two Temperaments*, (1907, repr. Keele: Ryburn Publishing, 1994).

[106] Thwaite, *Glimpses of the Wonderful*, pp.116-7.

[107] For individual books, see Freeman, and Wertheimer, (eds.), *Gosse Bibliography*, p.6. For Gosse's valuation of his income, see Thwaite, *Glimpses of the Wonderful*, p.255.

[108] For an introduction to using publishers' archives, see Weedon, *Victorian Publishing*, Ch. 1.

[109] On payments by periodicals in the 1830s, see Cooney, "Publishers for the People", pp. 94-5. On RTS rates in the 1840s, see RTS CCM 20 January 1847.

[110] RLF 1315.13, Martin's application form, 1 June 1854.

[111] RLF 1385.2, Milner to RLF, 7 July 1855.

[112] RLF 1315.3, Martin to RLF, 11 April 1853.

[113] RLF 1315.47, MJ Martin to RLF, 30 October 1863.

[114] Martin: Baldwin, Cradock & Joy in 1837/8; and Whitehead & Co in 1840. Milner: W. S. Orr in 1854, William Freeman of Fleet Street in 1857/8, and W. & R. McPhun of Glasgow in the mid-1870s.

[115] RLF 1385.2, Milner to RLF, 7 July 1855. Orr's bankruptcy is discussed in William Chambers, *Memoir of Robert Chambers with Autobiographical Reminiscences*, (New York: Scribner, Armstrong and Co, 1872), Ch. 13.

[116] No correspondence with Longman's survives, but the payments (of £160 in total) are recorded in the Miscellaneous Expenses ledger (A3) from 1854-56, Longman Archives, Reading University Library. The final payment for *The Baltic* was on October 2, 1854, just days before Orr's bankruptcy. My thanks to Michael Bott for checking this.

[117] RTS CCM, 20 September 1854 and 18 October 1854. Only three of the volumes on *Our Home Islands* appeared, in 1857, 1858 and 1860.

[118] They moved from a house of £40 rent to one of £26, see RLF 1385.2, Milner to RLF, 7 July 1855.

[119] RLF 1385.3, Aspray to RLF, 9 July 1855. See also RLF 1385.2, Milner to RLF, 7 July 1855.

[120] The RTS was sufficiently concerned that it send one of its editors to Milner's Brixton home to enquire after his health. RTS CCM, 19 December 1855.

[121] RLF 1315.28, M. J. Martin to RLF, May 1860.

[122] RLF 1315.42, M. J. Martin to RLF, 18 November 1862. On gout in the early nineteenth century, see Roy Porter, and G. S. Rousseau, *Gout: The Patrician Malady*, (New Haven: Yale University Press, 1988), Ch. 8.

[123] RLF 1315.28, M. J. Martin to RLF, May 1860.

[124] Martin received £40 in 1859, then £30 a year for the next four years; his widow received £50 in 1864. See RLF 1315 passim.

[125] Gosse had £14,000 of investments on his death, but it was mostly derived from his second wife's inheritance, according to Thwaite, *Glimpses of the Wonderful*, p.293. In contrast, successful novelists might be able to save enough to retire. Anthony Trollope did. Glendinning, *Trollope*, esp. pp. 359-61.

[126] On vocation, see James A. Secord, "The Discovery of a Vocation: Darwin's Early Geology", *British Journal for the History of Science*, 1991, *24*: 133-157.

[127] [Kaye], "Pendennis: Literary Profession", p. 371.

[128] RLF 1315.11, Martin to RLF, 16 April 1853.

[129] The phrases come from "The late Mrs. Esther Copley", *Christian Spectator* (1851): 667; L. Davidoff, and C. Hall, *Family Fortunes: Men and Women of the English Middle Class, 1780-1850*, (London: Hutchison, 1987), p. 67 (re children's writer Jane Taylor).

[130] Thomas Pearson, *Infidelity: Its Aspects, Causes and Agencies; Being the Prize Essay of the British Organization of the Evangelical Alliance*, (London: Partridge and Oakey, 1853), p. 509.

[131] Pearson, *Infidelity*, p. 505. See also Thomas Arnold on "Christian tone", quoted in Arthur Penrhyn Stanley, *Life and Correspondence of Thomas Arnold Dd*. 2 vols, (London: B Fellowes, 1844), vol. i, p. 252.

[132] On the concept of "safe science", see Topham, "Science and Popular Education". For examples of science publishing which were decidedly not "safe", see Adrian Desmond,

"Artisan Resistance and Evolution in Britain 1819-1848", *Osiris*, 1987, *ns 3*: 72-110. For more on the combination of spiritual and secular, see Fyfe, *Science and Salvation*, Chs. 2 and 3.

[133] Dick had been forced to leave the church under rather less salubrious circumstances than Milner's retirement. See William J. Astore, "Observing God: Thomas Dick (1774-1857), Evangelicalism and Popular Science in Victorian Britain and Antebellum America", D.Phil., University of Oxford, 1995, section 2.2.

[134] Milner, *Astronomy and Scripture*, p. 371.

[135] Milner, *Astronomy and Scripture*, p. 370.

