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Essay review

Fallible or inerrant? A belated review of the ‘constructivist’s bible’

Jan Golinski, *Making Natural Knowledge: Constructivism and the History of Science*. Cambridge History of Science. Cambridge: Cambridge University Press, 1999. Pp. xiv + 236. ISBN 0-521-44913-8. £15.95 (paperback).

When Jan Golinski’s *Making Natural Knowledge* was published in 1998 it was generally applauded for its ecumenical stance between the empirical ‘art’ of historians and the theoretical focus of the social sciences. Indeed, such a middling position was a unique approach to be taken in wake of the ‘science wars’ and this, in combination with the book’s clear organization and (for the most part) forthright prose, quickly earned it a place upon HPS, STS and SSK postgraduate reading lists. Now, five years since its first edition was published (hardback, 1998), the work has become a standard introduction to historically minded scholars interested in the constructivist programme. In fact, it has been called the ‘constructivist’s bible’ in many a conference corridor. Since the book has attained such a status (and since it has not been reviewed in the *BJHS*), it is perhaps worth reflecting on whether or not such canonical text (to use a biblical analogy) is fallible or inerrant – especially in relation to its content and pedagogical efficacy.

Claims and content

A quick search for *Making Natural Knowledge* on any social sciences reference index (or any other humanities database for that matter) is guaranteed to turn up a substantial amount of works that cite the book. If one takes the time to pursue these citations, it becomes quite clear that the book, for better or for worse, has become a rhetorical commonplace for scholars wishing to pay a footnote to the constructivist position (which is quite ironic considering Golinski’s own work on science and rhetoric). This, considered in combination with the fact that most postgraduate students are often asked to read only the parts of the book that are relevant to their course, suggests that it is becoming one of those works that is more often cited than read. Bearing this in mind, the following section offers review of the book’s claims and content. For those who are intimately familiar with the book’s entire scope, such a recap might be all too familiar. If this is the case, I recommend skipping over the next few paragraphs and turning to the second section where I address aspects of the book’s pedagogical usefulness.

As stated in the preface, the book is both a work of an uncertain genre and an ‘extended historiographical essay’. Golinski loosely defines ‘constructivism’ to be a

'methodological orientation [rather] than a set of philosophical principles; it directs attention systematically to the role of human beings, as social actors, in the making of scientific knowledge' (p. 6). Although he does not give a specific definition of what he means by 'science', the very title of the book and his use of the term indicate that he sees it as the creation and manipulation of natural knowledge. His thesis is that the history of science can be enhanced by the questions posed by the constructivist programme and he supports this claim by summarizing an admirable amount of secondary literature. He contrasts the constructive approach with that of 'conservative writers' (p. 163), a term used to represent historians who have reservations about applying the sociological perspectives offered by constructivism. Even though it is not specifically stated in the Introduction, a sub-thesis that runs throughout the book is that constructivism can potentially deliver the history of science from microhistories (studies that concentrate only on small spans of time) which do not adequately consider the larger social factors that influence local scientific communities. The organization of each chapter is rather straightforward; he presents one or two constructivist ideas at the beginning and then seeks to illustrate how they have been (or could be) fruitfully applied to the practice of writing scientific history.

As its title indicates, Chapter 1 is 'An outline of constructivism' as relevant to the history of science. Beginning with a largely sociological interpretation of Kuhn's 1962 *The Structure of Scientific Revolutions*, it moves on to explain how Kuhn inspired Edinburgh's Strong Programme to investigate the role played by social causation in scientific beliefs. It then shows how this programme contributed to the emerging field of the sociology of scientific knowledge during the late 1970s and how this led to several different forms of sociologically influenced histories of science during the 1980s and 1990s. Having summarized the emergence and basic tenets of 'constructivism', the remaining chapters seek to demonstrate how this perspective can be applied to 'mapping the social profile' (p. 46) of science via historical studies.

After addressing the initial influence of Robert Merton's teleological internal/external thesis upon early constructivists, Chapter 2 explains how later sociological histories deconstructed this historiographical typology, thereby paving the way for studies which addressed how social factors influence the way in which institutions – academies, courts, universities, laboratories and lecture theatres – foster and then disseminate experimental knowledge. Having shown the relevance of constructivism to such institutions, Golinski uses the first part of Chapter 3 to focus on the laboratory, a place traditionally considered to be the epicentre of the scientific endeavour. His main objective is to demonstrate that constructivism has shown that laboratories do not exist in a social vacuum. The rest of the chapter goes on to summarize historical studies which have investigated how social factors are involved in validating the natural knowledge generated by laboratories, museums and fieldwork sites.

Chapter 4 treats scientific discourse; that is, the use of rhetoric and hermeneutics to communicate natural knowledge. The first half advances a claim which was initially developed in his *Science as Public Culture* (1992), namely that rhetorical analysis (in the classical sense) can be used by historians to investigate how convention, audience, situation and form influence the reception and exchange of natural knowledge. The second

half of the chapter addresses hermeneutics, which Golinski defines to be an endeavour that ‘is concerned with how meaning is constructed by the interpreters of discourse’ (p. 120). This is evidently his own definition and although it harmonizes with the goal of his book, it does leave one to wonder if it is nuanced enough to include the hermeneutical positions of several of the philosophers who are subsequently cited – Gadamer, Heidegger, Ricoeur and Wittgenstein, for example. Based on his conception of hermeneutics, Golinski advances three ‘categories of analysis’ (semantic, semiotic and narratological) (p. 127) and then proceeds to cite studies which have used such a methodology.

