



# Becoming Digital

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## Overview

It's all happening so quickly. In the beginning was the Micro Gallery, opening in 1991 in the brand new Sainsbury Wing of the National Gallery, London. Then, in 1994, a curator amazed staff at the Science Museum, London, by magicing a blurred image of a dinosaur bone down the Internet, all the way from the Museum of Paleontology in Berkeley, California. In 1995 museums went digital. They leapt to use the new multimedia, a potent source of telephone-number volumes of visitors, even if only virtual. In early 1995 there were 120 museum World Wide Web sites indexed in the Virtual Library of museums; in mid-1996 there are over 400. The Virtual Library of museums has 1,500 accesses a day and the Science museum pages have enjoyed over three million mouse clicks in the past nine months. What then does being digital mean for a museum? The *actual* museum consists of physical collections, documentation, people and buildings. It builds and conserves collections; interprets them through exhibition, publication and education; undertakes research; publishes and exhibits. Its objectives in performing these functions are to preserve an archival record of evidence relating to its particular theme, and to enlighten, inspire and hopefully entertain people, present and future. It uses as the means its collections, related information, knowledgeable people, and the museum itself with its galleries and displays of objects. The digital museum will have these same means and ends, but its buildings, people, and physical objects will be digitised—i.e. virtual, not actual—and the means of production will be computing and telecommunications hardware and software.

The digital museum can manifest itself in different ways. At present these are online access via the Internet; electronic terminals or screens, from PC-sized to wall-sized, in the physical museum; and takeaway multimedia publications, currently CD-ROMs. In many ways, it is online access that could have the greatest effects on museums. But will it really change their nature in fundamental ways? It is far from clear as yet who are the users, and what they might want. If a museum disregards the seductive new technology, or finds it too expensive, will the institution wither away? Or will it thrive regardless of whether the information superhighway is just a vast distraction from its real business? This paper investigates a few of the opportunities that arise from being digital; it examines the nature of the digital museum, especially as it would affect or serve collections and curatorial activities; and it explores some consequences for museums as organisations.

## **Virtual Characteristics**

The characteristics of electronic communications are quite different from those of present museum communications. They bring new opportunities—new ways to achieve traditional museum objectives.

### *Unlimited users*

An electronic product, once created, can be delivered over the Internet to one person or to millions, on a terminal in the museum or on the other side of the world, for the same cost. The number of users at any one time is limited only by the capability of the server and the network infrastructure. Like roads or the telephone network, the major cost of infrastructure falls at present not on the individual museum but on whatever national and international mechanisms are in place to maintain the Internet itself, whether public or through private providers.

### *Broadcast or narrowcast*

Delivery can be broadcast to millions, but equally, users will be able to self-select content tailored to their exact requirements and preferences (Bearman, 1995; Signore, 1995). This will require sophisticated search engines and user interfaces (some examples can be found in the Netscape search page, <http://home.netscape.com/hom/internet-search.html>). These tools will become as important as content (Stubbs, 1995), as the amount of available content increases beyond that which individuals can scan or search for themselves. Or access could be confined to certain users—for example, those who have paid.

### *Two-way communication*

Rather than interpretation being predominantly ‘us-to-them’, as now, the virtual museum will facilitate increased two-way communication between museum staff and their public, who may indeed be equally or more knowledgeable than the staff. Such communications may take place instantaneously or be stored centrally or locally for later retrieval.

### *Multimedia*

Multimedia refers to the way that text, images, animations, video or film clips and sound can be combined in a single product. Live events can be combined with digitised images and text.

### *Wires not walls*

The essence of the Internet is that it allows electronic information to be seamlessly linked to other electronic information (Strohecker, 1995). A page in the World Wide Web can be linked to a second page in the same server, or to another server on the other side of the country, or the world. A museum collections database can be linked to the many other related databases in the world outside the museum.

*Electrons and paper*

Paradoxically, electronic means are offering highly sophisticated possibilities for paper publishing. For example, publishers are beginning to publish journals electronically. Already, it is possible for an individual to select a compilation of papers from a publisher, to be printed out and posted to them. British Telecom has transformed its technical library service in a similar manner (Stubbs, 1995).

