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creativity and skill. But it was definitely threatening. Printing and bookselling were concentrated almost exclusively in the vast social morass of London, a city represented by most courtiers and scholars as incipiently rebellious and fascinatingly venal. As would-be authors complained, Wisdom might find as heedless an audience in these streets as in those of Old Testament times.[87] Philosophers would be forced to see the problem with particularly stark clarity.

We cannot say how Galileo would have fared had he been an Englishman. The nearest equivalent to his struggles in Rome and Florence, however, was a controversy over Copernicanism and related issues that occurred in 1634–46 between Alexander Ross and John Wilkins. Wilkins indeed took the *Sidereus Nuncius* as his model, reproducing one of its images of the Moon.[88] But the differences between the two cases are as revealing as the similarities. There was scant trace in this dispute of Tycho's sterilized way of printing and distributing texts, and of Galileo's recourse to court conventions. Wilkins's initial tract was anonymous, and was displayed in the shop of the most incendiary Puritan bookseller in London, Michael Sparke, who had earlier introduced Tycho himself to the London public in the guise of a Protestant millenarian prophet (fig. 1.12).[89] Sparke's was the most prominent name on the title page. His notoriety, like that of Galileo's bookseller in Rome, fueled the conflict. Ross did attempt to use the issue for preferment in the church, but with minimal success. He ended up a bookseller's hack, churning out pedantic diatribes against every original thinker of the time. Neither writer managed to gain an audience at court, if that was their aim. In a sense, neither achieved authorship at all.

The *aspiration* to authorship, however, stood at the center of the Wilkins-Ross dispute, just as it had of Bacon's concerns. It was expressed as a mutual repudiation of the illegitimate "singularity" displayed by those who boasted, not reasoned knowledge, but passionate "fancy." Reconciling aspiration with credit was clearly difficult. To assert originality while avoiding the taint of singularity became a central problem for writers in all fields.

87. Abiezer Coppe, for one, put himself in the place of Wisdom: Mack, *Visionary Women*, 105. For later uses of the text, see Vincent, *Literacy and Popular Culture*, 174–5.

88. [Wilkins], *Discovery*; [Wilkins], *Discourse*; Ross, *Commentum de Terrae Motu*; Ross, *New Planet no Planet*. The standard treatment remains McColley, "Ross-Wilkins Controversy," but see also Johns, "Prudence and Pedantry." Ross seems to have been an early example of the professional author, paid by booksellers like Richard Royston to produce tracts for popular sale. See Glenn, *Critical Edition of Alexander Ross's 1647 "Mystagogus Poeticus,"* 625. His role should be compared to that of the Dominican Tommaso Caccini in Galileo's struggles: Finocchiaro, *Galileo Affair*, 28–9, 136–41, 282; Blackwell, *Galileo, Bellarmine*, 112–6.

89. Brahe, *Learned Tico Brahae his Astronomicall Conjectur*.

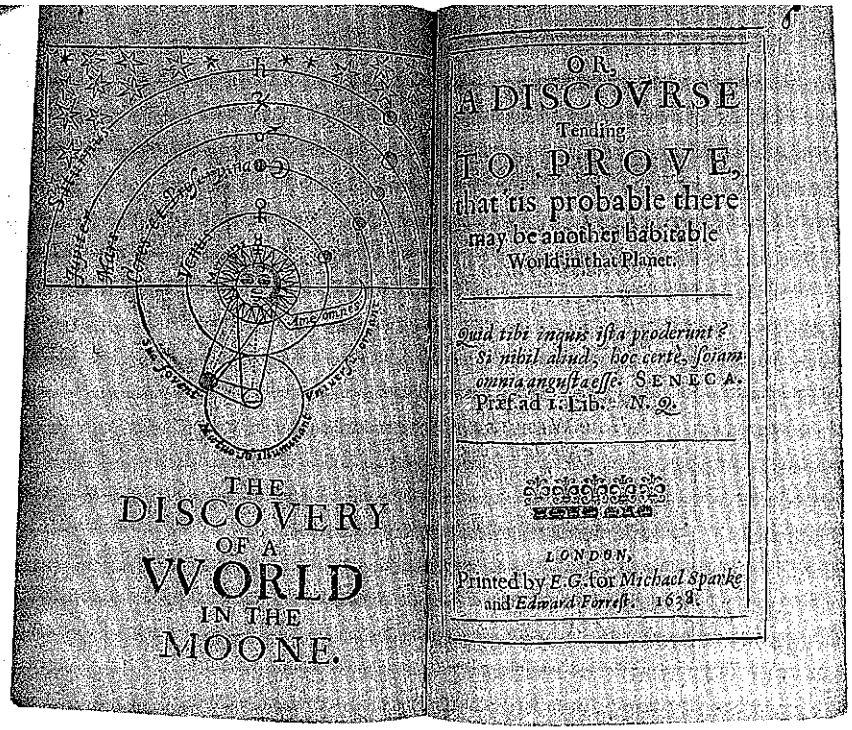


FIG. 1.12. [Wilkins], *The Discovery of a World in the Moone*. Frontispiece and title page. (By permission of the Syndics of Cambridge University Library.)

Some simply listened to the advice of their peers, and kept silent. Others relied on a flourishing and successful manuscript distribution system to evade the charge.[90] Still others, like Wilkins himself, chose to insist upon a "Philosophical Liberty" to suggest (but not to insist upon) ideas at variance with those espoused by received authorities. Geographer Nathaniel Carpenter actually funded his own printing and publication.[91] Wilkins took a further step, and ingeniously appropriated the conventions of modesty to avoid the charge of singularity. A writer must display hesitancy and probability, not a stentorian insistence on the certainty of his ideas, in order to reconcile credit with authorship. Doing so, one could avoid the trap of "boldness" into which singular authors invariably fell. Modesty could hold the commonweal together. Wilkins thus argued that Ross's "singularity" encapsulated at once his "conceit" for his own ideas, his "servile and superstitious" attitude to authority, and his slavery to "sense" rather than "discourse and

90. Love, *Scribal Publication*; Woudhuysen, *Sir Philip Sidney and the Circulation of Manuscripts*, 27–203, 224–41.

91. Davis, "Religion and the Struggle for Freedom," 514–5; Shapiro, *John Wilkins*, 55; Feingold, "Mathematical Sciences," 388–400.

reason." Wilkins's opponent was the archetypal "captious" man.[92] In contrast, Wilkins himself had begun to articulate principles of authorship that historians of science will recognize as characteristic of early experimental philosophy.

