artificiality and synthetic "nonbeing" which grow out of the instabilities and changes inherent in postindustrial society. The primacy of the manufactured object has been dissolved into other states of energy (or microelements) rather than into concrete matter: a "disappearance of the object" in favor of its artificial or virtual facsimile. The exhibition space, designed as a labyrinthian tour of "sites" or hanging islands, each with a separate theme, interpreted and defined many of the major features of Postmodernity as a new moment in culture. It offered a significant perspective on how the terms of our cultural conditions and their relation to historical and philosophical issues have brought about a crisis of outlook in the late twentieth century. "A series of key themes was brought forth and reiterated: the primacy of the model over the real, and of the conceived over the perceived. That we live in a world in which the relation between reality and representation is inverted was made clear by countless examples. Much attention was paid to the copy, to simulation, and to the artificiality of our culture. In fact, "Les Immatériaux" suggested nothing so much as our common fate in living with abstractions.[9] For example, completely artificial flavorings, fragrances, experiences are an inversion of former experience of "the real thing" as part of new but artificial states. The exhibition's dramatically lit theatrical spaces, where suspended objects and images loomed out of the darkness, demonstrated the already pervasive artificiality of our present existence—for example, *Site of Simulated Aroma, Site of All the Copies, Site of the Shadow of Shadows, Site of the Indiscernables, Site of the Undiscoverable Surface.*

Lyotard comments on this major change in the relations between the Modern concept of mastery and production as opposed to the Postmodern:

> Whereas mechanical servants hitherto rendered services which were essentially "physical, automatons generated by computer science and electronics can now carry out mental operations. Various activities of the mind have consequently been mastered. . . . But in so doing . . . the new technology forces this project to reflect on itself. . . . It shows that man's mind, in its turn, is also part of the "matter" it intends to master; that . . . matter can be organized in machines which, in comparison, may have the edge on the mind. Between mind and matter the relation is no longer one between an intelligent subject with a will of its own and an inert object.[10]

The Postmodern self is distracted and atomized into multiple heterogeneous domains sheared away from conscious life.

The Computer as a Dynamic *Interactive* Partner

Possibilities for change in the relationship between the viewer and the art work has been affected by increasingly sophisticated interactive systems for controlling artworks which are capable of responding to viewers' commands. The viewer must choose between the options to receive a single message from the many. Electronic nonsequential viewing has affected how art is produced and

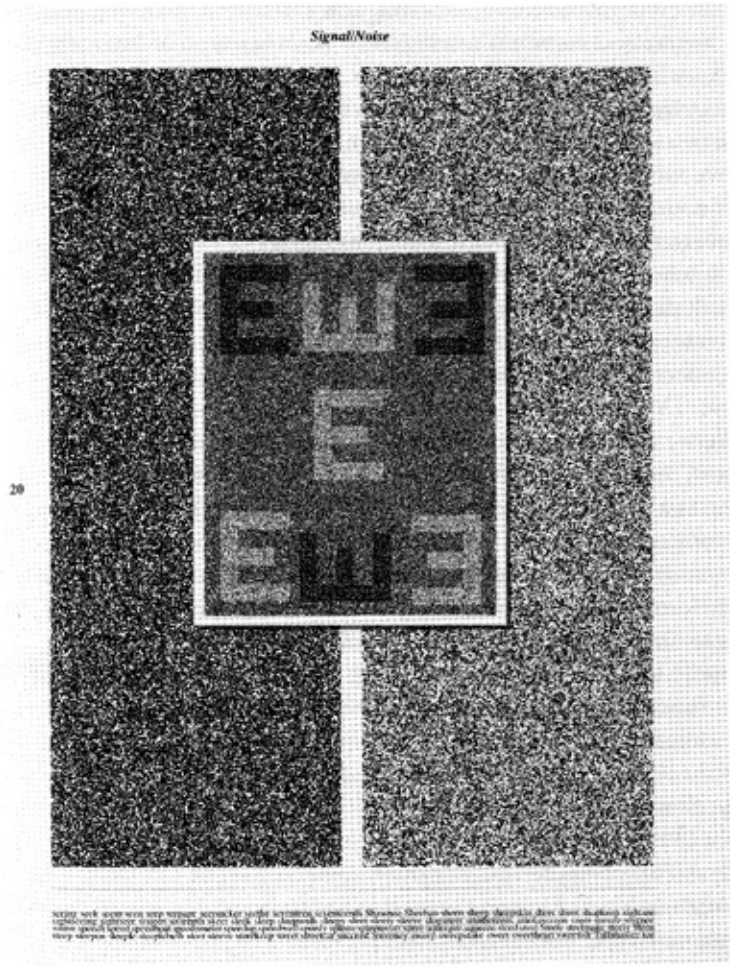


Figure 96. Craig Hickman, *Signal to Noise #1*, 1988. Computer drawing. *Signal to Noise* is not a sequential book, designed to be read cover to cover, but rather one whose structure is more like music. Tuning in signals makes for a kind of "cultural stew" of different mixtures of music, noises, whistles, and overlapping sound distortions join and superimpose themselves. His interest in short wave radio led him to be fascinated in the space between receiving a signal (or message) and its bleeding out of focus to mere noise. The book explores three kinds of messages and plays with the system used to decode them. *(Courtesy Craig Hickman)*

how it is accessed by the viewer. It calls for a new way of viewing based on visual icons or touching devices and time blocks. Electronic media promotes perspectives on aesthetic experience as well as on artistic production because it changes the experience of art-making and ultimately the nature of what is seen.

Creation is dependent on collaboration between the intelligent system designed by the artist and the actions of the participant which trigger causal

relationships. The computer then perceives and interprets incoming information from the viewer and responds intelligently. Another type of interactivity is environmental—where the viewer's presence is monitored and sets up a pattern of interference triggering different aspects of a computer programmed display of lights or shapes which may appear on a large screen.

Interactive viewing is completely different from linear activity. For example, a painter's outlook on reality is from a natural totally linear distance while a film-maker penetrates reality through multiple fragments of it, edited together to make a new whole seen at a different speed, with added sound. Interactive multimedia work permits creation of a new kind of viewing which may take the form of an interactive accessing of picture elements in a synthesis of animation and sound. In effect, watching television provides an everyday interactive experience: Imagine TV as a web of image blocks from which we draw our own meanings while we choose our way through the day's programming choices.

"Hypertext," first referred to by Theodore H. Nelson in the 1960s as "nonsequential writing as a text that branches and allows choices to the reader" has come to mean an informational medium where blocks of texts are linked electronically. However, *Hypermedia* extends the original concept of hypertext by encompassing in the work other forms of information such as visuals, sound, and animation. The new technologies are changing the nature of what is seen and what is read.

Interactive CD-ROM multimedia works typically link blocks of images and electronic functions to each other or to other video segments mixed with still images, animations and sound. These can then be manipulated and rearranged at the viewer's command. A computer provides the possibility for interaction by allowing for the branching out of visual or textual material to present choices to the viewer through a series of document blocks linked to different pathways. The computer creates interconnected webs of information. It is able to link various kind of image files and other types of documents, network them and create paths and nodes to connect them.

The words "link," "node," "path," "network," used by Roland Barthes in his 1970 essay in *S/Z* have become literalized in the actual functioning of the digital medium itself.

> In the ideal work, the networks are many and interact, without any one of them being able to surpass the rest . . . 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 . . . the systems of meaning can take over this absolutely plural text, but their number is never closed, based as it is on the infinity of language.[11]

Implications of Interactivity for the Artist

Interactive implies that the viewer has the power to be an active participant in the unfolding of a work's flow of events and influencing or modifying its form.

An interactive multimedia work is one which allows some choice in moving through combinations of text, sound and still or motion images. It is a flexible, nonlinear interactive system or structure, one designed and coded with linking capabilities which allow the viewer to make choices in moving along different paths through the work. It is a system-based approach to creating work which has viewer participation as a primary aspect built into it.

Interactivity deeply entwines the functions of viewer and artist. In so doing, the artist's role changes. This convergence transforms what had been two very different identities of artist and viewer. What interactive art now solicits from the viewer is not simply reception, but an independent construction of meaning. In interactively participating, the viewer derives power nearly parallel with that of the artist: to choose one's own path and discover one's own insights through the interactive work.

Artists, in designing a collaborative piece meant for interaction, place themselves outside their traditional roles vis-à-vis the viewer. For the artist, this can contribute to the loss of the self and of the single voice in favor of a democratic, collaborative dialogue. The artist now becomes an agent who does not create specific images, but instead, creates novel processes for generating new images and experiences.

In a 1994 article "The Aesthetics and Practice of Designing Interface Computer Events,"[12] Stephen Wilson discusses the relationship of traditional cultural forms to interactivity. There are some aspects of interactivity inherently present in traditional cultural forms because they must be accessed through close viewer attention. A book is the cultural form which allows for the ultimate in rapid, easy access to all its pages, without the immediate presence of the technology that reproduced it. VCRs have fast-forward and reverse capabilities in accessing movies or other video materials. There is a level of emotional engagement and internal viewer adjustments/identification which forms part of most art forms including theater and music events. Most successful art is psychologically interactive. Critics of interactive artworks claim there is too much disruption in the viewer's focus of concentration. Its defenders claim that the richness and opportunity to explore more differentiated aspects of a discreet work make it a potentially revolutionary form which will force change in how we see and understand.

However, interactive media have special qualities. They avoid the linear sequencing of a film or novel. They allow instead a less linear choice system structured into the work which is designed to function only through viewer action. The viewer will only be able to understand the work's meaning or its conceptual structure by exploring the many layers and margins which form the context of the piece. Information about parallel related texts or images can be accessed in the data space of the work and brought onto the screen for review.

Up to now, artworks have always been shaped by visual artists, poets, writers, composers, choreographers, who assumed the total responsibility,

opportunity and challenge of creating their own discreet work without invasion of the work from outside participation. They had to decide on content, format, style, sequence, materials, medium. However, with interactivity, readers, viewers, listeners can pass through the boundaries of the work to enter it. This puts them in a position to gain direct access to an aspect of authoring and shaping the final outcome of a work in a way that never before existed before the advent of the computer. The viewer has a position of power in the work which one never had before. The artist gives up total control in favor of a new kind of viewer communication and experience, one which offers a less passive position for the viewer, one which also celebrates the inherent creative capacities of all individuals. Interactivity offers important new avenues to cognition to take place, where works can begin to flow with the more psychological internal associations of the individual viewer's make-up and identity in mind.

This fundamental change in the relationship between the artist, the artwork, and the public creates new potential for change in the arts and for expansion into new territory. Although, as we have seen, there has always been a continuing questioning and refusal of the boundaries of traditional forms in the evolution of art, interactivity as a new aspect of representation is different from the earliest attempts to include in their work some aspects of audience response by the Dadaists, Constructivists, Fluxus, and Conceptual movements when they invented new forms such as performance, free-form installation, and diverse kinds of theater events (see Chapters 2, 3, 4, and 6).

In order to understand how far we have come in relation to the profound crisis in representation brought about by digitization, interactivity, and simulation, it is important to review the brief history of how the computer has impacted the visual arts. Such a perspective can put into context the major issues and technical developments that have led to this major break in the visual field.

