Encyclopaedic Visions

Scientific Dictionaries and Enlightenment Culture

The eighteenth-century English dictionaries of arts and sciences claimed to contain all knowledge that a person of education should possess. These early encyclopaedias responded to the explosion of information by reducing knowledge to essentials, stressing the need for a coherent account of the sciences, and for some time excluding biography and history. Richard Yeo places these scientific dictionaries in a rich cultural framework of debate that includes the classification of knowledge, the tradition of commonplaces, the Republic of Letters, the Enlightenment public sphere, copyright issues and the specialisation of science. He discusses dilemmas involved in the quest for knowledge to be both organised and readily available, examining assumptions about the organisation, communication and control of knowledge in these works. Elegantly illustrated and accessibly written, *Encyclopaedic Visions* provides a major contribution to Enlightenment studies, the history of science and the history of ideas in general.

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Preface

> No man, however astonishing his talents, and intense his application, can ever reasonably expect to be a walking *encyclopaedia*.[1]

As a concept, the round of learning or circle of sciences – the original Graeco-Roman notion of encyclopaedia – has a long history; and it is not one without moments of crisis and change. One of these surely occurred towards the end of the eighteenth century, when observers acknowledged that there was by then an unbridgeable chasm between the knowledge contained in individual memory and the collective body of knowledge stored in an encyclopaedia. The quotation above concerns James Tytler (1747?–1805), a hack writer, ship's surgeon and balloonist, who almost single-handedly compiled the second edition of the *Encyclopaedia Britannica*. In doing so he displayed the general knowledge and talent for clever abridgement that made him a desirable, if ill-paid, worker in the Edinburgh printing trade. Writing in 1805, however, his biographer realised that these capacities had their limits. Indeed, to take even more illustrious examples, early Victorian polymaths such as T. B. Macaulay and William Whewell (1794–1866), regarded as encyclopaedic in their learning, nevertheless acknowledged that their omniscience was not truly comprehensive. Macaulay admitted that science was not his forte and that he had 'gulfed', or failed, mathematics at Cambridge. Whewell, the historian and philosopher of science, was considered amazing precisely because his extensive knowledge *did* include the sciences, although he confessed that increasing specialisation meant that he could only hope to keep abreast of some branches. As one who aspired to embrace the complete circle of sciences, Whewell did so at a time when multi-volume encyclopaedias, fuelled by specialist advances in knowledge, visibly demonstrated the decline of the encyclopaedic mind. The demise of such universally learned individuals had been spoken of before – Bayle, Leibniz and Gibbon had been mentioned as the possible last survivors of the species – but this became

[1] [Meek,] *James Tytler*, 10.

incontrovertible once encyclopaedias themselves betrayed either candid doubts, or false confidence, about their ability to contain knowledge in a manageable set of volumes. As one writer reflected in 1862, the time had passed when 'every man whose business lay in intellectual matters was bound to be his own encyclopaedia'.[2]

Deriving from an ancient classical heritage, the encyclopaedia is also closely linked with the emergence of modernity, with assumptions about the public character of information and the desirability of free intellectual and political exchange that became distinctive features of the European Enlightenment.[3] And although the interpretations of this movement have changed and deepened over the past fifty years, the encyclopaedia remains a crucial element in most conceptions of it – symbolising the achievements of science and reason, but also epitomising the success of print capitalism. The first of these conceptions was, of course, the work of eighteenth-century writers themselves. The *Encyclopédie*, edited by Denis Diderot (1713–84) and Jean Le Rond d'Alembert (1717–83) from 1751, and completed in seventeen volumes of text and eleven volumes of plates in 1772, became almost synonymous with Enlightenment.[4] This work was envisaged as a record of the intellectual advances since the extraordinary ferment of the seventeenth century – a leap in knowledge and the possibility of applying it to social and moral ends that the editors did not expect to be repeated. From this perspective, encyclopaedias, science and Enlightenment assumptions about knowledge – the components of my title – form a natural alliance of mutually reinforcing elements. Secondly, encyclopaedias have figured in the efforts of historians to understand the social and cultural factors that supported the appeal of new ideas in science, philosophy and political thought, and how this interest related to the emerging phenomena of consumerism and commercial marketing of leisure.