[136] Thomas Milner, *The Gallery of Nature, a Pictorial and Descriptive Tour through Creation, Illustrative of the Wonders of Astronomy, Physical Geography, and Geology*, (London: Orr, 1846), pp. 188-91. By the 1850s, the nebular hypothesis was mentioned in later editions of the *Gallery* as a theory discredited by the earl of Rosse's observations, see Thomas Milner, *The Gallery of Nature, a Pictorial and Descriptive Tour through Creation, Illustrative of the Wonders of Astronomy, Physical Geography, and Geology*, revised ed, (London: Orr?, 1855), pp. 188-9. On Rosse, see Simon Schaffer, "The Nebular Hypothesis and the Science of Progress", in James R. Moore (ed.), *History, Humanity, and Evolution*, (Cambridge: Cambridge University Press, 1989), pp. 131-164; Simon Schaffer, "On Astronomical Drawing", in Caroline A. Jones and Peter Galison (eds.), *Picturing Science, Producing Art*, (London: Routledge, 1998), pp. 441-474, especially pp. 456-68. On *Vestiges* and the hypothesis, see Secord, *Victorian Sensation*, pp. 9-10, 386-7.

[137] Milner, *Gallery of Nature*, pp. 784-8.

[138] The RTS campaign to Christianise popular science, with which Milner and Martin were both involved, is discussed in Fyfe, *Science and Salvation*, Ch. 2. Concerns about the dangerous implications of the sciences had existed since at least the 1820s (see L. S. Jacyna, "Immanence and Transcendence: Theories of Life and Organisation in Britain, 1790-1835", *Isis*, 1983, *74*: 311-329 and Desmond, "Artisan Resistance"), but were greatly exacerbated by the increased output of the book trade in the 1840s. See Aileen Fyfe, "Expertise and Christianity: High Standards Versus the Free Market in Popular Publishing", in David M. Knight and Matthew D. Eddy (eds.), *Science and Beliefs: From Natural Philosophy to Natural Science, 1700-1900*, (Aldershot: Ashgate, 2005).

[139] On the theological strategies of slightly later science writers, see Lightman, "Visual Theology".

[140] See, for instance, the beginnings of William Martin, *Our Domestic Fowls*, (London: RTS, 1847); William Martin, *British Fish and Fisheries*, (London: RTS, 1849).

[141] He was proposed by George O'Gorman (elected 1840) and Thomas Lee (elected 1839), see his Certificate of Election, Royal Geographical Society archives. My thanks to Sarah Strong for checking this for me.

[142] Thwaite, *Glimpses of the Wonderful*, 194. Thwaite notes that his FRS cost Gosse £10 to join, and £5 a year.

[143] Martin had been elected in 1831 (one of his proposers was Nicholas Vigors of the Zoological Society), and he resigned his fellowship in 1844. See his Certificate of Election 1831, and his letter to the Linnean Society, 18 April 1844, in the Linnean Society archives. My thanks to Gina Douglas for locating these for me.

[144] RLF 1385.2, Milner to RLF, 7 July 1855.

[145] Tree, *Ruling Passion*, p. 8.

[146] The SDUK connection is a guess, but Vigors was on the SDUK publications committee at the same time as he was on the Zoological Society committee to which Martin reported.

[147] On Gould, see Sauer, *Gould the Bird Man*; Tree, *Ruling Passion*; Barbara Mearns, and Richard Mearns, *The Bird Collectors*, (San Diego: Academic Press, 1998), Ch. 7.

[148] For his free afternoons, see Thwaite, *Glimpses of the Wonderful*, pp.156-7, 163.

[149] The RTS refused a book, but took an article (*Leisure Hour*, 22 April 1852), see RTS CCM, 21 May 1851. H. G. Bohn published William Martin, *A General History of Humming-Birds, or the Trochilidae: With Especial Reference to the Collection of J Gould, FRS &c Now Exhibiting in the Gardens of the Zoological Society of London*, (London: Bohn, 1852). On Gould's humming birds, see Mearns, and Mearns, *Bird Collectors*, pp. 149-50 and Sauer, *Gould the Bird Man*, pp. 129-30, 240-41.

[150] RLF 1315.23, Gould to RLF, 2 February 1859.

[151] RLF 1315.4, Owen to RLF, 11 April 1853.

[152] RLF 1315.11, Martin to RLF, 16 April 1853.

[153] Unlike most of his works, the title-page announces: "By W. C. Linnaeus Martin, FLS". The date of publication, and the subject matter, leads me to suspect that this is the work Whitehead had commissioned.

[154] See Thwaite, *Glimpses of the Wonderful*, pp. 123-4.

[155] Knight mentions the work and its intended audience in his memoirs, see Charles Knight, *Passages of a Working Life During Half a Century: With a Prelude of Early Reminiscences*. 3 vols, (1864-65, repr. London: Knight & Co., 1873), vol. iii, pp.18-20.

[156] RLF 1315.11, Martin to RLF, 16 April 1853.

[157] RLF 1315.11, Martin to RLF, 16 April 1853.

[158] Youatt's suicide is clear from his obituary in *The Times*, 14 January 1847, which is reprinted in John Clewlow, "The Death of William Youatt: An Update", *Veterinary History*, 2000, *10*: 74-75. Youatt had been medical superintendent of the Zoological Society's menagerie. Thanks to Ben Marsden for drawing Youatt to my attention.