An Interface for High Speed Visual Thinking

In his historic May 1969 *Artforum* article "Computer Sculpture: Six Levels of Cybernetics,"[13] sculptor Robert Mallary analyzed the benefits of the computer as a tool for "high-speed visual thinking" in art-making. His prophetic understandings grew out of research into the possibilities for kinetic sculpture and optics at the end of the sixties, although developments in computer science were still in their infancy and few artists were able to gain access to computer labs to experiment and innovate. He grouped computer functions into two major categories: as a means of calculation (tools), and as an optimum creative interface between artist and machine (medium). In the first grouping, the computer performs calculating chores to specify articulation of color and form, sorting out visual data on receding planes of objects in space. It adds randomness to a structured idea to test variable solutions and new proposals where speed and precision lessen the need for tedious work, thus making possible a new level of

interactive decision making. The relationship between artist and computer can be symbiotic—for each depends on the other, and both do together what neither could do alone. However, this relationship may not always be advantageous and at every step, the artist may need to veto and monopolize the decision-making process, accepting, rejecting, and modifying while prodding and coaching the machine in the right direction. Another aspect of calculation functions can lie in the area of programming the computer to move in a set way over a prescribed route according to a scenario of set commands that contain guidelines and criteria designed by the artist for making tests and permutations on an existing idea. Such research can be stored for future reference and further decision making.

In the second context of artist-machine interaction, the computer begins to make decisions and generate productions even the artist cannot anticipate. At this level, all the contingencies have not been defined in advance. In fact, the program itself manufactures contingencies and instabilities and then proceeds to resolve unpredictable productions, not only out of random interventions (which dislocate and violate the structured features of the program) but out of the total character of the system itself, modifying and elaborating its own program. At this stage, there can be a redefinition of relationship between artist and machine—where the computer is alternatively slave, collaborator, or surrogate. The artist operates the machine, monitors it, or leaves it to its own resources. "He is active and passive; creator and consumer; participant and spectator; artist and critic." The computer can check against past performances of consensus criteria stored in its program file, for the heuristic[14] program embodies its artist's preferences. At this optimum creative level, the true synergistic potential of the artist-machine relationship can be achieved.

A broad range of both European and North American sculptors interested in kinetics were particularly drawn to the computer both as an influence and as a tool. This group, which included Nicholas Schöffer, Nicholas Negroponte, James Seawright, Aldo Tambellini, Takis, and Otto Piene, used the computer to control and move their constructions. Some artists sought collaboration with scientists or engineers. In some cases the enthusiasm for "technoscience" made too little distinction for art between artistic imagination, scientific innovation, and technological experimentation.

Early Years of Computing Images

Since computers had been developed originally[15] for solving scientific and engineering problems, it is not surprising that their use for producing digital sound and textual and visual images was initially limited only to those scientists who had access to the cumbersome mainframe machines located in remote air-conditioned settings in university research labs. Because music and texts represent

coded information, it was possible to program these into computer language as early as 1955. Composers such as Lejaren Hiller, Iannis Xenakis, and Herbert Brun, working out of university labs, used the computer as a compositional tool. These early experiments opened the way for later extensive development of computer synthesizers as the popular musical instrument in use today.

By 1965, computer research into the simulation of visual phenomena had reached an important level, particularly at the Bell Labs in Murray Hill, New Jersey. Here the pioneer work of Bela Julesz, A. Michael Noll, Manfred Schroeder, Ken Knowlton, Leon Harmon, Frank Sinden, and E. E. Zajec led them to understand the computer's possibilities for visual representation and for art. That same year Noll and Julesz exhibited the results of their experiments at the Howard Wise Gallery, New York, concurrent with Georg Nees and Frieder Nake's exhibition of digital images at Galerie Niedlich, Stuttgart, Germany. Research in Germany at the Stuttgart Technische Universität was conducted under the influence of the philosopher Max Bense, who coined the terms "artificial art" and "generative aesthetics," terms which grew out of his interest in the mathematics of aesthetics.

Some of the earliest computer experiments related to art included the ones by A. Michael Noll in which he simulated existing paintings by Piet Mondrian and Bridget Riley in an effort to study existing style and composition in art. In approximating the Mondrian painting *Composition with Lines,* Noll created a digital version[16] with pseudorandom numbers.

An Artists' Tool Programmed by Artists

Although computer graphics research was, by the late sixties, being conducted internationally in the highly industrialized countries, Mallary was one of the few artists who had access to equipment or were trained in the specialized programming needed at that time to gain control over the machine for their work. However, they saw the computer as a means of researching their visual ideas and sought the collaboration of computer scientists and engineers as programmers.

Ken Knowlton, in his essay "Collaborations with Artists—A Programmer's Reflections," points to important differences in temperament and attitude between artists and programmers as a major difficulty. He describes artists as "perceptive, sensitive, impulsive, intuitive, alogical," and often unable to say "why" they do things; whereas, programmers are "logical, inhibited, cautious, restrained, defensive, methodical ritualists" with layers of logical defenses which helps them to arrive at "why." Although these antitypes are obviously stereotypical, they illustrate the difficulty of finding in one person all the qualities which created that hybrid breed—an artist-programmer.

By the early seventies, a new generation of artists began to emerge who were able to retain their intuition and sensitivity while exercising a logical, methodical approach to work. For example, artist Manfred Mohr (self-taught in computer science) and Duane Palyka (with degrees in both fine arts and mathematics) began to

program their own software as a result of frustration with existing programs and systems which did not serve their creative needs. "Hybrid" artists have since made important contributions to the field of visual simulation. Some have custom-designed paint systems and video interfaces for interactive graphics as well as working with robotics in sculpture. Following development of powerful new microprocessing chips, their work was simplified by the advent of microcomputer turnkey systems which freed them at last from large mainframe support.

By the midseventies, important advances in technology opened possibilities for the computer to become a truly personal tool for artists. The invention of the microprocessor and more powerful miniaturized transistor chips, (integrated circuits), changed the size, price, and accessibility of computers dramatically. Commercial applications in design, television advertising, and special image-processing effects in film and photography became an overnight billion dollar industry, providing the impetus for incredibly powerful image-generating systems.

The need for intimate collaboration between scientists and engineers with artists was no longer so essential, for custom "paint system software" and "image

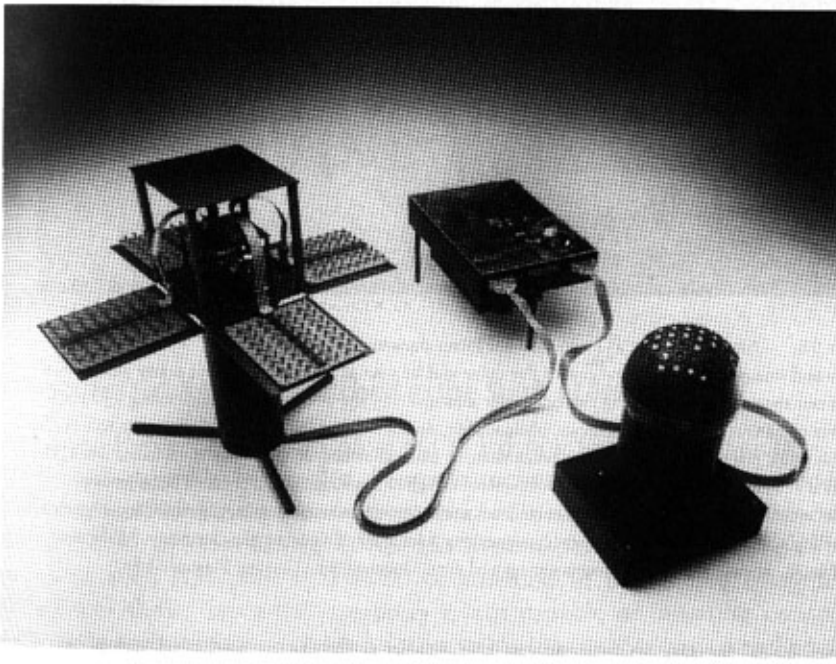


Figure 97. James Seawright, *Houseplants*, 1983. Microcomputer-controlled kinetic sculpture, 2" H × 5" D. *Houseplants* is an interactive computer-controlled sculpture that can respond to changes in environmental light levels or follow preprogrammed patterns of movement. The "plants" open to reveal their LED studded "leaves," and the flip disks on the domed plant click open and shut creating a whirring sound. Seawright has been producing interactive works since the early seventies. *(Courtesy James Seawright, Photo: Ralph Gabriner)*

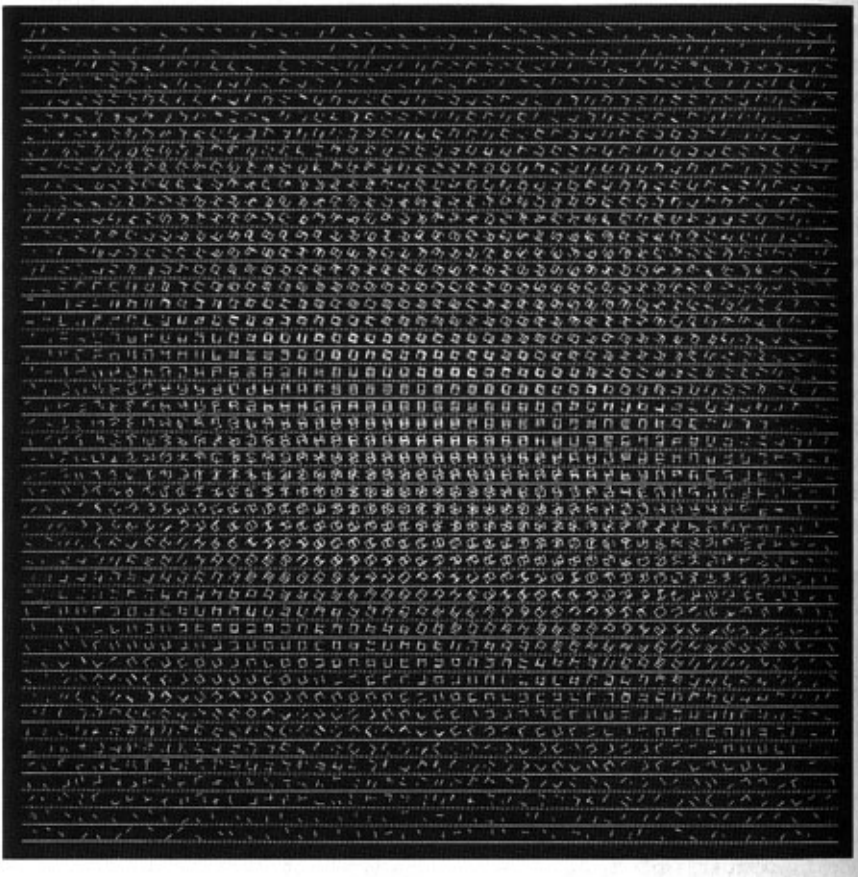


Figure 98. Manfred Mohr, *P-159/A*, 1973. Plotter drawing (ink on paper), 24″ × 24″. Mohr's intense and imaginative investigations of the cube and its spatial relations have for many years been carried out through programming the computer and printing the results of his work using a plotter on paper or canvas. There is a rigorous, philosophic, aesthetic, and mathematical structure to which all of his work refers in its countless transformations and variations. In this early minimalist work, the process is revealed as Mohr uses the set of twelve straight lines required to create a cube in two dimensions. The cube's repertoire of twelve lines are assigned numerical values in order to unleash a compelling scheme of line arrangements, suggesting a form of movement and harmony. Mohr is a hybrid artist, at ease with both programming and visual innovation. *(Courtesy Manfred Mohr)*

synthesizers" began to appear on the market. Programmed and developed by "hybrids" such as John Dunn (Easel, or Lumena Paint software), Dan Sandin (Z-Grass, a digital image-processor), and Woody Vasulka (Digital Image Articulator), out of their own imperatives as artists, new interface software for the computer provides easy access to two-dimensional and three-dimensional image processing in combination with animation and video. As a result, artists may now come to the computer with their visual arts training intact, without