This book considers the place of encyclopaedias in the period from 1700 to about 1820. During the first half of the eighteenth century, they were called dictionaries of arts and sciences, and although clearly the predecessors of the encyclopaedias we know today, they were much smaller works, usually confined to two large folio volumes. I consider these dictionaries of arts and sciences not merely as poor approximations to later, and larger, encyclopaedias, but as inheritors of an earlier cultural legacy – one that included questions about the organisation of knowledge, the role of memory in relation to print, the practice of keeping personal commonplace

[2] Masson, 'Universal Information', 357.
[3] For common features and national contrasts, see Porter and Teich, *Enlightenment in National Context*.
[4] See the beautifully illustrated essays on the *Encyclopédie* in *Les Cahiers de Science et Vie*, no. 47.

books, and the ideal of individual comprehension of the circle of arts and sciences. These concerns informed the rationale of the first encyclopaedias of the Enlightenment, making them more restrained in their vision than the *Encyclopédie* and the nineteenth-century counterparts that promised exhaustive coverage of an ever-increasing body of knowledge. The authors of these early dictionaries were very much aware of the problem of ordering and communicating knowledge, and these works can be seen as responses to what contemporaries perceived as a knowledge explosion, witnessed in the rapid multiplication of books and the pace of discovery in geographical exploration and in the physical sciences. In seeking to abridge, condense and summarise, scientific dictionaries reflected respected educational notions about the value of rounded learning and the unity of the sciences. Moreover, they had not yet abandoned the hope of keeping individuals within reach of knowledge that could be visualised in graphic form and thus understood as part of an ordered whole, one that could be feasibly grasped by great scholars. For this reason they did not so decisively shatter the possibility of an encyclopaedic mind as their successors did. And although the final chapter of this book shows how some of these convictions began to fade, it may be that this history holds lessons for our new age of information.

Of course, Diderot and d'Alembert were famous not only in their role as editors of a major encyclopaedia, but as *philosophes* engaged in controversial debates. In this book I discuss the British dictionaries of arts and sciences compiled by less well-known figures such as John Harris (1667–1719) and Ephraim Chambers (1680?–1740). Their works, respectively, *Lexicon Technicum* (1704 and 1710) and *Cyclopaedia* (1728), were the stimulus for the *Encyclopédie*, which began as a translation of Chambers' successful publication; they were also the model for most later alphabetical encyclopaedias. As virtual handbooks of the Scientific Revolution sold by subscription to a readership that extended beyond elite scholars, these works embodied the two images of the Enlightenment: intellectual progress and improvement, as well as rational recreation and consumerism. Commenting on studies of Enlightenment culture, Elizabeth Eisenstein has recently called for better relations between intellectual history and the history of the book, suggesting that some major proponents of the latter have overplayed the role of greed, profit and sensationalism while missing the appeal of so-called 'high-brow' ideas for a wide variety of readers.[5] Some of the dictionary makers and booksellers who appear in this book confirm her point. As modest members of the Republic of Letters, they engaged in dialogue with the ideas of major philosophers, such as

[5] Eisenstein, *Grub Street Abroad*, 22–35.

Bacon, Locke, Leibniz and others, who contemplated the expansion of knowledge and the problems of organising and communicating it. The case of Chambers is instructive here: although a minor figure, an assistant to a London globe maker and bookseller, he confidently placed his *Cyclopaedia* in a tradition dating back at least to Renaissance polymaths such as Joseph Scaliger, compared it to the work of the Académie Française (often referred to as the French Academy), took Locke as his intellectual guide in making a dictionary, and hoped that this work would serve the cause of Newtonian science. In this audacious prospectus we have some of the assumptions that made these dictionaries the encyclopaedias of the eighteenth century: they advertised access to universal knowledge – or at least the main arts and sciences – and promoted this as something of universal interest, capable of transcending social, religious and geographic boundaries.

The frontispiece of Chambers' *Cyclopaedia* (see figure 17, p. 121, below) moves Raphael's famous fresco, the 'School of Athens' (1510–11), out of the accademia into the piazza, to an open public space inhabited by individuals and groups engaged in observation and experiment. This is a realisation of the Baconian programme for the advancement of natural knowledge and it suggests why these works, with their coverage of the sciences and the practical arts and crafts, were called 'scientific dictionaries', in spite of the fact that they also included subjects such as law, music and heraldry. In contrast with earlier scholastic encyclopaedias, these eighteenth-century works stressed the degree to which the recent and continuing progress of the physical sciences demanded accessible compilations able to communicate this knowledge – in the vernacular rather than in Latin – to a wide readership. In Bacon's vision, science was conceived as pre-eminently public knowledge because it revealed the design and order of nature, God's second book, and also because it had to be communicated in order to advance. Secret knowledge could not be truly progressive because it was not shared and hence not subject to adequate criticism or confirmation. Scientific dictionaries made science public in the form of explanations and accounts of terms and concepts. In this way they recorded a common terminology and, potentially, a consensus on what had been established and what still needed to be done. More generally, these dictionaries and encyclopaedias exemplified the Enlightenment ideal of knowledge as open, collaborative and public – characteristics also promoted by scientific lecturers and apologists.

