Beyond Visual Culture: The Challenge of Visual Ecology

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Beyond Visual Culture: The Challenge of Visual Ecology

James W. Marcum

abstract: The library profession remains grounded in textual, print media, creating vulnerability amidst a culture increasingly characterized as visual. This essay develops a model of visual ecology to facilitate full appreciation of the challenge presented by the emerging visual-interactive culture. Librarians must engage the tools and practices of visualization in order to capture, preserve, and disseminate today’s culture for posterity.

Today we live in a different milieu, a visual culture in which print and graphics, television and telecommunications, video and movies, and computer displays of various size convey information of such intensity that it diminishes the dominance of speech and print media. A vast infrastructure of wired and wireless instruments transfers information from broadcasting and databases, and among millions of networked workstations, personal computers, and “smart” handheld devices, engaging growing multitudes of people in an unprecedented new conversation.

The new reality is not just a visual culture—it is a visual ecology, a comprehensive and continuous participatory event, a universe of action, and a world of knowledge and learning rather than of information transfer. For a simple illustration, consider the difference between a print Who’s Who biographical sketch and a personal web page complete with...
Beyond Visual Culture: The Challenge of Visual Ecology

The study of visual culture emerged as an academic discipline in the last two decades of the 20th century. On a general level visual culture is the study of the use of images to present meaning—encompassing the extensive fields of the history of art, photogra-
Some descriptions of visual culture outline the role of art in cultural history. The influence of photography stirred debate at the start of the 20th century and the rise of cinema expanded the debate soon after. Graphic design fore-shadowed what was to come as image-based advertising grew in step with newspaper and magazine sales. Indeed, the graphic and photographic media bridged the chasm between fine and popular arts. Study of the history of art expanded to become study of the history of the image.

Around the middle of the century television wrought another transformation. Americans and other developed societies quickly embraced the new medium and installed the new image receivers in the heart of their homes; a mass society and culture quickly emerged, redefining elite aesthetics and other authoritative values. Simultaneously, video affected the power of the photographic image, raising a host of issues about violence, the visual presentation of the sexes and the races, and many related matters. Henceforth, “continuous media” would exercise a steadily rising influence. Television joined the cinema and literature in tapping mythical archetypes to inspire fright, desire, and other emotions. In particular, advertising plumbed the cultural heritage for meanings, beliefs, and values that could be manipulated for commercial advantage. Visual culture studies became an extensive, multidisciplinary field of study broadening our understanding of contemporary culture.

Media: Beyond Communication to Participation

The role played by mass media in the visual ecology requires a new understanding. Media cannot be considered mere channels of communication but rather must be seen as the infrastructure of the living (perceived) environment. The new function moves beyond the information transfer paradigm to a system of cycling action and perception.

Various authors contribute to this new perspective. Michael Real proposes that media should be considered ritual, a process through which a shared culture is created and adapted. Mary Ann Moser describes a virtual environment, the product of immersive media. Allen Brockerbrough and Richard Orr take this “media environment” farther, stressing the interactivity of autonomous components. The function is not information transfer, but an action-perception cycle. For example, a GUI (graphic user interface) icon is not just a symbol but an interactive agent, something facilitating action; clicking on a trashcan icon doesn’t send a message, it deletes the selected file. A medium is not just a channel of communication but can be an interactive, autonomous part of the environment, utilizing object-oriented design and programming to facilitate action (with internal codes and files) rather than simply transferring information. Accordingly, “media” can no longer be set apart either as a purveyor of popular culture or as a peripheral department in the learning environment; media services must be fully integrated and centrally situated at the heart of the library and the learning enterprise.

The Image: From Distraction to Ecology

Historically, modern society denigrates the role of the image. The Western intellectual tradition long separated perception from thought; the dominant model disdained the
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arts and mistrusted the senses. Daniel Boorstin, for example, derides the “graphic revolution” as fostering the creation of pseudo events, an unreality that leads Americans to extravagant expectations. He views the vivid, synthetic, ambiguous nature of the image and its misuse to fabricate news, celebrities, and adventures as undermining the positive role of ideals play for society. The study of human intelligence offers another example of the intellectual dominance of word and text by overemphasizing linguistic competence and not yet adequately investigating the importance of visual and sensory perception. Accordingly, society is mis-measuring its most precious resource, human intelligence.