Wilkins's espousal of modesty and a liberty of philosophizing immediately reminds the modern reader of Boyle. But a significant difference exists. Wilkins's argument extended to questions normally the preserve of the mathematical sciences, not just natural philosophy and natural history. This division—between disciplines devoted to the mathematical representation of phenomena and those characterized by their collection and philosophical investigation—was ancient and persevering. Wilkins was one of several important figures to advocate a novel realignment. But such a transformation was as yet far from complete. One should therefore recall that the specific program of experimental philosophy proposed by Boyle was far from the only candidate for natural knowledge on offer. Even within the Royal Society itself, there were noteworthy alternatives, including various plans for natural and artificial histories, and indeed the "Physico-Mathematicall-Experimentall Learning" recommended by Wilkins himself. Isaac Newton was one contributor who pointed up the differences between Wilkins's and Boyle's conventions.[93] All, however, from mathematicians to alchemists and from experimentalists to physico-mathematicians, found themselves facing the problems of authorship and reception cast up by contemporary printing. The Royal Society helped all to address those problems, and it did so partly under the aegis of Boylean principles. It is in this context, then, and not just in that of Boylean experimental philosophy itself, that the Society's experiences of print proved consequential. It is not just that the virtuosi—as the Society's fellows were widely known—pioneered ways of dealing with print; those ways became central to the fortunes of natural knowledge of diverse traditions.

The Society's own success has always been signaled by its publishing enterprises—which included the first "scientific" periodical, the *Philosophical Transactions,* and Isaac Newton's masterpiece, the *Philosophiae Naturalis Principia Mathematica.* But an account of the role of the book and other printed materials in the Society should end with these, not begin with them. One must first reconstruct the efforts to enact conventions of reading within

92. [Wilkins], *Discovery,* 3; Wilkins, *Discourse,* 136–8, 144, 146–8, 226; Wilkins, *Of the Principles and Duties of Natural Religion,* 138–9, 203–4; Shapiro, *John Wilkins,* 239. Gassendi and Boulliaud also found Ross unimpressive: Mersenne, *Correspondance,* IV, 324–6, 348.

93. Kuhn, "Mathematical versus Experimental Traditions," 35–52; Dear, *Discipline and Experience,* 2–3, 8–9, 227–43, 245–9; Westman, "Astronomer's Role," 116–33; Whitaker, "Culture of Curiosity," 82–5.

the Society itself, by which incoming books and papers could be handled and, perhaps, published in conditions of civil trust. In its interactions with the book trade, too, the Society worked hard to establish mastery, so that its productions would not be reprinted, translated, or even pirated without its consent. The maintenance of faith in its reports—and therefore in important natural and technical conclusions—depended on its success. Without these conventions it could not have built up and maintained renown as a location in which personal authorship would be safe. Indeed, upon them rested the very possibility of reconciling personal probity with the aspiration to philosophical authorship. Without them even a respected virtuoso might fall victim to a printer's conduct. "All y^e^ Stationers" had to be "reduced to better Termes of Reason & honesty," warned John Beale, an active fellow of the Society. But the Society had to start with its own Printer, who generated "y^e^ loudest outcrye" of all. "I wish he had subscrib'd his own name, & not mine," Beale complained after seeing the printed version of one of his papers, for readers would otherwise ascribe its "Phantastical, Imprudent, or Distracted" character to the authorship of Beale himself. "Wee should have more prudence, than to expose our reputations to the humour of such a sordid man."[94]

Surely, it may be objected, printing may have affected the communication of knowledge, but scarcely its creation. Chapters 6 and 7 challenge this assumption by looking in close detail at the practices of knowledge-making in the Royal Society, and at the notions of reading and representation that underlay them. Chapter 7 in particular addresses the fortunes of natural philosophy. Chapter 8 then extends the scope of this analysis. It proceeds to examine one of the major mathematical sciences, namely astronomy. It demonstrates that not even apparently "raw" empirical observations and rigorously quantitative calculations could escape the implications. To do so it traces in detail the course of an astronomical dispute of central importance to the history of science.

From 1675 Astronomer Royal John Flamsteed worked to construct a catalogue of the positions of the fixed stars. It promised to be the greatest work of observational astronomy ever produced. But by the end of 1712 Isaac Newton, Edmond Halley, and John Arbuthnot had printed and dispersed a text of his work, against Flamsteed's vehement opposition. The unauthorized volumes presented a radically different view of the role of the astronomer from his own—one implying that he had been sorely deficient as a public servant. Even its apparently objective positional figures had been changed in the course of Halley's extensive "correction" of the press. The

94. Beale to Oldenburg, 15 March 1669/70: Oldenburg, *Correspondence,* VI, 560–1.

chapter shows in detail how booksellers, printers, and natural philosophers combined in alliance to achieve their aims. If they failed, even elementary statements of observation would prove vulnerable. Together chapters 7 and 8 therefore demonstrate the centrality of the issues raised by earlier sections of the book for both philosophical and mathematical approaches to Creation.

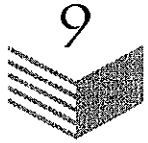
One reason Flamsteed suffered was that his observatory stood on Greenwich Hill, several miles distant from the clamor and grime of London. The character of the metropolis itself represents a final reason to focus on England. The unprecedented expansion of London created a unique urban environment with powerful and assertive craft communities. Here, as the Restoration virtuosi always stressed, the creation of natural knowledge must be a collaborative enterprise. It must draw together not just gentlemen, but printers and booksellers too—not to mention the critical readership thronging the coffeehouses. The labor would be long, and it would be hazardous to the good names of all involved. Philosophical writers would have to negotiate all the obstacles facing every other kind of would-be author, including regulatory régimes, piracy, skeptical booksellers, and unruly readers. Printers and booksellers, for their part, would suffer frustration, ridicule, debt, prison, and death. The story of natural knowledge in this period should embrace all their efforts. This book thus proceeds in a trajectory from the printing house and bookshop to the Royal Society and the Royal Observatory: from Joseph Moxon and Francis Kirkman to Isaac Newton and John Flamsteed. It is a valuable realignment. Emphatically, intellectual history cannot be just the history of intellectuals.[95]

Scientific debate as such was unknown in the early modern world. We would be unjustified in artificially selecting what seems to us the "scientific" content of disputes such as that between Newton and Flamsteed in order to explain the successes of some theories, artifacts, and individuals over others. It is scarcely a novel proposition. A vast amount of work has been done to reveal the historical and cultural specificity of such strategies. What is more original is the suggestion that we need to appreciate just how important conventions of propriety in books' manufacture, dispersal, and use really were in the practice of natural philosophy. Adding this appreciation may result not just in an extension of our knowledge, but in a change to the very essence of our historical perceptions. Early modern London, where the cultural construction of print coincided with the fashioning of experimental philosophy, offers unusually intriguing possibilities for such an approach. So intriguing, perhaps, that it is possible to suggest a still greater implication.