Building on Chapter 3’s treatment of experimental knowledge and Chapter 4’s interest in how scientific ideas are communicated, Chapter 5 turns to instruments and visual images that have been traditionally associated with the laboratory. Golinski’s treatment of instruments emphasizes that they are constructed objects and as such are only as infallible as their users. Furthermore, their correct usage and the interpretation of their results often depends on tacit forms of knowledge that can only be taught in a local setting. This issue of interpretation then leads into the second part of the chapter where he discusses the visual rhetoric and hermeneutics of scientific images (p. 146). He suggests that these can be studied empirically in relation to how setting, function and technology contributed to their formation and reception.

After a brief recap of the book’s goals, Chapter 6 addresses a concept that has become very popular in the social sciences over the past two decades: culture. Golinski once again challenges unnamed ‘conservative writers’ by asserting that the social focus of the constructivist gaze offers a new concept of culture that is not fettered to an overt dedication to intellectual history. By looking at science from this wider perspective, he believes that this will encourage studies that concentrate on cultural networks rather than on scientific localities – a development that would bring scholars one step closer to crafting the macrohistories of science mentioned earlier in the book. To illustrate the applicability of this claim, he spends the rest of the chapter discussing metrology; that is, the study of how measurements become standardized in different locations. Building on the constructivist emphasis upon the inherently social nature of scientific networks, he cites several events in the history of metrology which demonstrate that the road to standardization has not been a smooth one. This interest in studies which look at the larger role of science in society sets the stage for the coda where he discusses ‘the obligations of narrative’. He returns once again to his contention that most historians of science are currently interested in writing microhistories. He suggests that constructivism’s focus on larger social factors has paved the way for a ‘new vision’ that is interested in ‘the re-emergence of big-picture narratives, albeit of a rather different kind from the traditional stories of progressive epistemological accomplishment’ (p. 189). The rest of the coda explores this position as evinced in several studies that have used socially oriented historical narratives as an approach to the history of science.

Pedagogical considerations

As the above summary indicates, this book covers quite a bit of intellectual territory. For those ‘conservative’ thinkers who are not familiar with SSK or with how sociological

methodologies have been generally applied to the history of science, this is a relatively short book (206 pages) which gives a helpful introduction to a historiographical genre that has generated a significant amount of jargon and secondary material over the past three decades. As can be imagined, the historical studies of Shapin, Bloor and Latour receive considerable attention. For those who are familiar with these authors, some of the summaries of their positions might seem a bit verbose or even contentious. In fact, Golinski's portrayal of the Strong Programme has raised the eyebrows of both historians and sociologists of science;¹ and for a book that is often used to introduce students to SSK studies, this seems rather problematic. Additionally, Golinski's penchant for throwing around the names of a good many twentieth-century philosophers has often confused more than helped the students who take my undergraduate history of science modules. This difficulty is usually not a problem for postgraduates, because most of them realize that Golinski generally uses a philosopher's name to represent a certain type of thought or idea as construed by constructivists – so the philosophical content is not as complicated for students willing to use a basic philosophical dictionary.

Despite these and other shortcomings, the book has proven to be rather resilient over the past five years. This is because it fills the notable gap that still exists between how 'science' is represented by theoretically centred sociological approaches and by the more empirically focused historical enterprise (incidentally, the trendy sociological term now used to identify the former practice is 'trace' work). Interestingly, most of the citations paid to *Making Natural Knowledge* in recent books occur in works that are being pitched at readers who are not prepared or able to wade into the unpredictable (and often inconveniently located) wilds of archival collections (particularly the pre-1800 European-based collections that are painfully inaccessible for a great many North American and Australian researchers). This being the case, it is quite easy to see why the book so often occurs on the syllabi of social science courses which are more interested in the larger narratives of history than the fine specifics of archival work.

Yet, no matter what one thinks of Golinski's blend of sociology and history, it is generally acknowledged that one of the most pressing methodological ambiguities of the book is its rather loose conception of 'constructivism'. Golinski has no problem including philosophically, socially or culturally minded authors who might not wish to be placed in the constructivist tradition – Kuhn being the most obvious example. He defends this methodological egalitarianism by stating that constructivist ideas have provided a theoretical rationale for the studies he has chosen to cite and that this method offers 'the prospect of connecting empirical local studies with more general themes concerning the constitution of scientific knowledge' (p. 80). Fair enough for those willing to accept such a position. However, for the more methodologically (or perhaps pedantically) inclined historians of science out there, Golinski's forthright justification might not be as satisfying. This is because he cites an incredible amount of case studies taken

1 This was pointed out in the initial reviews of the book. For the historical perspective, see John Henry, 'Calls for a ceasefire in the science wars', *Nature* (1998), 395, 557–8; for a sociological analysis, see Ingemar Bohlin, 'Making history', *Social Studies of Science* (1999), 29, 459–80.

from secondary sources. These are most often grouped around the thematic foci of the chapters as summarized above. Although this allows him to give a general structure to the book, such a practice is pedagogically problematic.