Barbara Maria Stafford critiques the unwarranted subjugation of the image to the word. She regards the bias for reading over seeing as anachronistic and the assumption that personal reflection is incompatible with sensory messages as unwarranted. The idolization of language and the reduction of cognition to a processing of codes and symbols—mathematical and textual—have marginalized the study of the image. She initiates the important task of validating the image as an effective form of intellectual communication, a task that should be—but is not yet—adequately developed by our education system.

In an ecological system, as distinguished from an environment, the subject interacts with and participates in the creation and evolution of the system. James J. Gibson develops this perspective as an “ecological approach” to vision. According to his influential but controversial view, vision is direct and enabled by “affordances” between the perceiving being and the surroundings. Vision is not “snapshots” or sensations processed neurologically, but is “information pickup” and interactivity between mobile, perceiving beings and a changing environment. That environment consists not so much as objects in space as substances and surfaces acknowledged by ambulatory animals (such as humans) with a maturing and evolving effectiveness. Certainly, the notion of a visual, sensory ecology helps in the recognition of a world of interactive participants constructing varied and complex perceptions, with hyperlinked communication facilitated by an extensive infrastructure creating a “telepresent” universe (to use Stafford’s term).

Constructivist learning theory complements this interactive perspective. According to this theory, learning is not received passively but encompasses knowledge received from others, reflected on subjectively, developed through rational procedures, and integrated into a functional, socially shared system. Learning is interpretive, recursive, and extensively social if it is successfully to lead to deep understanding and knowledge “reorganization”. Constructivism reinforces the importance of social context in developing human knowledge, shedding the limitations of the information processing paradigm.

Perceiving the Visual Ecology

The omnipresence of the visual ecology does not mean that its recognition is easy or natural. In a visual ecology the lines between entertainment and infotainment blur quickly. Images of reality overpower experience—as Boorstin wryly put it, actual cowboys become inferior reflections of John Wayne. The boundary between real and imagi-
nary (or virtual) events becomes more difficult to maintain. Still, prevalent notions of visual culture and mass communication fail to capture the distinctiveness of contemporary culture—the witnessability, interactivity, and random-accessibility that characterize its uniqueness.

Consider the difference between how American society learned about the Cuban Missile Crisis and how the reader experienced the Professor Anita Hill-Judge Clarence Thomas hearings, the fall of the Berlin Wall, or the attack on the World Trade Center. In the case of the earlier, 1962 crisis, the public learned of the matter from news reports and official news conferences. Briefings from President John F. Kennedy or other officials might be seen on television, but learning the details required reading newspapers or newsmagazines. Further analysis awaited publication of memoirs and reports from Robert Kennedy and other participants. Only later could definitive studies emerge, such as Graham Allison’s *Essence of Decision.*22 From the public perspective the event was reported rather than witnessed or experienced. There were no news helicopters hovering to photograph the Russian freighters as they turned about instead of testing the planned boarding by the blockading U.S. Navy.

No such limitations pertain today in much of the world. The attentive public may sit transfixed, observing the perspiration and body language of the testifying professor and the judge-nominee, or cheering the crowds pulling down the symbolic walls in Berlin, or watching the explosive crashes and stunning collapse of the symbolic twin towers “real time”—or conveniently replayed—as each happened. Observers frequently conveyed information—by fax, cell-phone, or Internet—and influenced events directly. One can only wonder about the nature of the “definitive” histories of these events; it may be that they cannot be satisfactorily represented in print version alone since so many people hold visual versions in their memories.