There were, however, some tensions in these associations between encyclopaedias, science and the public sphere. First, encyclopaedias sought to collect and codify knowledge, often promising that they were works of permanent value that removed the need to read other books. But the constant progress of scientific knowledge

meant that doctrines and theories were not always stable entities. This posed a challenge that influenced decisions on the most appropriate organisation of these works. The alphabet was preferred because it allowed the easy addition of new data without affecting other entries; but dictionary makers also insisted that their works allowed the methodical reader to appreciate the coherence of a science, or even the relations between various sciences. Some, such as the *Encyclopaedia Britannica*, asserted that sciences had to be seen as 'systems' treated in discrete treatises, rather than broken up in small alphabetical entries. By the end of the eighteenth century the specialisation of the sciences, marked by the demise of a general natural philosophy and the appearance of new disciplines, reinforced the impetus towards large treatises on single sciences. Although these were advertised as keeping pace with expert advances, these specialist treatises cast doubts on the ability of encyclopaedias to serve non-expert audiences.

Secondly, the claim of encyclopaedias to embody the ideal of an open, public communication of knowledge became caught in legal debate. It is no coincidence that scientific dictionaries were involved in arguments about literary property, or copyright, following the first Statute on this issued by the English Parliament in 1710. Dictionaries of arts and sciences professed to gather knowledge from a variety of sources into a single book for which owners sought copyright protection. The direction of the legislation, however, was towards the protection of authors, granting them the right to control the printing of their works and limited monopoly once published. For the compilers of scientific dictionaries this had implications for whether originality was claimed for definitions of terms, the explication of theories or for the overall organisation of the work. It forced them to affirm the public role of these dictionaries as collective records of knowledge.

In this book, I try to approach these massive texts without replicating the encyclopaedic scale of the works themselves. Severe warnings are available for scholars embarking on such a quest. The best of these come from past editors. Take David Brewster (1781–1868), the Scottish man of science, writing to his co-editor in 1809: 'My hand is absolutely shaking with fatigue, and my head almost turned with . . . temporary delirium of over exertion.' And this was twenty-one years before his *Edinburgh Encyclopaedia* was completed in eighteen volumes.[6] So, like the eighteenth-century compilers who addressed their readers in a preface outlining grand aims combined with apologies for inevitable shortcomings, I impose limits on this study. I do not attempt a quantitative survey of the content of these works, nor a detailed study of the coverage of

[6] Brewster to John Lee, 6 October 1809, NLS, MS. 3432, f. 226.

particular sciences, although I do look at the place of Newtonian natural philosophy, chemistry and optics in some of the major British encyclopaedias.[7] I do not see this book as a publishing history or a study of readership, although I have used the research of historians of the book and I hope my work contributes to the significant intersection between history of science and the history of the book.[8] My main intention is to reveal and analyse the assumptions behind the encyclopaedic project and to consider how these influenced coverage and format. As suggested in the above examples, I aim to show that a cultural history of Enlightenment encyclopaedias must confront some important ideas about the organisation and communication of knowledge, especially scientific knowledge. I also believe that the proper dimensions and nuances of this topic are more fully seen if the British dictionaries of arts and sciences, usually overshadowed by the *Encyclopédie*, are restored to this history.

Synopsis of chapters

The Introduction situates the eighteenth-century encyclopaedic project within a longer Western tradition. This makes clear that there have been various notions of what an encyclopaedia is, and what has been meant by comprehensive coverage. I explain what was distinctive about the new dictionaries of arts and sciences and how they aspired to encyclopaedic status. One issue confronted here is that the classification of knowledge and the sciences, so central to medieval works, had to be reconsidered once encyclopaedias adopted alphabetical format. But in refusing to abandon convictions about the order and unity of the sciences, these eighteenth-century works aligned themselves with their predecessors.

Against this background I divide the book into three parts. In Part I, the chapters examine two crucial, and interacting, themes: assessments of the state of knowledge and the need to record it in summary form; and convictions about the desirability of communicating such condensed knowledge to a variety of readers. Chapter 1 places encyclopaedias within the imagined community of the Republic of Letters and its ideal of a cosmopolitan pursuit of universal knowledge. Chapter 2 shows how the progress of science created particular problems for these dictionaries of arts and sciences and for the pretensions of encyclopaedias to be systematic

[7] George Sarton saw these works as a neglected source, remarking that 'historians of science need not only the latest encyclopaedias but also the old ones, as such offer one of the simplest means of recapturing the educated opinion of earlier times': Sarton, *Guide to the History of Science*, 82–3.

