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**Article:**

Topham, J.R. (1998) Beyond the "common context" : the production and reading of the Bridgewater Treatises. *Isis*, 89 (2). pp. 233-262. ISSN 0021-1753

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# Beyond the “Common Context”

## The Production and Reading of the Bridgewater Treatises

By *Jonathan R. Topham*\*

### ABSTRACT

The Bridgewater Treatises were among the most widely circulated books of science in early nineteenth-century Britain, yet little is known of their contemporary readership. Drawing on the new history of the book, this essay examines the “communication circuit” in which the series was produced and read, exploring some of the processes that shaped the meanings the books possessed for their original readers. In so doing, it seeks to go beyond the standard interpretation of the Bridgewater Treatises as contributing to a “common context” for debate among the social and cultural elite. Instead, the essay demonstrates the wide circulation of the series among many classes of readers and shows that consideration of the distinctive meanings with which the books were invested by readers in divergent cultural groups serves to elucidate the contested meaning of science in the period. It is argued that by thus taking seriously the agency of all those involved in the communication circuit, including readers as well as authors and publishers, this approach supersedes the increasingly unworkable analytical category of “popular science.”

**T**HE BRIDGEWATER TREATISES on “the Power, Wisdom, and Goodness of God as manifested in the Creation” have long been seen as providing an important insight into

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This essay has benefited from numerous comments and suggestions made by those who heard earlier versions read at conferences and seminars organized by the British Society for the History of Science (1994), the Wellcome Institute for the History of Medicine (1994), the Geological Society of London, History of Geology Group (1997), the Cambridge Historiography Group (1997), and the Society for the History of Authorship, Readership, and Publishing (1997). I am especially grateful to John Brooke, Geoffrey Cantor, Patricia Fara, Margaret Rossiter, Anne Secord, and five anonymous referees for their helpful suggestions on earlier drafts. Above all, I would like to thank Jim Secord, who has provided extremely insightful comments on successive drafts of this paper, as well as constant encouragement. Manuscript sources have been quoted with kind permission of the Librarian of the Bodleian Library, Oxford, the Syndics of Cambridge University Library, the Governing Body of Christ Church, Oxford, the Librarian of New College, Edinburgh, the Oxford University Museum, the Master and Fellows of Trinity College, Cambridge, and the Librarian of University College London.

*Isis*, 1998, 89:233–262

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0021-1753/98/8902-0002\$02.00

the role and meaning of science in British culture during the 1830s.<sup>1</sup> One of the first and most influential statements of this view is found in R. M. Young's seminal thesis that there was, in the early decades of the nineteenth century, a "common intellectual context" in Britain, reflected in the periodical literature and held together by a "relatively homogeneous and satisfactory natural theology" found paradigmatically in the Bridgewater Treatises. While Young's claim about the homogeneity of natural theology in early nineteenth-century Britain is now generally rejected, scholars have done much to substantiate his argument that natural theology nevertheless fulfilled important "mediating functions" in this period, providing a context in which scientific, economic, political, and theological discourse could be related. In particular, the Bridgewater Treatises have often been portrayed as the last flourish in a tradition, dating back to the seventeenth century, in which natural theology served "as a bridge between scientific and lay culture" and as "one of the main vehicles by which scientists addressed the public and advertised the cultural and moral goods that scientific activity might deliver."<sup>2</sup>

Such claims about the role played by the Bridgewater Treatises in contemporary culture clearly involve significant assertions about the experiences of those who originally read them. However, as Young's phrase "common *intellectual* context" rather implies, his analysis concentrated exclusively on the views of those who wrote for and read the "high-brow" periodicals—the heavy quarterlies. Indeed, Young warned of "the mindlessness of

<sup>1</sup> The series was published in pursuance of the will of Francis Henry Egerton, eighth earl of Bridgewater, which directed that £8,000 be paid to the person or persons nominated by the president of the Royal Society who should "write, print, and publish one thousand copies of a work *On the Power, Wisdom, and Goodness of God, as manifested in the Creation.*" At the time of Bridgewater's death in 1829, the president of the Royal Society was Davies Gilbert, who sought the assistance of the archbishop of Canterbury and the bishop of London in appointing eight authors, seven of whom were prominent practitioners of science, to write on different branches of the subject. The terms of the bequest, together with the titles assigned to the eight authors, are included in an introductory notice appended to each of the treatises. On the Bridgewater Treatises see, e.g., Charles Coulston Gillispie, *Genesis and Geology: A Study in the Relations of Scientific Thought, Natural Theology, and Social Opinion in Great Britain, 1790–1850* (New York: Harper & Row, 1959), pp. 209–216; W. H. Brock, "The Selection of the Authors of the *Bridgewater Treatises*," *Notes and Records of the Royal Society of London*, 1967, 21:162–179; John M. Robson, "The Fiat and the Finger of God: The *Bridgewater Treatises*," in *Victorian Faith in Crisis: Essays on Continuity and Change in Nineteenth-Century Religious Belief*, ed. Richard J. Helmstadter and Bernard Lightman (London: Macmillan, 1990), pp. 71–125; Jonathan 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; and Topham, "'An Infinite Variety of Arguments': The *Bridgewater Treatises* and British Natural Theology in the 1830s" (Ph.D. diss., Univ. Lancaster, 1993) (hereafter cited as **Topham**, "'*Infinite Variety of Arguments*'").

<sup>2</sup> Robert M. Young, "Natural Theology, Victorian Periodicals, and the Fragmentation of a Common Context," in *Darwin's Metaphor: Nature's Place in Victorian Culture* (Cambridge: Cambridge Univ. Press, 1985), pp. 126–163, on pp. 127–128; and Steven Shapin, "Science and the Public," in *Companion to the History of Modern Science*, ed. R. C. Olby et al. (London/New York: Routledge, 1990), pp. 990–1007, on pp. 991, 999. For criticisms of the supposed homogeneity of natural theology see, e.g., John Hedley Brooke, "Natural Theology and the Plurality of Worlds: Observations on the Brewster-Whewell Debate," *Annals of Science*, 1977, 34:221–286; Brooke, "The Natural Theology of the Geologists: Some Theological Strata," in *Images of the Earth: Essays in the History of the Environmental Sciences*, ed. L. J. Jordanova and Roy S. Porter (Chalfont St. Giles: British Society for the History of Science, 1979); Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge Univ. Press, 1991), pp. 39–64; Peter J. Bowler, "Darwinism and the Argument from Design: Suggestions for a Reevaluation," *Journal of the History of Biology*, 1977, 10:29–43; Richard Yeo, "The Principle of Plenitude and Natural Theology in Nineteenth Century Britain," *Brit. J. Hist. Sci.*, 1986, 19:263–282; Pietro Corsi, *Science and Religion: Baden Powell and the Anglican Debate, 1800–1860* (Cambridge: Cambridge Univ. Press, 1988); Boyd Hilton, *The Age of the Atonement: The Influence of Evangelicalism on Social and Economic Thought, 1785–1865* (Oxford: Clarendon, 1988); and Topham, "'Infinite Variety of Arguments,'" esp. Ch. 4. On the mediating functions of the Bridgewater Treatises see Brooke, "Natural Theology and the Plurality of Worlds"; and Jack Morrell and Arnold Thackray, *Gentlemen of Science: Early Years of the British Association for the Advancement of Science* (Oxford: Clarendon, 1981), pp. 224–245.

being excessively inclusive," arguing that it is legitimate to demarcate "the study of the views of the intelligentsia" from "the study of low-brow popular opinion." More recently, however, historians have become increasingly concerned to map the social topography of science in early nineteenth-century Britain, providing accounts of provincial, bourgeois, and even proletarian science that have incidentally shed important new light on the views of the gentlemen of science.<sup>3</sup> Such work clearly demonstrates the untenability of Young's demarcation between "high-brow" and "low-brow" opinion, yet it does little to address the need for detailed analysis of the experiences of those who read such works as the *Bridgewater Treatises*.

It might be argued that the putative neglect of the consumers of science is belied by recent significant work on science popularization and on "public science." Yet while such analyses of what historical actors themselves intended to be "popular science" are undoubtedly valuable in revealing the manner in which the scientific elite sought to establish and maintain cultural hegemony and to legitimate their science, they often fail to recover in any serious way the actual experiences of contemporary audiences. Authorial intentions, even insofar as they can be recovered, are no reliable guide to the meanings that books have for their readers. Once a book has left its context of production, it is transmitted to a multiplicity of contexts of reading—different social and cultural spaces where it may be invested with a variety of meanings. It takes little imagination, for instance, to see that the meaning of William Buckland's *Bridgewater Treatise* when read by Sir Charles Bunbury as an illustrated guide to the paleontological collections of the British Museum was distinctly different from its meaning when read as a sourcebook for transmutation by the atheist Charles Southwell, languishing in a Bristol prison cell after his conviction for blasphemy.<sup>4</sup> Moreover, the control that Buckland could assert over these readings was clearly limited. Thus, what is required is an approach that, while taking seriously the attempts of authors and publishers to police the reading of the text, also recovers the agency of readers themselves.

Such an approach is provided by the new discipline of the history of the book, defined by Robert Darnton as "the social and cultural history of communication by print."<sup>5</sup> The history of the book is invaluable in this context because of its emphasis on recovering the creativity of the individual act of reading while at the same time recognizing the agency of authors, publishers, and others in attempting to prescribe particular readings. These two objectives are met by analyzing every stage of what Darnton calls the "communication circuit"—a circuit running from the author, through publishers, printers, binders, distributors, booksellers, and libraries, to the readers themselves and, thus, back to the author, who is influenced by readers both before and after writing. The objective is thus to provide an analysis of the contexts and practices of both *book production* and *reading*.

<sup>3</sup> Young, "Fragmentation of a Common Context," pp. 131–132. A useful review of the literature mapping the social topography of science is provided in Adrian Desmond, "Artisan Resistance and Evolution in Britain, 1819–1848," *Osiris*, 2nd Ser., 1987, 3:77–110, on pp. 77–78 nn 1–3.

<sup>4</sup> For an important survey and critique of the literature in science popularization and public science see Roger Cooter and Stephen Pumfrey, "Separate Spheres and Public Places: Reflections on the History of Science Popularizations and Science in Popular Culture," *History of Science*, 1994, 32:237–267. On Bunbury see Frances Joanna Bunbury, ed., *Memorials of Sir C. J. F. Bunbury, Bart.*, 9 vols. (Mildenhall, 1891–1893), Vol. 1, pp. 223, 239. On Southwell see Charles Southwell, "A Voice from Bristol Gaol," *Oracle of Reason*, 1842, 1:78–79.

<sup>5</sup> Robert Darnton, "What Is the History of Books?" in *The Kiss of Lamourette: Reflections in Cultural History* (London/Boston: Faber & Faber, 1990), pp. 107–135, on p. 107. A valuable discussion of the importance of book history for the history of science is given in Adrian Johns, "History, Science, and the History of the Book: The Making of Natural Philosophy in Early Modern England," *Publishing History*, 1991, 30:5–30.

The insights from the history of the book, so described, are complemented by insights from cultural studies. One of the main concerns of this tradition has been to recover the perspective of the socially dominated in the face of standard accounts that privilege dominant groups. In particular, more recent work has used the language of cultural hegemony to reveal the contest between dominant and dominated groups, in which the latter actively employ strategies both of resistance and of appropriation.<sup>6</sup> Little attention has been given to science in this field, but there are a number of studies that are suggestive for historians of science. Of particular interest is the study by Richard Johnson in which, weary of accounts of "popular education" that detail the strategies of would-be educators in the early nineteenth century, he provides an account of workers' own "really useful knowledge." Drawing on this, Adrian Desmond has given us an account of radical artisans in the same period creating their own materialist science in defiance of a dominant culture. One of the particularly striking features of Desmond's study is the way in which his atheist socialists appropriated resources from the scientific elite through printed books: they "cannibalized 'respectable' scientific works, where accessible, scouring the manuals of Charles Lyell, John Herschel, Henry De la Beche, and others for usable material."<sup>7</sup>

This kind of account of the agency of readers in actively appropriating or resisting the messages of books has far-reaching implications for our understanding of the meaning of science in its wider context. Indeed, Roger Chartier argues that such an approach supersedes the increasingly unworkable notion of "popular culture," and it is my contention that it also supersedes the equally untenable notion of "popular science." The notion of popular culture fails, Chartier contends, because it has been found impossible to correlate particular social groups with specific cultural objects and practices in anything like a rigorous manner. In particular, as he puts it, "it does not seem possible to identify the absolute difference and the radical specificity of popular culture on the basis of its own texts, beliefs, or codes." Clearly this results in part from the fact that the notion of "popular" culture has little inherent coherence when, as is usually the case, it is defined negatively as that which is not part of a dominant culture. But even if one attempts to study more organic cultural groups, like Desmond's "radical artisans," it is clear that the printed culture of such groups is by no means completely distinctive. As we have seen, the radical artisans read "gentlemanly" books by Lyell and Buckland in addition to more strictly "working-class" publications. Thus, as Chartier argues, it is not only necessary to abandon the simplistic dichotomy of popular and elite culture and to anatomize the "multiple divisions that fragment the social body"; it is also necessary "to recognise the fluid circulation and shared

<sup>6</sup> See, e.g., University of Birmingham Centre for Contemporary Cultural Studies, *Culture, Media, Language: Working Papers in Cultural Studies, 1972-79* (London: Hutchinson, 1980); Morag Shiach, *Discourse on Popular Culture: Class, Gender, and History in Cultural Analysis, 1730 to the Present* (Cambridge: Polity, 1989); and Patricia Anderson, *The Printed Image and the Transformation of Popular Culture, 1790-1860* (Oxford: Clarendon, 1991).