In such a milieu the task of separating history from imagination or from personal or intentional reinterpretation is exceedingly difficult. To take a recent example, it is useful to consider the historical revisionism disseminated by a recent acclaimed movie, *13 Days,* produced by Kevin Costner (an engaging modern mythmaker). The movie portrayed an aide to President Kennedy, Kenny O’Donnell, as playing a central role. O’Donnell’s “vital” participation in events goes unnoticed in previous memoirs and studies. Additionally, the roles of documented central players, such as Robert McNamara and McGeorge Bundy, are diminished substantially in the film, while depictions of military spokesmen in the crisis are little more than caricatures. Because the movie utilizes a documentary-style format that evokes strong realism, an interpretation is produced that is more akin to news coverage of recent crises than was the reality of that day. The result is a “history” that poses difficulties for teaching the politics of this Cold War crisis accurately. The visual ecology challenges the rational-print domain in fascinating ways, posing additional problems for archivists and librarians as well as historians.
Just as much of modern life takes place “onscreen,” displacing traditional visualization with interactive multiple media—moving the image from distraction to the locus of cultural and historical change—so is it also interactive. Because so much of the visual culture is digitized, it need not be presented, or viewed, in logical or linear progression. It can be snipped into bytes and juxtaposed with other images. MTV first presented this dimension of visuality in 1981; the style has carried over into print publication as well. Consider the presentation of *Wired* magazine or any front page of *USA Today*, compared to the dense textual presentation of the typical newspaper or print magazine available a few years ago.

Finally, all this information and presentation is networked, or at least potentially interlinked. Hypertext has become hypermedia, transforming observer into participant. Individuals can create their own newsletters or news programs and share them with friends and subscribers; indeed, they can become news events, presenting such matters as baths or births or decisions to a global audience. Participatory programming such as the *Survivor* television series appears to be the future of the medium. “Visuality,” writ large, has become an environment, an ecological milieu that may baffle many of the older generation, but which is known and taken for granted by the new. Young people today, whether or not they have ready access to the Internet, “know” a different world than that of their parents. For them the factors in question, such as witness-ability and random accessibility, are taken for granted.

**Visualization**

If visual ecology is the product and consequence of the rise of visual media, visualization is the process that enables and facilitates participation in that culture. Visualization, broadly, is the enhancement of perception to amplify cognition. Visualization encompasses a melange of intense research and study, ranging from visual cognition to vision research, to the inter-relationship of science and art, and from learning theory (notably visualization ability) to information visualization.

Just as people have long used images for spiritual and material purpose, so is there an historic interest in the mental process of seeing, both the observation of objects and the environment, and eliciting images from memory. Studies of visualization typically encompass art, memory, psychology, mythology, and related topics. Realization of the complexity and centrality of this process is rising dramatically. For example, scholar-entrepreneur Edward Tufte built a one-man industry around self-published books and workshops teaching the principles of effective presentation of visual information to thousands of professionals from business and the public sectors.

While multi-sensory, humans receive most of their information visually; about half of the human brain’s neurons are dedicated to visual processing. Visualization allows the extension of human cognition beyond what is perceived visually. There are two parts to this process. There is the organization of data into visual form for presentation. This step requires tools of information manipulation, which can be as simple as an engineer’s drawing or as sophisticated as computer-assisted design. More and more the trend today is toward the use of computer supported interactive visual representation.
The second component of the process (following the information-processing model for the moment) is the formation of the visual image in the human mind. The visual is experiential. The preeminence of the visual explains why so much of what people know is known tacitly. People can know things they cannot explain, and vision is a primary instance of tacit knowing. Humans perceive far more than the visual images they consciously process. To become conscious of an object or a movement requires attention. For example, the reader is asked to recall instances of walking through a crowd; to what extent were the people known, what were they doing, and were they friendly, hostile or indifferent? This simple exercise, retrieved from memory, suggests the extent of tacit perception and its potential for recall and utilization. Visualization is how humans establish their place—more specifically their position in space-time—in the environment.

John Seely Brown demonstrates the ecological view with a simple experiment that anyone can duplicate. The task is to rig narrow tubes—such as toilet-paper tubes—onto one’s glasses so that vision is limited to a narrow field directly ahead without peripheral vision. Lacking context, the subject becomes nervous and frustrated; everything is a surprise because one’s “space” is so restricted. Humans live within their ecology, not separated from and perceiving it from outside.