*The flickering screen*

The digital museum is currently delivered only via screens. This is a powerful constraint on design and use. Most screens are PC sized, but this is not inevitable; in the Royal Ontario Museum a room is lined with wall-sized touch screens.

**Virtual Possibilities**

Museums have already created a multitude of virtual products serving their different functions, and a host of others can easily be imagined. Indeed, there are already some museums that have only a virtual existence, for example, the Virtual Computer Museum, and the Web Museum. (See Appendix for further details, and World Wide Web addresses).

*Collecting*

At present, collections are perceived primarily as physical objects. Yet they have an information dimension too (MacDonald and Alsford, 1991), which is just as significant, and which can now be created in a way that was just not possible before. The contextual information about people, places, discoveries, events, will be held as data and related to and combined with the collections and object data (Bearman, 1995; Carlisle and Blackaby, 1995) (Figure 1). The object can, for the first time, really be the gateway to all the different contextual information it stands for. The data need not only be text. Images, sound and video can be digitised, made available in databases, and be indexed and searched in a similar way. For example, a printing press could be shown operating through video; the sound it makes could be reproduced at the same time; its ex-operator could recount what it was like to run it; catalogue descriptions and images of parts could be summoned up from his speech. A virtual reality recreation could explain how it works; images of documents it produced could be linked to it; other print workers could talk about the workplace and organisation. The museum database could be drawn on to show other printing presses and objects and to set it in context. This sort of capability is not unfamiliar in CD-ROMs, and on galleries; but soon it will be possible to deliver the same sort of content over a network and link it to an online event or discussion.

And the digital collections can extend outwards (Thomas and Friedlander, 1995). They will consist of specific parts of many museums' databases linked together. Objects not in any museum can be included in virtual form. Collections could be national, or international; specialist or inclusive; for scholars; for