95. Contra Krieger, *Ideas and Events*, 53.

"Do books make revolutions?" asks Chartier, and answers that books themselves do not, but the ways they are made, used, and read just might.[96] We can rephrase his query to ask, "Do books make *scientific* revolutions?" But the answer may well stay the same.

96. Chartier, *Cultural Origins of the French Revolution*, 85–7.



CONCLUSION

We like to talk about the machines which we create and which enslave us. But machines are not only made of steel. Any intellectual category we may forge in the workshops of the mind is able to impose itself with the same force and the same tyranny—and holds even more stubbornly to its existence than the machines . . . History is a strongbox that is too well guarded, too firmly locked and bolted. Once something has been put in it for safe keeping it never gets back out.

LUCIEN FEBVRE, "How Jules Michelet Invented the Renaissance," 258

Be not deceived: evil communications corrupt good manners.

SAINT PAUL, 1 Corinthians 15:33 (after Menander, *Principal Fragments*, 357)

Pick up a modern book, and there are certain features about it of which you can be immediately confident. Pick up an early modern book, however, and those features become less certain. An early modern reader could not necessarily take it for granted that something calling itself John Flamsteed's *Historia Cœlestis* would be owned by Flamsteed himself as the product of his authorship. It might not have been produced with his consent, and in his view it might not be what it claimed to be. Such an object might have been made by a bookseller or printer like Awnsham Churchill—or even one like John Streater—and under conditions very different from those obtaining today. A printed book might not have been published commercially, and it might well have been made with a specific, individual reader in mind. It could have been printed in anything from a few dozen to a few thousand copies, and a copy of the "same" book encountered in Paris, say, might differ significantly from one seen in London, Frankfurt, or Rome. Trusting in such an object meant vesting valuable faith in something very unlike the printed book familiar to readers at the end of the twentieth century.

Yet it is surely undeniable that such objects, fragile, insecure, and suspect though they were, became central to the subsequent course of Western history. Knowledge, politics, social life, and cultural practices were all transformed by the possibilities they offered. Today, accordingly, there can be few historians who do not rely substantially on printed sources, whether for their raw materials or to decide upon questions worth addressing in the first place. In an uncertain world, printed materials can be put to use in ways that make them powerful. *The Nature of the Book* has tried to explain how. It has attempted to reveal the historical roots of both their uncertainty and their authority.

Those who made and used books in early modern Europe labored as they did so to produce strategies for resolving their problems of credit. Much of the present work has been dedicated to a painstaking excavation of their efforts. Hitherto, historians have rather taken at face value the persuasive power of printed materials to affect the perceptions and actions of their readers; *The Nature of the Book* has conceded that this power came to exist, but has seen it as a hard-won and brittle achievement. It has therefore proposed that a richly detailed historical approach to the printed book, identifying it as a tool for the making of context and content alike, is the right one to adopt. This concluding chapter briefly recapitulates some of its major components, making explicit some points that may have remained implicit heretofore, before speculating as to some implications for our own experience of communications.

What is the history of the book for? A plausible answer lies in the role played by written and printed materials in the constitution of knowledge. The history of the book is consequential because it addresses the conditions in which knowledge has been made and utilized. All of its further implications may be derived from this. Hence the centrality in this work, and especially in its later sections, of the natural sciences. By concentrating on natural knowledge, we can hope to demonstrate how the making and use of printed materials could affect human comprehension at the most fundamental of levels. This book has thus aspired to display the centrality of practices surrounding print in the making, maintenance, and reception of representations of Creation, not because there is anything essentially unique about science, but for the very opposite reason. Conclusions demonstrated about science should be acknowledged as credible a fortiori for less authoritative fields.

The early sections of this book argued that the "domains" of print to be found in an early modern metropolis affected the ways in which knowledge of all kinds came into being and circulated. Debates had increasingly to be conducted through the mediation of these domains, where a commu-

nity of "Stationers"—printers, booksellers, binders, and others—facilitated agreement and disagreement alike. Their skills conditioned whether and how contests surrounding controversial claims could proceed to resolution. Printed pages were not intrinsically trustworthy, not least because a certain creativity was essential to the Stationer's craft. Contemporary readers could, however, assess printed books according to the places, personnel, and practices of their production and distribution. The recognition of printed books as reliable thus depended substantially on prior representations of the Stationers' community as well ordered. Fixity depended on civility.

In the seventeenth century, questions of literary "propriety" were customarily decided out of writers' and readers' reach, in the citadel of Stationers' Hall. There a surprisingly rich social protocol developed, capable of dealing with an impressive range of issues ranging from illicit printing to seditious publishing and piracy. Its solidity was further cemented by a secure coordination with the government's licensing system. The resulting combination grew into a powerful and wide-ranging system to bolster the economic and epistemological standing of all printed books. It would scarcely be an exaggeration to claim that the reliability of every published page, whether licensed or not, rested on this bilateral régime.

To some, however, the régime seemed ineffectual, if not actively iniquitous. These opponents identified an alternative source of virtue not in the autonomy of a company, but in the all-embracing powers of the monarchy. The Stuarts found themselves exhorted to replace the Stationers' conventions with a system founded in royal patents. If realized, such a proposal would represent a revolutionary change in the cultural politics of print. No longer could printing be a communal craft; it would instead become an element of court service. The security of printed knowledge would rest on the civility of such service, not on the honesty and skill encapsulated in craft customs. John Streater, who was instrumental in creating this argument, had long advocated a republicanism based in the publication of laws, his aim being to produce an informed civic populace able to recognize and fight for its own "preserving liberty." Now he and Richard Atkyns argued that the Stationers' register illegitimately challenged the power of the crown to protect *meum* and *tuum* in general. In two respects their intervention proved momentous. The strategies Streater devised for publishing substantial and authoritative books in a hostile and piratical environment established practices that endured well into the succeeding century. Their arguments, moreover, set the terms for a debate on the nature of print that would persist even longer. The future of print would now be decided in a realm of congers, pirates, and dunces—to be joined, eventually, by authors.