Recognition of the comprehensiveness of visual ecology requires consideration of the levels at which it operates. First, as seen above, there is the individual level of perception and mental activity associated with awareness and cognition; learning and individual visualization is the dominant mode at this level. Then there is the social level of art, representation, and design. Today computers and networks influence these activities dramatically; this is the technological nervous system of the ecology. Finally, there is the broader, cultural level that transforms all this into a complete ecological system.

**Uses of Visualization**

Turning to the technological level, the explosive accumulation of scientific data from private and governmental research since World War II generated enormous collections of data. Armed with powerful new instruments and technologies, researchers are plumbing the depths of the oceans, the outer limits of space, and the micro-intricacies of atomic and biologic structures. The quantities of data collected in these endeavors overwhelm the imagination. To illustrate, Heinz-Otto Peitgen and colleagues developed a formal description of plant growth that can be implemented through a computer process known as a parallel rewriting system, or L-system. The process generates long and complex strings of symbols that cannot be grasped by the human mind. A visual translation into a graphic image can make the findings of the process understandable, allowing human knowledge to progress. Other examples from science are the visualization of the human body and its processes in medical science and flow analysis in fluid dynamics.

The uses of visualization expand exponentially alongside the power of computing and networking. An inquiry into current applications of visualization found reports on its value for projects as varied as improving truck loading operations, evaluating public speaking effectiveness, and analyzing traffic accidents, as well as growing sophistication in
the more familiar uses for scientific analysis. Over a six-month period in 2001 an alert service in the sciences produced 1500 citations on the topic of visualization, reaching a rate of about 100 per week. Information must be simplified and managed into presentations that have meaning in order to fully utilize and comprehend the vast reservoirs of scientific, business, and public data that are accumulating, and a growing number of researchers are using visualization to analyze and present their data better. Visualization design is emerging as a primary tool for managing information glut to enhance knowledge and understanding. Visualization tools are used increasingly to amplify scholarship, to manage complexity, and to expand human understanding and competencies.

Visualization Tools and Techniques

Visualization of information is accomplished through tools and techniques that can be thought of as a continuum beginning with maps and charts, and moving smartly along to comics and animation, interface design, information visualization, data mining, interactivity design, visual language, and, potentially, cognitive engineering.

Comics: Scholars long overlooked, and still tend to minimize the importance of comics, characterized by the mutual dependence of pictures and text. But comics are not just for children, as any “Doonesbury” strip—often located on the editorial pages—demonstrates. They are used for information, education, propaganda, and religious purposes, not solely for entertainment. Comics, and the comic film that expands the medium, draw on the larger culture for their themes, develop their story over time, utilize colors and symbols to good effect, and mediate the values their authors or sponsors choose to represent. Certainly they exemplify visual culture and provide a major tool for socialization and the development of visual culture to diminish culture lag.

The popularity of prime time animated television series, such as The Simpsons, and animated feature films, such as Lion King and Atlantis, suggests that comics and comic film will be media of growing influence in the future, particularly given the reported decline of reading literacy. The message for anyone making presentations of information is clear.

Interface Tools: New technologies do not automatically “catch hold.” As long as one had to be wealthy and a mechanic to indulge, the automobile remained a novelty. But greater reliability, standardized interface tools (steering wheels and gearshifts), cheaper prices, and a support infrastructure—including roads and service stations—made the automobile a central feature of American life. The interface between the technology and humans was a critical factor. So it is with computers. Mouse-enabled editing, windows software, and graphic user interfaces provided the breakthrough necessary to make the desktop computer a necessity rather than a specialized tool. The Internet did not gain its power until Mosaic and web browsers ended the need to learn numerous protocols (such as file transfer protocol) to work efficiently. The computer and the Internet had to represent themselves in a language the potential user understands for their “take-off” to occur. That language (web browsers, windows software, and hypertext markup language) is essentially visual in both cases, or, to be more precise a combination of visual image and text.
Information Visualization Technology: The tools and processes of information visualization require attention. The presentation of information visually has become a widespread and conscious practice in only the past two decades. Medical imaging, geographic information systems, and exploiting business data are leading applications. The technology begins with consideration of the qualities of the eye and human perception, determining parameters within which presentations must be prepared and presented. Information visualization tools are computer based, and interactivity is characteristic. The use of one, two, three, and multiple dimensions is one option for working with visual images. Space, cyberspace, and fisheye versus binocular vision are matters of concern. Signs, diagrams, charts, and maps are tools of durable value. Computers support more complicated tools such as active diagrams, large-scale data monitoring, and information chromatography (which utilizes abstract representations of data to detect complex new patterns). Objects can be enhanced visually or modified; this has long been true of photography, but the morphing of objects in movies is a recent product displaying the potential, and hazards of the new tools.

