# MUSEUM TECHNOLOGY: NEW LINKS TO INTERPRETING, PRESENTING, AND CREATING ART

Search, Patricia
Rensselaer Polytechnic Institute
Troy, New York
USA

## ABSTRACT

Museum curators and exhibit designers are using interactive, computer programs to present information about art. With the adoption of this technology, the curatorial philosophy of museums is shifting from an object orientation to an information orientation, and this shift will effect the way we interpret and define art, especially electronic art. This paper traces the evolution of computers in museums and discusses the impact that high-tech exhibits and the changing philosophical role of the museum will have on the endorsement of electronic art. Technological advances in museum exhibits, presentations, and research facilities will alter the aesthetic criteria for defining art and initiate important changes in the way we evaluate and market art. In the end, a new awareness and sensitivity to the creative and aesthetic dimensions of electronic media will emerge, along with a personal approach to interpreting art that redefines the relationship between art and 'commodity' and enhances the relationship between art and technology.

For 25 years museum administrators have recognized the important role that computers can play in museums. Beginning in 1965, museums ranging in size from the Smithsonian Institution to small college museums began using computers to catalog their collections (Fig. 1). From there, interest in exploring the potential for computers in museums led to the establishment of the Museum Computer Network (MCN) in 1967.

Since then hundreds of museums have adopted some form of computer technology for museum management, research, or exhibit presentation. International conferences such as the Conference on Automatic Processing of Art History Data and Documents (Pisa, Italy) continue to provide support for the expanded use of technology in museums.

## Computers in Museums

**1965** Smithsonian Institution begins collecting data with computer.

**1966** Metropolitan Museum studies computer use in museums.

**1967** Museum Computer Network (MCN) forms at Whitney Museum of American Art.

**1968** Metropolitan Museum and IBM co-sponsor conference on computers and museums.

**1969** Museum of Modern Art creates computer catalog.

**1978** International Conference on Automatic Processing of Art History Data and Documents convenes in Pisa, Italy.

**1982** National Gallery of Art in Washington, D.C. produces videodisc.

**1982** International Museum of Photography in Rochester, NY produces videodisc.

**1983** Getty Art History Information Program begins several database projects.

**1984** International Conference on Automatic Processing of Art History Data and Documents convenes in Pisa, Italy.

**1988** University Art Museum at Berkeley, CA develops multimedia computer program.

**1990** Museum of Modern Art, Philadelphia Museum of Art, Boston Museum of Fine Arts, Art Institute of Chicago, Brooklyn Museum, Metropolitan Museum, and National Gallery of Art demonstrate multimedia project on impressionist art.

Fig. 1. For 25 years museums have been evaluating the role of computers to collect and present information about art. Although this summary highlights several American projects, similar developments can be traced in other countries.

With sophisticated developments in computer technology, increasing affordability, and the emphasis on museums as an informal learning environment, the use of computers has become more widespread than ever. In 1982, the Art Museum Association compiled a national survey on current and anticipated computer use in art museums. In the survey, 85% of the respondents that were not using computers said they would adopt computers for collections management and presentation in one to three years [1]. That same year, the American Association of Museums established the *Commission on Museums for a New Century* and published a report that stressed the importance of introducing computers and other electronic technology, especially multimedia presentation programs, into museum learning [2].

Despite the growing use of telematics in a museum setting, museums and galleries have not widely endorsed electronic art as a recognized art form. Artists working in electronic media flock to science museums and high-tech trade shows for opportunities to exhibit their work. However, as curators and exhibit designers continue to explore the potential of computers as communication tools, they are setting the stage for the recognition and acceptance of various forms of electronic art by the mainstream art world. The growth of computer technology in museums is putting the tools of the electronic artist into the hands of curators and art educators who are gaining a working familiarity with the visual and conceptual elements that make up the underlying grid or structure of various electronic media.