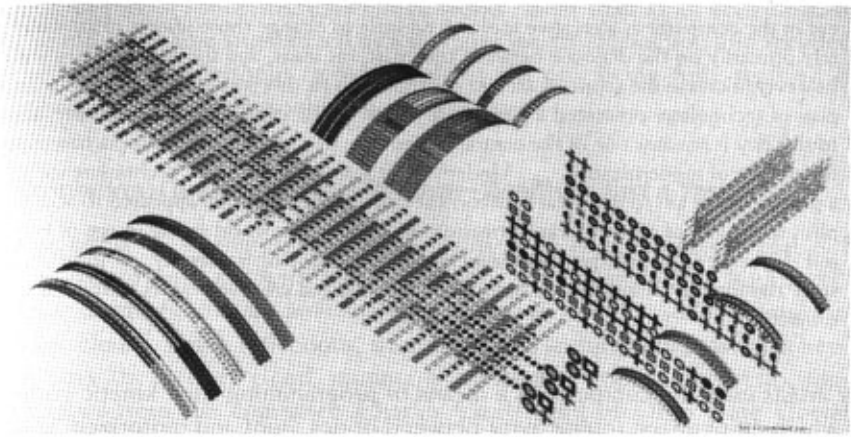


Figure 99. Mark Wilson, *NACL 17(C)*, 1986. Plotter drawing, acrylic on canvas, 44" × 84". Like Mohr, Wilson programs his own images and has experimented with different surfaces such as paper and canvas, and with materials, ink, and paint as part of the output aspects of his work. Plotters are capable of executing intricate detail in multiple colors. Pens can be easily changed in the apparatus. *(Courtesy Mark Wilson)*

the need to learn programming (in the same way that using a modern camera does not require full knowledge of optics). Learning to use a contemporary turnkey system with contemporary software is now comparable to a semester's course in lithography. However, programming is essential to any pioneering of new use of equipment. This need has continued to lead many artists, especially those interested in interactive applications, to collaborate with engineers or scientists or to study computer sciences for themselves.

Computer Exhibitions Launched in the Spirit of Modernism

The use of computers for art grew out of existing formalist art practices, especially with regard to Minimalist, Neoconstructivist, and Conceptual tendencies. However, use of the computer for art touched a deep nerve in an artworld fearful of the use of a mechanical device like the computer for the making of art. As we have seen (Chapter 3), Hultén commented in his catalog essay for the "Machine" show, "since the computer is not capable of initiating concepts, it cannot be truly creative, it has no access to imagination, intuition and emotion." In the catalog of the 1968 London ICA exhibition "Cybernetic Serendipity," the first devoted entirely to computer applications for poetry, sound, sculpture, and graphics, curator Jasia Reichardt commented:

> Seen with all the prejudices of tradition and time, one cannot deny that the computer demonstrates a radical extension in art media and techniques. The possibilities inher-

> ent in the computer as a creative tool will do little to change those idioms of art which rely primarily on the dialogue between the artist, his ideas, and the canvas. They will, however, increase the scope of art and contribute to its diversity . . . this dizzying display of technology presented a paradisical vision of the capacity of the machine, and to this day it remains one of the central projections of a technological utopia based on the notion of modernization. . . . Underlying it was the premise of "technoscience" as a prosthetic, or aid to universal mastery; the cybernetic revolution appeared to accomplish man's aim of material transformation, of shaping the world in the image of himself. Cybernetic Serendipity was launched in the name of modernity, an ideal that, since the time of Descartes, has focused on the will and creative powers of the human subject.

Many artists used the computer as a means of programming their kinetic sculptures which emphasized interactivity between optics, light and motorized, controlled movement such as those by Thomas Shannon, Jean Dupuy, and Hilary Harris. A witty attempt to humanize the computer was Edward Kienholz's motorized *The Friendly Gray Computer.*

In the catalog essay for the 1970 exhibition "Software: Information Technology; Its Meaning for Art" at the Jewish Museum in 1970, Jack Burnham used the body-machine-controlled-by-the-mind metaphor when he quipped: "our bodies are hardware, our behavior software." Curated by Kynaston McShine, the "Information" exhibition at the Museum of Modern Art demonstrated the concept of systems analysis and its implications for art. "Information" explored groups of networks of interacting structures and channels as a functionally interrelated means of communication. The computer was a natural metaphor for this exhibition. Agnes Denes, Hans Haacke, Les Levine, and Dennis Oppenheim were among the artists who explored use of computer concepts in their works. This was one of the first exhibitions to espouse the reductive, Minimalist principles of Conceptual art where the idea is the total work (no object is produced). Information as art.

As we have seen, the hostile response of the critics to the costly 1971 "Art and Technology" exhibition at the Los Angeles County Museum was a backlash against technological "corporate art" as it was termed. The Vietnam War and its aftermath of instability signaled a rupture with Modernist philosophical ideals and optimism about the future.

In the short thirty-year history of computer use in the visual arts, the first ten years ("first wave" 1965–75) was dominated by computer scientists with easy access to equipment. In the "second wave," significantly larger numbers of artists began to gain access and realize the potential benefit for their work. Many of these were interested in kinetic and interactive aspects of the computer. In the next decade, the continuing work of many pioneer artists probed at the edge of the computer's potential, participated in developing new software tools, and made vital contributions in laying the foundation for future achievements. In the early seventies the computer was still cumbersome, outrageously costly, and with limited access for artists. It was still better used as an analytic

tool for formal Modernist conceptual works rather than as an active partner. As a result, it became stigmatized as a medium for art production and receded into the background without its potential for the arts being fully realized in the onrush of developments which now took place.

Simulation: Quest for a New Realism—Reality Is Just a Test

The effort to simulate an artificial reality that is convincingly real is being approached seriously, with missionary zeal, as a major goal by high level computer scientists who are now analyzing a way to make persuasive simulations of trees, clouds, water, reflections, transparencies, textures, shadowing. They hope to coax the perfect cloud, mountain, or shining goblet with reflections and shadows from the computer. Charles Csuri, head of Ohio State University's computer graphics group keeps a reproduction of *The Origin of Language* by Réné Magritte on his office wall. The image is of a huge rock suspended above a shimmering sea, surmounted by a soft cloud of the same size. "It reminds me of what we cannot yet do realistically—water, clouds, rock, . . . fire, smoke. These are the major problems in computer graphics now. Natural phenomena, things that change shape over time, and things that are soft."[17]

Figure 100. Otto Piene and Paul Earls, *Milwaukee Anemone*, 1978. Mixed-media sky work. The figure depicts an inflatable flying sculpture by Otto Piene with outdoor laser projections by Paul Earls on steam emissions by Joan Brigham. Computer-controlled laser drawings have been used to produce a sky opera, *Icarus*. *(Courtesy Otto Piene and Paul Earls)*

The problems that artists have always faced in creating illusion—solving problems of rendering light, form, texture, and perspective, has now fully entered the computer realm through mathematical calculation. However, reality is vastly more complex than it seems. Scientists are devoting more attention than ever before to solving problems of vision and optics, color perception, perspective; they try to interpret textures such as softness and hardness. Artificial intelligence research is also investigating speech simulation and the workings of the mind.

IBM's Watson Research Center, scientists have generated persuasive computer imitations of landscapes and clouds. More than just pretty pictures, these scenes are proof that the branch of mathematics they work with, called *fractal geometry,*[18] accurately describes the real world. They can create programs using real data that simulate the growth of what seem like real clouds, and in this way, obtain a better understanding for example of how real clouds do in fact grow.

> Nobody's quite got it yet. In every image there's something that's a little off: the vase that looks more like plastic than glass, the shadow that's too sharp-edged, the city streets that are too clean. They're all missing detail, the richness and irregularity that our eyes and brains crave. And the world of computer graphics is mostly static and rather lonely—a viewer may swoop over a seascape or whirl around bottles on a table, but no waves lap at the shore and no people sit at the table. It's all a matter of the right instructions. Computers, of course, can't do a thing without instructions. But it's hard to think up a routine of steps that automatically and randomly puts cracks in sidewalks or mimics the action of wind.[19]

A variety of simulation techniques called texture mapping, ray tracing, three-dimensional modeling, and figure animation interpolation, have grown out of this high-level research which puts mathematics at the service of the quest for the "new realism."

One of the most formidable tasks the computer can accomplish is to simulate a three-dimensional shaded model. Once all the physical measurement information about the object has been fed into the computer's data bank, the simulated object then materializes on the screen. It can then be rotated, skewed, made to zoom in and out of space in perspective, with a choice of where the light source originates. According to instructions, the computer will calculate the range of highlights and shadings which define an object (depending on the choice of light source), add appropriate shadows, and animate it in full color.

At Lucasfilm, the computer graphics team has perfected the technique called procedural modeling, in which the computer is given the general characteristics of a class of objects and then makes many such objects, each unique. For example, the computer "grew" the flowering plants from a program that "knows" how a plant grows. Grass is simulated by providing the computer with information about range for the height and angle of the blade of grass and let-

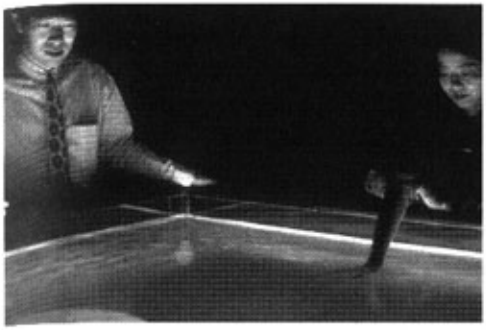


Figure 101. Christa Sommerer and Laurent Mignonneau, *A-Volve*, 1994. Multimedia Installation, (D & B). In the interactive environment of *A-Volve* viewers drawing on a monitor screen with a sensor pencil can create 3-D forms or organisms which immediately become "alive" and will seem to move in a water-filled pool nearby. Reacting to the slightest movement of the hand in the pool, the creatures will change their form and behavior. *(Courtesy Christa Sommerer and Laurent Mignonneau)*