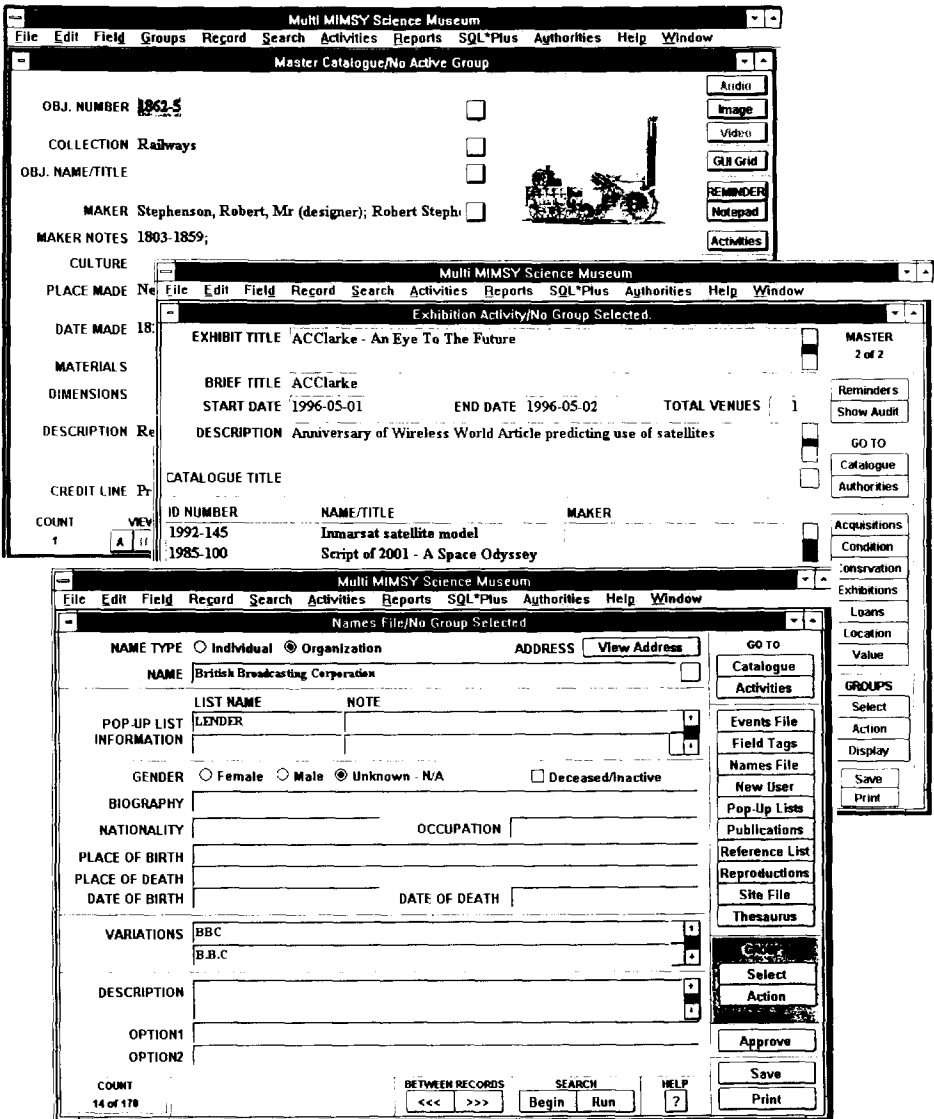


Figure 1. Some of the screens from an example of a comprehensive collections database: one of three Master Catalogue screens, a screen to hold information about exhibitions and events, and a screen on people and organisations.

schools; or to be marketed commercially to users. Museum catalogue information can link to related databases, such as sites and monuments records; natural history databases such as species distribution records; and to library information, so that references related to objects can relate to other related publications. Technical and data standards enable this, and will assume ever greater importance. There are some important museum-based projects that support this. LASSI [Larger Scale Systems Initiative (Keene, forthcoming)] was a consortium of United Kingdom museums which developed model requirements and

contractual terms for museum collections systems, now available to all museums there. RAMA [Remote Access to Museum Archives (Cisneros and Delclaux, 1994)] was a European project to develop software to work across the Internet to give access for researchers to museum archives, particularly image-based material. CHIO (Bearman and Perkins, 1993) is a group of museums together with the Getty Institute and CHIN, the Canadian Heritage Information Network, which is developing a standard means of electronically marking up museum data so that users can search and retrieve data from catalogues across many museums.

### *Conservation*

Digitisation can be a powerful tool for preserving the collections. Image collections, in particular, can be preserved in digital electronic form, theoretically indefinitely. Wear and tear on collections inflicted by physically searching through them can be drastically reduced if adequate images exist, and a database with images is even more convenient. Granted, resources and procedures for maintaining such digitised collections have serious resource implications (Ester, 1995). Image databases consist of very large amounts of data which require considerable computing capacity; they have to be regularly backed up, and the backups checked; as technology evolves they have to be transferred into formats readable by new software and hardware. In fact, Kodak is offering an image storage service founded on microfilm, as being the most permanent medium for archival storage. Digitisation can aid the process of diagnosing and deciding on treatment—as long ago as 1986, image processing was used to aid the understanding of the Turin Shroud (Doyle *et al.*, 1986). Virtual moving objects could reduce the pressure to run working objects. And software itself needs to be conserved, the more so as its importance to our lives increases (Keene, 1994).

### *Research*

At present, museum research is difficult to capture and access, and its output is now often dispersed among highly specialist publications, difficult for subsequent scholars or students to retrieve. Research notes are even less accessible. Electronic databases and networks make it possible to capture the results of research so that they can be retrieved by users, however dispersed in geography or time. In future research will increasingly consist of making connections between existing information, as much as in creating fresh text or content. The museum's paper files and solid walls, similarly, need no longer be a barrier for contributions to museum information. People can offer their specialist knowledge or expertise by digitising their own information as part of the collections data. At first thought, one might assume that this information could be stored anywhere, but to be truly part of the information collection, however, the data would have to be validated and stored in a way that ensured and maintained their security and integrity. The ability to guarantee the quality and integrity of their collections information will parallel the seal of authenticity that museums provide for their collections objects.