<sup>7</sup> Richard Johnson, "'Really Useful Knowledge': Radical Education and Working-Class Culture, 1790-1848," in *Working Class Culture: Studies in History and Theory*, ed. J. Clarke, C. Critcher, and Johnson (London: Hutchinson, 1979), pp. 75-102; and Desmond, "Artisan Resistance" (cit. n. 3), p. 89. In a similar vein is Anne Secord's work on the artisan botanists of early nineteenth-century Manchester, which demonstrates the social and cultural distinctiveness as sites of knowledge production of the pubs in which they met. Secord's work is particularly significant here, however, because of her account of the "intersecting social worlds" of the artisans and gentlemen. Once again, the cultural products of the scientific establishment—in this case the botanical books of the scientific gentlemen—are seen to have been of importance in the making of artisan knowledge. See Anne Secord, "Science in the Pub: Artisan Botanists in Early Nineteenth-Century Lancashire," *Hist. Sci.*, 1994, 32:269-315. See also Secord, "Corresponding Interests: Artisans and Gentlemen in Nineteenth-Century Natural History," *Brit. J. Hist. Sci.*, 1994, 27:383-408.

practices that cross social boundaries.<sup>8</sup> In this respect, books are of particular use, since they often pass between different cultural groups while being invested with distinctive meanings within each group. Analysis of this phenomenon provides a new dynamic element to cultural history, since by looking at the meaning with which a given book is invested in different local and class-based cultures, it is possible to uncover the competing knowledge claims of the groups involved and to expose the power of the several groups to legitimate or delegitimate different forms of knowledge.

The kind of approach that I am advocating, then, is one that takes on its own terms the natural knowledge of both dominant and dominated cultures, while at the same time seeking to analyze the relationships between the different groups, not least by considering their conflicts over the meaning of such cross-cultural objects as books.<sup>9</sup> Moreover, while my focus in this essay will obviously be on conflicting readings of books, it is quite clear that a study centered on any other medium of communication, from exhibitions and museums to lectures and sermons, would contribute equally important insights. The same also applies to studies of social settings like the artisan's workshop, the hospital, and the mine, where individuals from different cultural and social groups negotiate knowledge claims.

Of course, recovering the diversity of readings that books undergo in their several contexts of reading is by no means a straightforward task. At present, historians still often write of the readership of scientific books in terms that suggest that the text was transmitted to its readers through the ether, without ever being embodied in material form. However, by detailed analysis of the communication circuit, it is possible to re-embodiment the text, analyzing the significance of the material culture of print for both the context and the practice of reading. In this essay, I use the case of the Bridgewater Treatises to illustrate some of the social and cultural factors determining readership, before briefly illustrating the variety of readings of one of the treatises in particular. Clearly, a truly comprehensive analysis of the readership of such a diverse and widely read series of books as the Bridgewater Treatises is beyond the scope of a work of this length; however, this exploratory study will serve to exemplify both the methods and results of the kind of approach advocated here.

#### AUTHORS

Determined as we are to recover readers' own experiences of the Bridgewater Treatises, it is nonetheless clear that the strategies of the authors, from choice of subject to form of publication, materially affected readers' experiences. Thus it is appropriate to give some

<sup>8</sup> Roger Chartier, "Texts, Printings, Readings," in *The New Cultural History*, ed. Lynn Hunt (Berkeley: Univ. California Press, 1989), pp. 154–175, on p. 169.

<sup>9</sup> In an important recent paper, Roger Cooter and Stephen Pumfrey suggested that the phrase "ethno-natural knowledge" would describe the scope of a somewhat similar enterprise, "which would take as its subject everything from 'genuine' science (i.e. officially approved), popularised, popular and pop science, through 'pseudo-sciences' to craft knowledge and folk lore." However, Cooter and Pumfrey reject this approach on the grounds that it "would avoid confronting the key problematic issue—of discursive dominance and resistance—by drawing upon a socio-historically false assumption of a plurality of legitimate discourses." They emphasize the extent to which the "elitism of scientific discourse immediately de-legitimizes popular experiences and epistemologies of 'nature,'" from which they conclude that to study "ethno-natural knowledge" would be to repeat the error made by the early social historians of popular culture—that is, effectively to treat that culture as autonomous. See Cooter and Pumfrey, "Separate Spheres and Public Places" (cit. n. 4), pp. 253–254. It is my contention that to take seriously the natural knowledge of dominated as well as of dominant groups is not to make a priori claims about the social and cultural legitimacy of that knowledge. As I have made clear, the study in which I am engaged requires an analysis of the power relations embodied in competing knowledge claims.

consideration to what the authors of the Bridgewater Treatises actually intended their works to achieve. One problem inherent in this process is that, as I have shown elsewhere, the authors were by no means agreed on a common program. In appointing them, Davies Gilbert volunteered no directions about the scope of the enterprise beyond the rubric of the earl of Bridgewater's will and their several titles. The authors were left to organize themselves, and while Peter Mark Roget was a very able unofficial secretary for the group, he had no authority to impose a common approach. Moreover, while David Brewster was perhaps overstating the case when he wrote of "authors who had no previous communication, who had never seen each other's productions," they were equally not the "close and favoured clique" that Jack Morrell and Arnold Thackray suggest.<sup>10</sup> The differences are readily seen when one compares the stirring evangelical preacher, theologian, and churchman Thomas Chalmers with the religiously quiescent chemist William Prout, or the High Church Hutchinsonian William Kirby with the archetypal liberal Anglican William Buckland.<sup>11</sup> In view of such divergences, it is little wonder that, as contemporary commentators repeatedly claimed, the authors were not agreed on a common purpose.

Yet while it is difficult to make positive generalizations about the intentions of the Bridgewater authors, it is clear that they shared one negative determination: none of the authors primarily designed his treatise to be an exposition of the philosophy of the design argument. William Whewell caught the mood when he announced in his dedication, "The subject proposed to me was limited: my prescribed object is to lead the friends of religion to look with confidence and pleasure on the progress of the physical sciences, by showing how admirably every advance in our knowledge of the universe harmonizes with the belief of a most wise and good God." John Kidd went further, stating that the object of his treatise was "to unfold a train of facts, not to maintain a formal argument." Charles Bell, too, felt he had to apologize for his lack of theological sophistication, stating that "from at first maintaining that design and benevolence were every where visible in the natural world, circumstances have gradually drawn the author to support these opinions more ostentatiously and elaborately than was his original wish."<sup>12</sup>

The authors were equally not intending to write works primarily for the benefit of their scientific peers. When Whewell wrote to Davies Gilbert asking to what degree the treatises were "expected to be calculated for popular apprehension," he received the reply that "the work should be executed in a manner as a matter of instruction to all well educated persons, containing perhaps some more technical matter in notes, and certainly references to the best mathematical works." While Gilbert did not volunteer this advice to the other authors, they all nonetheless had nonspecialist readers in mind as they wrote. Yet they were by no means agreed about the ideal Bridgewater reader. John Kidd, for instance, expected his readers to read Greek and to know classical literature. When he made the decision to use

<sup>10</sup> [David Brewster], "Whewell's *Astronomy and General Physics*," *Edinburgh Review*, 1834, 58:422-457, on p. 425; and Morrell and Thackray, *Gentlemen of Science* (cit. n. 2), p. 120. On the lack of a common program see Topham, " 'Infinite Variety of Arguments,' " esp. Ch. 4; and Pietro Corsi, "Sciences in Culture," *Isis*, 1979, 70:593-595. On Roget's efforts as unofficial secretary see Topham, " 'Infinite Variety of Arguments,' " Ch. 3.

<sup>11</sup> See Stewart J. Brown, *Thomas Chalmers and the Godly Commonwealth in Scotland* (Oxford: Oxford Univ. Press, 1982); William H. Brock, *From Protyle to Proton: William Prout and the Nature of Matter, 1785-1985* (Bristol: Hilger, 1985); John Freeman, *The Life of the Reverend William Kirby* (London, 1852); and Nicolaas A. Rupke, *The Great Chain of History: William Buckland and the English School of Geology (1814-1849)* (Oxford: Clarendon, 1983).

<sup>12</sup> William Whewell, *Astronomy and General Physics Considered with Reference to Natural Theology* (London, 1833), p. vi; John Kidd, *On the Adaptation of External Nature to the Physical Nature of Man, Principally with Reference to the Supply of His Wants and the Exercise of His Intellectual Faculties* (London, 1833), p. viii; and Charles Bell, *The Hand: Its Mechanism and Vital Endowments as Evincing Design* (London, 1833), p. xi.

his inaugural lecture as Regius Professor of Physic at Oxford as the basis for his Bridgewater Treatise, Kidd clearly carried over his notional audience from one work to the other: his intended Bridgewater readers were the same Oxford-educated clerics and gentry before whom he had defended the religious value of the study of anatomy. Whewell, by contrast, found his model in Mary Somerville's *Mechanism of the Heavens* (1831), originally intended to be published by the Society for the Diffusion of Useful Knowledge, in which the author sought to popularize Laplace's *Mécanique céleste*.<sup>13</sup> To speak of the intended audience of the Bridgewater Treatises is thus to speak about the divergent intentions of eight disparate authors.

It is also clear that the several authors intended their works to be read on a variety of different levels. When Buckland included in his Bridgewater previously unpublished research on the Megatherium, he was certainly seeking, as he claimed, to illustrate for the lay reader the Cuvierian method of analysis. At the same time, however, he was publishing what Susan Cannon has called "palaeontological descriptions so detailed as actually to be a major contribution to monographic research." The fact that some reviewers considered Buckland's Bridgewater to have fallen between two stools only serves to demonstrate the general awareness that it was intended to function on at least two different levels. George Poulett Scrope, in his puffing *Quarterly* review, could see no conflict between the volume's esoteric and exoteric functions:

Even as a *reportorium palaeontologicum*, it will be eagerly sought for; and when we find that the subject is made an appeal to the better and nobler sentiments of our nature, in plain language, unincumbered as much as possible by the technical terms that deter too many from entering this most pleasant field of inquiry, we doubt not that Dr. Buckland will be the means of introducing many a saurian, many a trilobite, and many an encrinite to the acquaintance of those who would hardly have heard of such beings but for his excellent book.<sup>14</sup>

Thus, we have not only to contend with *readers* who actively multiplied the meanings of these works, but also with *authors* who intended their meanings to be multiple. Moreover, the ambiguities inherent in the Bridgewater Treatises are particularly profound: these were works the genre of which could not easily be defined. They were widely reviewed both in religious and in specialist journals, and they were read both by scientific experts and by laypeople. Yet it is precisely these ambiguities that make the Bridgewater Treatises particularly useful in exploring the place of science in the wider culture.

#### PUBLISHER

While the importance of the publisher in defining the contexts in which a book is read is so obvious as hardly to need stating, historians of science have still fully to acknowledge

<sup>13</sup> William Whewell to Davies Gilbert, 17 Oct. 1830, in John D. Enys, ed., *Correspondence Regarding the Appointment of the Writers of the Bridgewater Treatises between Davies Gilbert and Others* (Penryn, 1877), pp. 18–20; Gilbert to Whewell, [Oct.?] 1830, Trinity College, Cambridge, Add Ms. a.205<sup>18</sup>; John Kidd, *An Introductory Lecture to a Course in Comparative Anatomy, Illustrative of Paley's Natural Theology* (Oxford, 1824); and Whewell to Ann Whewell (his sister), 13 Mar. 1832, in Janet Mary Stair-Douglas, ed., *The Life and Selections from the Correspondence of William Whewell, D.D.* (London, 1881), p. 143.