More importantly, however, museums are increasingly integrating multimedia or hypermedia computer programs into their exhibits and educational programs, and these interactive programs are challenging the syntactical, stylistic, and conceptual boundaries between art forms. Hypermedia programs that provide random access to text, still and moving images, and audio recordings are augmenting the cognitive structure of art and fostering an information-oriented approach to evaluating art. These developments will ultimately impact the way we interpret and disseminate art and produce changes in the social, cultural, and economic strata of the fine art market--changes that will facilitate an open dialogue in the art community and create a more receptive forum for various types of electronic art.

## THE COGNITIVE STRUCTURE OF ART

Museums exist for a variety of purposes. Museums are not only the protectors of objects, they are also communicators of information. However, communication in a public setting presents difficult challenges because a museum exhibit or educational program must communicate to visitors who differ in age, class, educational background, sex, and nationality, as well as interest and intelligence. In addition, exhibit designers must take into consideration research on media and cognition that shows that individual learning skills vary with different media [3].

Interactive hypermedia programs that use multimedia data to present information address these problems and enhance the learning experience by enabling people to explore areas of personal interest at individual levels of

expertise. A museum visitor, for example, can investigate an artist, such as Jackson Pollock, by reading a biography, viewing some of his art, reading about political events that influenced his work, browsing through statements by critics, or viewing a video segment that discusses his art.

While meeting the educational demands of the museum environment, this information-oriented approach to exhibiting art is also reshaping and expanding the definition of art. In hypermedia presentations, a work of art is surrounded by a multifaceted cognitive structure that integrates dynamic syntactical relationships, multisensory and knowledge webs of data, modular dimensions in logic and time, and the semiotics of the computer interface design.

**Dynamic Syntactical Relationships**

Many hypermedia programs designed for the presentation and study of art include image processing and computer graphics applications that enable the user to modify individual art objects and integrate different art forms. The ability to manipulate images, text, and sound right down to the individual pixel or byte of digital data is contributing to new ways of structuring and interpreting art. The syntactical relationships between form, texture, color, motion, and sound can now be examined with intensity from many new perspectives.

Nelson Goodman described the visual image as a syntactically and semantically 'dense language' where the meaning of every mark is determined by its relationship to other elements in the image [4]. Computer

graphics programs give new meaning to Goodman's description by making it possible to create an infinite array of syntactical relationships. Details can be isolated from an image or audio track and merged with other data. Individual colors, lines, and forms can be modified to study the impact of change on the original work of art. Images can be inserted into other images; text and sound can be overlayed on top of still and moving visuals. The syntax of the art object is a dynamically changing entity that is subject to new relationships and aesthetic criteria.

### Multisensory and Knowledge Webs

However, with hypermedia museum programs, the syntax of art expands beyond the physical object to include a network of information webs. On a perceptual level, there is a network of multisensory data, and the structure of art becomes a dynamic integration of diverse interpretive elements: text, still and moving images, and sound. The conceptual interplay in this network is emphasized by the multimedia CRT screen that permits the user to make comparisons by juxtaposing whole images, parts of images, text, and motion video on one computer screen. The aesthetic and conceptual boundaries between art forms are visually redefined within the context of an integrated information network.

A hypermedia program also includes a knowledge web of associated facts and ideas. This web consists of two types of links: objective links that connect facts and subjective links that connect opinions and ideas [5]. Subjective links, in turn, can be subdivided into (1) expert opinions or predetermined links and (2) user-created annotations or paths through the database. The

meaning of art becomes a dynamic structure that changes as new links are added and the web is reconstructed to incorporate diverse interpretations.

The network of links in a hypermedia program is traditionally depicted by linear flowcharts that emphasize the hierarchial relationships in the database. However, the multiple layers of associations and the dynamic flexibility and movement in a hypermedia program suggest circular webs of interaction (Fig. 2). The semantic structure of these webs can be compared to Roland Barthes's concept of plural text which supports multiple interpretations instead of a singular meaning. Christopher Burrett cites the introductory statements in *S/Z*, Barthes's hypertext-like translation of Balzac's *Sarrazine,* when comparing the concept of plural text with hypertext/hypermedia [6]:

> In this ideal text, the networks are many and interact, without any one of them being able to surpass the rest; this text is a galaxy of signifiers, not a structure of signifieds; it has no beginning; it is reversible; we gain access to it by several entrances, none of which can be authoritatively declared to be the main one; the codes it mobilizes extend 'as far as the eye can reach,' they are indeterminable...[7]