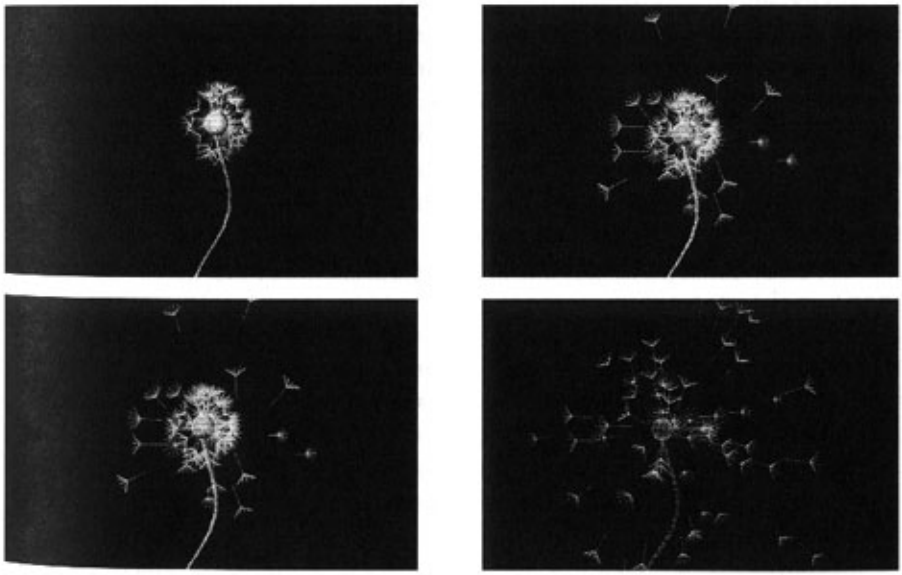


Figure 102. Edmond Couchot, *I Sow to the Four Winds*, 1990. Couchot is fascinated by the interactive instability of the digital image which can be invaded, and is thus completely unstable, mobile, changeable. In a poetic vein, he speaks of the life-time of such an image as only a breath, one which sows the fragments broken from its surface to be borne elsewhere possibly taking on a different form. In this work, a dandelion head moves under the influence of a "virtual" breeze on-screen. When the spectator breathes on the screen, clumps of seeds detach and softly fall until there is nothing left to dislodge. A new flower eventually appears and the interactive game, always slightly different, can begin again. *(Courtesy Edmond Couchot)*

ting it draw different blades; fire is produced by telling the computer the basic characteristics of a flame and letting it do the work. "Reality is just a test, like controls in an experiment. If you can make a convincing computer picture of a silk scarf falling on a wooden table, then you can make a convincing picture of a wooden scarf falling on a silk table."[20]

The computer can sort through all the instructions and models that describe the scene: its tone, color, optical laws—factoring in all the instructions, checking and sorting out what each piece the mosaic of pixels should represent. The more powerful the computer, the more image information the computer can process at greater speed. The more complexity and resolution demanded of the computer to create more lifelike simulations with reflections, highlights, and the like, with sound and movement the more memory the computer needs to calculate the information, and the more time it will take to render it.

Computer Animation

Films and videos are now being designed for insertions of animated figures with live photographed ones in the most complex interactions of reality and fiction yet attempted. In *Hard Woman*, the Mick Jagger music videotape by Digital Productions, the aggressive line-drawn animated figure seems to be in total control of the real-life action. At Lucasfilm in California, a powerful computer graphics machine called *Pixar* has been designed to capture the essential character of real forms and textures through the programming of digital instructions designed to simulate the diminishing size of tree branches as the trunk rises from the ground. The Lucasfilm team has even been able to recreate the blur of motion that is caused by a wave striking the shore or two billiard balls colliding. Various computer programs which build in a randomness factor have been developed to make images seem more lifelike.

Apart from generating specific images, the computer can calculate in-between frame of movement between separate drawings. This is the "interpolation" technique used by animators, where the computer is issued commands to compose as many slightly different intermediate images as required in the metamorphosis of a movement from one stage to the next. Thus, the animator's task in movement simulation and color transformations is enormously facilitated by the computer.

Computer-animated films have been produced by artists since 1961. A remarkable early example is Cannes Festival prize-winner "Faim" (Hunger) made by Peter Foldes at the National Film Board of Canada in 1974. Foldes not only generated by computer the film's intermediary motion frames, but used interpolation techniques to make transitions between two different themes—images of the starved "have-nots" transposed against the greed of the "haves."

Computer-assisted animated effects now dominate commercial advertising and have been used extensively for special effects in films such as *Terminator Two*,

Jurassic Park, and *Toy Story*. Artists' use of animation "paint" effects and drawing interpolation methods, combined with special effects generators, are a growing phenomenon now that software support animation packages are widely available. Expressive three-dimensional modeling of the human face and of the figure in motion requires still more powerful computers with compression software to manipulate the immense quantity of digital information involved.

At New York University's Media Research Lab, software has been developed for an artificial intelligence environment called *IMPROV*. Its narrative mechanisms include real-time personality and behavior attributes which create interactive, live, impovisational animation where the characters decide to respond to the actions of the viewer based on their mood and personality. Their reactions are generated in real-time as 3-D color animation.

Computer-simulated graphic images or animated passages can be encoded as a video signal and inserted into a work as part of its totality. Entire video passages can be digitized and edited from the AVID software, reformulated, manipulated and again reformatted as a video signal. This provides for an unprecedented expansion of pictorial variety and texture. In the future, the computer may play a greater role than the camera in film making. Although they will have the look of photographic reality, most backgrounds and locales in Hollywood films may eventually be computer generated. The actors may be electronically keyed-in, using computer/video techniques. By the early nineties, computer animation to perfect human or animal imagery produced the first examples of three-dimensional actor-simulated, feature-length animation. Amongst many others, were: "Who Killed Roger Rabbit"; "Forrest Gump"; and "Terminator."

New Potential for the Fine Arts Creates a Quickening of Interest

Although use of the computer by artists in the last twenty-five years has until recently brought the same rebuff by critics as early reactions to photography in the nineteenth century, the wide dispersal and greater access to greatly improved equipment for a far broader group of artists and to much more "friendly" technology has created important new conditions. More and more artists are gaining access to flexible and challenging ultrapowerful computer hardware and software at lower cost, and a new aesthetic is emerging as a broader range of artists come to the instrument with visual arts training rather than from computer science.

The computer allows for rapid visualization of complex spatial concepts at a different level of conceptual decision making, as well as for ease in quickly cycling through color harmonies when making decisions about color composition. Pluralistically, applications for the computer open out important new avenues to art-making beyond rigid categories. Interactive environments enter an expanded realm where a different set of abstract relationships can be brought into play.

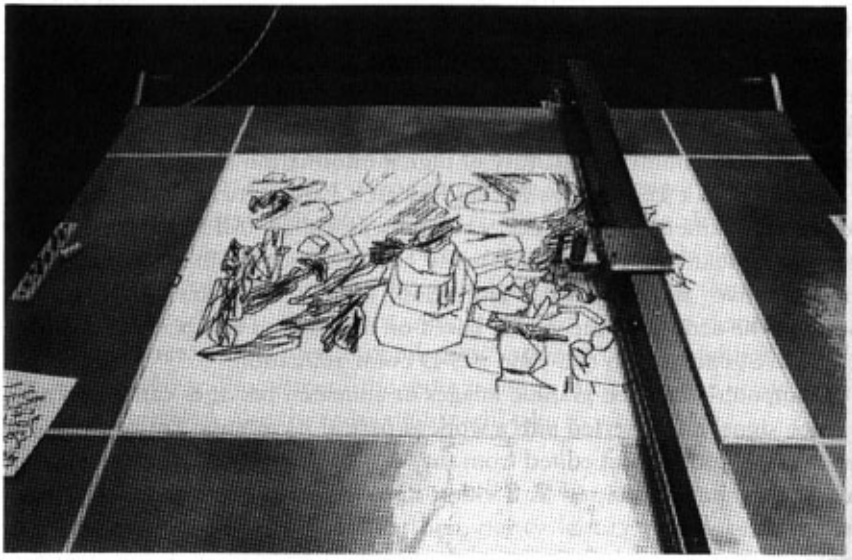


Figure 103. Harold Cohen, *Brooklyn Museum Installation*, 1983. Drawing, India ink on paper, 22" × 30". The drawing turtle is an "adjunct" artist guided by a computer program designed by the artist, Harold Cohen, and used to generate drawings that investigate the cognitive principles that underlie visual representation. Called AARON, the knowledge-based program addresses fundamental questions—what do artists need to know concretely about the world in order to construct plausible representational objects? What kind of cognitive activity is involved in the making and reading of these? *(Courtesy Robert A. Hendel, Photo: Linda Winters)*

Harold Cohen, an internationally known British artist, has been involved with computers since his 1968 visit to the University of California, where he now teaches. Cohen thinks of the computer as an "interface for the creation of his work—a collaborator, and an assistant in the drawing phase."[21] Cohen's drawing program is what he terms a formal distillation of the rules and habits a human artist follows during the process of drawing. The computer sifts through these programmed rules and drives an artist-built drawing machine (called a "turtle") by steering it with separate commands.

Cohen applies artificial intelligence techniques to the process of image making. He instructs the turtle to be interested in such issues as spatial distribution, figure-ground relationships, and figure integrity (avoiding the drawing of one figure over another); and to be aware of "insideness" and "outsideness." Cohen has defined the rules for image making, but because the rules combine and interact in a complex, dynamic way, the results are satisfyingly unpredictable. If both wheels of a turtle move at the same speed, the mechanism will go in a straight line; different ratios make it move in arcs. The changing location of the turtle's path is defined for the computer by sonar devices installed at two corners of the paper. The complex works contain closed and

open figures, embracing abstract asymmetric forms which resemble natural shapes like fish, stones, and clouds. In 1983, the Tate Gallery in London and the Brooklyn Museum in New York both featured Cohen's mural-sized computer drawings.

A growing tide of international exhibitions in galleries and museums demonstrate the quickening of interest in the use of computers for art.[22] Many countries including, for example, England, Canada, Germany, Spain, Italy, Japan, and Mexico, have either originated exhibitions of computer-assisted art or have hosted traveling exhibitions such as the Siggraph Art Show.[23]

Up to now, the major museums have tended to acquire works which incorporate computer influence as part of their photography, video, and sculpture collections—works such as Jon Kessler's kinetic sculptures, Bill Viola's video installations, and Jenny Holzer's computer-controlled electronic message boards. These tend not to isolate the computer aspect of the art but, rather, to integrate and enhance its overall conception.

Use of the computer raises particularly thorny problems for some artists who fear they may lose control to a machine which has a powerful agenda of its own. It is invasive—replacing publishing mechanisms, photography and text processing to such an extent that it is becoming a standard studio tool for some functions (much as the camera eventually did), raising questions about what aspect of it can be used for their work, although most do not yet contemplate its use as a medium in its own right.

Art speaks according to certain rules (or against them). It is part of how we rewrite the present. How do we evaluate artists' work in terms of art? Periods of major technological change transform art and disrupt the criteria used for evaluating it. Technologically based art is a form of representation which explores different aspects of the real world in all its complexity and tends to be an art that raises questions.

The Computer as a Tool for Integrating Media

Use of the computer linked to other outputs such as video integrates elements in a new way. It leads to multimedia productions, where the computer program operates the entire program (for example, the audiovisual, computer-controlled projection installation works of Toni Dove, Dorit Cypis, and Carolee Schneeman, which include live performance, film, slide projections, and music).