Publication

With CD-ROM publishing becoming commonplace, and the advent of sound and video delivery over the Internet, technology is converging. The content that museums can provide could be reusable on the World Wide Web, on a gallery, in a CD-ROM (Figure 2). Beware the magic solution, however: another school of thought says that content is not inherently reusable (Bearman, 1995) because



Figure 2. Screens from the Exhibition On-Line, Flight (<http://www.nmsi.ac.uk/exhib.html>). Catalogue type details and label text for the object are held in the database repository for use in whatever format is required. (Author: A. Nahum. Creator: P. Bailes.)

technical standards will be rapidly superseded and each user's needs and interests are so specific. Still, the arrival of highly sophisticated collections databases immediately makes it possible to collect together all the information that is generated daily about the collections—object labels, captions for photographs, answers to enquiries. Over time, this will form vast knowledge bases—the intellectual collections themselves. Stories can be compiled from the knowledge base: in the logical world of data entities and links, a story is a combination of data on the object and on people, places, events and concepts. Already, there is a pilot project in which texts needed by students for coursework are being scanned, to be viewed by students over a network in the college library (two European projects developing this are ERIMS, in which the University of Oxford is a partner, and DECOMATE, with the London School of Economics and other European organisations). The texts can be existing publications, specially prepared material or lecturers' unpublished work, and students can have documents of their choice printed out for payment. Museums already service very large numbers of enquiries from researchers, the public and from commercial companies, and there is the opportunity to become important information providers in a brand new and growing market.

## Exhibition

The digital museum can be realised within the display galleries themselves though a major constraint at present is that it has to be delivered via a screen. Interactive screen-based experiences require careful design to be other than for individuals since it is no fun watching someone else click the mighty mouse. Users have to spend time to learn their way around the offering (Swade, 1995). Contrast this with museum visits, which are commonly for families or groups. A visitor normally gives only a few moments' attention to the contents of a showcase, and while the actual museum may offer a focus for a social experience, the digital museum might be more like reading books. This is one of the reasons why it is at present difficult to incorporate electronic information into exhibitions and displays. The one-to-one screen-based experience creates a dissonance with the group-focused broadcast medium of a gallery display. There is no natural eye contact between users.

This is not inevitable. The San Francisco Exploratorium has experimented with different configurations of computers, and found that some encouraged intense socialisation between visitors (Semper, 1995). The Science Museum in London has a dispersed network of computers on which users can play a game with others at remote parts of the network: virtual social interaction is thereby created. Or, museums could welcome the propensity of people to spend time working with a screen by giving them the opportunity to gain more from the museum. The National Gallery in London has created a separate space for people to consult the digital collection in a thoughtful way: the Micro Gallery.

Galleries have had electronic components for some time, and these will soon become ubiquitous. The difference is that exhibitions can now be untied from the galleries and delivered outside the museum walls worldwide. There are so-called virtual galleries in most museum World Wide Web sites. Many of these are, disappointingly, 'What's on' or 'Coming soon' lists. Slightly more graphic is a gallery or museum plan, offering 'click on the gallery', and some can be viewed,

occasionally using simple three-dimensional imaging software. But the visitor is often offered only one illustrative image and a general description—not so much a digital museum as a digital museum information leaflet!

### **Events—A Two-way Conversation**

In the actual museum, live events have become an important way of communicating with our audiences. These too can be electronically delivered. There have recently been examples both of political debates (organised by The Guardian On-Line) and public discussion fora for scientific issues (by the London Science Museum and the San Francisco Exploratorium). The Science Museum and Exploratorium discussions are quite interesting trawls of public opinion, but one could not avoid feeling that the Ashdown debate would have come across better as a phone-in radio show. Then again, the Internet got Ashdown into homes around the world. But if the competition were between politicians and curators, then on this evidence one would feel optimistic about the chances of curators.

### **How Significant?**

The scale of penetration and use of digital delivery mechanisms makes them highly important determinants of the future environment. Museums can hardly ignore them (Sherwood, 1995), and a commercial marketing research report published in 1996 (Durlacher Multimedia Ltd, 1996) provides the following statistics:

- There are around 33.4 million users in early 1996, forecast to rise to at least 200 million partly connected by 2002;
- Commercial subscriptions are forecast to grow at 100% per year;
- The United Kingdom market will grow from £35m in 1995 to more than £900m by the turn of the century;
- The World Wide Web is doubling in size every three months, and 100,000 sites are forecast for early 1996, 75% of them in North America;
- The United Kingdom generated around 10% of Internet turnover in late 1995, but by the end of the 1990s, this will fall to 6%; and
- The next stage of development of the Internet is for it to become a source of profitable business.