**Modular Dimensions in Logic and Time**

In a hypermedia program, the cognitive structure of art is also defined by the added dimensions of logic and time. Access to data and the display of information on the CRT screen are all subject to the organizational control of the underlying software, but the designer or user of a hypermedia presentation can manipulate the *psychological* dimensions of logic and time. With hypermedia, the interpretation of art is no longer restricted to the

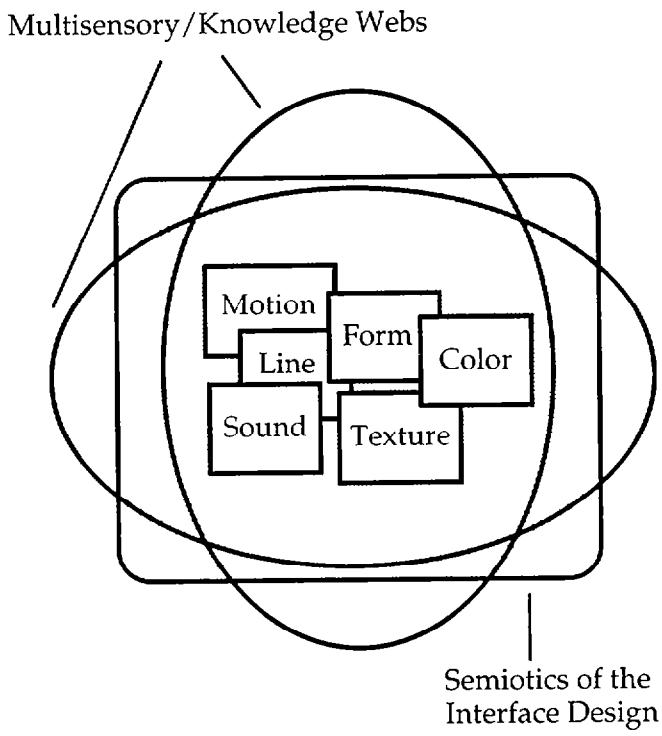


Fig. 2. A hypermedia program on art enables the user to build a cognitive structure that integrates dynamic syntactical relationships between design elements (line, form, color, texture, motion, sound, etc.), multisensory and knowledge webs of information, and the semiotics of the interface design.