First, it allows him to skip over the methodological commitments that led to the conclusions of the very case studies that he is citing. When one digs below these conclusions, it becomes apparent that some of their methodologies are incompatible with each other – and as the first chapter of the book so clearly demonstrates, there are many different methodological variants within constructivism alone and this often influences how the historical data is arranged. Second, Golinski's thematic arrangement allows him to sidestep the fact that the data used in many of his case studies is of a radically different nature, both in terms of where it came from and when it was gathered or created. This is especially problematic when he uses a constructivist theme (sociological questions about the laboratory, for example) to categorize case studies selected from both the modern and the early modern periods (p. 86). Such a practice does not seem to recognize that there is a difference between the source materials of a study conducted on living physicists (who can be queried and where primary documents have not been destroyed and are therefore more abundant) and one conducted on the founders of the Royal Society (who are dead and whose personal notebooks and correspondence have often been lost). These two methodological concerns are significant and although they are obvious to professional historians, they are not so easily spotted by students.

Even though the book is concerned with demonstrating how the constructivist perspective provides new questions that can be asked of the history of science, it is interesting to note that it is relatively silent on how industrious students can use constructivism to unearth new and diverse primary sources that might help them see pre-1900 science from a more social or culturally nuanced angle – a particularly perplexing point for a book interested in addressing scientific historiography. True, Golinski is calling for a new approach to primary sources that have been used for centuries. But this means that he has to rely implicitly on a scientific canon that was largely determined by nineteenth-century historians who were content to eliminate sources that many of today's constructivists would be quite interested in embracing. Because he relies on this traditional canon, the majority of his case studies are based upon sources that were originally selected because of their relevance to institutions like the Royal Society or the 'great men' of science like Copernicus, Galileo, Bacon, Boyle, Hooke, Newton, Lavoisier, Banks, Davy, Faraday and Darwin. By focusing on these men, the very case studies that Golinski uses to propound the relevance of constructivism end up implicitly supporting the conservative position that he is trying to challenge. This being the case, it would seem that one of the crucial goals for the book should have been to suggest how constructivism could be used to reconfigure the scientific canon so that the same people and ideas are not constantly reaffirmed by an older historiographical position. Such an approach would provide constructivism with a stronger foundation from which it could re-evaluate the historiographical representation of scientific ideas, cultures and episodes. It would also allow it to draw from several philosophical (or perhaps ideological) traditions that Golinski only treats in a cursory manner. A case in point is feminism. Instead of reaffirming that the role of women in science has been ignored (p. 91), he could have used

feminist approaches to unearth documents which showed that women actually were proactive agents in the scientific enterprise.

The book's format also presents two points worthy of consideration. The first is that Golinski uses internal notation. This offers an aesthetic advantage because it removes the distraction that footnotes often create. However, should a more advanced student want to look up a given text or case study, this system presents difficulties because it usually does not provide specific page numbers. This problem becomes particularly acute in places where the methodological issues mentioned above are at stake. Second, although the thematic arrangement of the book provides a clear overarching structure, the internal organization of each chapter's two or three subsections is sometimes hard to follow, even for a specialist, let alone a student. Golinski's most common method for presenting constructivist ideas is by summarizing the views of another author who has written on a given subject. This is advantageous because it helps the reader to map the many different positions represented by the constructivist terrain. Nevertheless, this approach does become confusing in places. Many of the summaries could pass as in-depth book reviews in which Golinski does not clearly indicate where a given author's position ends and where his reflections begin. Additionally, some of these summaries turn into a dizzying list of secondary sources without explaining their precise relevance to the thematic goal of a given subsection – hardly a desirable trait in a textbook. Furthermore, even though he does criticize several authors, Golinski, for the most part, seems to accept the questions posed by constructivism without necessarily accepting the methods that it uses to answer them.

So, in light of the pedagogical 'fallibilities' mentioned in this essay, is the constructivist's bible useful as a textbook for historians of science? I would venture a cautionary response in the affirmative. Asking postgraduate students to read summaries of historiographical positions should not replace the need for them to read primary texts themselves. This being the case, although it glosses the positions of several sociological authors, and despite the fact that its index and bibliography are far from being exhaustive, most readers will find that the book still makes for a helpful reference work – especially for the more historically minded courses that take constructivism as a point of departure. Additionally, I have found that the book provides a helpful focal point for seminars or tutorials interested in exploring the advantages and tensions that arise when a historian attempts to apply a given constructivist approach to a specific time period or different types of data – a deconstruction of constructivism, if you will. I do this with the realization that, just like the laboratory instruments that Golinski discusses, the reception and use of the book is ultimately couched within the tacit knowledge communicated to the student via the larger community in which s/he is studying. Even so, time has shown that within the wide variety of environments interested in teaching various aspects of the history of science, the book's difficulties have not prevented it from being a pedagogically useful text.

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