There is speculation as to whether people will get bored with using the Internet; or, that it will become so popular that the infrastructure will cease to be able to cope with the amount or traffic. Undeniably, its growth has been exponential. As demand rises, so service providers seem to be using their growing income to increase and improve the infrastructure in order to maintain the standard of their provision.

Other forms of digital delivery are also increasing rapidly. Publishing on CD-ROM is predicted to be about to take off as the number of PCs with multi-media capability reaches critical mass. Hardly a new PC is sold now without this. Even business machines need CD-ROM capability, as bulky programs are delivered much more conveniently in this form. The next generation of CD-ROM players will offer access as fast as a hard disk drive. The cost of a machine to write CD-ROMs has fallen to around £700. CD-ROMs may not be a standard delivery



platform for very long, but they are surely with us for some time to come. For some types of organisation, the benefits of going digital are not so obvious. Companies which produce goods can use it for little more than advertising and marketing, or as a means of offering products to be ordered. It has, nevertheless, been found useful in fostering niche markets. In some cases, it is a useful medium for communicating with users who need to be continuously updated for optimum use of the product (for instance, those using high technology medical devices for home treatment). Here, the demand for hospital beds could fall because of the expert nursing care and advice which can be delivered over a network. On the other hand, service companies such as banks or travel agents could see the Internet becoming a primary means of delivering their service to their customers. This will cause major readjustments to their organisations. Software companies already use it to issue free bug fixes for their software, as well as to inform their customers and users of new developments using a highly congruous medium. Museums are almost uniquely well placed to take advantage of digital possibilities, which offer a natural extension of the means to pursue their central purposes.

### Digital Consequences

The digital museum, then, performs all its traditional functions and delivers its objectives, but using electronic means. This can be done in ways as diverse as are the varied products of the actual museum now. What will be the consequences? Crystal ball gazing is as irresistible as it is notoriously inexact (who foresaw that the most far-reaching consequences from the arrival of computing would be word processing?).

#### *The growth of knowledge bases*

Already, museums are seen as significant information providers for the ballooning multimedia publishing industry (Bangemann, 1994). Publishers are creating pools of reusable content, and there will be pressure on the museums to do likewise. Their information databases will become as important as are the physical collections. There will be pressure on museums to provide collections images, also. But there is much more to digitising a collection than simply scanning images. Images without explanation are almost pointless (Sherwood, 1995; Ester, 1995; Figure 2). Because of the vast volume of digitised data and content available, eventually across many museums, data structure and design, and being able to summon up what one wants to know about, will become as important as the data and content themselves (Bearman, 1995; Stubbs, 1995). Terminology instruments and intelligent search engines will come to rule our lives, ways of categorising information and finding it again.

### Organisational Effects

The push to be digital will affect jobs and the organisation of museums. The importance of curators' central role—to know about the collections—will become highly apparent (Swade, 1995). The difference is that curators will be expected to contribute their expertise to a knowledge base that will be widely

available, and reusable without recourse to the provider of the information. For example, a schoolteacher might download WWW pages to use in photocopied pages for a lesson. Database specialists will determine the format and the standards and terminology used. This will create tensions over intellectual ownership which will mirror those of the present and recent past over ownership of exhibitions and of collections themselves.

Curators could increasingly become information brokers for users, as they do now with enquiries (Stubbs, 1995). But information brokerage is likely itself to be digitised. Curators will be information conduits, not gatekeepers. Digitisation offers entrancing new opportunities to interpret, present and publish the collections in entirely new ways. Curators are likely to become high-value users themselves, with research in the sense of gathering factual information and storing it in the database relegated to research assistants. Tensions could be exacerbated because the museum may engage its many constituencies of special interest groups, if it wishes, to join its own content providers. Therefore, content provision will no longer be the exclusive territory of museum staff. Of course, strictly it is not now, because anyone can study museum collections or the related context and publish books or whatever they wish.