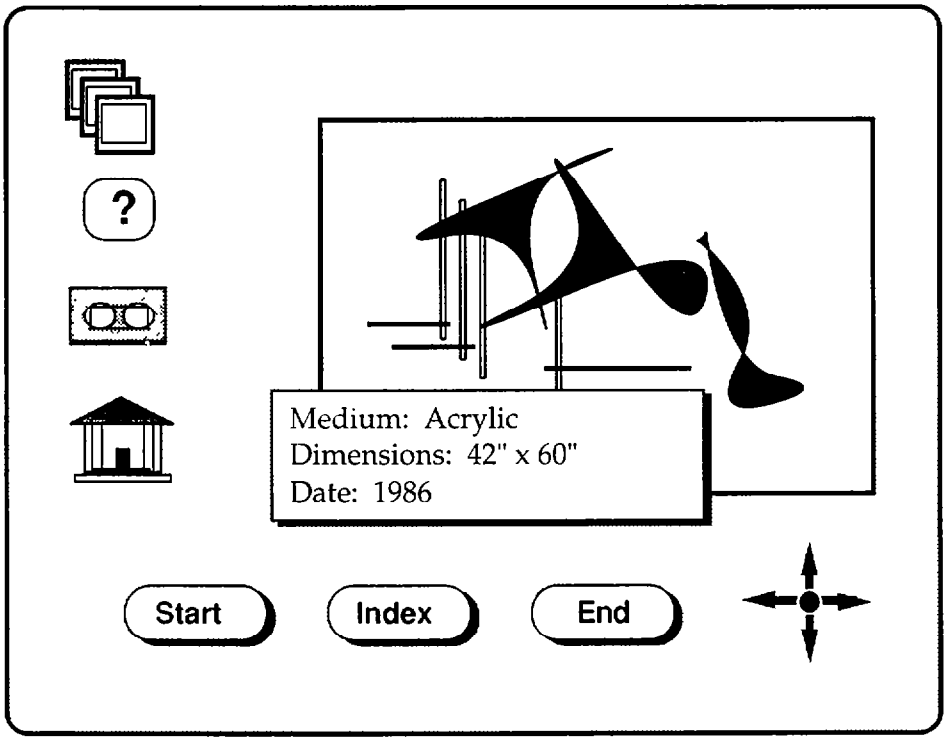


Fig. 3. In an interactive computer program, there is a conceptual interplay between the semiotics of the screen design and the visual imagery in the art itself.

sequential flow of associated events or ideas. Information can be broken down into modular chunks of data that users, guided by personal interests and individual levels of expertise, can randomly access in various ways; there is no right or wrong way of exploring information in the database. Time can be compressed by condensing events, such as the biography of an artist or the history of an art movement, into a sequence of still images or a few seconds of video. On the other hand, the analytical powers of the computer that make it possible to investigate pixels, highlight audio-visual details, and isolate individual still frames from a segment of video, enable the user to expand the notion of time and space.

**Semiotics of the Interface Design**

The discussion of the cognitive structure of art in a hypermedia program would not be complete without acknowledging the semiotics of the interface design and its impact on the presentation of a work of art. The user interface forms the critical link to the database information and ultimately, becomes the bridge to interpreting and understanding the art. Database information is accessed through a network of visual symbols: icons, color codes, diagrams, windows, and predefined screen layouts. As design elements are chosen to support and enhance, rather than interfere with, the presentation of the art, a dialogue emerges between the visual symbolism in the fine art and the semiotics of the screen design (Fig. 3).

Although specific guidelines for designing hypermedia interfaces have yet to be developed, experts agree that the interface should provide a 'seamless' link to the information in the database. No one knows exactly what the ultimate

seamless interface should look like, but the goal is to use icons, screen layout, color, and sound in a way that minimizes the conceptual overload for the user by reducing the number of physical and mental steps necessary to access and process information. The underlying structure of the computer program and the integration of the diverse media on the computer screen should be transparent to the user and encourage exploration. In an art presentation program, this seamless approach to designing the interface will increase the symbolism between images and ideas and highlight new associations between space, form, motion, and time. In turn, the cognitive structure of art will assume a new level of interpretation and meaning as the semiotic dimensions of symbol design become an integral part of the presentation of a painting, sculpture, or other work of art. This interplay between fine art and communication design will pave the way for new art forms that incorporate the visual and philosophical components of two traditionally disparate artistic disciplines.

## INFORMATION-ORIENTED ART

With the adoption of electronic displays in the museum setting, museums are expanding the definition of art by shifting from an object-oriented philosophy to a focus on information and communication. Interactive computer programs are removing the conceptual barriers to understanding art and stripping art of the mystique that has traditionally isolated fine art from the public. Parallel philosophical movements in museums and the field of electronic art are converging to create a synergy that will challenge the

established elitism of fine art and lead to new social structures for evaluating and disseminating art.

### The Art Mystique

The sanctity and mystique of the art object is being dispelled as museum visitors use interactive computer programs to modify original art by changing colors, adding new elements, and integrating diverse media to create new art forms. Non-artists can now create an infinite array of new works of art. Art and creativity are no longer mysteries that are only accessible to the gifted or knowledgeable. With interactive museum programs, it is possible for anyone to enter the 'virtual reality' of the artist's mind--to hear and read the artist's thoughts, to modify the art, to step into the creative process itself. The key to understanding the art is no longer restricted to the interpretations of a few scholars, curators, or critics. Hypermedia encourages individual interaction and personal involvement with the work. Like Barthes's concept of plural text, the art takes on a plurality of meanings derived from individual experiences and insights.

In the future, this focus on individual interaction with art will expand to include an increased emphasis on group interaction. Collaborative programs will allow multiple users to collectively modify and exchange information. This type of collective authorship will expand the cognitive structure of art to include individual networks of associations or links that can be endlessly joined to form complex cognitive maps that further diminish the significance of the art object (Fig. 4).