The basic steps of information visualization are to translate the raw data to a data table, which can then be mapped to a visual structure. This image can be transformed, augmented, and manipulated to increase its impact. The next step is to consider the human interaction with the visual structure, which occurs within a visual workspace, on behalf of visual sense-making and the conveyance of meaning. Many additional uses of these tools are emerging. To take one promising example, flow-chart type diagrams can be used to show the events, facets, and relationships of a personal history, providing useful insights into medical histories and assistance in oversight practices such as juvenile behavior.

Beyond Data Mining to Dynamic Surrogate Visualization: Data mining (DM) is a technique being developed to search data collections more effectively. Utilizing automatic searching techniques to find information within larger frames of databases or resources, DM utilizes select, related definitions, phrases, and other devices to locate and prioritize information to meet specified user needs. Link analysis and sequence relationships provide important information in the DM process. Despite data mining’s proven effectiveness in narrow subject matter searches—such as those in medicine and business—the process is not yet proven in the more open environment of the library. The lack of standards and the existence of multiple formats render DM ineffective for general information searching thus far.

Data mining is less precise than professionally mediated searches, but unexpected connections sometimes emerge. The goal of finding previously unknown patterns, or trends that depart from the norm, is now a declared rationale for the process. In understanding “patterns,” it is useful to resort to the laws of “gestalt” (from the German for pattern) in quest of proximity, similarity, continuity, closure, figure and ground, and transparency.

The development of “metadata” categorization for managing information in various formats provides the profession with tools that can be utilized for websites, museum artifacts, and images. Metadata enable expanded use of surrogates. Librarians know surrogates—such as MARC records—intimately. Library catalogs are surrogate-dependent while the Web is largely surrogate-free. The creation of traditional, static surrogates is
human labor-intensive. But new architectures, such as the Warwick Framework, utilize semantics to create dynamic and derived surrogates to query resources and to facilitate information discovery in extensive, digitized databases and resource collections.\textsuperscript{57}

Donald Beagle suggests that surrogates can facilitate the process and reduce the cost-prohibitive task of full-text searching for information in various media. He proposes the addition of a metadata option to the web browser’s view menu (similar to the “view source” or “view page information” options); this would provide access to the embedded metadata for the page. Greater use of the 856 field in the MARC record to provide active links to resources and gateways would be progression toward the dynamic searching environment envisioned by Beagle and others.\textsuperscript{58} Advances in video visualization and archiving promise improved access to video content over networks as well.\textsuperscript{59} Abby Goodrum cautions that both image and textual surrogates are required to guide the user to successful access of moving images.\textsuperscript{60} It requires but little reflection to determine that librarians cannot leave these skills and techniques to others without jeopardizing the future of the profession.