With this new future came a new past. Atkyns and Streater had built their case against the existing order by rewriting the history of the press. The

consequences of their story resonated for the next 150 years. Questions of authenticity and credit were central to what became a sophisticated argument over the origins, character, and implications of printing. The contributors to this debate, who included some of the Enlightenment's most influential and unusual figures, helped to reconstitute contemporary representations of the press. Tracing their controversies thus serves to demonstrate that alternatives were always available for contemporaries dissatisfied with descriptions numbly proclaiming the intrinsic "fixity" of print. Their existence matters, since early modern individuals and societies made far-reaching decisions about publishing and reading by reference to just this sort of knowledge. Only toward the end of the period did a representation of print culture begin to be articulated that is identifiable with modern equivalents, and even then it was unconventional. Moreover, analyzing these disputes also helps us to understand why, when it did finally arrive, the historiography of "fixity" was eventually to become so dominant. That modern writers have been able to refer to the press's ability to impose a "logic" of cultural behavior is, in fact, a consequence of its very inability to do so: proponents had to propagandize extensively in such terms to establish fixity as plausible. By ignoring the reasons for their statements, we risk taking for a technological fact what was really a hard-won cultural artifact. Men like Streater and Atkyns worked hard to rewrite the history of printing. We need to do the same.

The scope of this effort must extend from the continental to the microscopic. This is particularly true of the history of reading. In seventeenth-century Europe, human beings were typically seen as creatures of body and soul. Their knowledge was necessarily mediated through physiological mechanisms of perception and the passions, and that included the knowledge developed through reading. Readers needed to discipline their passions if they were to avoid erroneous or even dangerous results. This had three major consequences. First, texts could not easily transcend locale. Even the most raw and direct engagement with a page would be represented and understood in terms appropriated from resources to hand, especially items of knowledge of the human frame. The process of arriving at natural knowledge by the use of texts was thus often reflexive. As is today well known, the human body has a history and a geography of its own; reconciling these with the history of reading will be a fascinating and highly consequential enterprise. Second, if, as Paul Veyne has asserted, "history is knowledge through documents," then the consequences for historians themselves may be rather disconcerting.[1] They will need to be more aware than hitherto of the historical specificity of their own reading practices. And, third, to identify the

1. Veyne, *Writing History*, 5.

importance of the history of reading need not imply that the use of a book or periodical was ever *arbitrary*. In fact, particular uses of a book were always more or less costly or beneficial in particular circumstances. Ideal, asocial readers could perhaps have pursued any reading at all; real, historical ones could not prudently do so, since the social costs of most readings rendered them unlikely choices. No reader was an island. The achievement of the Royal Society was partly that it established a setting in which definitions of illegitimate reading would be set by the agreed and unspoken standards of genteel civility.

The consequences of this reassessment extend into the history of knowledge, and in particular into that of what is now the most authoritative knowledge of all: science. *The Nature of the Book* has argued that the epistemological implications of the Stationers' commonwealth became central issues of concern for early modern natural philosophers. Although recorded well before 1660, their fears became acute with the development of experimental philosophy in the Restoration. The practice of experiment instituted at the newly chartered Royal Society depended substantially on the making, distribution, and use of records. The Society had to become an arena dedicated to the polite management of philosophical disputes mediated by written and printed texts. That is, it had to work to establish and protect authorship itself. It attempted to do so by means of protocols involving disciplined reading, registration, and publication. The virtuosi put into practice principles of polite reading that were just as creative, practical, and performative as the experiments that are so much better known to historians of science. Some of these pioneering practices have since become fundamental to the scientific community. It has even been claimed that they *define* science.[2] Yet at first the Society was by no means unambiguously successful. Its eventual accomplishment was thus all the more impressive. It would provide an exemplar for eighteenth-century proponents of literary and other modes of authorship. The story of how it prospered by putting print to use is therefore a central component not only in the history of science, but in that of the book too.

That experimental philosophy, which depended on witnesses' testimony, should be acutely vulnerable to conventions of communication is perhaps not too uncomfortable a conclusion. But Boylean experimentalism was certainly not the only new approach to Creation developed in the late seventeenth century, and perhaps it should not even be regarded as the most important one.[3] It could still be argued that there was (and is) a core discipline in the natural sciences to which these concerns could be considered peripheral. The mathematics of Isaac Newton's *Principia*, say, or the raw data garnered by a practical astronomer like John Flamsteed, surely rested on secure epistemological foundations in their own right. The geometrical rigor of the former, and the sheer empirical immediacy of the latter, would render both immune from the problems of credit permeating print. Even if problems obscured their value for a while, eventually that value must be recognized. It might even seem that such a notion enjoyed contemporary support, since it was conventional to observe that mathematical language compelled assent. Yet such confidence would be unmerited, as the story of Flamsteed's *Historia Cœlestis* confirms. The implications of Flamsteed's encounter with the Royal Society and the Stationers' commonwealth extended all the way to what modern academic philosophers, in their own canting speech, call "observation statements."[4] The credibility even of raw data was rendered contestable. And Newton made his own success partly by exploiting this situation—by becoming the press practitioner par excellence. Many of his most controversial victories relied on his mastering the practices of editing, printing, publishing, and reading. Newton knew how to "play the Stationer" and win, as Flamsteed discovered to his cost. By the time he was president of the Royal Society, he was therefore in a position to use its rules of propriety and printing to ruthless effect. In so doing, he may reasonably be seen as creating—rather than simply revealing—his own supremacy as the author of his age.

In the story of the *Historia Cœlestis*, the central issues of *The Nature of the Book* became visible and compelling. That story properly extends until at least the 1830s, when Francis Baily made the struggle between Flamsteed and Newton emblematic of a new quarrel pending between his own Royal Astronomical Society and the Royal Society.[5] This, along with the earlier pursuit of Coster and Corsellis into the nineteenth century, poses questions of the chronological focus applied in the rest of this book, and of what has transpired since the end of its chosen period. They are among a number of

2. See remarks in Johns, "Ideal of Scientific Collaboration."

3. Dear, for example, characterizes Boylean practice as a "detour" on the route to modern experiment: *Discipline and Experience*, 3.

4. I have myself heard a philosopher of science insist on this status for Flamsteed's figures, during the course of a paper he was delivering in Cambridge. The general claim remains, I think, a common one, although now very dated; for remarks, see Barnes, Bloor, and Henry, *Scientific Knowledge*, 1–17.