<sup>14</sup> William Buckland, *Geology and Mineralogy Considered with Reference to Natural Theology*, 2 vols. (London, 1836) (hereafter cited as **Buckland, *Geology and Mineralogy* [1836]**), Vol. 1, p. 139; Walter [Susan] Faye Cannon, "The Problem of Miracles in the 1830s," *Victorian Studies*, 1960, 4:5–32, on p. 19; and [George Poulett Scrope and William John Broderip], "Dr. Buckland's *Bridgewater Treatise*," *Quarterly Review*, 1836, 56:31–64, on p. 62. For a review that considered Buckland's attempt to address divergent audiences unsuccessful see, e.g., [Baden Powell?], "Buckland's *Bridgewater Treatise*," *Magazine of Popular Science*, 1836, 2:330–346, on p. 340. See also Topham, "Infinite Variety of Arguments," Ch. 5.

this fact in their practice. Our historical narratives often fail to analyze the publisher's role as a strategist who, in managing the material form of the book, seeks to impose particular readings. Moreover, they show little awareness of the extent to which the choice of a particular publisher by the author of a work serves further to illustrate the intentions of that author. In the case of the Bridgewater Treatises the differences among the authors about the purpose of the enterprise were to some extent manifested in their complicated negotiations to find a publisher. At their first meeting, early in December 1830, the authors decided that, while they should each "write a separate work, forming one or more octavo volumes of not less than 300 pages," their works should still be "published in an uniform manner." This decision reinforced the extent to which each treatise was to be read in the light of the others and contributed to making the series a singular publishing event. It meant, however, that Whewell's desire to publish a cheaper duodecimo was frustrated by the apparently general belief of the authors, expressed by Buckland, that it was "due to the dignity of the Thousand Pounds" that each author was paid to publish the treatises at least in octavo.<sup>15</sup>

In looking for a publisher, "dignity" was evidently an important consideration. Initially, Roget approached two giants of the London publishing world: Longman's, an old-established firm from the traditional bookselling quarter in the shadow of St. Paul's; and the more dashing John Murray from the fashionable West End.<sup>16</sup> Both houses were of unimpeachable reputation, and both were generalists. The authors wished their treatises to be standard works, a character that these large and respectable publishing houses could help them to secure. Moreover, they were keen not to restrict the audience of the works to one that was narrowly theological or, for that matter, scientific. Had the authors wished to do so, they might have gone to any number of specialist publishers, from Rivingtons' for theology to Samuel Highley for medicine and natural history; but they eschewed both of these genres in favor of something with a potentially larger appeal.

Murray proposed a more generous financial deal than Longman's, but while the authors readily accepted his offer in the spring of 1831, he was tardy in producing a written agreement. Despite issuing advertisements for the series in March 1832, by August of that year Murray had signaled his desire either to be released from his verbal contract or to alter the terms. A slump in the book trade since the time when he had verbally agreed to the contract meant, he explained, that he would incur "a certain loss" from the publication of the treatises.<sup>17</sup> Murray's business confidence had been shaken by the loss of £26,000 in an attempt to establish a daily newspaper in 1826. Moreover, the economic emergency

<sup>15</sup> Peter Mark Roget to Whewell, 10 Dec. 1830, Trinity College, Cambridge, Add. Ms. a.211<sup>14</sup>; Roget to Thomas Chalmers, 11 Dec. 1830, New College, Edinburgh, CHA 4.147.33; and William Buckland to Whewell, 5 Oct. 1832, Trinity College, Cambridge, Add. Ms. a.66<sup>29</sup>.

<sup>16</sup> Roget to Chalmers, 21 Mar. 1831, New College, Edinburgh, CHA 4.167.54. On Longman's see Asa Briggs, ed., *Essays in the History of Publishing: In Celebration of the 250th Anniversary of the House of Longman, 1724–1974* (London: Longman, 1974); and Harold Cox and John E. Chandler, *The House of Longman: With a Record of Their Bicentenary Celebrations* (London: Longman's, Green, 1924). On Murray see Samuel Smiles, *A Publisher and His Friends: Memoir and Correspondence of the Late John Murray, with an Account of the Origin and Progress of the House, 1768–1843*, 2 vols., 2nd ed. (London, 1891); and Henry Curwen, *A History of Booksellers: The Old and New* (London, 1873).

<sup>17</sup> On Murray's initial proposal and the ensuing delay see Roget to Chalmers, 21 Mar. 1831, 9 Apr. 1831, 13 June 1832, 20 Aug. 1832, New College, Edinburgh, CHA 4.167.54–55, CHA 4.189.11–13; and Chalmers to Roget [copy], 4 Apr. 1831, New College, Edinburgh, CHA 3.13.17. On his expectation of a loss see Buckland to Roget, 26 Aug. 1832, Bodleian Library, Oxford, Ms. Eng. Lett. b.35, fols. 30–31. Murray advertised the series in an eight-page catalogue of his publications that appeared in March 1832; a copy is stitched into the Cambridge University Library copy of Henry Philpots, *A Speech Delivered in the House of Lords, March 22d, 1832, on the New Plan of National Education in Ireland* (London, 1832).

that accompanied the Reform crisis of 1831–1832 so severely affected the confidence of the book trade that many publishers considered the situation even more serious than that during the financial panic of 1825–1826, when several publishers had been bankrupted. Yet while Murray's caution might seem to be explained by these difficult financial conditions, the subsequent success of the Bridgewater Treatises should cause us to reexamine the question. Murray had been concerned that "so many as 1000 copies may not go off," but within fifteen years more than sixty thousand copies of the Bridgewater Treatises were in print.<sup>18</sup> That so experienced a publisher should turn down a series that was by contemporary standards a publishing coup, believing that he would incur "a certain loss," raises important questions about Murray's expectations as to the readership of the series.

Considered as theological books, the series' prospects for a good sale were perhaps not great. In the view of the evangelical journalist James Grant, theology was out of vogue, with "perhaps not one theological work out of twenty or thirty" paying its expenses. Equally, while Murray's lists at the time included works like Charles Lyell's *Principles of Geology* and Mary Somerville's *Mechanism of the Heavens*, scientific publications were by no means an obvious source of rapid remuneration. Grant averred: "It is generally some time before works of a scientific, philosophical, or historical nature command a tolerable sale; but when they once get a hold on the public mind, they usually keep it for a length of time." Sales of such books were "seldom or never rapid"; they were "slow or gradual, but steady." Yet Murray had apparently failed to predict that, whatever their title pages suggested, many readers would not read the Bridgewater Treatises either as strictly theological or as strictly scientific treatises. Instead, for many the series would represent a largely nontechnical, politically conservative, and religiously safe compendium of contemporary science. To that extent, the treatises arguably represented a nascent publishing form that would later be called "popular science"—a form that publishers were very soon to find highly remunerative, but one that in 1832 was only beginning to be formulated as a commercial reality.<sup>19</sup>

When approached by the authors for the second time, Longman's also seemed uncertain of a large sale, inserting a clause in the draft agreement about the disposal "of the remainder, at lower price"; but since the authors were unhappy with the financial terms offered by Longman's they decided to look elsewhere.<sup>20</sup> Almost two years after their appointment, however, the authors' predicament was now becoming serious. So, in October 1832, they finally agreed to employ as their publisher William Pickering of Chancery Lane, in the heart of London's secondhand book district. Roget wrote to Chalmers: "We

<sup>18</sup> Buckland to Roget, 26 Aug. 1832. For details of the size and period of sale (in wholesale) of the Pickering editions of the Bridgewater Treatises see Topham, " 'Infinite Variety of Arguments,' " table 5.1. On the perceived problems of the book trade see Royal A. Gettman, *A Victorian Publisher: A Study of the Bentley Papers* (Cambridge: Cambridge Univ. Press, 1960), pp. 7–11. A rather less dramatic interpretation of the effects of the 1825–1826 crash is given in John Sutherland, "The British Book Trade and the Crash of 1826," *Library*, 6th Ser., 1987, 9:148–161. In November 1831 the editor of the *Quarterly Review*, John Gibson Lockhart, considered that "an additional stagnation of six months would make every bookseller bankrupt, except Longman and Murray": K. M. Lyell, ed., *Life, Letters, and Journals of Sir Charles Lyell*, 2 vols. (London, 1881), Vol. 1, p. 352.

<sup>19</sup> James Grant, *The Great Metropolis: Second Series*, 2 vols. (London, 1837), Vol. 1, pp. 131, 210. On the notion of "safe" science see Topham, "Science and Popular Education in the 1830s" (cit. n. 1), esp. pp. 403–405; and Topham, " 'Infinite Variety of Arguments,' " Ch. 5. On the development of a new "popular science" genre in mid-nineteenth-century Britain see Richard Yeo, "Science and Intellectual Authority in Mid-Nineteenth-Century Britain: Robert Chambers and *Vestiges of the Natural History of Creation*," *Victorian Stud.*, 1984, 28:5–31; and Jonathan Topham, "Vestiges of the History of 'Popular Science,'" *Metascience*, N.S., 1995, 8:48–55.

<sup>20</sup> It was apparently Roget who persuaded his fellow authors not to accept Longman's terms with regard to future editions. See Roget to Buckland, 9 Oct. 1832, Bodleian Library, Oxford, Ms. Eng. Lett. b.35, fols. 36–37.

have by report from several quarters, assured ourselves of the high reputation of Mr. Pickering, and of his ability to execute the publication in the most satisfactory manner." Yet, as a bookseller who combined his publishing activity with a notable antiquarian and rare-book business, Pickering was by no means an obvious choice. The majority of his publications were quality reprints of standard authors, often appearing in series (such as the *Aldine Poets*, published from 1830 to 1844) and often with a theological bent. His overriding interest was "in preserving, strengthening, and disseminating works enshrining traditional literary and religious views to a select, well educated, discriminating and monied public." With little available capital, Pickering was not the flamboyant patron of literary talent that the young John Murray had been, and he sought to minimize financial risk by publishing books with a predictable readership, which might realize "an unspectacular but relatively certain sale."<sup>21</sup>

Pickering's strategy in publishing the Bridgewater Treatises indicates that he anticipated the same gentlemanly readers for these as for his other publications, and he was certainly not aiming at the variety of readers and readings that emerged. The authors had already decided on the octavo format, but Pickering was a publisher of taste, and the books were prepared with wide margins and a large typeface, as befitted serious theological treatises. Their prices, between 9s. 6d. and £1 15s., were in keeping with Pickering's market: such prices made the works readily accessible only to the aristocracy, the gentry, and the upper middle classes (see Figure 1). Pickering apparently thought of the Bridgewater Treatises as theological works, much as he would later regard George Crabbe's *Outline of a System of Natural Theology* (1840). But in regard both to readership and to genre, his expectations of the series were wide of the mark. Although the Bridgewater Treatises retailed for approximately the same price as Crabbe's work, they each sold several thousand copies over the next fifteen years, while Crabbe's work sold only 258 copies in the same length of time.<sup>22</sup>

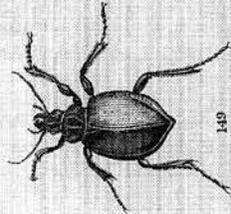
The fact that the authors all failed by varying degrees to keep to the original schedule meant that the publication of the Bridgewater Treatises was effectively serial, a point that worked to the authors' advantage, since it kept the series constantly in the public eye over a period of three and a half years. Indeed, Longman's had considered it good business sense to emulate the serialized "libraries" of the period, suggesting that "the volumes should follow each other in monthly succession and that two of the most popular subjects

<sup>21</sup> Roget to Chalmers, 13 Oct. 1832, New College, Edinburgh, CHA 4.189.18–19; and James Martin McDonnell, "William Pickering (1796–1854), Antiquarian Bookseller, Publisher, and Book Designer: A Study in the Early Nineteenth Century Book Trade" (Ph.D. diss., Polytechnic of North London, 1983), pp. 43–44, 44. On Pickering see Geoffrey Keynes, *William Pickering, Publisher: A Memoir and Check-list of His Publications*, rev. ed. (London: Galahad, 1969); Bernard Warrington, "William Pickering and the Book Trade in the Early Nineteenth Century," *Bulletin of the John Rylands University Library of Manchester*, 1985, 68:247–266; Warrington, "William Pickering, His Authors, and Interests: A Publisher and the Literary Scene in the Early Nineteenth Century," *ibid.*, 1987, 69:572–628; Warrington, "William Pickering, Bookseller and Book Collector," *ibid.*, 1989, 71:121–138; Warrington, "The Bankruptcy of William Pickering in 1853: The Hazards of Publishing and Bookselling in the First Half of the Nineteenth Century," *Publ. Hist.*, 1990, 27:5–25; Warrington, "William Pickering," in *Dictionary of Literary Biography*, Vol. 106: *British Literary Publishing Houses, 1820–1880*, ed. Patricia J. Anderson and Jonathan Rose (Detroit/London: Gale, 1991), pp. 245–250; and McDonnell, "William Pickering." On the "flamboyant" Murray see Gettman, *Victorian Publisher* (cit. n. 18), pp. 1–10.

<sup>22</sup> Pickering later advertised Crabbe's work as "Uniform with the Bridgewater Treatises." This statement occurs on the advertising leaves bound in my copy of Samuel Taylor Coleridge, *Aids to Reflection*, ed. Henry Nelson Coleridge, 2 vols. (London, 1843). For the decision regarding the octavo format see Roget to Whewell, 10 Dec. 1830, Trinity College, Cambridge, Add. Ms. a.211<sup>14</sup>; and Roget to Chalmers, 11 Dec. 1830, New College, Edinburgh, CHA 4.147.33. For sales figures see Topham, "Infinite Variety of Arguments," Ch. 5; and McDonnell, "William Pickering," p. 127.