\textit{Interaction Design}: Interactivity can emerge naturally, but proper design precipitates the practice. The three steps of interaction design are, first, to structure the information by clarifying goals and arranging the data to serve that purpose; image mapping is a useful tool here. Then the information must be worked into an arrangement that allows interactivity. Guidance and navigation features, usability, functionality, and access routes are critical matters. Finally, there is the design of the presentation itself. Keeping things simple, utilizing an effective visual theme or style is helpful, control must be maintained, and various media must be integrated smoothly and without complications for the user.\textsuperscript{61}

Working with media today increasingly means digitized media. The digital revolution makes information design and visualization much more powerful. But there are limitations. For example, there is a practitioner’s “law” of digital media by which one can use two of three elements—high image and sound, acceptable performance, and ability to run on most computers—but not all three.\textsuperscript{62} Web design is interactive in purpose and that shapes its parameters. Interactive design is something very different from graphic design generally; accordingly, designing web pages should be thought more akin to product design or architectural design, with user interface considerations and flexibility counting as more important than artistic considerations.\textsuperscript{63}

Interactivity holds enormous promise if certain problems can be resolved. The present personal computer configuration, known to some as WIMP (Windows, icons, menus, and pointing) is anything but “fixed,” and the potential of computer-assisted information retrieval is far from being visualized, much less realized. Work is underway toward broadening information retrieval to encompass sense-making, decision-making, and other interactive tasks on behalf of the user. For example there is Cognitive Coprocessor Interaction Architecture to accommodate multiple users and agents. New 3-D/Rooms and interactive animation utilize knowledge of human cognition and larger “information spaces” to open

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\textbf{Interactivity holds enormous promise if certain problems can be resolved.}
vast new vistas of information retrieval and utilization. Previews and overviews can facilitate selection and utilization of information by accelerating the user’s selection or rejection of an image. As sophisticated as visualization is becoming, however, it still falls short in effectively meeting users’ needs, according to Min Song. Song distinguishes between the component level (documents, users, and search processes), the technique level (points, vectors, and maps), and the interactive level (queries, browsing, and evaluating) of effective visualization system design. Utilizing all this to achieve user-friendly visualization for information retrieval remains a significant challenge.

Intellectual Access to Images: For the visual ecology to prevail in the world of academe requires providing intellectual access to images. The work is underway, beginning with extensive indices and reference sources such as the Image Directory and CORBIS. Gaining complete access to images, however, involves going beyond concept-based approaches to undertake content-based strategies. Traditionally, concepts have been best expressed in words, easily indexed by traditional means. Now tools are available for representing knowledge visually and presenting “concept maps” via the Web. Since images involve content, indexing efforts began with the listing of colors and other features that could be automatically identified and extracted. Visualization tools tested for possible benefits in Web searching include distortion, zoom, 3-dimension, and expanding outline; findings thus far suggest that problems of cognitive overload may outweigh benefits. The quest for meaning led back to Erwin Panofsky’s iconography, which provided a structure for meaning ranging from the basic to the cultural to the more sophisticated. Software tools such as IBM’s QBIC (Query by Image Content) use appearance factors such as colors (lots of green for pastoral scenes), or texture (large or small blobs of color), to offer automatic searches that are imprecise but often very useful in the query of large, multiple repositories of information.

Additional approaches to indexing images include paying greater attention to the story and activity perceived by the viewer, moving well beyond objects, colors, and location in assigning significance to the item. Going a step further, searching data collections for purposes of subject—or domain—analysis is an emerging practice seeking to map intellectual structures through automatic citation analysis. Calling upon naive users to test the utility of more precise descriptors has proven effective in demonstrating design robustness. Continuous media offer additional challenges in providing intellectual access, but progress is being made; changes in the composition of the image, for example, signify changes of scenes between long image sequences.

Visual Language: Robert Horn argues that while in a print culture the image was secondary, in the visual culture of modern media those roles are reversed: vision dominates and the verbal augments. Since we will have both print and the visual for communication for some time, a combination is emerging, an amalgam that Horn describes as visual language. Visual language integrates words, images, and shapes into a single device for communication and understanding. Just as verbal language can be analyzed through morphology (study of words), syntax (how words are put together), semantics (conveying meaning), and pragmatics (use in social contexts), so can the new visual language. For example, the semantics of visual language include the use of visual metaphors, diagrams, cartoons, space, time, and composition to supplement and complement language.
The inclusion of shapes warrants comment. Shapes include lines, points, abstract figures (such as square, triangles, and arrows) and space between shapes. Shapes are distinctive items that do not exist in nature; this contrasts with images, which are representations of familiar items that do exist in the environment.