5. Interestingly, when he (and all other readers) had failed to decipher the shorthand of Flamsteed's most informed correspondent, Abraham Sharp, Baily turned to Charles Babbage for help. Babbage agreed to assist, and eventually succeeded in decoding Sharp's text: Baily, *Account of the Revd. John Flamsteed* (1835), 390–1 (not reprinted in the modern facsimile). Babbage's involvement at the end point of my story suggests an appealing metaphor for the trajectory of the current book, which might be summarized as leading from an "identity engine" (the now prevalent notion of the printing press) to a "difference engine" (the printing press as reconsidered here).

more general issues raised by the approach and conclusions of *The Nature of the Book*. It is appropriate to address them now.

To begin with, it is worth pausing to correct explicitly two interpretations of my work that I have occasionally heard voiced. The first is that I mean to reattribute the "scientific revolution" to printers. This is emphatically not so. Although Newton may (very debatably) have been a pirate, most pirates were not Newton. Besides, as remarked in chapter 4, a key point has in any case been to identify the collective and practical realization of authorship, and not simply to reassign to new individuals a concept of authorship that has itself remained unchanged and unquestioned. Second, *The Nature of the Book* is not simply the negative component of a dialectic. It does, I hope, effectively challenge the validity of current interpretations of print culture. But it has not been developed solely as a critique of those interpretations, and it does not simply advocate their obverse. Its roots and claims are fundamentally different. Moreover, its argument not only questions current assumptions about print; it also explains how they came into being, and why we have found them so plausible.

More seriously, it may be thought that *The Nature of the Book* has told only half a story. If the advent of fixity merely came later than has generally been supposed, then the close focus on the early modern period maintained here has simply amounted to looking in the wrong place. For the familiar story to reappear, according to this proposal, one would just have to extend the empirical treatment forward in time to the transformation in printing that undeniably occurred in the early to mid–nineteenth century. When that change came, first to iron presses and then to mechanized, steam-powered ones, it was as much a revolution in working practices as in technology. In the eyes of William Blades, for one, it was steam printing, not the hand press, that introduced the characteristics of modern print culture. As described at the end of chapter 5, Blades emphasized that it was only with lithography and industrial printing that one could finally become certain about the identity of the first English printer of all, William Caxton. If fixity came about at this juncture, then perhaps here is the change that should really be labeled as revolutionary. If so, then the further question arises of whether this transition was implicit in the craft of printing and merely took a long time to appear, or whether, on the other hand, it was specific to the industrial processes of Blades's and later times.

If it really amounted only to a claim that the familiar "printing revolution" happened four centuries later than anyone has hitherto thought, then the argument of *The Nature of the Book* would in the end not be all that disquieting. Such a claim would imply no more than a reconsideration of the chronology of what would, in essence, remain the existing story. Our understanding of our own situation would not have been seriously challenged. In fact, I would not wish to reject the point entirely: extremely important changes did take place with industrial printing. But I nonetheless hope and think that the implications of this book will not prove so easy to assimilate. Even Blades found that the most faithful technology available to him could not guarantee accreditation unless accompanied by testimony as to the probity and skill of its practitioner, whom he named. In practice, I suspect, much the same incapacity to enforce credit was experienced by other practitioners of the steam press, and it may even persist today. So why do modern readers assert the existence of fixity? If it does not inhere in printed objects simply by virtue of their being printed, where has it come from, and how is it maintained? These are the real questions underlying the chronological contention.

In contrast to the concrete empirical detail of earlier chapters, a speculative answer is the most that can here be advanced to such general questions. Their implications, however, are certainly extensive. It has been widely claimed that the deployment of identical texts and images on a very large scale is central to the experience of modern life. How we understand their advent and nature is therefore a subject of uncommon importance. The development of truly mechanized printing with the steam press is certainly one element. The new technology increased production rates vastly, and the relative concentration of capital needed to invest in such machinery did militate against a diversity of printing operations. Place is another factor. Industrialized printing and publishing moved from the home to the factory. In doing so, it may not quite have reduced human workers to the mechanical automata called, in Dickens's evocative term, "hands," but the new location's relatively rigorous discipline did condition people and their practices, exerting a conventional pressure to uniformity. Weber's argument that the separation of workplace from living space was a key moment of transition in the historical development of modern capitalism rings true in this context.[6] Yet new technologies and new places, while essential components of a satisfactory answer, cannot provide one alone. The experiences of groups such as the Society for the Diffusion of Useful Knowledge suggest why.

The Society for the Diffusion of Useful Knowledge has already been encountered in chapter 5. It was not the only body dedicated to employing the press to create uniformity among popular readers. But it was the most ambitious, and, as the first to make full use of the steam press, the most successful. As such, it is particularly revealing of the possibilities and limitations of industrial printing. The society aimed at "diffusing" safe knowledge mechanically to the new readership of the industrial working class, by means

6. Weber, *Protestant Ethic*, 21–2; Dickens, *Hard Times*, esp. 102–3.

of its *Penny Magazine* and *Penny Cyclopaedia*. It was founded out of a long-standing fear that even books innocuous enough in restricted settings could take on dangerous, even seditious, meanings in the hands of a mass proletarian audience. So it resolved to swamp the country with cheap periodicals containing "nothing to excite the passions." Lawrence, Paine, and the writings of materialist philosophers like La Mettrie must be overwhelmed by steam-printed "useful" knowledge. Geometry would be a chosen theme, not materialism; Paleyite natural history would supplant Lamarckian evolution. By 1832 its magazine was, as Brougham crowed, "by far the most extensively circulated of any periodical works that issue from the press." It estimated its readership at the unprecedented figure of one million.

But the effects of this enterprise were not necessarily those hoped for. Critics of all political persuasions understood and attacked the project. Peacock's negligent cook, who fell asleep while reading by candlelight a tract on hydraulics published by the "Steam Intellect Society" and almost burned Crotchet Castle to the ground, stood for a Tory conviction that the project dispersed unnecessary ideas that nonetheless might still prove dangerous. Radicals, on the other hand, complained of the anemic character of the *Penny Magazine*. They clamored for "really useful knowledge," yet found that the society wanted nothing more than to "stuff our mouths with Kangaroos." Moreover, the society itself was rather conflicted in its relation to the steam press. On the one hand, it clung to a belief that the *Penny Magazine* and *Penny Cyclopaedia*, produced in vast quantities and sold at a correspondingly low price, could "diffuse" safe knowledge safely. It argued that uniform texts would produce uniform docility in their proletarian readers, the press being (in Carlyle's words) "a machine for converting the Heathen." Yet on the other, its very existence was inspired by a contradictory concern that existing books might acquire newly dangerous applications in the hands of undisciplined readers. The paradox was expressed succinctly in a contemporary satirical print pastiching the *Penny Magazine* itself. The caricature displayed both Brougham's ideal (the "broom" being used to ram copies down a captive worker's throat was a common visual pun on the name of the society's leading advocate) and the variety of readings to which steam literature could be subjected. Each resulted in its own little social disaster, from traffic accidents to falling masonry (fig. 9.1).[7]

7. [Brougham], "Progress of the People," 234–41; Peacock, "Crotchet Castle," 13–14 (13–26 is a dialogic summary of arguments over knowledge in this period); Kelly, *Adult Education*, 112–80; Laqueur, *Religion and Respectability*, 113–19, 203–27; Johnson, "'Really Useful Knowledge'"; Gilmartin, *Print Politics*, 25–6, 83–4; Shapin and Barnes, "Head and Hand." For the social and epistemological controversies fomented by other groups' efforts to distribute cheap religious works, see Knox's excellent discussion in "Dephlogisticating the Bible." I am most grateful to Alison Winter for showing me the caricature of the *Penny Magazine*.

