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## History of science on the World Wide Web

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## Essay review

### History of science on the World Wide Web†

Museum of the History of Science (Jim Bennett and Giles Hudson), *The Measurers*,  
<http://info.ox.ac.uk/departments/hooke/>  
 Rice University (Albert Van Helden *et al.*), *The Galileo Project*,  
<http://es.rice.edu:80/ES/humsoc/Galileo>

The World Wide Web (WWW) has grown explosively since its first appearance at the European particle accelerator laboratories of CERN in 1989. Originally intended as a means of allowing large, dispersed groups to collaborate on physics projects, the WWW is now a vast interlinked network of texts and images. As the WWW has expanded, it has become increasingly relevant and useful to historians of science. Mundane but important information, such as the registration details of conferences, is easily made available. Similarly, various international bodies are working on creating a unified bibliographical database in electronic form.<sup>1</sup> Recently, however, more elaborate history of science WWW projects have appeared which rival the traditional monograph in terms of effort, sophistication and imagination. These ‘virtual museums’ display and interpret artefacts, or explore important historical actors, and their size suggests incorporation into the review process. This essay is the first in a hybrid genre: paper reviews of electronic exhibitions and publications. It has two parts, an introduction to the essentials and jargon of the WWW, and secondly, a review of two WWW projects.

The idea of a networked database has a far longer history than the current WWW.<sup>2</sup> In the 1940s, the American electrical engineer and science administrator Vannevar Bush imagined and described the Memex, a machine that would store and associate texts and images. Bush considered that this machine, by imitating the associative character of memory, represented a more ‘natural’ method of information storage. This non-linear nature was shared by later attempts at networking texts, or hypertext, as it came to be called. WWW, the hypertext system created at CERN in 1989, spread rapidly, supported by the laboratory’s powerful computers. It was made freely available to users to whom CERN devolved the capability to construct and add their own pages to the web. Pages stored on geographically widely separated machines could be accessed over the Internet, a mesh of

† *Editor’s note.* Information about the *British Journal for the History of Science* and books published by Cambridge University Press is available on <http://www.cup.cam.ac.uk/>. In North America the address is <http://www.cup.org/>. Reviews of web sites will be included in future numbers of the Journal.

<sup>1</sup> See R. W. Home’s report, ‘Towards an international bibliographical database in the history of science, technology and medicine’, *British Society for the History of Science Newsletter* 49 (February 1996).

<sup>2</sup> Lenny Zeltser, 1995. ‘The World-Wide Web: origins and beyond’, <http://homepage.seas.upenn.edu/~lzeltser/WWW/>.

computers communicating via standardized protocols that had mushroomed from an American military network.

A computer connected to the Internet and a software package called a browser are both needed before WWW pages can be viewed. The browser is a program that can understand the language, HyperText Markup Language (HTML) with which web pages are composed, and which then displays the information. Each page has an address, or Uniform Resource Locator (URL). For example, the URL of the WWW Virtual Library of the History of Science, Technology and Medicine, an excellent compendium of WWW sites of likely interest to *BJHS* readers, is: [http://www.asap.unimelb.edu.au/hstm/hstm\\_ove.htm](http://www.asap.unimelb.edu.au/hstm/hstm_ove.htm). This collection, maintained by Tim Sherratt at the University of Melbourne, is organized by speciality, and also contains directories of museums, electronic journals, email discussion lists, societies and a biographical dictionary.

Curiously, two of the most interesting history of science WWW projects currently online examine early modern, or more precisely 'Scientific Revolution', subject matter. The first is the virtual exhibition *The Measurers: A Flemish Image of Mathematics in the Sixteenth Century* at the Museum of the History of Science in Oxford, with content by Jim Bennett and web design by Giles Hudson. Its URL is <http://info.ox.ac.uk/departments/hooke/>, and the authors recommend Netscape 1.1 or higher as a browser. The title of the exhibition is deliberately droll as the visitor is first confronted by a large scanned painting, titled *The Measurers*, attributed to an Antwerp painter, and showing instrument makers. The painting is meant to draw our attention to the practical activities of the instrument makers, and also to act as an organizing principle for the exhibition as a whole. The exhibition has three interlinked sections, called 'The Mathematicians', 'The Measurers' and 'The Collectors'. Each section contains images and texts, and the images can be examined in more detail by clicking on them. (The range image of a geographical globe from Peter Apian and Gemma Frisius' *Cosmographia* of 1584, for example, was clear enough to read the names of topographical features.)

In 'The Mathematicians', Bennett argues for the existence of a broad 'mathematical programme – the reform of a range of practical arts through the application of geometry'. Its historiographical stance – understanding terms like 'arts' and 'science' in their Renaissance meanings – will be a familiar exhortation to *BJHS* readers, but a thought-provoking idea to casual electronic visitors. Bennett focuses on the Flemish practitioners that worked around Antwerp and Louvain, the most well known now being Gerard Mercator. The central section of *The Measurers* is 'The Measurers'. Here, Bennett discusses the activities that the instrument maker or mathematician sought to reform: music, weighing, gauging (of wine or ale), surveying, and measuring grain and cloth. The link between the Flemish practitioners and extant present-day artefacts is discussed in the final section, 'The Collectors'. These men, ranging from the Emperor Charles V (1519–55) to Lewis Evans (1853–1930), who donated his large collection of mathematical instruments to the Oxford Museum in 1924, have shaped the history of science through their choice of orders and purchases.

The virtual exhibition also contains a catalogue, with more detail on the pictures, and a bibliography. It is a small, self-contained and simple WWW site that is easy to navigate

and understand. The only important presentation fault is the choice of background colour, which makes the text occasionally unreadable. Essentially it is similar in format and content to a well-written printed exhibition guide.