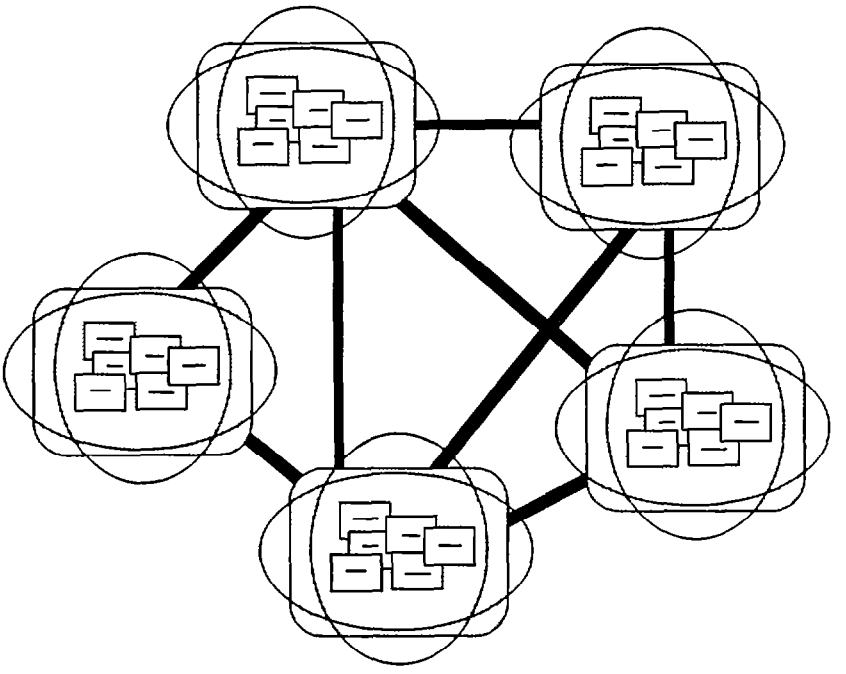

Fig. 4. Collaborative networking produces a cognitive map that links individual knowledge structures.

## Merging Philosophies in Museum Didactics and Electronic Art

The integration of telematics and information-oriented exhibits into museum educational programs is simultaneously increasing curatorial and public awareness of parallel philosophical movements in electronic art. In the same way that museum presentations are highlighting the creative process and emphasizing the cognitive structure of art, artists like Harold Cohen [8] and Roman Verostko [9] are using the interpretive powers of the computer to analyze artistic creativity. They have developed computer algorithms that are carefully constructed sets of rules for creating art that enable the computer to make aesthetic decisions about the interrelationship of line, form, and space. These artists are not interested in the creation of art as an object-making process. Instead, they seek to unmask the complex decision-making process that guides the inception and development of a creative work of art. According to Cohen, "Whatever art is, it's also a dialogue about the nature of art..." [10].

Russell Kirsch, a specialist in image processing and pattern recognition, has advocated that art historians heighten their perceptual sensitivity to the artist's use of line, form, space, and texture by using computer graphics software to isolate and analyze individual elements in a work of art [11]. In addition, Kirsch and his wife Joan, a printmaker and art historian, have been analyzing the conceptual structure of the creative process. They have developed a set of rules or grammar to describe the structure of paintings by Richard Diebenkorn, making it possible for computer algorithms to simulate Diebenkorn's work [12]. Similarly, Raymond Lauzzana and Lynn Pocock-Williams have constructed a 'rule-base' for describing Kandinsky's work [13],

and Terry Knight has developed grammars for analyzing stylistic changes in works by Georges Vantongerloo and Fritz Glarner [14].