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they possess in common with all articulated animals, the typical form of which consists, as we have seen, of a series of rings, or segments, joined endwise in the direction of a longitudinal axis. The principal portions into which the body is divided are the



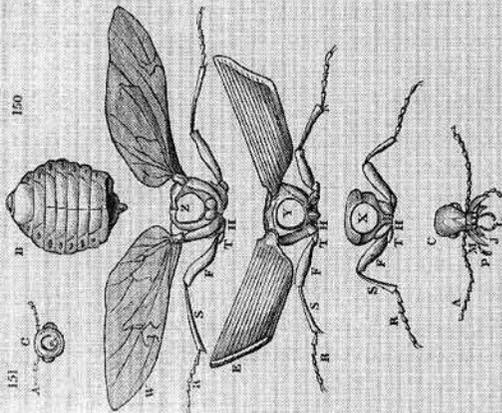
*head*, the *trunk*, and the *abdomen*: each of which is composed of several segments. I have here given in illustration, the annexed figures, showing the successive portions into which the solid framework, or skeleton, of one of the beetle tribe,

the *Coleosoma sycophanta*,\* may be separated. The entire insect, which presents the most perfect specimen of a complete skeleton in this class of animals, is represented in Fig. 149; and the several detached segments, on an enlarged scale, in Fig. 150. The head (C), as seen in the latter figure, may be regarded as being composed of three segments; the trunk (X, Y, Z), of three; and the abdomen (B), of nine. Fig. 151, is a view of the head separated from the trunk, and seen from behind, in order to show that its form is essen-

\* *Coleosoma sycophanta*. Linn.

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tially annular, and that it resembles in this respect the rings of which the thorax consists, and to which it forms a natural sequel.



The *head* contains the brain, or principal enlargement of the nervous system, and the organs of sensation and of mastication. Its size, as compared with the rest of the body, varies much in

YOL. I.

Figure 1. A gentleman's book: stylish typography, intricate woodcuts, and spacious margins in Peter Mark Roget's Animal and Vegetable Physiology Considered with Reference to Natural Theology, 2 vols. (London, 1834), Volume 1, pages 320-321.

should take the lead." Pickering's editions were never large (his modal print run was five hundred copies), and when he came to publish Whewell's treatise in March 1833 he issued only the thousand copies required by Bridgewater's will.<sup>23</sup> Moreover, even though Whewell's first edition sold out almost immediately, Pickering adopted the same procedure with Kidd's Bridgewater in April. Chalmers's reputation as a popular author persuaded him that the third Bridgewater "would sell in much greater proportion than some of the others," and so he published fifteen hundred copies, which again sold out very quickly. Yet when Charles Bell's Bridgewater appeared in June Pickering reverted to a thousand copies, so that the edition was oversubscribed by three hundred copies.<sup>24</sup> Even the cautious Pickering now fully realized the demand, and subsequent first editions reached heights almost unparalleled in his publishing experience: two thousand copies, three thousand copies, and finally, in the case of Buckland's work, five thousand copies.

The incongruity of this cautious antiquarian bookseller publishing best-selling and fashionable books was evident to contemporaries. In his *Reminiscences* (1836), the bibliographer Thomas Frognall Dibdin imagined himself arriving at Chancery Lane, as part of a tour of literary London: "How does Mr. Pickering do this morning? And where are his *Caxtons* and *Wynkyns*, and *Pynsons*—his *Alduses*, *Elzevirs*, and *Michel Le Noirs*? But Mr. Pickering has a note of louder triumph to sound, in being publisher of the BRIDGEWATER TREATISES . . . which bid fair to traverse the whole civilized portion of the globe."<sup>25</sup>

From the book buyer's perspective, this incongruity had more of an edge. What was a bookish gentleman's publisher like Pickering doing publishing works that might otherwise be read by all classes? None of the recently developed contrivances of the popular publisher had been employed, and the price of the Bridgewater Treatises was consequently prohibitive for many potential purchasers. Reviewers complained bitterly about the lack of a cheap edition and considered it a disgrace that so many readers should be excluded merely by the form of publication.<sup>26</sup> Such remarks make it abundantly clear that the decisions of the authors and publisher about the form of publication of the Bridgewater Treatises very materially affected the contexts and practices of their reading, both in terms of their availability and in terms of the cultural meaning of the book. What is also clear, however, is that the strategies of both authors and publishers were undermined by readers themselves, who bought the works in large numbers and read them in ways that had not been anticipated.

#### PRINTER

While publishers are commonly regarded as constituting an important link between authors and readers, historians of ideas rarely even consider printers. Yet William Pickering's

<sup>23</sup> Roget to Buckland, 9 Oct. 1832, Bodleian Library, Oxford, Ms. Eng. Lett. b.35, fols. 36–37. On Victorian serial publication see Leslie Howsam, "Sustained Literary Ventures: The Series in Victorian Book Publishing," *Publ. Hist.*, 1992, 31:5–26. Information on Pickering's standard print run comes from McDonnell, "William Pickering," p. 122. The sizes of the Pickering editions of the Bridgewater Treatises have been derived from the Chiswick Press Debit and Credit Ledgers, British Library, Add. Mss. 41,927–41,928. See also Topham, "Infinite Variety of Arguments," Ch. 5; and McDonnell, "William Pickering," pp. 51–53, 122, 128, 2xi–2xxi.

<sup>24</sup> William Pickering to Chalmers, 2 Mar. 1833, New College, Edinburgh, CHA 4.212.15; and Pickering to Chalmers, 22 June 1833, New College, Edinburgh, CHA 4.212.18–19 (on Bell's treatise). Bell was, not surprisingly, delighted, telling Lord Brougham: "I am happy to say that before a copy is in the shops another edition is called for": Charles Bell to Brougham, [June 1833], University College, London, Brougham Papers 45606.

<sup>25</sup> Thomas Frognall Dibdin, *Reminiscences of a Literary Life: With Anecdotes of Books, and of Book Collectors*, 2 vols. (London, 1836), Vol. 2, pp. 904–905.

<sup>26</sup> Such reactions are discussed in Topham, "Science and Popular Education in the 1830s" (cit. n. 1); see also Topham, "Infinite Variety of Arguments," Ch. 5.

relationship with Charles Whittingham, his chief printer from 1830, cannot be so easily disregarded (see Figure 2). Their businesses were heavily intertwined, to the extent that Whittingham provided Pickering with much of the cash finance he needed to stay in business, while Pickering was by far Whittingham's largest customer. The chief attribute that brought and bound the two together was a keen interest in high-quality typography. Whittingham, who had been introduced to Pickering as "the most accomplished printer" in London, could supply the skill that the publisher needed to prepare the fine editions that his readers expected. His strength was not in the technology of mass production; Whittingham's reputation, like that of Pickering himself, lay in his ability to produce a high-quality product. He thus served to reinforce Pickering's own resistance to the publication of cheap, mass-produced Bridgewater Treatises. Moreover, contemporaries knew that the exclusiveness of the Bridgewater Treatises was a question as much of typography as of format. "Think of printing these treatises," howled one reviewer, "designed for universal dissemination, in a style, and at an expense, that must limit their circulation to the narrowest compass. Between the lines of the work before us the Earl of Bridgewater might almost have driven his cab!"<sup>27</sup>

The same point is clear when we consider Whewell's desire to publish a duodecimo edition of his Bridgewater. Pickering finally conceded to Whewell a smaller, foolscap octavo edition in 1837; it used smaller type and sold for 6s. instead of 9s. 6d. Whittingham prepared stereotype plates, from which three thousand copies were ultimately taken, and the second printing, in 1846, sold for 5s. Yet it is clear that the printer did not have the machinery necessary to take full advantage of such stereotype plates in producing a large and cheap edition. Even at his retirement in 1860, Whittingham still used hand presses exclusively. The cylinder machines used by other printers to produce large print runs, like that of the *Penny Magazine*, were inappropriate for a printer of small editions like Whittingham. Moreover, the fact that the cylinder machine produced an inferior impression (it was called the "type-smasher" by printers) could not sit easily with Whittingham's typographic art. It is consequently unsurprising that with none of the other Bridgewater Treatises did Pickering attempt to produce a cheap edition. Not until the advent of the Bohn's Library editions in the 1850s did the Bridgewater Treatises become generally cheaper. Printed from stereotyped plates, but this time on machine presses by the leading printer William Clowes, the series benefited from the economies of scale possible with standard works. The implications for readers of this change in the printing process were considerable. In 1852 Kirby's biographer reported that his Bridgewater Treatise had hitherto been "extensively read by men of literature" but that it was now, "by its republication, brought within the reach of every one who could have even curiosity to see it."<sup>28</sup>

<sup>27</sup> See Arthur Warren, *The Charles Whittinghams, Printers* (New York: Grolier Club, 1896), p. 135; and [Anon.], "Kirby on Instinct," *Medico-Chirurgical Review*, 1835, 23:400–413, 1836, 24:79–93, 358–365, on p. 400.

<sup>28</sup> Freeman, *Life of Kirby* (cit. n. 11), p. 440. On Whittingham's exclusive use of hand presses see Warren, *Charles Whittinghams*, p. 338. On the Bohn "Libraries" see David B. Mock, "H. G. Bohn," in *Dictionary of Literary Biography*, Vol. 106: *British Literary Publishing Houses, 1820–1880*, ed. Anderson and Rose (cit. n. 21), pp. 59–62; Francesco Cordasco, *The Bohn Libraries: A History and a Checklist* (New York: Burt Franklin, 1951); Anthony Lister, "Henry George Bohn (1796–1884): Bookseller, Publisher, and Controversialist," *Antiquarian Book Monthly Review*, 1988, 15:54–61; [Anon.], "Bohn and His Library: The History of Both, with a Noteworthy New Foot-note," *Book Monthly*, 1904–1905, 1:463–467; Edward Bell, *George Bell, Publisher: A Brief Memoir* (London: Privately published, 1924), pp. 72–75; and Alexis Weedon, "A Quantitative Survey: George Bell and Sons," *Publ. Hist.*, 1993, 33:5–35. On Clowes see W. B. Clowes, *A Family Business, 1803–1953* (London: Clowes, [1953]).



**Figure 2.** A publisher and his friend: William Pickering and the printer Charles Whittingham in Whittingham's summer house at Chiswick. Drawn by Frank Dodd from an oil painting by Charlotte Whittingham. From Arthur Warren, *The Charles Whittinghams, Printers* (New York: Grolier Club, 1896), page 209. (By permission of the Syndics of Cambridge University Library.)

#### BOOKSELLERS, BOOKBINDERS, AND LIBRARIES

In attempting to delineate the contexts in which the Bridgewater Treatises were read, it is obviously highly desirable to obtain as much information as possible about their wholesaling and retailing. However, not only is the wholesale and retail book trade of this period still generally obscure, but Pickering's business records have not survived, and it is impossible to make the kinds of rigorous geographical and social analysis that such documents would allow. Yet much can still be learned from the sources that survive.

Although Pickering was a retail bookseller, he could not hope to sell more than a few Bridgewater Treatises to the antiquaries and bibliophiles who frequented his shop in Chancery Lane. Instead, the bulk of his trade needed to be with other London retailers and with the wholesale traders who supplied the country market. For Pickering, however, this presented a serious problem, since from early in 1832 many London booksellers had been refusing to sell his works. This extraordinary state of affairs was part of a trade dispute with roots in the economic uncertainty of the postwar period. Pickering had fallen foul of a set of regulations drawn up in December 1829 by a committee of the most powerful

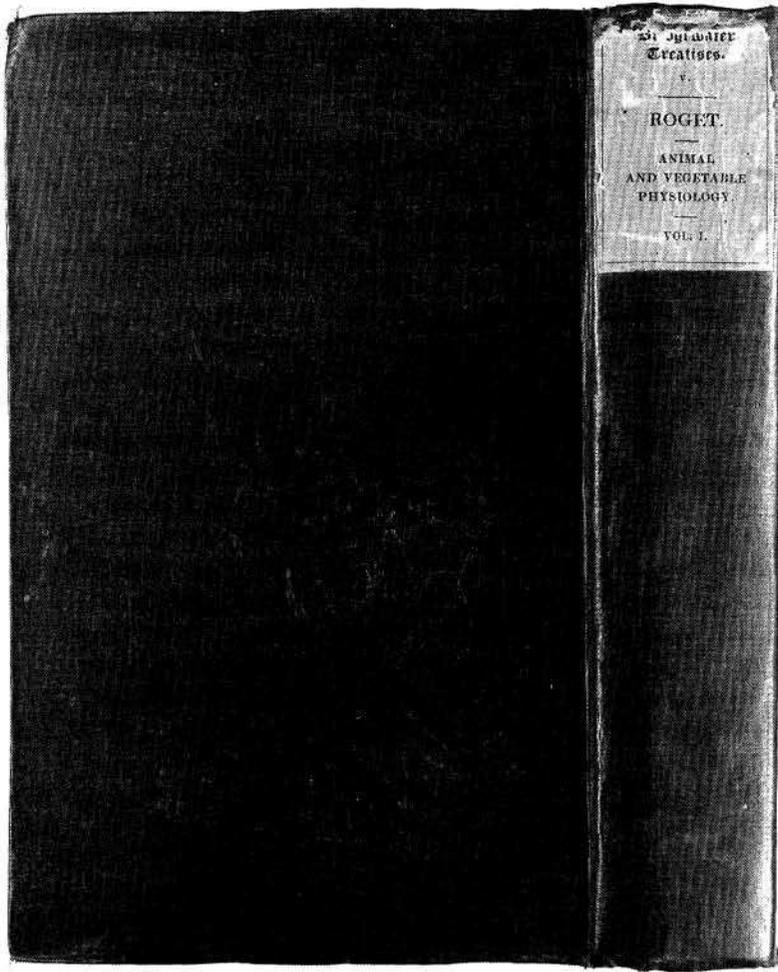
London booksellers and publishers in response to growing fears about the undercutting of standard retail prices.<sup>29</sup> On suspicion that he had supplied books to two London retailers who had been blacklisted for underselling, Pickering was refused new books at trade prices, at some establishments his own publications were reported to be “not out,” “out of print,” or “discontinued,” and his shop was put under surveillance by the committee’s spies. Pickering’s extraordinary predicament was reportedly relieved early in 1833 by the publication of the Bridgewater Treatises. As the series began to appear the demand was so great that, by refusing to supply the trade with the treatises on wholesale terms, Pickering was able to exact a compromise, demanding that he should be removed from the blacklist. As one free-trade advocate remarked: “what a God-send these Treatises have been . . . and how completely they have unmasked the cupidity of the band of interested traders.”<sup>30</sup> The power that the publication of the Bridgewater Treatises gave to Pickering was thus very considerable, and though we know little of the specific details of Pickering’s dealings with other traders, it is clear that in this case they were very much in the position of supplicants.