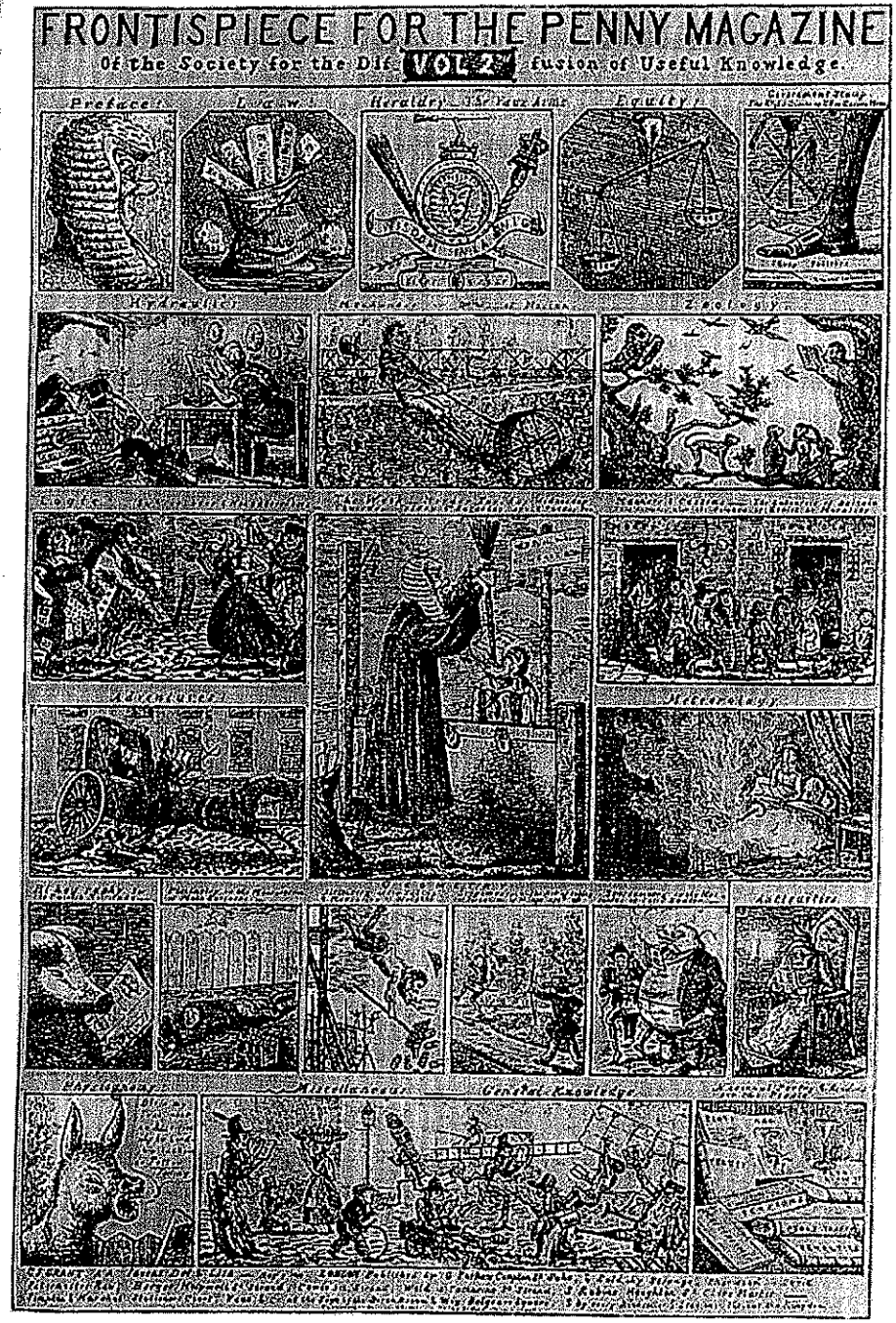


FIG. 9.1. A radical satire on steam intellect: ways of reading the *Penny Magazine*. (By permission of the British Museum, Department of Prints and Drawings.)

Like most successful jokes, the caricature on the *Penny Magazine* encapsulated a significant truth. Organizations such as the society found that their aspirations to "diffuse" modes of conduct through uniform texts fell victim to readers no less creatively appropriative than those who had stymied comparable projects during earlier eras. Indeed, it represents one among a succession of such attempts, the best known being those of the Counter-Reformation, all of which found their prospects for success qualified by the same factors; it is interesting to observe that the historiography of popular culture until recently built its conventional chronology around such programs. A more likely candidate than technological innovation for the advent of fixity is thus the practice and representation of reading itself. As urged throughout *The Nature of the Book*, reading is a complex skill with a complex history. It is not easily disciplined by texts. But that does not mean that it is free from all discipline whatsoever. Readings need to be defended in social settings if they are to be made consequential, and social settings generate maxims of conduct that one may not breach without cost. Successful readers are those who understand and exploit such maxims most effectively. They rest on a wide variety of foundations, including representations of society, gender, and Creation itself. One possible characterization of the present book, indeed, is that it constitutes a primer of the kinds of knowledge a person needed in early modern Europe in order to succeed in his or her reading: knowledge of the circumstances and personnel involved in making and distributing books, of the history and nature of printing itself, and of the shifting bounds of civility guiding distinctions between valid and illegitimate interpretation. In those shifting bounds, perhaps, lies the true history of fixity.