In visual language icons alone do not carry the meaning of icons accompanied by words. Words accompanied by symbols and visual images can convey much more meaning because of the reinforcement factor. Visual language will serve as a boon to education because it is accessible by more people with variable learning preferences. In short, visual language unleashes the full power of communication and will be an enormous aid to learning, group and community development, and other human needs in a visual culture. Fortunately for the library profession, learning visual language does not appear to be overly difficult; unfortunately, the work remains to be done.

Cognitive Engineering: The purpose of visualization tools is to enhance perception to amplify cognition. That can be expanded into the world of work and action by designing information systems to support problem solving, decision-making, and even thought. To this end cognitive engineering utilizes situation diagnosis, human information processing and mental models; these must be considered alongside the need to collect excellent information about the work domain itself, higher concepts of the work, and mental mapping of possible strategies. Jens Rasmussen led the development of this systems approach for purposes of avoiding human error, particularly in large systems such as nuclear plants or aircraft control. Rasmussen did not stress the visual in this process, but one of his schemas for testing his theory relied on visual perception; that model was his design for a cognitive system-based library, known as BookHouse.

The patrons of the (public) library in question were casual, untrained users. Their search strategies were highly variable and only sometimes effective. The location of fictional treatments of given topics and special interests presented particular difficulties. How could these users be supported in using the structured database and organized information resources? The selected design was a “book house,” with rooms designated for types of users, such as children or adults. The extensive use of icons served both to represent subject choices and to trigger action. The icons combined elements of symbols, images, and text. The system showed promise. Evaluation suggested that most users preferred the new system, that unsuccessful searches became rare, that librarians could concentrate on dialogue with users, and that many additional books were borrowed beyond the usual popular titles. Numerous problems hampered efforts to apply the BookHouse model elsewhere, but the influence of this experience in utilizing cognitive symbols to guide patrons and to improve library services has been slighted. The discipline of cognitive engineering may prove helpful in coping with visual ecology and should be monitored and encouraged.

The combination of visual language with extensible markup language (XML) to create standardized and unambiguous documents that still qualify as “user friendly” provides another path in this endeavor. Implicit in this proposal from Lars Johnsen is the reality that in a visual ecology communication contains technological, perceptual, and rhetorical components of comparable importance. Such documents, or objects, comprise a basic knowledge-based, engineered item.
From Digital Libraries to Visual Libraries?

The progression from comics to interface design to visualization, visual language, and cognitive engineering creates enormous challenges for libraries. The development of the digital library provides priceless skills and resources for meeting the challenge, but the model must be developed more fully if the challenge is to be met.

The rise of the digital library is an important step in the development of the library as a cultural resource. The effort remains focused overmuch, however, on text and the digitization of text for greater access. Distinguished projects such as JSTOR, which digitizes long runs of major academic journals, exemplify this perspective.81 Treatments of the digital library tend to discuss visual media only in passing, as a supplement to print.82 Technologies for managing continuous media are emerging, and the tools for accessing the complex subject matter of visual continuous media are being developed.83, 84 The greater challenge is to visualize the total culture, the visual ecology, in order to select wisely what should be preserved for posterity.

The complexities of capturing, preserving, and providing access to the visual culture defy the imagination. The Library of Congress’ American Memory Project, which began by presenting unique documents on its website has now expanded to recordings and film clips of relevant interest.85 The progress made in the important work is suggested by the development of user-friendly multi-media “learning” gateway pages to the project (available at <http://memory.loc.gov/ammem/ndlpedu/index.html>). Such efforts face enormous obstacles. The News Film Library at the University of South Carolina needs between seven and fourteen million dollars to preserve the footage of the Movietone News Collection in its care.86 Great challenges warrant great strategies.