Bookbinders, like booksellers, do not feature largely in standard histories of science. Yet here again the material culture of the book has important implications for readership. William Pickering represents a singularly interesting study in this respect, since it was he who in the 1820s pioneered the use of cotton cloth to produce permanent, but still relatively cheap, trade bindings for books.<sup>31</sup> The early technical problems of coloring and dressing cloth to cover boards in place of paper were solved by Archibald Leighton, one of the London bookbinders later employed by Pickering to bind many of the Bridgewater Treatises. Between 1830 and 1832, Leighton was again prominent in overcoming the difficulties associated with graining the cloth and blocking its surface, but Pickering initially kept his bindings plain, with no grain, and with paper labels rather than gold embossed lettering. Most if not all of the Bridgewater Treatises were bound up in this serviceable form at Pickering’s expense (see Figure 3), and the implications are not inconsiderable. While the new cloth binding quickly became common, many works in the 1830s were still distributed to booksellers in sheets, or in less durable paper-covered boards, and readers were thus faced with the additional cost of a leather binding. From the start, however, the Bridgewater Treatises were issued in a durable cloth binding that could and did serve for many years.

<sup>29</sup> See James J. Barnes, *Free Trade in Books: A Study in the London Book Trade since 1800* (Oxford: Clarendon, 1964), pp. 1–18. Pickering himself gave the most detailed account of the case in his *Booksellers’ Monopoly: Address to the Trade and the Public* (London, 1832), which is reproduced in Graham Pollard, “The English Market for Printed Books: *The Sanders Lectures, 1959*,” *Publ. Hist.*, 1978, 4:7–48, on pp. 43–47. The case was also discussed in Charles Babbage, *On the Economy of Machinery and Manufactures*, 4th ed. (London, 1835), pp. 328–329; and in a short-lived periodical, the *Retail Booksellers’ and Bookbuyers’ Advocate*. On the latter see Barnes, *Free Trade in Books*.

<sup>30</sup> Pickering, *Booksellers’ Monopoly*, p. 4; and *Retail Booksellers’ and Bookbuyers’ Advocate*, Jan. 1837, p. 23, quoted in Warrington, “William Pickering, His Authors, and Interests” (cit. n. 21), p. 621. See also Pollard, “English Market for Printed Books,” p. 47. On the surveillance of Pickering’s shop see *Retail Booksellers’ and Bookbuyers’ Advocate*, 1836, 1:18, quoted in Barnes, *Free Trade in Books*, p. 16. The spies were reportedly “two wretched creatures dressed as mechanics,” whose instructions were to “follow the inmates . . . both male and FEMALE, wherever their occupations might lead them.”

<sup>31</sup> See Bernard Warrington, “William Pickering and the Development of Publishers’ Binding in the Early Nineteenth Century,” *Publ. Hist.*, 1993, 33:59–76; Philip Gaskell, *A New Introduction to Bibliography* (Oxford: Clarendon, 1972), p. 245; and McDonnell, “William Pickering” (cit. n. 21), pp. 96–99. On the development of cloth and board binding see Michael Sadleir, *The Evolution of Publishers’ Binding Styles, 1770–1900* (London: Constable; New York: Smith, 1930); John W. Carter, *Binding Variants in English Publishing, 1820–1900* (London: Constable; New York: Long & Smith, 1932); and Carter, *Publishers’ Cloth: An Outline History of Publishers’ Binding in England, 1820–1900* (New York: Bowker; London: Constable, 1935).



**Figure 3.** Plain but serviceable: the novelty of a sturdy and durable publisher's binding was still fresh in the early 1830s. Peter Mark Roget, *Animal and Vegetable Physiology Considered with Reference to Natural Theology*, 2 vols. (London, 1834).

The fact that many of the surviving copies were rebound in sumptuous leather bindings indicates more about the wealth of many of the early readers than about the durability of Pickering's cloth.

Another reason why so many of the extant copies of the Bridgewater Treatises are found in leather bindings is that these were works that many contemporaries considered "should be purchased, as ought every great work, for all the best public and private libraries." The fact that the series was beyond the financial reach of most potential readers very much increases the historical significance of these library copies, which opened the Bridgewater Treatises to a vast new reservoir of potential readers. Moreover, the records of library holdings, and even of loans, are more enduring than the records of personal purchases, so

that library studies hold out the prospect of great insights into the context and pattern of reading.<sup>32</sup>

### READERS

The preceding discussion has demonstrated that the readership of the Bridgewater Treatises was to a great extent shaped by an elaborate series of negotiations between authors, publishers, printers, binders, and booksellers concerning not only the content but also the format and price of these books. An understanding of these generally little-regarded aspects of the communication circuit is thus clearly of great importance in interpreting the cultural meaning of the series. However, another striking feature of the account is the extent to which the size and range of the readership for the Bridgewater Treatises, at least as represented by sales, took many of those involved in producing them by surprise. That this was so, as I have argued, broadly indicates the growing market for works in which contemporary science was summarized in a nontechnical but authoritative manner. Such a development represents a highly significant moment in the history of science in Britain, when the growing specialization of science, together with changes in the book trade and in patterns of reading, presented opportunities for the development of new genres of scientific publication.

However, while the kinds of evidence cited so far provide insights into both the availability of books and the actual pattern of book purchasing, many questions about the divergent meanings that the books possessed for actual readers remain unanswered. As already stated, it is not my objective here to give a comprehensive account of the readership of the Bridgewater Treatises. Instead, the purpose of this last section is to demonstrate, first, that these books were read in a wide variety of contexts, in which they served radically different purposes and possessed radically different meanings, and, second, that these divergent and sometimes conflicting readings reveal some of the divergences in early Victorian society concerning the status of competing bodies of knowledge about nature—and thus contribute more generally to an understanding of the place of science in early nineteenth-century Britain. In order to provide some depth to the analysis, I have found it necessary to discuss readings of only one of the Bridgewater Treatises (Buckland's *Geology and Mineralogy*) and to maintain a relatively tight temporal and geographical focus (readers in Britain during the period immediately following its publication). While it may be objected that Buckland's was the Bridgewater that provoked the most extreme reactions, I believe the same general points could be substantiated in respect of any of the others.<sup>33</sup> Moreover, although the different readings consequent on the different editions and foreign translations are clearly of great interest, our objective here is to see how radically different readings could simultaneously be achieved from identical material objects.

It is important to observe at the outset that attempts to manipulate readers' reactions to books did not end with publication. The early nineteenth century saw a vast increase in the number and range of periodical publications, so that, when the Bridgewater Treatises came to be reviewed in the 1830s, the reading public was bombarded with more than 120 reviews in over forty different periodicals. Moreover, the periodical literature was rapidly

<sup>32</sup> R[ichard] H[enry] H[orne], "Buckland's Theology," *Monthly Repository*, N.S., 1836, 10:269–278, on p. 278. Topham, " 'Infinite Variety of Arguments,' " Ch. 5, provides a discussion of the distribution of the Bridgewater Treatises in the institutional libraries of Leeds.

<sup>33</sup> See Topham, " 'Infinite Variety of Arguments,' " esp. Chs. 5–7. On the reception of Buckland's Bridgewater Treatise see also Rupke, *Great Chain of History* (cit. n. 11), esp. pp. 18–20.

becoming highly differentiated and specialized, as publishers sought to exploit the full extent of the burgeoning reading public. As a number of historians have been quick to recognize, this had the effect of polarizing reviewing policies in the different journals and of causing the individual editors to seek to identify their journal's usually anonymous "voice" with the views of a tightly defined readership.<sup>34</sup> However, the relationship between reviewers and readers was by no means straightforward, and it is important to appreciate that reviews were only one element in a complex context of reading. The decision to read a book and the manner in which it was read depended on many social and cultural factors, including not only reviews but also conversations of many sorts, sermons, lectures, and addresses. Only by recreating, so far as is possible, the different social worlds in which books were read can we adequately recover the purposes they served and the meanings they possessed.<sup>35</sup>

### *Gentlemen of Science*

Buckland's Bridgewater Treatise provided plenty of scope for the creation of expectations in advance of publication, since it took its author some six years to complete. In particular, the effectively serial publication of the treatises meant that it became the long-awaited conclusion of a series that had by then achieved a considerable reputation. Buckland himself noted that it was lucky for some of the Bridgewater's that Whewell's, which was "decidedly the best," "came forth first into the world, & gave the whole series a good name." "From coming at the fag end," he quipped, "mine had the advantage of making up every bodies set."<sup>36</sup>

However, it was not only the other volumes in the series that created expectations of Buckland's work amongst the gentlemanly practitioners of science. Rumors about its contents had been circulating in such circles for a considerable time, so that the book had a "virtual" existence long before it actually appeared. The scientific elite in early nineteenth-century Britain was remarkably small, and within the context of the select London and Edinburgh scientific societies a book's reputation was often to a large extent determined in advance of publication. Moreover, authors from within the select confines of gentlemanly science could use the intimate conversations of that world to adjust their work in response to criticism. Indeed, Buckland had various friends look over and comment on parts of the book in proof, most notably that part relating to the reconciliation of modern geology with the Genesis creation narrative. He subsequently used these verbal "reviews" to prepare the way for the book, reporting to his scientific peers the theological approval of the Oxford professors of divinity and Hebrew (Edward Burton and Edward Bouverie Pusey) and the bishops of Llandaff and Chester (Edward Copleston and the evangelical John Bird Sumner). Pusey, whom Buckland counted a friend, even provided him with a

<sup>34</sup> See, e.g., Alvar Ellegård, *Darwin and the General Reader: The Reception of Darwin's Theory of Evolution in the British Periodical Press, 1859–1872* (Chicago/London: Univ. Chicago Press, 1990), pp. 5–6. Some discussion of the readership of the Bridgewater Treatises and a detailed list of reviews is given in Topham "Infinite Variety of Arguments," Ch. 5 and bibliography.

<sup>35</sup> In developing the analysis in this section, I am greatly indebted to James A. Secord's paper "Conversations on Creation," which was presented at a day-long conference on the *Vestiges of the Natural History of Creation*, held at the Wellcome Institute for the History of Medicine on 16 Nov. 1994. I would like to thank Secord for providing me with a copy of his paper and allowing me to refer to it.

<sup>36</sup> Buckland to Alexander Irvine, 25 Feb. 1837, Christ Church, Oxford, Ms. 531.

confirmatory note for inclusion as a footnote in the published chapter, giving his interpretation an imprimatur of no small weight.<sup>37</sup>

In the months after its publication, Buckland's *Bridgewater* continued to dominate the conversations and correspondence of his peers among the gentlemen of science and even (less typically) became the subject of discussion and recommendation in the course of the formal business of the metropolitan scientific societies.<sup>38</sup> In his presidential address to the Geological Society of London in February 1837, Lyell chose to conclude by congratulating the society "on the appearance of Dr. Buckland's *Bridgewater Treatise*," discussing its contents and merits at considerable length. He laid particular emphasis on the extent to which, by giving "a general view of the principal facts brought to light by the study of organic remains," Buckland had contributed "towards the filling up one of the greatest blanks which existed in the literature of our science." This, indeed, was the great subject for praise among Buckland's peers, who, while they were aware of, and generally grateful for, the treatise's value in popularizing and apologizing for geology, held that it served an important specialist function.<sup>39</sup> Buckland's work became, within geological circles, a valuable sourcebook of paleontology.