Organisationally, the museum will need networks of expertise linking basic data acquisition (both images and text based) through database management, information science, content authorship, electronic media and interface design, software design, technical and hardware support, publishing and marketing. This range of expertise will be found partly internally and partly by outsourcing from commercial companies, as in gallery projects and publishing now. The temptation to corral information expertise into a separate department is sterile, and should be resisted. Electronic literacy and capability must be fostered in professionals in all museum areas, who will form cooperative teams just as they do in publishing and exhibition creation now.

### **Resource Allocation**

Going digital will affect the way in which the museum allocates its resources. Sophisticated databases do not maintain themselves. They require specialist staff, expert in information science and knowledgeable about museum information, to oversee terminology, to ensure compliance with standards, to assess and develop the scope of the information system and the knowledge base.

### **Intellectual Property**

Already, there are complex issues over the intellectual property rights of employers versus those generating the information; these will become more urgent, as the interests of individuals, organisations, and the public diverge. The quasi-public status of museums in many countries today will complicate matters further. Commercial copyright issues are in some ways more straightforward. Potential markets will be large, but competition will be intense, and control over the museum's intellectual property will be crucial. But museums must not be paranoid: this must be a process of property management, not prevention. Even if making money were the primary concern, who became the richest: Apple with its strictly controlled proprietary systems, or IBM/Microsoft, licensing all comers to

use their operating systems? Paradoxically, the full marketing potential can only be realised by museums cooperating through mechanisms like the Performing Rights Society, because negotiation with many individual organisations will be too costly for content users (Bearman, 1995; Sherwood, 1995). Some museums are already signing some control over images, etc., to commercial companies such as Bill Gates's Corbis. One wonders whether this is wise quite so early in the game. If museums need to be imaginative about how they use digital possibilities, they need to be even more imaginative about how to generate income from them.

## Conclusions

As yet, going digital is for most museums driven by the availability of the technology, rather than by some urgent purpose for using it—by the feeling that we may miss opportunities in the future rather than by a burning need to do something now. Precious few concrete benefits are being realised. But this did not prevent the spectacular rise in the market value of Internet companies such as Netscape and Yahoo!, when they were recently floated on the New York Stock Exchange. Digital media are undoubtedly a good advertising medium for the actual museum. The Istituto e Museo di Storia della Scienza in Florence found its visitor figures rose by 40% the summer following its arrival on the Web, and many of its visitors cited the Web pages as prompting their visit. This effect may be confined to less-known museums in much-visited cities. However, it will not be long before virtual visitors can be charged for access: they can already buy things from museum shops. Virtual visitors are not as yet reported in performance indicators, but it can only be a matter of time before these numbers are counted alongside those for actual visitors. But more fundamentally, museums are there to provide a civilising influence on society, by communicating about their collections. A medium that has the potential to communicate with so many more people, in so many more places, simply cannot be ignored.

Will going digital be crucial to a museum's survival? Museums, and especially their collections, are under considerable threat. Ten or fifteen years ago, in the United Kingdom at least, there was such a thing as society, and it was axiomatic that certain benefits should be provided for the public good, funded through taxation. As we well know, the interests of the individual have since then come to be held paramount. The concept of stakeholders is currently enjoying some popularity. Stakeholders legitimise a much wider spectrum of agendas, but they are still perceived primarily as individuals. Museum collections are quintessentially held for the benefit of society, and, even less fashionable, for its long-term benefit. It seems more and more necessary to substantiate our claims that museum collections will benefit people in the future by showing how these benefits might be delivered. We find ourselves startled players in a paradigm shift of the world's economy. The economic engine is changing from energy, by means of which physical goods are produced, to data, with information as the prime output (Boisot, 1995). We are right to sense that museums are at the heart of the whirlwind of change. Cultures and identities are merging in the common information pool. In an important way we are the world's cultural memory, by which countries and people maintain their identity. A good fairy has touched our dusty old card indices with a wand of gold. No wonder it is taking us a while to come to terms with what this means.

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## Appendix

### Examples and World Wide Web References

It is surprising, after such a short time, what a number of virtual possibilities are already being exploited, and by how many museums. If the reader of this article has a computer connected to the WWW, they will be able to examine all these examples without stirring from their seat, without going to a library, without travelling to a museum.