The subject matter of Gretchen Bender's computer controlled video works is the media itself. Seeing television as a giant machine spewing out symbols, signs, referents, and image materials, which have often been reprocessed and again subjected to reprocessing, she confronts in her work the uncontrollable torrent of information with which we are flooded. She asks how an image, once absorbed into the undifferentiated flux of TV, can also have meaning by being brought into a system of control imposed by the artist and then by the viewer

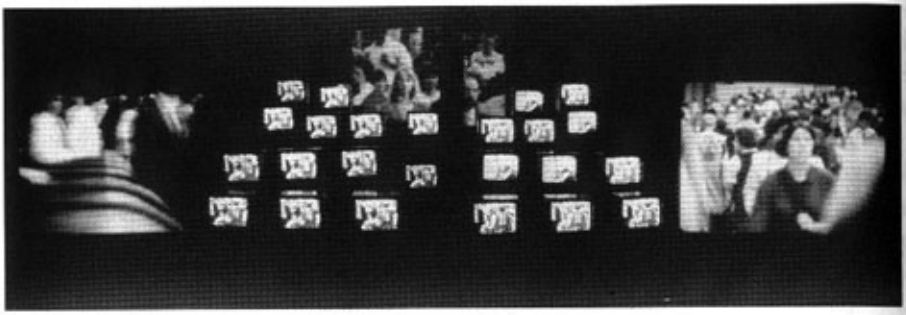


Figure 104. Gretchen Bender, *Total Recall*, 1987. Electronic theater, 24 monitors, 3 film screens, 8 video channels. *Total Recall* is meant as a critique of the optical overload in the media culture of today. Employing sophisticated editing effects to manipulate a powerful array of logos and images appropriated from TV, Bender inquires into cultural desires and the techniques and seduction of media representation, and she investigates the networks of information-communication transfer. Bender uses the computer to control the video multiple-monitor performance film and synchronized installed effects. In this ambitious work, she bombards the viewer with high-speed images. (*Courtesy Gretchen Bender*)

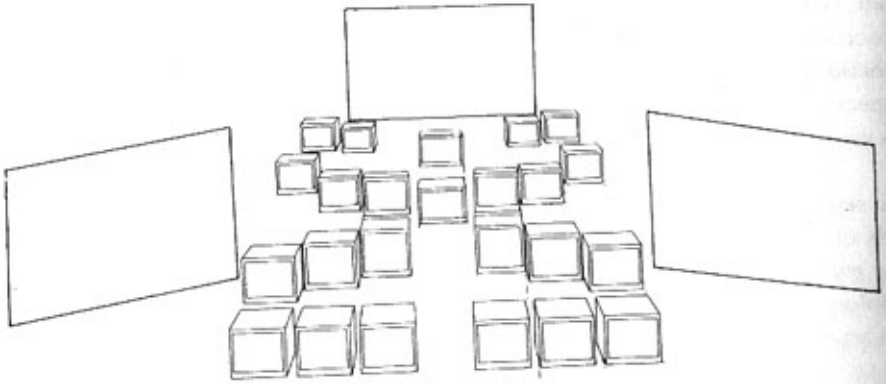


Figure 105. Gretchen Bender, Diagram of Monitor Arrangements for *Total Recall*.

in a process of critical awareness. In effect she removes the image in order to examine it. Another system of control she makes use of and examines is the technological reduction of all image components, so they are addressable by a computer and video system. Images that can be created, edited, controlled and manipulated digitally, and reproduced for dissemination on a flat digital plane, where all aspects of it are undifferentiated, create a very different kind of fragmentation from that of a Rauschenberg collage in which images have been placed together compositionally according to form, color, and line. Her work often takes on the form of a multichannel video-wall, sometimes with accompanying film loops as in *Total Recall*. Part of her strategy in commenting on our social and perceptual experience of watching television is to intensify this

experience of watching, to create an ambiance of "overload" to force the viewer to extreme experiences of fragmented, multiplied versions of watching. Her quickly exploding collages full of swirling logos and frantic speeded-up movement, take advantage of digital systems to address any single part of any image.

The Message Is the Medium: A Public Art

Jenny Holzer makes use of computer technology to animate her aphorisms on anger, fear, violence, war, gender, religion, and politics. Invited by the Public

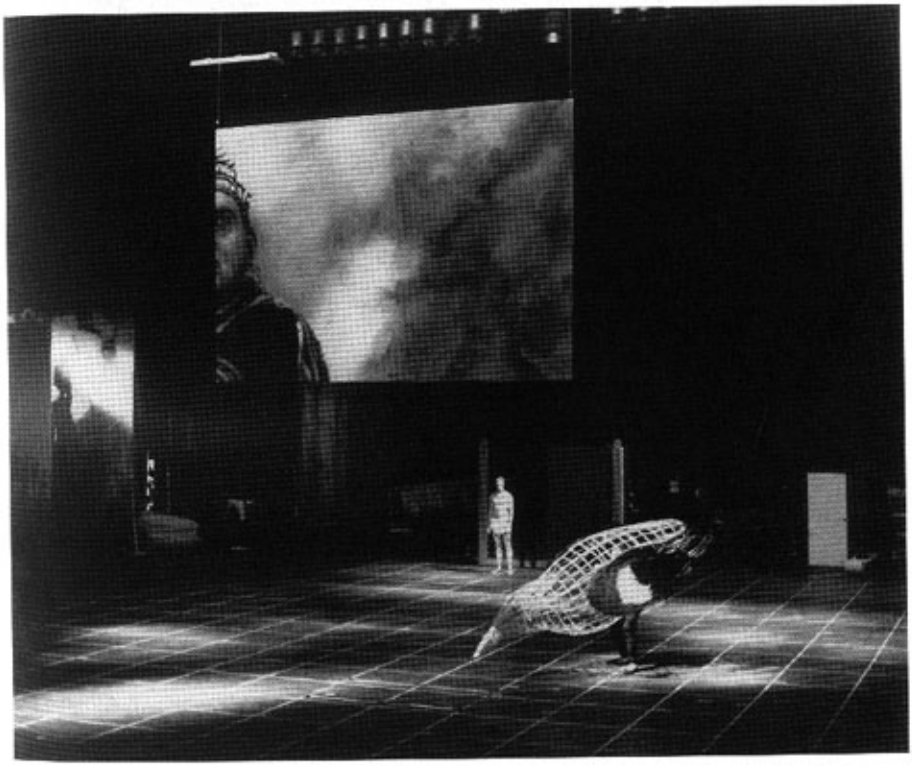


Figure 106. John Cage, *Europeras I and II*, 1988. Multimedia opera with electronics. John Cage combines elements of chance, randomness, information, and a fusion of genres in his *Europera*, first performed in Frankfurt in 1987. A combination of opera fragments (no longer protected by copyright), music scores (photocopied at random), singing types (chosen at random from the 19 styles), arbitrary stage backdrops (chosen from a range of available photographs), and sets moved in random time form the main scene, while a computer program, compiled by chance operations, controls the computer-assisted lighting process, generating 3,500 separate cues. Having combined this wealth of disparate elements into a giant collage, Cage proceeds to add elements of his own, including amusing visual jokes and puns interwoven with twelve alternate plots, thus creating a beguiling and entertaining pastiche of cultural productions of the past as a gaming collage for the present. (*Courtesy Summerfare, International Performing Arts Festival at SUNY Purchase*)

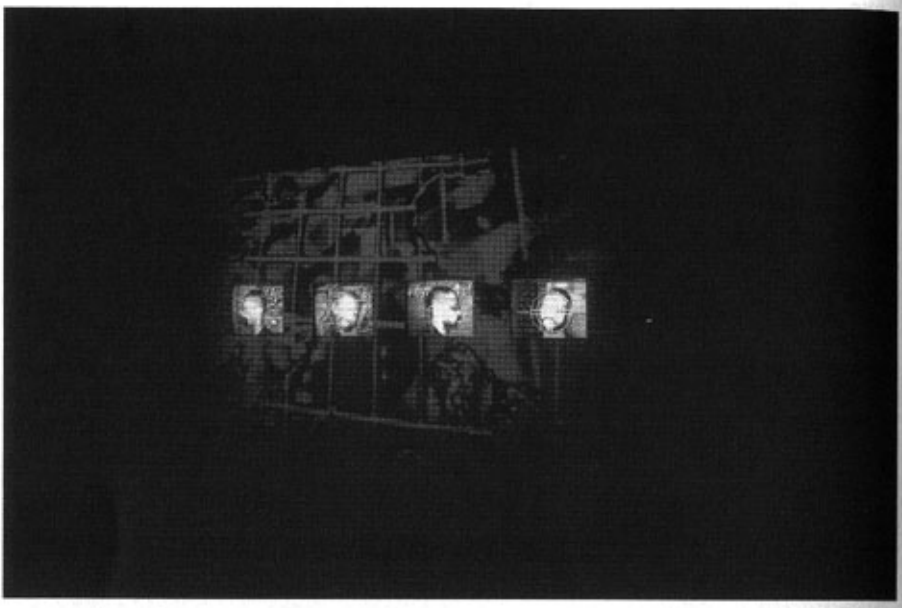


Figure 107. Keith Piper, *Tagging the Other*, 1992. Computer processed video and electronic composite images shown on four monitors. In the conditions of today's economic remapping of the globe, and as internal borders between nation states in Europe are dismantled, new kinds of boundaries of Europeanness are emerging to keep out "the other." Central to his piece is the framing and fixing of the black European, through a technological gaze that seeks to delineate "the other" in a discourse of exclusion. *(Courtesy, Keith Piper and The International Center for Photography)*

Art Fund to create a work for their computerized sign project "Messages to the Public" above Times Square in New York City, she used the Spectacolor Board. It changed the direction of her art. The possibility of producing text art fitted perfectly with the capacity of her computer-based medium. Her conceptually based work consisting of tersely written texts attached to iconic images endow cliché "truisms" with a strong and wry twist. Her work refers to and updates the immateriality and social commentary of the Conceptual Movement. *What Urge Will Save Us Now that Sex Won't* has its moving image and text information equalized and written in raw color sign lights. Her work is intended as a way of communicating with the public: "I try to make my art about what I am concerned with, which often tends to be survival. . . . My work has been designed to be stumbled across in the course of a person's daily life. I think it has the most impact when someone is just walking along, not thinking about anything in particular, and then finds these unusual statements either on a poster or a sign." Her work argues that art is an accessible language. If it is placed in a public environment by electronic means, the impact can be profound.

Following her first use of the computerized Spectacolor Board, Holzer began to use electronic message boards as a major medium of her own as her art

work. Her programs for LED machines have various levels of complexity but have been seen around the world from Paris, to Documenta, to the Venice Biennale and back, on huge message boards and on mobile boards mounted on trucks. In the same spirit as her electronic signs installation is her intention to buy fifteen second blocks of commercial time on TV to feature her texts—which she will adapt for TV. People buy her LED signs and objects but her art is not confined to museums and galleries: it is out in the streets. Holzer resists the traditional notions of art as a rare and precious object. Her works are unsigned. They question power. Her words and voices make room for thoughts and feelings that people generally keep to themselves and that art has generally excluded.

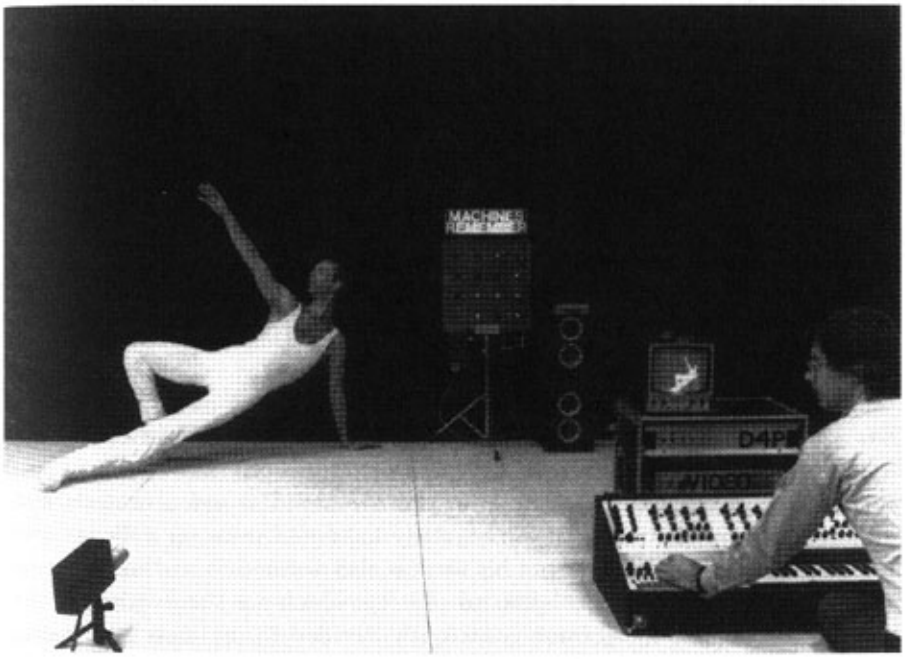


Figure 108. Christopher Janney, *Tone Zone*, 1983. Performance, commissioned by the Institute of Contemporary Art, Boston. Janney's experiments with movement, sound, and electronic media has led to interactive collaborative projects that rely on the collective efforts of dancers, musicians, designers, and technicians for their realization. *Tone Zone* translates the body's movements and inner pulses into sound. The musical score is thus produced by the movement patterns of the dancers. *Tone Zone* uses a synthesizer, an electronic sensing device, a video camera, and three dancers. The equipment is rigged to capture any move from the dancers. The synthesizer booms out sounds that reflect the speed and location of each movement. For example, a quick leg jab may create a sharp bleep or a slow twisting arm movement may produce a low braying sound. The choreography, composed by Tom Krusinski, is playful and open-ended, the perfect complement to Janney's electronic intentions. In *Heartbeats*, a solo designed for dancer Sara Rudner, a monitor is fastened to her chest so that the electrical impulses of her beating heart are carried on the sound system, creating the rhythm for the piece, like a percussion instrument.