This realization helps us to contextualize a quintessentially solitary reading experience, like Charles Darwin's careful study of half of Buckland's *Bridgewater* at his father-in-law's Staffordshire house in the summer of 1840. Although the source materials available to us (Darwin's manuscript notes) are entirely private, they cannot be understood apart from the context of the metropolitan scientific elite, in which Darwin had been completely immersed for the preceding three years. Darwin's notes indicate that he read Buckland's *Bridgewater* as a sourcebook of paleontology; they chiefly record examples that Darwin thought might be useful or cause difficulties for his theory.<sup>40</sup> This use of the book was clearly shaped by the verbal reactions of the gentlemanly elite of science, from Lyell's anniversary address to the Geological Society, which Darwin was present to hear, to the general gossip and private recommendations of those with whom he mixed socially. It was also shaped by his personal experience of the author—an experience suitably testified to by the discussion of some of Darwin's *Beagle* specimens in the "supple-

<sup>37</sup> Regarding rumors about Buckland's work see, e.g., Charles Lyell to Gideon Mantell, 18 Jan. 1832, and Lyell to John Fleming, 7 Jan. 1835, in K. M. Lyell, ed., *Charles Lyell* (cit. n. 18), Vol. 1, pp. 367–368, pp. 444–446. On friends' comments on proofs see Buckland to Adam Sedgwick, 28 Oct. 1835, Cambridge University Library, Add. 7652, IB, fol. 44; and William Buckland, *Geology and Mineralogy Considered with Reference to Natural Theology*, 2 vols., 2nd ed. (London, 1837), Vol. 1, p. ix. On Buckland's use of such comments see Buckland to Sedgwick, 28 Oct. 1835; and Lyell to Fleming, 7 Jan. 1835, in K. M. Lyell, *Charles Lyell*, Vol. 1, p. 446. Pusey's note appears in Buckland, *Geology and Mineralogy* (1836), Vol. 1, pp. 22n–25n; see also pp. 21n, 26n, 27n.

<sup>38</sup> In November 1836, in his anniversary address as president of the Royal Society, the duke of Sussex concluded by referring to the completion of the *Bridgewater Treatises*, stating: "a list which is headed by the name of Whewell and closed by that of Buckland, can hardly be considered as an unworthy representation of the science and literature of this country." *Proceedings of the Royal Society of London*, 1837, 3:429–441, on p. 433.

<sup>39</sup> Charles Lyell, "Address to the Geological Society, Delivered at the Anniversary, on the 17th of February, 1837," *Proceedings of the Geological Society of London*, 1838, 2:479–523, on p. 517. On the specialized merits of Buckland's treatise see, e.g., Sedgwick to William Daniel Conybeare, 5 Dec. 1836, in John Willis Clark and Thomas McKenny Hughes, eds., *The Life and Letters of the Reverend Adam Sedgwick*, 2 vols. (Cambridge, 1890), Vol. 1, pp. 468–471.

<sup>40</sup> On Darwin's 1840 reading of Buckland see Frederick Burkhardt et al., eds., *The Correspondence of Charles Darwin*, 10 vols. (Cambridge: Cambridge Univ. Press, 1985–1997), Vol. 4, p. 460. For his notes see Cambridge University Library, DAR 71, fols. 125–127; and DAR 80 (ser. 2): 29. No copy of Buckland's treatise belonging to Darwin is known to exist; see Mario di Gregorio, ed., *Charles Darwin's Marginalia*, Vol. 1 (New York: Garland, 1990).

mentary notes" issued for use with both the first and second editions of Buckland's *Bridgewater Treatise*.<sup>41</sup>

### *Fashionable Society*

Another, very different, context in which the scientific status of Buckland's treatise was of considerable importance was in fashionable London society. Buckland's diluvial theory and his work on the Kirkdale Cave in the previous decade had made him a minor celebrity in fashionable literary as well as scientific circles (see Cover). As Jim Secord has indicated in a recent paper, such literary "lionism" was an important aspect of the culture of print in early nineteenth-century high society. The effect of having fashionable authors like Buckland at select social gatherings, Secord argues, was to maintain the sense of those who moved in such circles that there existed a "select readership, distinct from the ordinary public."<sup>42</sup> Buckland's performance and reputation in this sphere contributed to give his book a "virtual" existence for such readers that was singularly protracted.

By the autumn of 1835, Buckland's friend John Murray, the publisher of the *Quarterly Review*, was making preparations to arrange "the best possible review" of Buckland's *Bridgewater* and asked Buckland to advise him "as to the persons most competent to do the needful on such an occasion." In the event, it was George Poulett Scrope and William John Broderip who wrote the "splendid review" that appeared in the *Quarterly Review* in March 1836.<sup>43</sup> However, since the book continued to be delayed by the production of the plates, the review predated it by some six months and itself became a subject of discussion in fashionable society. And while the appearance of a review before the book itself might be a subject for drollery, it did, importantly, maintain the interest in Buckland's *Bridgewater*, serving "to convince the world that it had not perished in the gestation."<sup>44</sup>

While all the advance publicity for Buckland's treatise certainly boded well for sales, his friend the fashionable sculptor Sir Francis Chantrey, a prominent member of London's high society, was concerned that if the "D<sup>d</sup>. Book" did not appear shortly, it would be "blasted by *mismanagement alone*." He advised: "The season will pass & although sale to a certain am<sup>t</sup>. is certain yet triumph over the others of the series cannot fail to be endangered."<sup>45</sup> This stern warning indicates the importance of the London social season for the sale of relatively expensive books to the small social group that could afford to buy them. The advertising of new books at the start of the season, in October and Novem-

<sup>41</sup> Darwin returned from his five-year voyage on H.M.S. *Beagle* about a week after the appearance of the first edition of Buckland's work, and Buckland was shortly afterward invited to examine some of the South American fossil mammals in Darwin's collection. See Charles Darwin to John Stevens Henslow, [30–31 Oct. 1836], in Burkhardt et al., eds., *Correspondence of Charles Darwin*, Vol. 1, pp. 512–515, on p. 513; and Buckland, *Geology and Mineralogy* (1836), Vol. 1, p. 603.

<sup>42</sup> Secord, "Conversations on Creation" (cit. n. 35). On Buckland's celebrity see, e.g., Rupke, *Great Chain of History* (cit. n. 11), pp. 64–74.

<sup>43</sup> Buckland to Sedgwick, 28 Oct. 1835, Cambridge University Library, Add. 7652, IB, fol. 44; Buckland to George Featherstonhaugh, 25 Apr. 1836, Cambridge University Library, Add. 7652, ILL, fol. 32; and John Murray to Buckland, 21 Nov. 1835, Bodleian Library, Oxford, Ms. Eng. Lett. b.35, fols. 35–36. Buckland, who argued that the book was so wide ranging that it could not be adequately reviewed by a single individual, approached several distinguished naturalists, including Adam Sedgwick and Robert Brown, with a request that they contribute to the review.

<sup>44</sup> Buckland to Featherstonhaugh, 25 Apr. 1836. For discussion of the anticipatory review see, e.g., Lyell to John Frederick William Herschel, 1 June 1836, and Lyell to Mantell, 6 July 1836, in K. M. Lyell, ed., *Charles Lyell* (cit. n. 18), Vol. 1, pp. 464–469, 470–471.

<sup>45</sup> Francis Chantrey to Buckland, 17 June 1836, Bodleian Library, Oxford, Ms. Eng. Lett. b.35, fols. 20–21.



**Figure 4.** *Caroline Fox.* An etching by Hubert Herkomer, A.R.A., 1881. From Horace M. Pym, ed., *Memories of Old Friends, Being Extracts from the Journals and Letters of Caroline Fox of Penjerrick, Cornwall, from 1835 to 1871* (London, 1882), frontispiece. (By permission of the Syndics of Cambridge University Library.)

ber, was of particular importance if a publisher hoped to make any impact on the culture of soirees, conversazione, and dinner parties around which the season revolved.

Even before his *Bridgewater* was finally published, on 24 September 1836, Buckland was being lionized. After the annual meeting of the British Association for the Advancement of Science (held in August at Bristol) he stayed with the Quaker geologist Robert Were Fox and, according to Fox's daughter Caroline (see Figure 4), "took his turn with three others in lecturing to an attentive audience" in the drawing room. She continued:

we listened with great and gaping interest to a description of his geological map, the frontispiece to his forthcoming *Bridgewater Treatise*. He gave very clear details of the gradual formation of our earth, which, he is thoroughly convinced, took its rise ages before the Mosaic record. He says that Luther must have taken a similar view, as in his translation of the Bible he puts "1<sup>st</sup>" at the third verse of the first chapter of Genesis, which showed his belief that the two first verses relate to something anterior.<sup>46</sup>

<sup>46</sup> Horace N. Pym, ed., *Memories of Old Friends, Being Extracts from the Journals and Letters of Caroline Fox of Penjerrick, Cornwall, from 1835 to 1871*, 2 vols., 2nd ed. (London, 1882), p. 9.

Fox's detailed report of this private lecture contrasts with her diary's apparent silence concerning the speech Buckland made about his *Bridgewater Treatise* during the final session of the British Association meeting itself, reports and discussion of which dominated the newspaper press, as we shall see. From Buckland's personal presentation in her own drawing room, Fox carried away both conviction and a mass of detail; but her attendance at the closing of the British Association meeting, while mentioned in her diary, apparently prompted no comment on Buckland's *Bridgewater* at all. Indeed, earlier in the week, she had found a similar evening meeting of the British Association to be so crowded that the "most extraordinary muscular exertions" were required to obtain admittance and had complained that "all the time the people made such a provoking noise, talking, coming in, and going out, opening and shutting boxes," that one could hear very little.<sup>47</sup> For those in fashionable society, and especially for women, private opportunities to engage authors in conversation were often most significant.<sup>48</sup>

Even when the "lion" was absent, as the Oxford professor Buckland inevitably was from London society for much of the 1836–1837 season, such personal contacts were crucial in forming opinion. Charles Lyell, who considered this the "emptiest of seasons," found himself called upon in March to deputize for Buckland at a gathering of one of the most influential social sets. At a dinner given by Sarah Rogers and her brother, the poet Samuel Rogers, Lyell and his wife found themselves in company with Lord and Lady Holland, whose London establishment was the heart of Whig social life and arguably the leading salon of early nineteenth-century Britain.<sup>49</sup> Others present were the Hollands' physician, John Allen, the religious historian and prominent clergyman Henry Hart Milman and his wife, the wit and society poet Henry Luttrell, the writer and law professor William Empson, and the artist and Royal Academician Sir David Wilkie. Such a careful mix of public figures from different fields was part of the culture of polite entertaining, intended to provide for a wide-ranging and stimulating conversation, and, indeed, Lyell's report of the dinner shows that this was certainly achieved.

However, it was not until the ladies had withdrawn that Lord Holland asked Lyell "about Buckland's book, and whether he knew much of geology." Lyell reported:

He seemed not to have formed a high estimate of the said *Bridgewater*, so I spoke up in favour of the body of the work, on fossils. This led to a talk on new species, and that mystery of mysteries, the creation of man. Lord Holland said that we were no further on that point than Lucretius, out of whom he could take mottoes which would have done for each of my volumes.<sup>50</sup>

Holland's naive question here seems remarkable, for the periodical press had by this stage long been trumpeting the success of Buckland's *Bridgewater* in achieving a synthesis as much valued by specialist geologists as by nonspecialist readers. Yet for a figure of Hol-

<sup>47</sup> *Ibid.*, pp. 6–7. Since the original of Fox's diary appears not to have survived, and the published edition consists merely of extracts, the conclusion that she said nothing about the discussion of Buckland's *Bridgewater* at the BAAS meeting cannot be drawn with absolute certainty.

<sup>48</sup> Buckland had a strikingly similar conversation with the Unitarian philanthropist Mary Carpenter (sister of the physiologist William Benjamin Carpenter) on his return journey to Oxford from Robert Fox's house. See J. Estlin Carpenter, *Life and Work of Mary Carpenter* (London, 1879), pp. 62–63.

<sup>49</sup> Lyell to Charles Lyell (his father), 4 Oct. 1836, in K. M. Lyell, ed., *Charles Lyell* (cit. n. 18), Vol. 1, pp. 472–474, on p. 474. Much has been written on the Holland House circle. See, e.g., the introduction to Abraham D. Kriegel, ed., *The Holland House Diaries, 1831–1840: The Diary of Henry Richard Vassal Fox, Third Lord Holland, with Extracts from the Diary of Dr. John Allen* (London: Routledge & Kegan Paul, 1977).

<sup>50</sup> Lyell to Sophia Lyell (his sister), 19 Mar. 1837, in K. M. Lyell, ed., *Charles Lyell*, Vol. 2, pp. 7–9, on p. 8.

land's standing, in regular contact with opinion makers in every field, the personal ratification of a specialist like Lyell might obviate the need for that relatively recent invention, the periodical review.

That the discussion led to the question of the origin of new species is also revealing. Buckland had, of course, discussed the subject in his *Bridgewater*. Yet while Buckland stated his strong opposition to theories of species transmutation, he did not commit himself unequivocally to the miraculous origin of new species, quoting Whewell's ambiguous statement that the appearance of new species in each epoch represented "a distinct manifestation of creative power transcending the operations of *known* laws of nature."<sup>51</sup> Lyell, too, had avoided publicly committing himself on the actual cause of new species in his *Principles of Geology* (1830–1833). Indeed, the issue was one fraught with dangers and utterly unsuited to speculation in print. Yet in the context of select gentlemanly conversation a more open consideration of the possibilities might be appropriate. This would not have been a subject suitable for conversation in mixed company, given its dangerous social and moral implications. However, it was precisely the sort of slightly more risqué fare appropriate for discussion after the withdrawal of the ladies, serving to consolidate gender roles.