Between 1500 and 1900 this knowledge changed. Nothing made radical skepticism about printed objects impossible in principle. Indeed, it remains theoretically possible today. But it became increasingly costly to propose such radical skepticism in practice. In particular, the conventions of reading as well as those of publishing were transformed by the development of authorship. Around that concept was forged a civility—a congeries of practices and representations used to discriminate propriety from impropriety in everyday life. Radical skepticism about printed books became too costly, it may be argued, because it violated that civility. Its fee might well be exclusion from an authoritative group such as the Royal Society. And as the recognition of authorship blossomed, so, in a mutually reinforcing process, arguments demonstrating a resolved identity for printing began to win the upper hand, and the credit of its products became more widespread. By the end of the nineteenth century, print and fixity were as firmly conjoined by culture as ever could have been achieved by machinery. The appropriate mode in which to analyze their alliance, accordingly, was suddenly that of

quantification. Steam printing now lent itself to the new science of statistics as hand printing never had. So it was that at the 1900 Paris Universal Exposition, the German Empire estimated itself to have published more than 700,000 new books in half a century, and to be producing 24,000 new publications yearly—"one printed composition of literary worth to every 2,000 persons . . . to every three Germans one copy of a book, and to every 2 Germans a literary printed composition." Nothing, its brochure remarked, "reveals the development of the intellectual life of Germany more significantly." The quantification is as striking as the quantities themselves. No *Annaliste* would ever match such literary metrology.[8]

The emergence of fixity was a matter of convention and trust, of culture and practice. As such, fixity may appropriately be compared to the kind of impersonal trust that is now customarily vested in modern organizations on the basis of their systems of expertise, without personal contact. Such credit is very difficult to challenge successfully. But Shapin and others have suggested that this routine and almost implicit faith may be resolved into more personal interactions if the focus of analysis is close enough. The same may be true of fixity.[9] If so, it may not really be justifiable to think of a clear and distinct division between modernity and its print culture, on the one hand, and the early modern world, with its realm of piracy and propriety, on the other. When we probe beyond commonplace representations, this suggestion seems increasingly probable.

Consider the following account of the making of an author, and ask yourself whether he was living in 1620 or 1920. The man concerned was an aspirant philosopher recently returned from military service in a cataclysmic war. Clutching the manuscript of a treatise that he was convinced would transform the enterprise of philosophy itself, he traversed the world of print looking for a publisher. One entrepreneur offered to produce the book if the writer himself would pay for the paper and printing. He refused, saying that such a process would be "indecent" and would signal disrespect for the work and its would-be author. "The writing was *my* affair," he maintained, "but the world must accept it in the normal manner." He further became aware that, at sixty pages, the manuscript seemed to occupy an unpromising genre. It was not specialized enough to be respected for its erudition, and not long enough to be read as an authoritative general treatise. Only "totally hopeless hacks" published such short books on such major themes, he averred, and he would not confirm his own membership of such a group by agreeing to what we today would call vanity publishing.

Further dispiriting experiences followed. A leading philosopher of the

8. Von Halle, "German Empire," 51–2 (a reference for which I am grateful to Richard Staley).

9. Giddens, *Consequences of Modernity*, 26–36; Shapin, *Social History of Truth*, 409–17.

time suggested that he split the work into fragments and publish them as papers in one of the philosophical journals then struggling to unite a republic of letters. This too the writer declined, saying that such division would "mutilate it from beginning to end and, in a word, make another work out of it." He then approached a literary journal, sending a series of letters to the editor that even now constitute his most extensive surviving exegesis of the work. Nonetheless, the editor declined the text, citing the economic problems facing the publishing craft. At this point the writer began to contemplate suicide. The shocked editor promptly offered to print his piece out of sympathy, but even now would do so only if he could obliterate the forbidding numeration of paragraphs that made the text look like a piece of mathematics. Its writer again refused, saying that such an edition would be "incomprehensible." Who were these men to insist on such changes? he demanded to know. "Is there a *Krampus* who collects evil publishers?" At this point, during a visit to The Hague, he met another leading philosopher, himself a proven author. This new patron offered to contribute a preface to the work, and, since he was already known to printers, his endorsement would of itself render the writer's text no "risk" for any undertaker. Yet still nobody would take it up, even in the publishing center of Leipzig. The writer gave up hope and went to work in a monastery as a gardener.

By now, though, the manuscript was out of the writer's hands once and for all. The great philosopher whose patronage he had gained at The Hague had passed it on to a friend. At length, the editor of a journal of natural philosophy agreed to print this text—an editor, however, whom the writer himself believed to be "an utter charlatan" who would "tamper" with the text. Hearing of the intended printing, he tried to secure at least the reliability of the content. Would his patron personally oversee the proofs? the writer anxiously inquired. His fear proved justified, since in the event nobody did. Far from meddling with the text, however, the printers exercised too little creativity. The edition they produced was full of incomprehensible peculiarities reproduced directly from personal codes in the manuscript, which should have been translated into logical and mathematical symbols for publication. Their literal transcription was not prevented since the writer himself was never consulted, and indeed never received even the final publication. When he did at length encounter a copy—printed in Germany, but sent from England—he denounced it as a "pirated edition" (*Raubdruck*). And as his modern biographer says, this printing indeed resembled "a Shakespeare quarto—and [would be] of as little use for establishing a better text." Horrified, the writer himself then redoubled his efforts to produce a correct version. He believed his real work to have been published only when an English text at length appeared that he had overseen himself,

and that included substantial changes (not the least of which was a new title). Its translator had visited him in person, and they had read through the text together while he explained its more difficult passages. With this disciplining exerted, the book finally emerged in a form satisfactory to its creator. But even now, the publishers paid nothing for their reproduction rights.[10]

This writer had undergone a grand tour of the world of print before finally succeeding in his ambition to become a published author. He had experienced rejection, the need for patronage, the essential value of face-to-face conversations, the willingness of publishers creatively to amend his work (and the incomprehensibility of the resulting text when they did *not* do so), the vicissitudes of journal editors, the difficulties of manuscript circulation, and the humiliation of piracy. He had also realized the need to discipline readers in person. But who, and when, was he? The experience could well have been Descartes's, Galileo's, Spinoza's, or Flamsteed's, and it could have befallen any would-be learned author of the sixteenth, seventeenth, or eighteenth century. In fact, however, it was the young Ludwig Wittgenstein who encountered these problems. He did so between 1919 and 1923, after returning to Austria at the end of World War I. The philosopher who suggested fragmenting his work was Frege. The patron at The Hague was Bertrand Russell. The "pirate" was the chemist Wilhelm Ostwald, who edited a journal named *Annalen der Naturphilosophie*. The English translator was Frank Ramsey, and the work that he finally helped save from these perils was published in 1922 as Wittgenstein's *Tractatus Logico-Philosophicus*. It is, of course, a founding tract of modern philosophy.