#### *Virtual museums and galleries*

The Virtual Museum of Computing: an excellent World Wide Web site, complete with exhibits, demonstrations, objects, and associated papers and articles  
<http://www.comlab.ox.ac.uk/archive/other/museums/computing.html>

The Web Museum: a collection of images and catalogue descriptions of paintings by famous artists  
<http://mistral.enst.fr>

#### *Collecting and multimedia*

The LASSI specification, met in the first instance by the Multi MIMSY database software (Keene, forthcoming), enables contextual information about people, places, events, etc., to be catalogued along with object information.

The World Wide Web site for the Museon, in the Hague, has an excellent example of how object information can form a network with that about cultures, historical people, and countries. Their object information is also linked to objects in other museums—for example, a page on early astronomy has a link to an early book in the British Library's pages; a piece on Suriname has a link to that country's home pages.  
<http://museon.museon.nl>

In-depth information about some of the automobiles that have helped shape America is offered by the Henry Ford Museum, Dearborn. Each featured vehicle has pages about its design, its advertising, parts, specification, and many other aspects. This is perhaps the closest yet to a real exhibition, and virtual visitors can add reminiscences, too.  
<http://hfm.umd.umich.edu/>

The Museum of Science and Industry, Chicago, has simple and well-designed pages including lots of animations and sound clips. Irresistible to readers of this journal will be "Curators' Closets".  
<http://www.msichicago.org>

From Florence, the Istituto e Museo di Storia della Scienza offers informative information on its research programmes, and virtual visits to its Galileo gallery,

with detailed catalogue information on objects, including some animated diagrams:

<http://galileo.imss.firenze.it/indice.html>

### *Exhibitions*

The Royal Ontario Museum, Toronto, offers two galleries that can be viewed through 360°, using simple three-dimensional imaging software.

<http://www.rom.on.ca/evisit/vrtours.htm>

Virtual galleries, again based on the physical museum, are the First People's Galleries in the Canadian Museum of Civilization.

<http://www.cmcc.muse.digital.ca/cmcchome.html>

The Science Museum, London, offers Exhibitions OnLine, the first of which was Flight. There is a choice of different overview concepts: a timeline showing the development of flight; lists of the aeroplanes and engines on display; a list of the notable people involved; a graphic plan of the exhibition. The object information is deliberately designed to draw on basic collections data, supplemented with images of objects and photographs from their past.

<http://www.nmsi.ac.uk/collexh/welcome>

### *Staff and volunteers*

The Henry Ford Museum at Dearborn, Michigan, has a vast collection of images relating to their collections. A group of volunteers from one of the many motor enthusiasts' clubs is cataloguing one of the sub-collections. The images are digitised by scanning them and saving them onto Photo CDs or similar digital format, and club members add the catalogue information. The images, complete with catalogue information and captions, can be added to the collections database, which has otherwise been compiled by museum staff.

### *Events*

Museums are already holding two-way public debates.

The Science Museum, London, through the Biotechnology Interactive Online Science Information System project,

<http://www.scicomm.org.uk/biosis/index.html>

The San Francisco Exploratorium,

<http://www.exploratorium.edu/genepool/ETHEX.html>.

The Guardian on-line political debates include ones with Paddy Ashdown, John Monks, Edwina Curry/Tony Marlow, Tony Benn, and leaders from Northern Ireland.

<http://www.guardian.co.uk/livewire/debate.html>

*Research*

Museum activities could be displayed to the public as they happen. Already, the Natural History Museum, London, is showing examples of curatorial research into puzzle objects:

<http://www.nhm.ac.uk/sc>

There is a set of pages explaining the process of archaeology from the Royal Ontario Museum, including a puzzle archaeology game, in which visitors are invited to infer the history of a section of a site from the contents of the 'bags' of finds from the layers.

<http://www.rom.on.ca/educate/zarchhist.htm>

*Publishing*

There are, of course, the CD-ROMs of the National Gallery's Micro Gallery (National Gallery, 1993); Glass, in the Victoria and Albert Museum, London, and others now too numerous to mention.

*Europe*

There is much useful information available on the World Wide Web on European policies and projects on digital information, for example:

For an electronic newsletter, 'I'm Europe', on the European Commission and links to more specific information,

<http://www.echo.lu/>

For an overview of European policies and programmes on information technology,

<http://www.access.ch/e-news/pandora/GuideEU.html>