### *Middle-Class Domesticity*

Those in high society, with immediate access to the literary lions, were not, of course, the only ones for whom books figured as an important part of social intercourse. Moreover, as we have seen from the experience of Caroline Fox, Buckland's *Bridgewater* could provide an opportunity for mixed-company conversation on science that would be uplifting and not, importantly, morally hazardous. In his review in the *Edinburgh Review*, David Brewster drew particular attention to the book's moral safety: "There is something unclean about animal bodies, and their functions, and their products, which deters all but professional men from their study, and therefore robs them of their inherent claims as incentives to piety and as proofs of design." With fossil skeletons, however, the case was "wholly altered"; the bones had undergone "purification" so as to become "sainted relics, which the most sensitive may handle, and the most delicate may prize." For the Manchester merchant Robert Hyde Greg such a book presented an appropriate focus of domestic discourse on subjects of science. In October 1836, just three weeks after the book was published, Greg wrote to John Phillips, telling him: "We have got Buckland & [are] reading him, in an evening, aloud." This practice of reading aloud in the family circle was of no small significance in early Victorian middle-class households, where the increasing differentiation of the roles and the spheres of operation of men and women made such integrative activities essential. To Greg and his wife, Mary, Buckland's book presented rational entertainment that they could enjoy together, although the book was a target for their common theological disapprobation.<sup>52</sup>

<sup>51</sup> Buckland, *Geology and Mineralogy* (1836), Vol. 1, p. 586, quoted from [William Whewell], "Lyell's Principles of Geology," *British Critic*, 1831, 9:180–206, on p. 194 (emphasis added). Cannon attributed a belief in physical miracles to Buckland in "Problem of Miracles in the 1830s" (cit. n. 14), pp. 6, 21; however, she subsequently retracted this interpretation in Cannon, "William Buckland," in *Dictionary of Scientific Biography*, ed. Charles Coulston Gillispie, 16 vols. (New York: Scribners, 1970–1980), Vol. 3, pp. 566–572, on p. 572.

<sup>52</sup> [David Brewster], "Dr Buckland's *Bridgewater Treatise—Geology and Mineralogy*," *Edinburgh Rev.*, 1837, 65:1–39, on pp. 38–39; and Robert Hyde Greg to John Phillips, 14 Oct. 1836, Phillips Papers, Oxford University Museum (I am grateful to Anne Secord for bringing this reference to my attention). According to Greg, a Unitarian, Buckland played "the deuce with Moses." If such a free translation were allowed with the Creation narratives, he continued, there was no knowing what would become of "other parts of sacred writings." On reading in middle-class families see Leonore Davidoff and Catherine Hall, *Family Fortunes: Men and Women of the English Middle Class, 1780–1850* (London: Routledge, 1994).

There were, however, other uses to which the uplifting character of a book like Buckland's might be put in mixed company. One such use, albeit fictional, is represented in George Eliot's *Mill on the Floss* (1860). Eliot had herself read Buckland's *Bridgewater* "with much pleasure" in 1841, finding its subject matter sublime. In her novel, however, she represented the book as an occasion of polite love-making. The fictional encounter takes place at the house of Mr. Deane, a junior partner in a great provincial mill- and ship-owning business, Guest & Company. Deane's daughter, Lucy, and his penurious niece, Maggie Tulliver, are joined in the drawing room by Stephen Guest, son of the senior partner in Deane's firm, who is, we are told, at that stage of courtship with Lucy Deane "when each is sure of the other's love, but no formal declaration has been made." This is the first time that Stephen has met Maggie Tulliver, and he is visibly astonished "at the sight of this tall dark-eyed nymph." Maggie's beauty and her rather confrontational reaction to his compliments leave him wishing she would look at him again. Seeking to diffuse the social tension, however, Stephen talks lightheartedly to Lucy of "impersonal matters," coming in due course to the question of whether she intends to be present at the next meeting of the ladies' book club in the neighboring town:

Then followed the recommendation to choose Southey's "Life of Cowper," unless she were inclined to be philosophical, and startle the ladies of St Ogg's by voting for one of the *Bridgewater Treatises*. Of course Lucy wished to know what these alarmingly learned books were; and as it is always pleasant to improve the minds of ladies by talking to them at ease on subjects of which they know nothing, Stephen became quite brilliant in an account of Buckland's *Treatise*, which he had just been reading. He was rewarded by seeing Maggie let her work fall, and gradually get so absorbed in his wonderful geological story that she sat looking at him, leaning forward with crossed arms, and with an entire absence of self-consciousness, as if he had been the snuffiest of old professors, and she a downy-lipped alumnus. He was so fascinated by this clear, large gaze, that at last he forgot to look away from it occasionally towards Lucy.

When he finds the "stream of his recollections running rather shallow," Stephen offers to bring Maggie the book, only to have her blush "with returning self-consciousness at this direct address" and take up her needlework again.<sup>53</sup>

In this narrative, the sublimity of Buckland's *Bridgewater* serves to facilitate unself-conscious social interaction between a young man and woman where otherwise a social awkwardness, not to say danger, exists, while also serving to reinforce gender roles by contrasting the erudition of the man of the world and the unenlightened domesticity of the women. The only other point in Stephen's "impersonal" conversation that gives rise to a similar, if shorter, interaction is his description of the charitable actions of a local clergyman, which again prompts Maggie to let her work fall and exclaim: "That is beautiful." Eliot's heroine is a young woman of moral and intellectual earnestness, and it is subjects of moral and intellectual sublimity that engage her unselfconscious attention.<sup>54</sup> This encounter between Maggie and Stephen is a pivotal point in the book, leading ultimately to their elopement and Maggie's disgrace.

<sup>53</sup> See George Eliot to Martha Jackson, 4 Mar. 1841, in Gordon S. Haight, ed., *The George Eliot Letters*, 9 vols. (New Haven, Conn./London: Yale Univ. Press, 1954–1978), Vol. 8, pp. 7–8, on p. 8; and Eliot, *The Mill on the Floss* (1860), ed. Haight (Oxford/New York: Oxford Univ. Press, 1981), pp. 366, 376, 378, 380–381, 381.

<sup>54</sup> Eliot, *Mill on the Floss*, ed. Haight, p. 379. When, in the afternoon, the party takes to the river, Stephen—calculating that "a gentleman who wishes ladies to look at him is advantageously situated when he is rowing them in a boat"—is not rewarded as he expects: Maggie's mind is elsewhere, and she gazes at the river bank. *Ibid.*, p. 382.

### *The Public Arena*

In contrast to the private sphere of middle-class domesticity, the meeting of the British Association for the Advancement of Science held in Bristol in August 1836 was the ideal means by which to convey a book like Buckland's into the wider social world. Now in its sixth year, the British Association had already become firmly established as one of the leading vehicles by which the "gentlemen of science" could articulate and consolidate their claims to cultural authority. This was clearly important in the various provincial localities in which the meetings were held, but it was also important because national periodicals—most notably the competing *Athenaeum* and *Literary Gazette*—reported the proceedings of the meetings in great depth, bringing the deliberations of the association to a far wider audience.<sup>55</sup>

Buckland, who was a seasoned BAAS performer, took the opportunity to refer to the content of his "new work" repeatedly during the week, and on the Friday morning he placed an advance copy of it on the table in the Geology section, presumably for the inspection of its members. Buckland's main performance came on the Saturday evening, when he had obtained permission to begin the final meeting, intended to be devoted to the various votes of thanks, by presenting an advance copy of his book to the marquis of Northampton and delivering an address in which, the local newspapers reported, he

adverted to the subject of doubts which agitated some minds as to the theory of the geologists, that the world had an existence many millions of years before our account of the creation; and stated, that it was the opinion of Luther, and other Reformers of the Church, that there was not the slightest discrepancy between the theory of the geologists, and the most literal translations of the Mosaic legends. There was not the slightest doubt that the world had existed for millions of years antecedent to the Hebrew account of the creation.<sup>56</sup>

As Jack Morrell and Arnold Thackray have argued, this liberal Anglican emphasis on the mutual supportiveness of science and religion pervaded the rhetoric of the British Association's meetings and formed a central element of its ideology.<sup>57</sup> Buckland's choice of topic in presenting his treatise to the association was thus highly calculated, and his speech presented him with the perfect opportunity at once to attach to his own work the imprimatur of the British Association and to reiterate the commitment of the association to the liberal Anglican conciliation.

A paragraph reporting Buckland's comments was reprinted from the local press by the national newspapers, bringing them to the attention of just about as wide an audience as could be reached by printed means in early nineteenth-century Britain. Very quickly, moreover, the report elicited responses both in the correspondence pages of several newspapers and, increasingly, in editorials, making Buckland's Bridgewater Treatise "quite as much a newspaper subject as would an horrid murder or a glorious victory." The opening volleys came from two weekly newspapers with reputations for scurrilousness. First, the radical Whig *Satirist* ridiculed the Anglican establishment in a satirical attack on what it

<sup>55</sup> On the role of the British Association in early nineteenth-century Britain see Morrell and Thackray, *Gentlemen of Science* (cit. n. 2).

<sup>56</sup> *Literary Gazette*, 1 Oct. 1836, p. 634. Other references to Buckland's treatise are reported in *Athenaeum*, 3 Sept. 1836, p. 624, 10 Sept. 1836, pp. 652, 657; and *Lit. Gaz.*, 17 Sept. 1836, p. 602. See also Mary Buckland to William Buckland, [Sept. 1836], in Elizabeth Oke Gordon, *The Life and Correspondence of William Buckland* (London, 1894), p. 134.

<sup>57</sup> See Morrell and Thackray, *Gentlemen of Science* (cit. n. 2), pp. 224–245.

called Buckland's "frightful blasphemy"; the following day, the ultra-Tory *John Bull* launched a serious attack on the reported events, seeking from Buckland "a confirmation or denial of the statement." Next to enter the fray was the *St. James's Chronicle*, a thrice-weekly newspaper of Evangelical affiliations, which one contemporary reported was "read largely by country clergymen and country gentlemen of Tory principles."<sup>58</sup> The reactions in this paper were universally negative, and over twelve issues there appeared eleven letters and three editorials attacking Buckland's theology. Much of the same material appeared in the evening *Standard*, the London counterpart of the *St. James's Chronicle*, and a similar approach was taken by the widely circulated conservative journal *Bell's Weekly Messenger*.<sup>59</sup> The torrent of criticism carried in these journals soon brought the leading evening newspaper, the *Whig Globe*, into the fray. Through the course of September 1836 several editorials and letters appeared in the paper in defense of Buckland. Moreover, despite his wife's imploring him not to lower his dignity by "noticing newspaper statements," Buckland wrote letters to *John Bull*, the *Standard*, and the *St. James's Chronicle* in defense of his views, referring them to his Bridgewater Treatise, which was now imminent.<sup>60</sup>

For the gentlemen of science, the battle for cultural authority with the scriptural geologists was of very grave importance. However, the reactions of the latter indicate that their defeat was not easily to be achieved, and Buckland's treatise and his announcement at the British Association brought forth an extremely vigorous and extensive riposte, not only in the newspaper press but in factional periodicals and pamphlets and from the pulpit. One of the most powerful of the scriptural geologists who responded to Buckland's Bridgewater Treatise was William Cockburn, the Evangelical dean of York, who in 1838 published two pamphlets on the subject. The first addressed Buckland directly, arguing that the facts of geology elaborated in his Bridgewater could be accommodated within a short earth history. The second, however, addressed the duke of Northumberland, who was shortly to be president of the 1838 meeting of the British Association, warning him that "these annual assemblies of Thespian orators . . . have been, and are likely to be, injurious to religion." Cockburn claimed that "a favourite subject of discussion at the ensuing meeting" would be "the theory of the creation of the world, many ages before the birth of Adam," citing in evidence Buckland's having, in his Bridgewater Treatise, "enlisted himself on the side of Volney, as an asserter of the fact of a pre-Adamite world." Such a direct assault on the ideology of the association, and on the cultural authority of the gentlemen of science, could

<sup>58</sup> [Anon.], "Geology and Mineralogy Considered with Reference to Natural Theology," *Spectator*, 1836, 9:947; *Satirist*, 11 Sept. 1836, p. 283; *John Bull*, 12 Sept. 1836, p. 293; and James Grant, *The Newspaper Press: Its Origin—Progress—and Present Position*, 2 vols. (London, 1871), Vol. 2, p. 127.