The second WWW project reviewed here is a more ambitious affair, less obviously rooted in traditional print formats. The *Galileo Project* of Rice University (<http://es.rice.edu:80/ES/humsoc/Galileo>) is intended, in the words of its coordinators, 'to provide hypertextual information about Galileo and the science of his time to viewers of all ages and levels of expertise'. The 'current developers' are Albert Van Helden, Elizabeth S. Burr, Adam C. Lasics and Neil Warnes, with previous help from developers Adam J. Thornton and Martha A. Turner. Like the Oxford authors, the Rice group have chosen an image to organize their material, although in this case the image is dynamic. By clicking on parts of a large architectural ground plan of the villa in which Galileo spent the last years of his life, the visitor can investigate different aspects of the natural philosopher's life. For example, the Instrument Closet has pointers to illustrated texts on Galileo's apparatus, including the telescope; the Chapel leads to accounts of the Inquisition figures such as Cardinal Bellarmine and Giordano Bruno; and the Library contains a bibliography for the whole *Project*. Each section has further pointers, akin to footnotes, to other relevant characters and objects. Thus more information about Hans Lipperhey or Copernican cosmology are available whilst reading the Telescope page. As an alternative to the Villa, there are also three other tools to navigate *The Galileo Project*: a very lengthy timeline of Galileo's life, a series of maps, or a purely text-based tool.

Whilst the *Project* team wish the WWW site to be accessible to all age ranges, from primary schoolchildren to university academics, the largely textual basis of the site makes it only really suited to university students and above. (This emphasis may change, however, with the construction of a 300-image Portrait Gallery). In an imaginative experiment *The Galileo Project* forms the basis of a university course called 'Galileo in Context', in which student groups construct their own web pages as part of the coursework (possibly to be connected into the main project at a later stage). With the continuing efforts of students and the organizing team, *The Galileo Project* is a large and growing web site. It is rich in information and the interpretations seem fully up to date. The stress given in the historical accounts (although I am no expert) would not surprise readers familiar with, say, Mario Biagioli's *Galileo, Courtier* (Chicago, 1993). However, the descriptive tone of the electronic texts written by Albert Van Helden creates an impression of stability and consensus over interpretations of Galileo. The *Project* would be greatly enhanced, not least as a teaching tool, by some discussion of divergent historical argument, for example over the usefulness and implications of the expression 'Scientific Revolution'. The organizers promise to add a full bibliography directed towards students, detailing references to texts and images.

Historians of science are often made aware of the subject matter and quality of printed literature through the mechanism of the book review, which enables them to judge the suitability of a book for, say, teaching purposes. Likewise, if the proliferating web pages are to be of pedagogical use, they also need to be brought into a review process. Like books, web pages should be reviewed by peers with a comparable grasp of subject matter and contemporary debate. The remainder of this essay explores the potential of the WWW for

historians of science, in particular with regard to popularization, teaching and as a format for publishing academic research.

As the number and range of people who have access to the Internet rises, then so the possibilities of raising interest in history of science are increased. Many corporate and personal WWW pages are already essentially advertisements: front windows, with all that that metaphor implies. The Science Museum in London has followed other museums around the world in investing effort in both WWW exhibitions and guides, and in interactive exhibits.<sup>3</sup> Of certain use to historians of science will be the availability of archive listings online (for example Manchester University's National Archive for the History of Computing has made its complete catalogue of archived material available via its WWW page).<sup>4</sup> Certain large archives have, mistakenly I believe, chosen the technology of CD-ROMs, which offer more traditional proprietorial possibilities than the WWW, to make available archive listings and key documents. The advantage of the CD-ROM to these archives, such as British government papers in the Public Record Office, is that the end-users (primarily libraries) share some of the costs of production, at the expense of a wider availability.

The use of *The Galileo Project* as the central resource in a university history of science course raises interesting questions. With web pages easily accessible by students, there is arguably less need for descriptive, factual lectures, and consequently more time for discussion groups. Lecturers will need to familiarize themselves with web pages as sources for essays and projects. A course could also be built around a collection of WWW sites held at another institution: for example, I would recommend both the web sites reviewed here for inclusion in a course on early modern natural philosophy. I have integrated some material from these sources into a history of computing course, along with a very necessary caveat to students to be more critical than they would be towards the traditional information sources found in the university library. Again this heightened caveat is a consequence of the absence of a review process for WWW sites.

While the use of WWW sites for popularization and as a replacement for some aspects of lecturing is about the *representation* of largely published texts, the potentiality of WWW sites to present *new* academic argument and research is yet to be explored within history of science.<sup>5</sup> Few web sites are *positioned* with respect to ongoing debate. Partly this is an outcome of our disciplinary convention that printed monographs, edited volumes and papers should underlie professional and intellectual status. This, again, is surely a product of the absence of a review process, without which an economy of credit cannot operate. After all, book reviews are forums for debate as well as the judgement of quality. If WWW sites offered merely a substitute for the printed alternative, then this argument would be trivial: special pleading for a new technology. However, the non-linear character of WWW design, the possibilities of interlinking and cross-referencing, and the possession by the

3 <http://www.nmsi.ac.uk/Welcome.html>.

4 [http://www.man.ac.uk/Science\\_Engineering/CHSTM/nahc.htm](http://www.man.ac.uk/Science_Engineering/CHSTM/nahc.htm).

5 For an indication of what is possible within the discipline of history, in particular in matters of presentation, see George P. Landow's impressive WWW site *The Victorian Web* at: <http://www.stg.brown.edu/projects/hypertext/landow/victorian/victov.html>.

author of sophisticated means of combining illustrations with texts, can be used to construct and reconstruct the history of science in different ways.

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