[8] Jardine and Frasca-Spada (eds.), *Books and the Sciences in History*, including Yeo, 'Encyclopaedic Knowledge'.

works of lasting value. Chapter 3 explores early modern diagnoses of the burgeoning number of books and the way such perceptions informed the Enlightenment scientific dictionaries.

Part II concerns the major British encyclopaedic types: the works of Harris and Chambers, both published in London before the *Encyclopédie*, and the *Encyclopaedia Britannica*, which appeared in Edinburgh from 1768. It examines the rationales of these works, the traditions on which they drew, and their attempts to present accessible accounts of science. Chapter 4 considers the dictionaries of Harris and Chambers in the context of older, and ongoing, debates about the storage and retrieval of knowledge. This allows us to see that in some ways these works participated in concerns about the role of memory and its relation to textual records of knowledge, such as those manifested in the Renaissance practice of keeping private commonplace books. This also returns to the theme of managing knowledge, one that was crucial for Chambers' conception of his *Cyclopaedia*, which is treated in chapter 5. In chapter 6, I continue to focus on Chambers, explaining his coverage of the arts and sciences in relation to the ideas of both Bacon and Locke. Whereas his treatment of the practical and mechanical arts and trades was not strong, and hence well short of Baconian dreams, his work can be understood as an implementation of Locke's strictures on the use of language, as applied to scientific terminology. Approached in this manner the *Cyclopaedia* can be seen, although not without some problems, as a commonplace book of Newtonian science. Chapter 7 investigates the approach of the *Britannica*, which rejected the format of short entries on terms – successfully used by Harris and Chambers – and announced the introduction of large treatises, or 'systems', on the sciences and other major subjects, although still arranging these alphabetically. Whereas Locke was a mentor for Chambers, I investigate whether the conjectural histories of the leading Scottish philosophers had any effect on the *Britannica*. Having discussed Chambers' account of the Newtonian sciences in chapter 6, chapter 7 concludes by looking at the difficulties involved in dealing with chemistry in the last two decades of the century, a period of conceptual revolution.

Part III reflects on the ways in which encyclopaedias can be thought of as collating and codifying knowledge that could be possessed or owned. It does this by looking at them in relation to three different contexts: the legal debates around copyright from 1710; the practice of dedicating major cultural works and objects to princes; and the emerging culture of expertise that informed encyclopaedias towards the end of the eighteenth century. Chapter 8 shows how Chambers' *Cyclopaedia* was a valuable commercial entity that raised issues central to contemporary disputes about literary property. As a work eminently worth protecting by legislation

and other means, its value consisted in part in its summary of other works, which might also claim copyright. For this reason, it sharply posed the conflict between private and public rights to intellectual property. Did scientific dictionaries, in view of their public utility, deserve special exemptions from the charge of plagiarism – given their free borrowing from other books? If encyclopaedias could be envisaged as custodians of useful, public knowledge, chapter 9 asks why these and other similar works were dedicated to monarchs and portrayed as part of the king's intellectual possessions. This theme was played out in a number of cases throughout the eighteenth century, and these expose interesting tensions between encyclopaedias as the products of a cosmopolitan Republic of Letters, a kingdom and a nation. By the early nineteenth century, however, another claim for the control of encyclopaedias came from the expert contributors upon whom editors now relied. Chapter 10 investigates the dynamics between editors and experts, especially in the case of the *Supplement* to the sixth edition of the *Encyclopaedia Britannica* produced by Macvey Napier (1776–1847). The assertion of expert authority over specialist domains was accompanied by the collapse of the earlier assumptions about individuals, either humble compilers or famous polymaths, attaining some grasp of the circle of sciences. At this point, the jokes and mild ridicule about walking encyclopaedias seem to have entered our language.

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Abbreviations

BL	British Library, London
Black Papers	Papers of Joseph Black, Edinburgh University Library, Edinburgh
Const. & Co. Papers	Constable and Co., Agreements, Minutes and Letters, 1812–22. These papers concern the purchase of the *Encyclopaedia Britannica*; microfilm copy held in Columbia University Library, New York
DNB	*The Dictionary of National Biography: From the Earliest Times to the Present*, Leslie Stephen and Sidney Lee (eds.), 22 vols., London: Oxford University Press, 1917.
EUL	Edinburgh University Library, Edinburgh
HP	John Herschel Papers, Royal Society of London, London
JJ Coll.	John Johnson Collection, Bodleian Library, Oxford
NLS	National Library of Scotland, Edinburgh
PRO	Public Record Office, London
Session Papers	Court of Session Papers, The Signet Library, Edinburgh
WP	William Whewell Papers, Trinity College Library, Cambridge
(no abbrev.)	'Register of the Copies of Books', Stationers' Company Records, reel 6 of microfilm copy held in St Bride's Library, London