Museums and artists alike are also experimenting with advances in telecommunications. Linked to the world via satellite and wired internally with 1,345 miles of cable, Canada's Museum of Civilization in Ottawa will be networked with 25 communications systems and will establish a telecommunications standard for all museums [15]. Similarly, artists are experimenting with computer networks and the power of interactive, collaborative communication. In 1983, Roy Ascott directed a collaborative work, *La Plissure du Texte: A Planetary Fairy Tale,* for the ELECTRA exhibition at the Musée d'art Moderne de la Ville de Paris. Using an electronic network, artists from 11 cities throughout the world created a story by 'dispersed authorship'. In 1984, for the Biennale de Venezia, Ascott organized a collaborative exchange of creative energy that involved 100 artists telecommunicating with text and images [16]. Another group of researchers, Vladimir Bonačić, Miro Cimerman, and Dunja Donassy (the artistic team >*bcd*< ), used collaborative networking to explore the concept of dematerialized art that exists outside the limits of space and time. They created the cybernetic sculpture *Instantaneous* that used sixteen networked computers to act as independent parallel processors. The team's goal was to create 'dynamic objects' where the computer system and the work of art are one entity, and artists interact and communicate through a common medium structured by the computer system itself [17].

## Future Implications

The shift to an information-oriented approach to presenting and creating art will necessitate different institutional structures for evaluating and disseminating art. Traditionally, the aesthetic merit of art has been closely related to its commercial value as a marketable commodity. The established criteria of 'high art,' issues of authorship, originality, genre, and style, have dictated marketing strategies in the past and been a major obstacle in the recognition of electronic art.

However, as museums and artists continue to focus on the cognitive structure of art, as opposed to the art object, new venues for evaluating and disseminating art will emerge. Museums are already distributing videodiscs of their collections, and commercial software is available to link these videodiscs to computers to create interactive, hypermedia programs. Museums will soon gravitate toward digital discs like CD-ROM for improved color accuracy, higher resolution, and greater flexibility for interactive applications. Advances in telecommunications will facilitate the transmission of complex software, large image files, and real-time video, and with these technical capabilities in place, new methods of publishing art will emerge that transcend social and cultural inequities to reach a globally integrated audience. Collaborative networking and teleconferencing will expand the potential for interaction between artists and provide new opportunities for collaborative projects between artists, curators, and the public.

New technologies for presenting art are also changing the curatorial language of art and providing new tools for interpreting art. In the past, art historians and curators have relied on text, slides, and photographic reproductions to document art. But multimedia technology can expand those options. Motion video, which can record the creation and installation of art as well as viewer interaction with art, provides valuable opportunities for analyzing the perceptual dialogue between imagery, space, sound, and time. Interaction with digitized art can simulate the creative process and add multiple levels of insight to the interpretation of the art. Conventional bibliographies that reference individual citations can be replaced by hypermedia paths that link multimedia sources in the database. All of these approaches to presenting information tap a wide range of cognitive skills and create new channels for learning and research. Of course, new technology does not operate in a vacuum. Experience and time will test the limits of these tools and establish directives for new forms of communication that will continue to reshape the language and definition of art.

## CONCLUSION

Changes in the way we interpret, present, and create art are altering the social fabric of art by bringing art closer to the public. The cultivated elitism of high art that has distanced art from the public is yielding to a personal and intimate approach to learning about art--an approach that is characterized by increased accessibility and direct interaction. Art can be moved out of the formal context of the museum and enjoyed in privacy of the home where the meaning of the art is assimilated into the social structure of individual

lifestyles. There is the freedom to choose what type of art to view, as well as how and when to view it, and this independence reduces inhibitions and encourages creative interaction with the art.

In short, the process of interacting with art is redefining the relationship between artists, curators, and the public. Multimedia presentations and collaborative networking highlight causal relationships, and the structure and meaning of art reflect a new order of authorization where the individual develops a personal approach to interpreting art. The key to understanding art is no longer dependent on the expert opinions of a single person or a designated group of evaluators.