Figure 109. Jenny Holzer, *Protect Me from What I Want*, 1986. Electronic billboard, Spectacolor billboard over Times Square, New York. Influenced by her experience in creating messages for the Spectacolor board, Holzer went on to use electronic signboards as a personal medium for her truisms. Holzer's work speaks to many viewers because it uses the commonplace to voice the subconscious. *(Sponsored by the Public Art Fund. Courtesy Barbara Gladstone Gallery, New York)*

Les Levine has always used media tools for his work. He was one of the earliest artists to become fully identified with the use of video and the computer. Both a public and a private artist, Levine produces video projects and paintings, and installations that are regularly exhibited in major galleries and museums. However, a large part of his work is also devoted to reaching a much broader audience through his billboard projects which are sited within in the flow of urban public life. Levine consciously decided to use mass advertising techniques in his work in order to get attention for his messages. Like Warhol, he maintains that "Advertising style is the most effective means of communication of our time because it is specifically designed to capture public attention." In the confusion and complexity of city streets, the eye is bombarded with thousands of messages and details. Levine's pieces work at many levels so that an investigation of his questions would demand a response which keeps on resonating in the mind—similar in character to the power of an advertising message which cleverly hooks itself, by its own form of power, to the consciousness of a distracted public, which does not want to be bothered, but is nonetheless a participant in the circuit of desire which is part of the way we inhabit the present. (See also Public Art, Chapters 3 and 7).

The Artist as Publisher

A form which also enjoys a wider audience is that of the book. The book form allows an artist to explore ideas and concepts as sequenced images, a "gallery of ideas," a record which lasts far longer than an exhibition and, one which may have a wider audience. Prior to the arrival of desktop publishing, artists experimented with the photocopier for book production. In the same tradition, today's book artists self-publish text/image works with the computer. The kind of planning and decision making about the work puts it in the category of conceptually driven idea art which originally drew strength from Conceptualism and the Fluxus movement in the sixties.

Sometimes conceived as multiples, in order to reach a larger audience, they have appropriated mass media production modes while rejecting the seamless corporate aesthetic of conventional high-volume publishing. Artists books are independently produced artistic statements in book form. They are a small but important site for the aesthetic investigation of image, text, and concept. Emerging from the context of painting, sculpture, music and dance, artists' books explore new forms related to the conceptual premises of the arts. The aesthetic issues book artists explore are specific to the book: linearity, timing, sequence, image and text relations, narrative tension, image frequency, page design, structures and materials, openings, turnings, margins, and gutters. At their best, artist books have the essential complexity, density of ideas, and intimacy of any art form.

The computer has replaced the photographic darkroom in the production of books for it can produce the half-tone film output required by offset printing. It allows for unlimited image and text manipulation in the same space and for rapid preproduction that some think represents a democratic ideal in publishing. It transforms what was once an industrial process—requiring services of a typesetter, a graphic artist, a printer, a designer, and an editor—into a largely private one where the author becomes the producer.[24]

In his essay, "The Author as Producer," Benjamin pointed out that, with the accessibility and growth of reproduction technologies, everyman can now become a writer, not only through letters to the editor in the daily press, but also, now, through publishing opportunities made possible by advances in [electronic] technology. "For as literature gains in breadth what it loses in depth, so the distinction between author and public which the bourgeois press maintains by artificial means, is beginning to disappear." The new electronic publishing technologies open communications possibilities to artists which were never available before.

Laser copiers now provide the capability of printing on-the-spot, "on demand," entire books from a compact optical disk or from a microfiche the size of a playing card. Justification for this trend comes from savings in traditional printing, inventorying, and monitoring for reorders. Backlist and out-of-print books can be digitized and printed on demand. Many publishers are con-

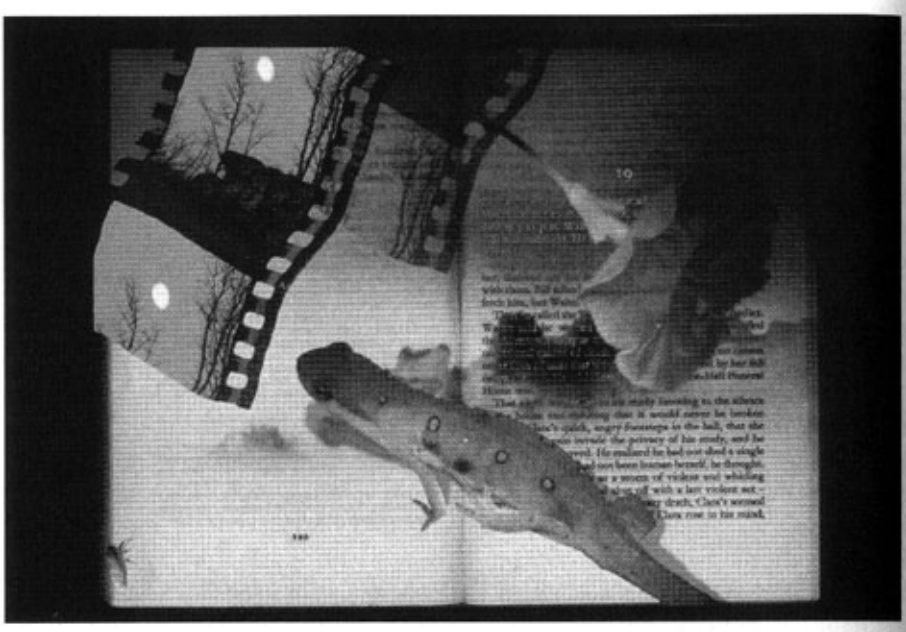


Figure 110. Peter Campus, *blunder*, digital photograph, 1995. Peter Campus was one of the first artists to appropriate tools of mass media in the late sixties and early seventies in his use of video and installation. Since 1988, he has become interested in using digital photography to alter and "reconfigure the relationship of painting and photography to nature." His newest collagelike constructions engage the viewer in a dialogue between disparate elements which have been digitally manipulated in color and scale to create works that are concurrently attractive and repulsive. As a result they seem to pulse with a level of emotional intensity. *(Courtesy Paula Cooper Gallery, Inc.)*

sidering the release of materials in the form of compact optical disks which can store hundreds of megabytes of information. Users could then print out information as needed. Electronic storage systems are of special importance to libraries already running out of floor space. Such systems are about to revolutionize not only the printing industry, but the dissemination and use of information. (See Chapter 6 for issues of print culture and of the future library on the Internet)

Transformations of the Book Form Dissolve Boundaries Between Media

Both electronic and print versions of a work often coexist in various ways. A printed book is functionally interactive. It seems natural to simply pack a disc into a printed bookwork as further outcropping to its ideas—as is "Swallows," a floppy disc inserted into the back of *The Case for the Burial of Ancestors* by Paul Zelevansky. Hypermedia on a disc may hold webs of texts which interactively connect to visual materials, with sound. Sometimes, a work originally produced as electronic communication (such as a video disc which holds moving images as well as sound and text), is reduced to a print format.

The electronic book today appears in several forms—not only as a CD-ROM, but also on-line, located on the Internet, eons away from the traditional material-bound, costly processes of hand-printing and binding. CD-ROM has become a mass medium for the publication of interactive works now that CD-ROM players, are built into desk-top computers. More and more artists are attracted to this medium because of its potential for harnessing in the same format, text, sound, and both still and moving images. With CD-ROM, the disc becomes "the gallery" and its accompanying text/brochure/book becomes the "catalog."

Pioneers of Interactivity

The whole process of creating interactive works is a pioneering experience of completely new territory where there are as yet, no traditions, no grammars, no guidelines. "I used to feel that interactive multimedia would build on existing

Figure 111. Esther Parada, *A Thousand Centuries*, (detail) 1992. Digitally generated color inkjet print 33" × 52". Interested in representations of North American cultural attitudes in the late nineteenth and early twenty centuries, Parada has constructed a collage of computer manipulated imagery and layered text. *A Thousand Centuries* is part of a larger series entitled *2-3-4-D: Digital Revisions of Time and Space* was part of a residency project entitled *Society and Perception: New Imaging Technologies*. In this work, she juxtaposes the kind of cultural foregrounding the "Columbus Story" has enjoyed in North America with its cultural spin-offs in the way other Latin American countries see themselves in relation to the context of their European or North American discovery, exploration, and economic development. Parada sees this as "a double-barrelled imperialism of representation." *(Courtesy Esther Parada)*

syntax," comments artist/producer George Roach. "I'm now beginning to believe that there's a whole new syntax needed by this medium that will be fundamentally different than television and film. Even the best of us are so shackled by our training. It's very hard to throw off all the vestiges of those previous forms. It will take a whole new generation that grows up inside of this medium to really find out what it's all about."[25]

Originally, interactive media grew out of developments in electronic computer games in the 1970s and 1980s. Because of the popularity of "games," the early technology became so developed that many artists decided to use the game concept of branched-out situations to involve the audience in a different kind of imaginative experience. Jane Veeder, Nancy Burson, and Ed Tannenbaum created different genres of interactive pieces.

About Face is an early example of an artist-designed interactive project. It was designed by Nancy Burson and prepared by the Rueben H. Fleet Science Center. *About Face* is also an example of how many interactive works originated in science museums, like San Francisco's, rather than in fine arts institutions. The projects are designed so that visitors will become engaged in the exhibition, by losing themselves in an interaction with a variety of experiences related to the range of "information" communicated by the human face. For example, when does a visual pattern become recognized as a face? (or, is it easier to mask an expression of anger or one of surprise?). The viewer can choose from among many sites where their faces are scanned and digitized and then manipulated according to the software programmed by the artist. The exhibition draws on findings in the fields of anthropology and psychology. *About Face* deals with questions of identity and desire by allowing, for example, playful manipulation of programs which allows people to create their own computer self-portraits by inserting on their own face a nose, eye, forehead, and so on, from famous prototypes.

Earlier work by Nancy Burson,[26] a series of "Warhead" portraits, combining the faces of the leaders of countries possessing nuclear weapons, statistically weighted by the number of warheads at each leader's disposal. She scans individual portraits for her composites into a computer by means of a television camera, encoding their images as digital information. Each of the scanned-in images are interactively adjusted as to size and format and then they are stacked and "averaged," stretched and warped.