Some librarians do not think visually, remaining more comfortable in a world of language, text, and print. It is imperative to move into the new world, whether it is described as electronic, digital, postmodern, or an age of information. To enter this world, this ecology, requires thinking visually; librarians must become multi-literate. It will be necessary to abandon control in favor of interactivity, to learn to communicate with visual language, to become skilled at information visualization for presentation, and to master the tools of visual knowledge. Realization of the challenge of creating “digital librarians” to meet these requirements is emerging.87 New “global” opportunities in the “new media” fields are open to librarians willing to learn these new skills.88

Finally, whether they be called digital or something else, libraries must be transformed into multi-media based services in order to grasp the ephemeral but omnipresent interactivity, to perceive the totality of today’s visual ecology, and to manage continuous media so that today’s culture will not be lost—or privatized—but will be preserved for society as the legacy of this exciting but complex era.

The rise of the digital library is an important step in the development of the library as a cultural resource.
Visual Ecology, Visualization, and Libraries

What, then, is the bottom line? What lessons must librarians learn? There are several implications. First, it is not enough to say that contemporary culture is visual or digital. The consequences of that visuality must be taken in hand. Librarians—and professors—must understand and incorporate the knowledge that certain kinds of information are presented better visually than in text or spoken language. While natural language is best for expressing abstract ideas, procedural information, and qualifying information, images are remembered better, explain structural relationships better (organization charts, for example), and better provide detail and appearance. To express causality, to signal acts of communication, or to show sequences of movements it is best to utilize animation. Tools for all these devices are readily available today; information visualization is already mainstream in many fields. Librarians can begin by exploiting the potential of Microsoft PowerPoint for improving presentations and Excel’s Chart Wizard for the many ways it can reorganize and display data. Flowcharts and diagrams can be developed in intuitive programs like Visio and imported directly into Word or Excel documents. Visual Basic, Java Script, Flash, and JWAVE offer powerful visualization capabilities. Training is required, however, for these software packages. Just as today’s library requires systems and records management expertise on the staff, so must they acquire (or “grow”) visual management skills. The IMAGES program at the University of Minnesota demonstrates that committed libraries can make major contributions in this work.

Librarians realistically cannot be expected to transform themselves into technical-media specialists on top of their current functions. New managerial and strategic measures are required. Libraries must incorporate, or partner with, media departments and providers. Popular culture is no longer a niche specialization but is a vast universe of important information to be addressed. Video and movie collections must be indexed for ideas and memorable images as well as for general content. Technology strategies must encompass new image support capabilities. Multcasting and video-on-demand servers will become commonplace; fortunately, thin client and wireless systems can make the costs of this upgrade more manageable.

Libraries designed for finite amounts of information available primarily in texts must be redesigned for infinite collections of information available in graphic, audio and continuous media as well as text. No “library” can do this. Only orchestrated networks of libraries with strategic plans at local, regional, national and global levels—collaborating with and providing bridges between communities of scholarly and professional practice—can undertake the enormous challenge of selecting, preserving, and providing access to the rich resources of visual ecology.

The profession must expand its definitions of librarianship to include new forms of expertise—as happened for archivists and systems librarians—to encompass the skills of presentation, content management, and visualization, and must recast the model of information literacy to embrace multiple literacies and sociotechnical competencies. Text and reading will not disappear, but the number of people with poor reading skills will grow and society needs their full participation if it is to flourish.

The task is vital and will be done in some fashion. Librarians can hide behind inadequate resources or other acknowledged limitations and leave the task to others. There
is great work in the management of text, but in the larger scheme of things that will mean marginalization. An aggressive focus that fosters collaboration among librarians and professionals of similar persuasion to undertake the transformation of libraries and fully to engage today’s visual ecology is the preferred approach.

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Notes
30. Colin Ware, Information Visualization: Perception for Design (San Francisco: Academic Press/Morgan Kaufman, 2000); and Card and others, Readings in Information Visualization.


52. Card and others, *Readings in Information Visualization*, 1–33.


55. Ware, *Information Visualization*, 201–222.


62. Ibid.


77. Ibid.


89. Ware, *Information Visualization*, 320–322.

90. See <http://digital.lib.umn.edu/IMAGES> [February 7, 2002].