The sociocultural revolution in the art world that is redefining the creative and interpretive roles of the artistic community is a reflection of a larger spirit of innovation that is being fueled by the electronic age of information. According to Junnosuke Kishida, honorary chairman of the Japan Research Institute, the computer age is forcing new concepts in creativity and invention by supporting a new social structure that emphasizes interconnections, merger, and synthesis. Kishida warns, however, that in order for this new spirit of creativity to flourish, it must be nurtured by interdisciplinary knowledge and a free exchange of information [18]. Curators and artists are rising to this challenge by using electronic technology to create collaborative systems and knowledge networks where art becomes the catalyst for an open exchange of information. These systems are generating a new level of consciousness about art. Art now derives meaning from multisensory data, the multiplicity of complex relationships, and the interaction of an integrated and diverse audience. The ultimate

interpretation of the art is derived from an intricately orchestrated cognitive structure that is a unique product of space, time, and the creative interaction of the artist, curator, and the public.

Interconnection, merger, and synthesis, the hallmarks of widespread changes in social, economic, and political value systems throughout the world, are also the cornerstones for a new platform of interaction within the art community that will generate an increased awareness and recognition of electronic art. Interactive museum presentations will help dispel the novelty and suspicion of electronic media and encourage an equalitarian restructuring of the sociocultural hierarchy. Theoretical criticism will be challenged to yield to new perspectives, and a surge of creative energies, sustained by increased tolerance and a high degree of intellectual and stylistic diversification, will enable museum presentations and electronic art to achieve greater levels of cognitive insight and aesthetic integrity.

## References


1. G. Dobbs, *Technology in Museum Environments: A National Survey of Current and Anticipated Computer Use in Art Museums* (San Francisco: The Art Museum Association, 1982) p. 5.

2. American Association of Museums, *Museums for a New Century* (Washington, DC: American Association of Museums, 1984) pp. 46-48.

3. G. Saloman, *Interaction of Media, Cognition, and Learning* (San Francisco: Jossey-Bass Publishers, 1981) p. 9.

4. N. Goodman, *Languages of Art* (Indianapolis, IN: Hackett Publishing Company, 1976) p. 235.

5. P. Kahn, "Objective and Subjective Links: Hypertext to Analyze Chinese Literature", in M. Bernstein, ed., *Hypertext '87 Digest* (Cambridge, MA: Eastgate Systems Inc., 1987) n.p.

6. C. Burnett, "Hypertext Computer Applications for Picture Collections: Representing the Fabric of the Archive", *Visual Resources* **6**, 1-18 (1989).

7. R. Barthes, *S/Z* (New York: Hill and Wang, 1974) pp. 5-6.

8. H. Cohen, "What's in an image?", *International Journal of Computers and Artificial Intelligence* **6**, 1028-1057 (1979).

9. R. Verostko, "Epigenetic Painting: Software As Genotype", *Leonardo* **23**, No. 1, 17-23 (1990).

10. G. Glueck, "Portrait of the Artist as a Young Computer", *New York Times*, 20 Feb. 1983, Arts and Leisure section.

11. R. A. Kirsch, "Making Art Historical Sources Visible to Computers: Pictures as Primary Sources for Computer-based Art History Data", *Proceedings of the Second International Conference on Automatic Processing of Art History Data and Documents* (Pisa: Regione Toscana, 1984) pp. 273-290.

12. J. L. Kirsch and R. A. Kirsch, "Storing Art Images in Intelligent Computers", *Leonardo* **23**, No. 1, 99-106 (1990).

13. R. G. Lauzzana and L. Pocock-Williams, "A Rule System for Analysis in the Visual Arts", *Leonardo* **21**, No. 4, 445-452 (1988).

14. T. W. Knight, "Transformations of De Stijl Art: The Paintings of Georges Vantongerloo and Fritz Glarner", *Environ and Planning B: Planning and Design* **16**, No. 1, 51-98 (1989).

15. D. Lancashire, "Ottawa's innovative 'global village'", *Smithsonian* **20**, No. 12, 114-125 (1990).

16. R. Ascott, "Art and Education in the Telematic Culture", *Leonardo, Electronic Art Supplemental Issue*, 7-11 (1988).

17. V. Bonacic, "A Transcendental Concept for Cybernetic Art in the 21st Century", *Leonardo* **22**, No. 1, 109-111 (1989).

18. J. Kishida, "The evolving concepts of creativity and invention (Postface)", in J. Richardson, ed., *Creativity and Invention* (Mt. Airy, MD: Lomond Publications, 1988) pp. 323-327.