Lyn Hershman is one of the first artists to have taken interactive laser disk[27] technology beyond commercial exploitation. Her project *Lorna* was produced by the Electronic Arts Archive, Texas Tech. It represents an important beginning artistic involvement with a potentially powerful interactive medium. Hershman is attracted to the interactive disk medium because its branching-out possibilities provide for a more intense way of dealing with reality, and because of her desire to actively involve her audience by empowering them to self-direct the video screen. Lorna, her heroine, suffers from agoraphobia (fear of

open spaces) and hides in her apartment, relating to the world only through objects that make her neurosis worse: the television and the phone. Viewers can use various channels to explore Lorna's options by accessing her possessions. When touched on the screen, these open out individually to comment on many issues—from women's rights to the threat of nuclear war.

Grahame Weinbren's and Roberta Friedman's complex interactive video disk project *The Erl King*, based on Schubert's song of the same title *(Der Erlkönig)*, also exploits laser disk technology to shape a contemporary way of telling a story with images. It is a multidimensional narrative in which the viewer manipulates and reconstructs its images by touching the monitor's screen. In *Sonata*, a more recent work, Weinbren creates even more subtle relationships in his nonlinear narrative. Weinbren wants to explore multiple points of view in work with a more response-type interface to create a subtle effect on viewers that seems more like a psychological flash-back than a separate response. In *Erl King*,

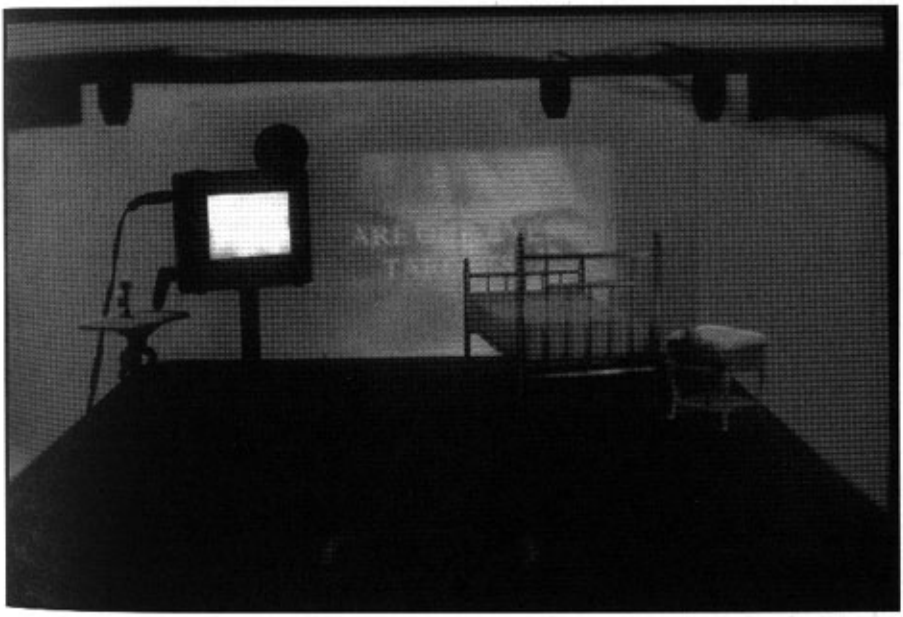


Figure 112. Lynn Hershman, *A Room of One's Own*, 1993. 18″ × 24″ × 36″. Interactive installation—miniature video monitor and video projection in miniaturized room. Continuing her feminist discourse about voyeurism in a *Room of One's Own* by forcing the viewer to see her work through a periscope peephole, Hershman adds the elements of how one responds to being looked at. The viewer's eye movements themselves are digitized and inserted into a small television set within the tiny specially constructed bedroom scene. The eye movements sends signals to a computer which causes the videodisc to access significant segments for viewing on the room's TV. Thus, the viewer/voyeur becomes a "virtual" part of the scene being viewed. Depending on whether one turns the periscope towards the bed, the pile of clothes, the telephone, the chair, or a monitor, one of the three screens on the back wall is triggered. For example, looking at the bed reveals unpleasant scenes of the woman shaking bars that ressemble a sexual prison.

Figure 113. Lynn Hershman, *A Room of One's Own* (detail) 1993. (*Courtesy Lynn Hershman*)

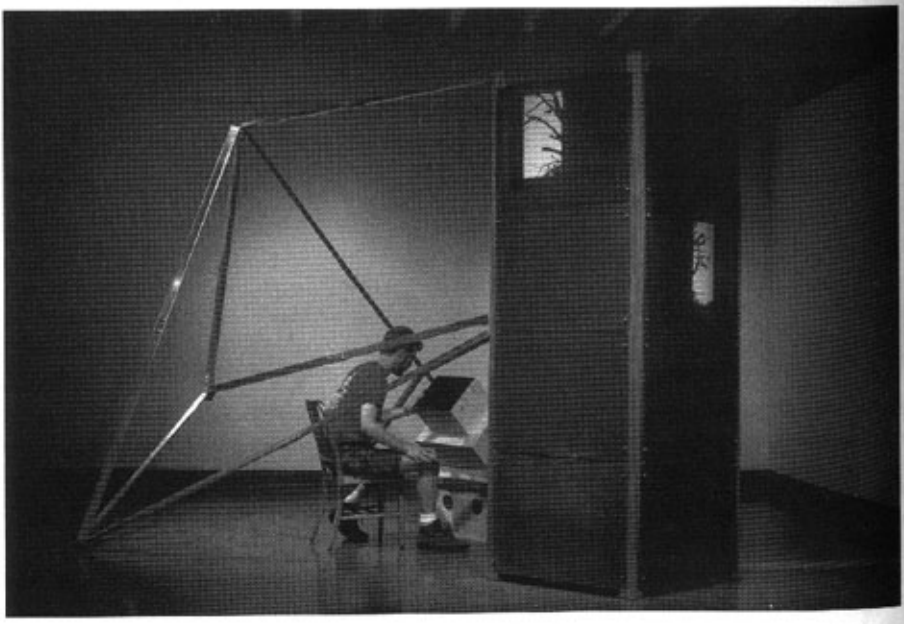


Figure 114. Grahame Weinbren. *Sonata* 1993. Interactive installation.

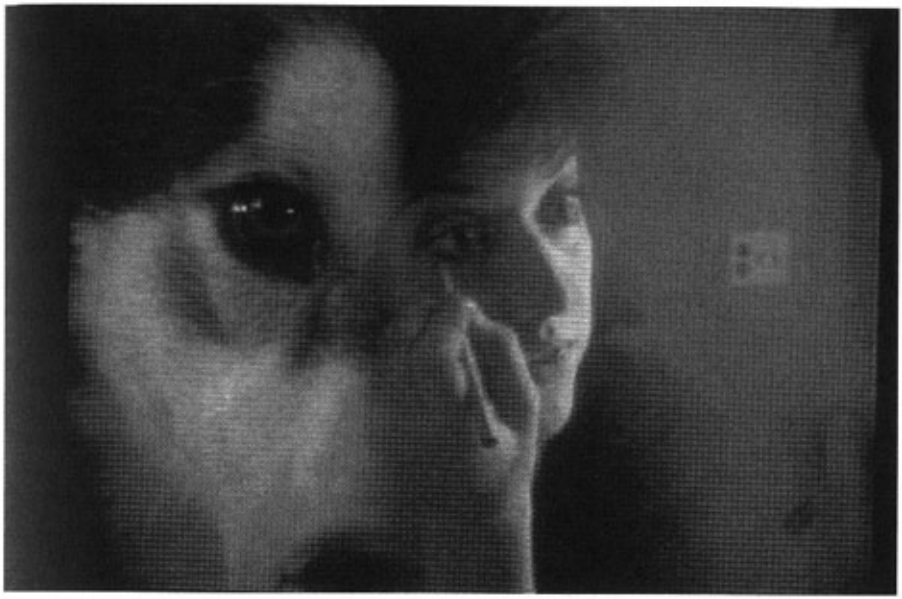


Figure 115. Grahame Weinbren. *Sonata* (detail) 1993. Interactive installation. In a deliberate investigation of the possibilities for a new kind of interactive cinema, Weinbren aspires to lay its foundations in a moment-by-moment collaboration between viewer and filmmaker. In *Sonata*, he juxtaposes a Tolstoy story of jealousy and mistrust leading to the murder of the wife with the Biblical theme of Judith and the enemy general Holofernes. The general is decapitated by the heroine Judith who thereby saves her people from a calamitous invasion. A primary aim of this multivalent narrative is to examine extremes of emotion. Weinbren structures the stories so they can be easily accessed by the viewer by pointing at the screen at any time. For example, the Tolstoy narrative segment is set on board a train as the protagonist, pardoned for the death of his wife, recounts his story. The viewer can interrupt the narrative flow at any time to visit visually the actual visual scenes being described verbally and then loop back to the main story. The viewer navigates around the narratives using a unique interface system where up, down, left, right all represent different temporal directions. Right and left move us forward and backward in time; down renders expansions of the present; and up, introduction of material outside time. Weinbren has found ways also to elaborate on these inputs. *(Courtesy of Graham Weinbren and The International Center for Photography)*

the viewer had actually to touch the screen of the monitor to activate changes. In *Sonata*, he positioned the infrared sensor beams several inches in front of the monitor screen so that the viewer needs only to move the hand, as though directing, to make changes. In general, his work stays closer than most to the concept of cinematic expression and provides a sense of the psychological workings of the mind—creating a fluidity of movement and montage that is deeply satisfying. The system he uses provides at high resolution thirty frames per second—much faster than image compression software can provide so far. In *Sonata*, Weinbren used two stories—Tolstoy's *The Kreutzer Sonata* juxtaposed with the biblical story of Judith and Holofernes. He also placed in the same

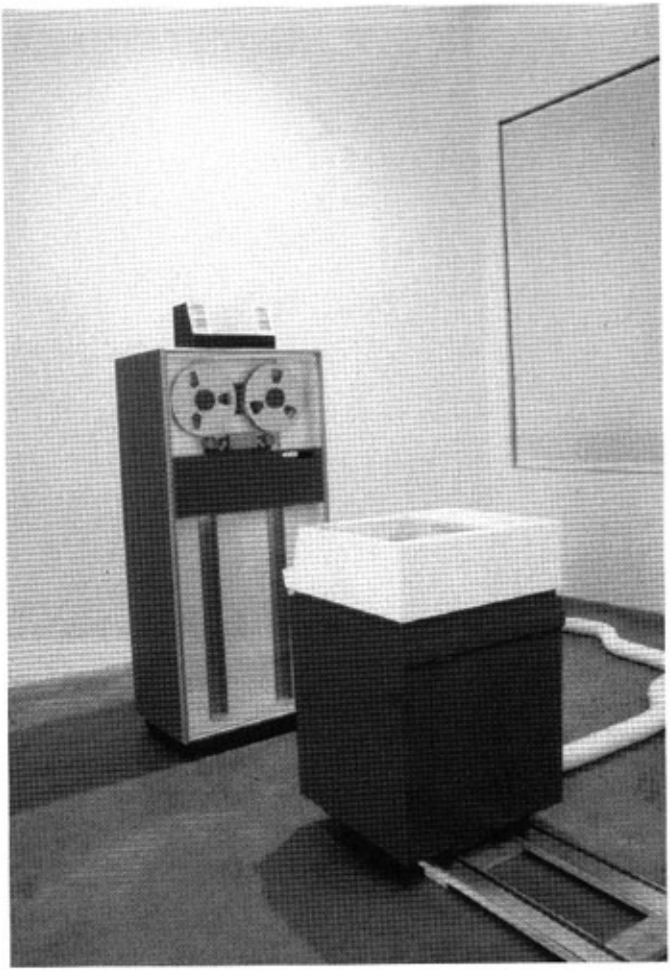


Figure 116. Jon Kessler, *Marcello 9000*, 1994. Mixed media with audiotape, lights, and motors. A pair of refrigerator-sized computers exchange fiery insults in a lover's tiff, with sound taken from the soundtrack of Fellini's *Dolce Vita*. The woman computer turns and departs along a short track shouting "Let me live"—but later returns to once again engage the argument. *(Courtesy Jon Kessler and Lubring, Augustine, and Hodes Gallery)*

databank, the text of Tolstoy's family diaries. At yet a further intertextual level of relationships, he inserts dreamlike images that are condensations of his feelings. While the viewer is free to move quickly and easily through the piece, Weinbren exerts control of the interactivity in one or two places where the viewer is not allowed to pass on at the high point of the intense climactic scene, such as when Tolstoy's character murders his wife.