<sup>59</sup> *St. James's Chronicle*, 6–8 Sept. 1836, p. 2; 13–15 Sept. 1836, p. 3; 17–20 Sept. 1836, p. 4; 20–22 Sept. 1836, p. 2; 22–24 Sept. 1836, p. 4; 25–27 Sept. 1836, p. 4; 27–29 Sept. 1836, p. 4; 29 Sept.–1 Oct. 1836, p. 4; 1–4 Oct. 1836, p. 2; 4–6 Oct. 1836, p. 3; 8–11 Oct. 1836, p. 2; 11–13 Oct. 1836, p. 4; 18–20 Oct. 1836, p. 3; *Standard*, 7 Sept. 1836, p. 3; 14 Sept. 1836, p. 2; 19 Sept. 1836, p. 2; 22 Sept. 1836, p. 3; 24 Sept. 1836, p. 3; 27 Sept. 1836, pp. 2, 3; 28 Sept. 1836, p. 3; 29 Sept. 1836, p. 4; 3 Oct. 1836, p. 3; 7 Oct. 1836, p. 2; 11 Oct. 1836, p. 3; 19 Oct. 1836, p. 3. See James Grant, *The Great Metropolis: First Series*, 2 vols., 3rd ed. (London, 1838), Vol. 2, pp. 96–97. *Bell's Weekly Messenger*, 26 Sept. 1836, p. 309; 2 Oct. 1838, p. 314; 9 Oct. 1836, p. 325. See Grant, *Great Metropolis: First Series*, Vol. 2, p. 128.

<sup>60</sup> For defenses of Buckland see *Globe and Traveller*, 17 Sept. 1836, p. 2; 24 Sept. 1836, p. 2; 4 Oct. 1836, p. 3. One of the letters of support was from Samuel Lee, Regius Professor of Hebrew in Cambridge—this nicely complemented Pusey's earlier endorsement of Buckland's exegesis of the critical Genesis narratives. Buckland's wife's plea is recorded in Gordon, *Life and Correspondence of William Buckland* (cit. n. 56), p. 196. His letters of self-defense appeared in *John Bull*, 26 Sept. 1836, p. 313; *St. James's Chronicle*, 20–22 Sept. 1836, p. 2; and *Standard*, 22 Sept. 1836, p. 3.

not be allowed to go unanswered, and the vice-president of the Newcastle meeting, the bishop of Durham, Edward Maltby, undertook to reply.<sup>61</sup>

The conflict between the British Association and the scriptural geologists over the meaning of modern geology in general, and of Buckland's *Bridgewater* in particular, nicely points up the manner in which books could become contested objects. Moreover, the conditions under which such a contest might develop were clearly framed by the entire communication circuit. The manner in which the *Bridgewater Treatises* had been written and produced, and in which they had been taken up by many readers as authoritative and fashionable books of science, meant that Buckland's contribution represented a real threat to the authority of the scriptural geologists, quite apart from his performance in Bristol. In this context, it is worth noting that Dean Cockburn's attacks were based on a copy of Buckland's *Bridgewater* borrowed from the York Minster library, which was used chiefly by local clergy and a handful of other professionals and gentlemen, in addition to the dean and his wife. The library had purchased all the *Bridgewater Treatises*, and 5 percent of the loans recorded between 1833 and 1838 were of books in the series.<sup>62</sup> Moreover, this represented the great bulk of the loans of scientific books from the library, so that the *Bridgewater Treatises* were clearly significant as one of the principal means by which elite science came within the sphere of this prominent group of York clergy. The very reputation and accessibility of Buckland's work increased the importance of attacking it.

### *Radical Artisans*

The authority of the gentlemen of science was under threat in the 1830s not only from scriptural geologists, but also from radical artisans seeking to fashion a science that would serve an ideology very different from that of the gentlemen. The two decades following the infamous "Peterloo" massacre of 1819 witnessed the rise in Britain of increasingly organized and vocal working-class movements. As a number of authors have recently shown, the political analyses of these intermingling groups of Carlileans, Owenites, and Chartists relied upon interpretations of nature that were often radically at odds with the providential nature of gentlemanly science. In particular, a number of prominent artisans—notably Richard Carlile—drew upon Enlightenment sources to argue that science, properly understood, served a materialist and antireligious end.<sup>63</sup>

During the course of the 1830s, as cheap scientific publications became increasingly widespread and as the radical critique became increasingly sophisticated, the reliance on Enlightenment sources gradually gave way to a more focused attempt to reinterpret the science of the gentlemanly elite to materialist ends. Two such reinterpreters of gentlemanly

<sup>61</sup> William Cockburn, *A Letter to Professor Buckland, Concerning the Origin of the World*, 2nd ed. (London/York, 1838); and Cockburn, *A Remonstrance Addressed to His Grace the Duke of Northumberland, upon the Dangers of Peripatetic Philosophy* (London, 1838), pp. 5, 6. On Maltby's reply see Morrell and Thackray, *Gentlemen of Science* (cit. n. 2), p. 240.

<sup>62</sup> C. B. L. Barr, "The Minster Library," in *A History of York Minster*, ed. G. E. Aylmer and Reginald Cant (Oxford: Clarendon, 1977), pp. 487–539; Elizabeth Brunskill, *Eighteenth-Century Reading: Some Notes on the People Who Frequented the Library of York Minster in the Eighteenth-Century, and the Books They Borrowed* (York: York Georgian Society, 1950); and Loan Registers, Library of the Dean and Chapter, York. The statistics on books borrowed are drawn from "Divers Accounts, 1812–1882," "Bills and Receipts," and Loan Registers, Library of the Dean and Chapter, York.

<sup>63</sup> See Desmond, "Artisan Resistance" (cit. n. 3); Roger Cooter, *The Cultural Meaning of Popular Science: Phrenology and the Organization of Consent in Nineteenth-Century Britain* (Cambridge: Cambridge Univ. Press, 1984); L. S. Jacyna, "Immanence or Transcendence: Theories of Life and Organization in Britain, 1790–1835," *Isis*, 1983, 74:311–329; and Topham, "Infinite Variety of Arguments," Ch. 7.

science active in the early 1840s were the disaffected Owenite socialists William Chilton and Charles Southwell, who together founded the weekly *Oracle of Reason* in 1841. This aggressively atheist publication was initially highly successful, with an average weekly sale of four thousand copies. However, the deliberately provocative approach of Southwell resulted, in January 1842, in his imprisonment in Bristol jail for blasphemous libel. On his confinement Southwell found that his reading matter, in addition to what he wrote, was subject to scrutiny by the prison governor and local magistrates, who were keen to weed out any material targeted directly against Christianity. Southwell's request, publicized through the *Oracle*, was that he should be sent Lyell's *Principles* or Buckland's *Bridgewater Treatise* if "comeatable."<sup>64</sup> The choice was obviously carefully made: these were works that the magistrates would not consider to be against Christianity—quite the contrary in the case of Buckland's *Bridgewater*—but that could nonetheless be made to serve that purpose.

Whether Southwell ever received his copy of Buckland's *Bridgewater* is not clear. However, Chilton certainly gained access to a copy of the work and made extensive use of it. From the first number, Chilton had contributed to the *Oracle* a series of articles on "regular gradation" in which he argued for the transmutation of species. This was a subject he considered to be of "vital importance to the cause of materialism," since it provided a means of undermining the Christian belief in special creation. Along with several other works of gentlemanly geology, Buckland's *Bridgewater* was put to work by Chilton in providing fossil evidence of organic progression—a central plank in his case for transmutation.<sup>65</sup> In an increasingly scientifically literate age, such references gave his theory a scientific credibility that was much needed.

The reinterpretation of elite science for a materialist end required considerable effort. Most important, it was necessary to explain why elite scientists like Buckland should not themselves have drawn the same transmutationist and materialist conclusions from their work as Chilton. In an article entitled "The Cowardice and Dishonesty of Scientific Men," Chilton explained the reluctance of scientific men to "tell the truth and strike away the crutches from religion" as a consequence of their fear of being denounced as infidels and of thus ruining their worldly prospects. Generally, he continued, they

make a wretched attempt to cover their infidelity by asserting, that whatever may be thought of their facts or deductions, nothing was more foreign to their *intentions* than to disprove the truths of religion, and that they are *not aware* that their language will bear such an interpretation. This I believe to be the substance of an apology by Dr. Buckland, for his *Bridgewater Treatise*: a sop for the dragon. In my articles on the "Theory of Regular Gradation," many passages will be met with from the learned gent.'s treatise, sufficient to alarm those who have vested interests in ignorance and credulity.

Thomas Paterson, who took over the editorship of the *Oracle* after Chilton's imprisonment in 1842, pointed out exactly what vested interests were at stake for Buckland in his *Bridgewater*: "A £1000 sterling, or thereabouts, is a powerful persuader."<sup>66</sup>

<sup>64</sup> Southwell, "Voice from Bristol Gaol" (cit. n. 4), p. 79. See also George Jacob Holyoake, "Mr. Charles Southwell," *Oracle Reason*, 1842, 1:193. On the *Oracle* see Edward Royle, *Victorian Infidels: The Origins of the British Secularist Movement, 1791–1866* (Manchester: Manchester Univ. Press; Totowa, N.J.: Rowman & Littlefield, 1974), pp. 71–88; and Desmond, "Artisan Resistance," esp. pp. 85–88.

<sup>65</sup> William Chilton, "'Vestiges of the Natural History of Creation'—Theory of Regular Gradation," *Movement and Anti-Persecution Gazette*, 1845, 2:9–12, on p. 9. See also Desmond, "Artisan Resistance," p. 99.

<sup>66</sup> William Chilton, "The Cowardice and Dishonesty of Scientific Men," *Oracle Reason*, 1842, 1:193–195, on p. 195; and Thomas Paterson, "Harmony of the Godlies," *ibid.*, 1843, 2:217–218, on p. 217.

Such a reading of Buckland's Bridgewater would clearly have galled its author not a little. One of his main objects in writing the book was to demonstrate the religious tendency of geology, and Chilton's reading played straight into the hands of those Evangelical and High Church opponents of geology who considered it "infidelity in disguise."<sup>67</sup> Such readings bring home forcibly the extent to which books could become contested objects, over which battles might be fought in an attempt to enforce conflicting knowledge claims about nature.

### CONCLUSION

This account of some of the readings of Buckland's Bridgewater Treatise illustrates the extent to which books are embedded in a complex and varied series of social relations. What readers might make of a book was crucially dependent on the context in which they read it: among other things, their interpretation depended on the private conversations and public events in which they had been involved, the other books and periodicals they had been reading, and their reason for reading. Of course, an account similar to this one could be elaborated for each of the books in the series. Like Buckland's *Geology and Mineralogy*, the other treatises functioned to varying degrees both as works of specialist science and as the subjects of fashionable conversation; they supplied both the substance of domestic intercourse and points of public controversy. We could, indeed, follow them into yet other contexts of reading—into the hands of medical, veterinary, and other professionals, desirous of some reputable and readable compendium of science, or into the hands of religious practitioners of varying hues, eager to have their science sanctified by an appropriate theology of nature. To be truly adequate, an account of the readership of the Bridgewater Treatises would have to anatomize the full range of these emerging audiences.

This essay also shows that analysis of readership requires evidence from the contexts of reading to be combined with evidence from the contexts of production. The often anecdotal accounts of reading experiences cited in this essay gain their wider significance when seen not only in the light of evidence about contemporary reading practices, but also in the light of evidence about publishing history. One of the most suggestive aspects of this study has been the extent to which both authors and publishers were surprised by the demand for the Bridgewater Treatises—taken aback by the emergence of those new reading audiences on whose existence they were soon to capitalize in developing new genres of self-consciously "popular" science books. As I argued in the introduction, it is by thus combining evidence from the contexts of production and reading that historians are able to move beyond the familiar top-down notion of "popular science"—sterile as an analytical while still useful as an actors' category—to a historiography that recognizes the agency of all those involved in the communication circuit, including not only the producers of books but their readers as well.

A particular advantage of such an approach is that it contributes to an increased understanding of the cultural dynamics of science. A number of recent studies have recognized that the rapid social change that took place in Britain during the first half of the nineteenth century, and the accompanying proliferation of reading audiences, had profound implications for science. Whereas R. M. Young identified a "common context" for debate among the intelligentsia, it is now clear that on a wider social scale there was much scope for conflict. The point is nicely illustrated by the foregoing analysis of the divergent read-

<sup>67</sup> [Anon.], "Infidelity in Disguise—Geology," *Church of England Quarterly Review*, 1837, 2:450–491.

ings of Buckland's Bridgewater. In the hands of Evangelicals like Cockburn or atheists like Chilton, *Geology and Mineralogy* could be made the focus for that contest for authority in which the gentlemanly practitioners of science were engaged. Clearly, then, an adequate understanding of the increasing cultural authority of science in that period requires not only that we investigate the role of scientific authors in managing print culture to secure their ends, but that we investigate the roles of all those involved in the communication circuit. Moreover, such an approach necessarily exposes the power relations that subsisted between the different groups, as each sought to establish its claims to knowledge. Indeed, this takes us round to the beginning of the communication circuit again, since the attempts of authors to recover and restate their knowledge claims in response to the counterclaims of their readers often result in revised editions and new works.

The history of the book is not a uniquely privileged means of exploring the place of science in its wider cultural context. Indeed, there has been much outstanding work in this area—some of which I have drawn upon here—that does not relate primarily to books.<sup>68</sup> Yet it is important to appreciate that books are far too important to be treated merely as texts: examined within the communication circuit of their time, they can be made to serve this wider historical purpose.

<sup>68</sup> See, e.g., Morrell and Thackray, *Gentlemen of Science* (cit. n. 2); and Arnold Thackray, "Natural Knowledge in Cultural Context: The Manchester Model," *American Historical Review*, 1974, 79:672–709.