If such an important publication was produced and circulated in such circumstances, what are we to make of the assumption that fixity is central to modern life and may be taken for granted? We may reasonably doubt that modern published communication really operates in a world of unquestioning trust in such a quality. Anyone who has had to negotiate in the arena of publishing houses, agents, subcontracted printers, proofreaders, referees, and editors will need no telling that a published work is at least as much a collective product, and its content is at least as dependent on the caprice of countless collaborators, as any seventeenth-century treatise—or Wittgenstein's *Tractatus*. On an individual level, writers are very likely to testify to the compromises this necessarily involves. Collectively, modern authorship itself in practice rests on them. Moreover, it remains the case that books, periodicals, newspapers, and the other manifold products of the press are

10. Monk, *Wittgenstein*, 173–84, 191, 203–7, 216; McGuinness, *Wittgenstein*, 296–7; Janik and Toulmin, *Wittgenstein's Vienna*, 192–3; Engelmann, *Letters from Ludwig Wittgenstein*, 48–9.

put to use in a vast range of different ways, and that their consequences are as dependent on the practices of their users as on any putatively objective content they may possess. For what it is worth, my own impression is that academic readers certainly do draw upon knowledge of such elements as the character of the publisher and the institution of the author in determining their response to a given work, and that such factors play an important part in conditioning such a work's influence.

At the risk of sounding unacceptably gnomic, one may conclude from stories like Wittgenstein's that the experiences of people in modern print culture are neither the same as nor different from those discussed in the body of this book. No such simple, constant, and unambiguous relation can be identified. The complex printing and reading practices developed in specific local settings in the interim would in any case be ill served by any attempt to telescope the intervening period into one brief epilogue. But past and present may, perhaps, be *approachable* in similar ways. Needless to say, the political and moral economies of publishing and reading are enormously different now from their state in Newton's day. Nevertheless, a close examination will almost certainly reveal not an elimination of sociability and civility in the constitution of reliable communication, but a transformation of the kinds of sociability and civility involved. *The Nature of the Book* points to the importance of these changes, in the various agencies involved with the book: publishers, booksellers, editors, authors, and readers. It exemplifies the understanding of communication in such terms.[11] In this respect the current work represents a necessary and replicable unification of the historiographies of civility and print.

If the changes that have taken place are indeed changes of sociability, this will have implications for the kind of history we compose. It will need to be fine-grained social history, with a different focus and perhaps a changed chronology. *The Nature of the Book* has concentrated largely on England; it has not dealt at length with Venice, Antwerp, Frankfurt, or Paris. But it is significant that print in these different cultural settings should be appreciated as just that: *different*. Moreover, similar approaches, to which the current work is indebted, are already being applied to these other regions. It is becoming increasingly difficult to characterize a single "revolution" associated with print that maintained the same nature across them all. Instead we shall perceive a multiplicity of less immediately evident, but equally pro-

11. This relation of fixity to civility should be compared to the arguments in Daston, "Baconian Facts," 348–58, and Porter, *Trust in Numbers*, 217–31, that concepts of objectivity came about in parallel circumstances, partly as efforts to unify fractious communities of scientists. Porter's argument should be compared closely to that of Shapin in *Social History of Truth*. See Porter et al., "Gently Boyle," 1–6, 19–23, for a direct confrontation between the two perspectives.

found and consequential, dynamic processes. I myself doubt that even the invention of authorial copyright—which is probably the current candidate to replace fixity as the centerpiece of a historiography of printing revolution—can really stand muster as the focus of a single transforming change. And the contention that the cultural significance of print can properly be understood only in fully contextual terms should hold good a fortiori for modern communications technologies. In this age of worldwide networks, e-mail, fax, photocopiers, word processors, desktop publishing, and satellite communications (all of which, incidentally, played their part in the production of this book), it is especially important that we attain a judicious understanding of the role we accord such devices in our own society. Such an understanding will need to include not just the results of these technologies, but the social and cultural foundations of their authority.[12] It is interesting to note, for example, that in these spheres credibility seems again to be at a premium. Financial institutions and other corporations are laboring to establish a means of rendering electronic communication secure enough to supplant more traditional media. It is not too fanciful to compare these efforts to the Royal Society's endeavors to secure the credit of printed communications in the seventeenth century. The implications may well prove just as far-reaching.

It is consequently reasonable to question the rather hyperbolic descriptions that so often appear on television and in the press, forecasting extraordinary trends in communications technologies and warning of massive future consequences. Such accounts typically combine a sophisticated account of the technology involved with rudimentary misunderstandings of the history and sociology. Suppose for a moment that we really lived in the new age of global uniformity that is so frequently heralded. The implications for our approach to history, at least, would be radically different. In such a world, it would no longer make sense to say that the past is a different country, since countries would have become indistinguishable. Regional and national cultures would have been rendered uniform by their common subjection to News Corporation, Microsoft, and Disney, so that such an aphorism would be meaningless. The eradication of such differences would be seen as the progressive realization of communicative objectivity, in much the same way as the advent of "fixity" does today. The past would no longer be a different country—just a different channel.

The study of history in our own realm tells us that such an outcome is

12. A comparison is appropriate in this respect with current initiatives in the "Public Understanding of Science," which face a similar issue: should they aim to convey a simplified version of scientific knowledge, or an understanding of how science itself attains its conclusions and invests them with such substantial authority? Scientists tend to favor the former.

unlikely. Monolithic hegemony of this order is fortunately not yet achieved, and if the approach of this book is valid then its achievement may even be impossible. At least, it will not be attainable by the mechanisms now typically proposed. That is a substantial conclusion to draw. The implications of communications technologies will, of course, be wide ranging and significant, but they are unlikely to be monolithic or hegemonic. They can best be understood and mastered with an appropriate knowledge of the cultural dynamics involved, and an appreciation of their appropriations by users as well as their impositions on them. History can make a contribution to this debate. If communications technologies were intrinsically authenticating, then there would be little the historian could usefully say about that fact. *The Nature of the Book*, on the contrary, asserts our capability not just to document the link between print and veracity, but to explain it. The final assertion of this book is, then, that we can address major current issues of communication, and perhaps even explain them, by using the historian's craft. It is, I think, an optimistic conclusion.

ON THE WORLD

The World's a *Booke*, writ by th'eternall *Art*

Of the great Maker, *printed* in Mans heart;

Tis falsely *printed*, though divinely *pend*,

And all th'*Errata* will appeare at th'*end*.

FRANCIS QUARLES, *Divine Fancies* (London, 1641), 173