Other artists interested in creating interactive alternatives to film are John Sanborn and Peter Adair. In *Smart Money*, which is designed to teach teenagers about money and credit, Adair uses a film narrative interspersed with a learning game procedure, where students make decisions about spending and saving issues in their lives. Although he designed it to be played only once, Adair has noticed the students play it again and again—first as a practical help, then as

fantasy. John Sanborn uses a choice mode as interface for a demonstration film he designed for a movie theater audience, who can use joysticks as a kind of "voting" device.

Creating an Interactive Aesthetic

The central issue in creating a non-linear media work is how the artist viewer relationship is altered and played out in the work. Some artist producers wish to retain a narrative format to sustain the emotional tension associated with film. Such artists are interested in issues of character and story development. Other artists want to create open spaces in the work where viewers can play and fantasize.

Driven by market forces, and extremely rapid technical evolution, interactive technology has entered the mainstream of mass audience entertainment, advertising and publishing. Much basic territory has already been explored.

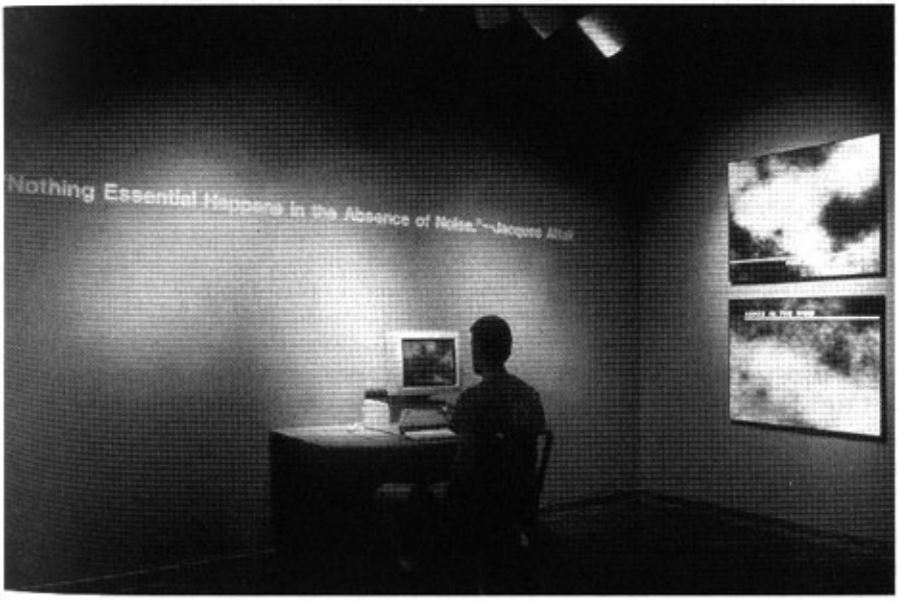


Figure 117. George Legrady, *Equivalent 11*, 1993. Interactive installation with computer monitor and keyboard. Interested in exploring the threshold between cognitive perception and cultural interpretation, Legrady asks viewers in *Equivalent 11* to consider the process by which we normally "read" images, (especially familiar photo representational ones) and the submerged social and historical structures of the cultural conditioning in which they exist. A computer program produces cloudlike images whose tones are controlled by typed-in text by the viewer. When key words stored in the data base are matched with those of the viewer, disruptions to the image-making process ensue. Later, the computer reveals previously entered words which match those in the current field. He asks questions about the relationship between ordered information (signal) and random information (noise). When a "noisy" image cannot be interpreted according to conventional experience, it becomes dependent on other sources for understanding it. *(Courtesy George Legrady and the International Center for Photography)*

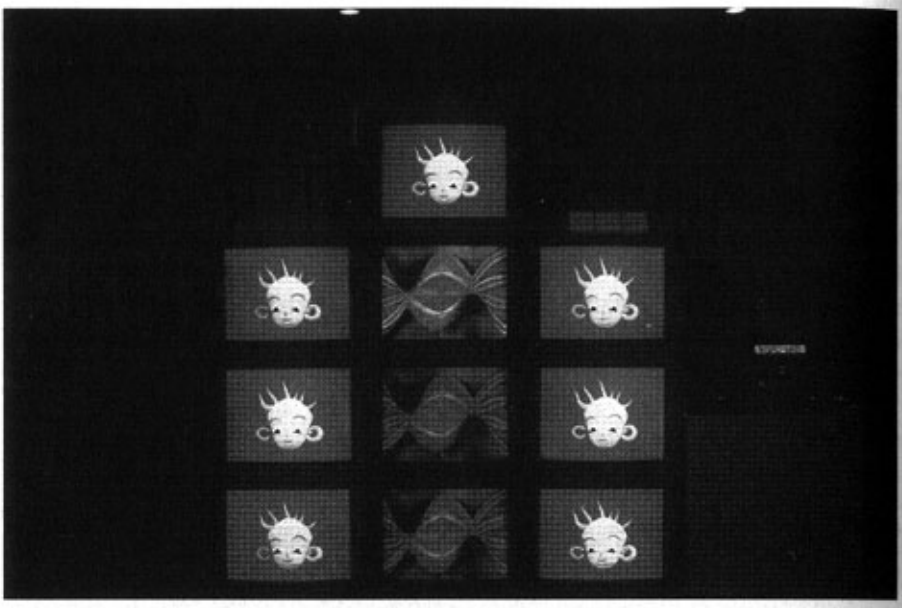


Figure 118. Naoko Tosa, *Talking to Neuro Baby*, 1994. Created in collaboration with Fujitsu Laboratories. An interactive performance system with voice input response and neural network software. With *Neuro-Baby*, we have the "birth" of a virtual creature with computer generated baby face and sound effects made possible by neurally based computer architectures. It represents an interactive performance system capable of recognizing and responding to inflections of the human voice which can trigger changes in facial expression of *Neuro Baby's* "Emotional Space." *Neuro Baby's* logic patterns are modeled after those of humans, making it possible to simulate a wide range of personality traits and reactions to various experiences. Tosa comments: "I created a new creature that can live and meaningfully communicate with many modern urban people like ourselves who are overwhelmed, if not tortured by the relentless flow of information, and whose peace of mind can only be found in momentary human pleasures. *Neuro Baby* was born to offer such pleasures . . . It is a truly loveable and playful imp and entertainer."

Many artists are already rejecting as too linear and simplistic options which provide the viewer with only one choice. Branching programs have a greater array of choice options; the viewer must actively search to find gateways to the next experience such as in the CD-ROMs *Myst* and Laurie Anderson's *Puppet Motel*. This type of choice is more challenging, intuitive, and allows for more associative connections to occur. Two further interaction interface types allow the viewer either to add texts or images, to the work or to establish new aspects of the program's capability in the form of new links to other sites or by importing new materials to the site.

As of today, a large group of pioneering artists are already involved in creating an interactive aesthetic and set of standards for clarity and functionality of the user interface. Their work in exploring the new media involves types of patterns of interaction.[28] Examples are: circular interaction; time sequenced inter-

action; and the way individual events influence other events and permits access. Other questions are: what navigational actions and user control input points need to be present for the content of the work to be expressed; what form do the system responses take which could lead to further viewer action; what screen design and type of movement and sound will be used. In providing guidelines for multimedia work, Apple Macintosh advises several major fundamental operating guiding principles for a successful outcome. First, the user must be made to feel in control of the piece. Second, fundamental concrete metaphors must be established which are then supported by all the visual effects and sound elements. Third, users must be able to loop through the work and must always be able easily to find a way out.

Those artists who choose to design interactive multimedia systems and effective interfaces for viewers (users) of their work face even more daunting tasks than those of historically analogous interdisciplinary artists in video, film, installation, performance. Aside from creating the mise-en-scène and the context and metaphoric associations of the work, its movement, sound, and acting, they must also give primary consideration to viewer interaction. This means abandoning the traditional approach to create meaning through controlled linear structures. So far there are no defined criteria and no canon for this expanded media, although there are technological restraints. Its raison d'être is to break open old boundaries and to experiment with new artistic possibilities for art and communication. Mindful of the Bauhaus motto: "form follows function," function and aesthetic are closely allied in forging from hypermedia a new cultural form.

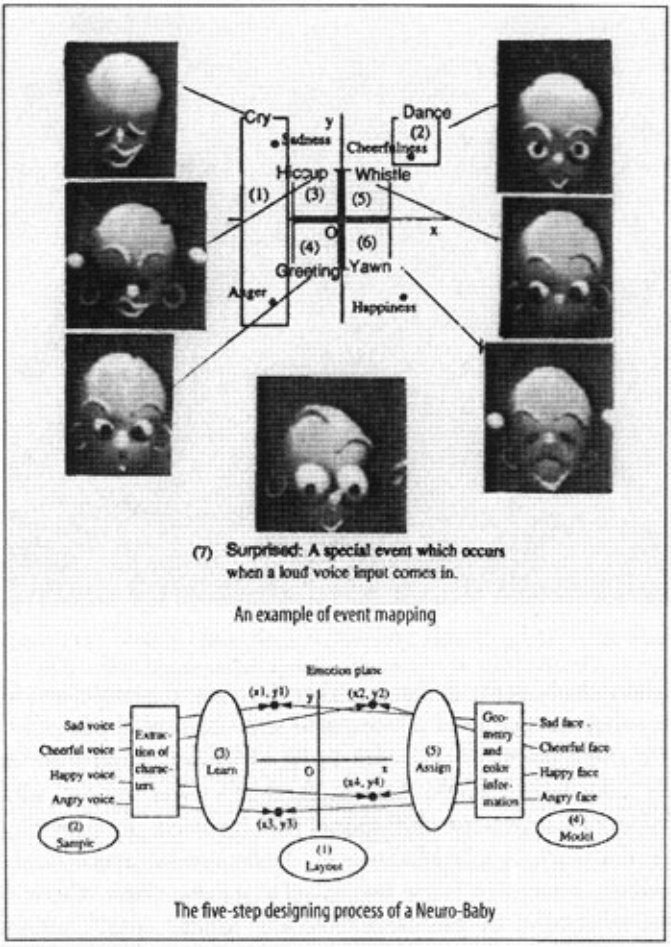


Figure 119. Naoko Tosa, *Talking to Neuro Baby*, (detail) 1994. (*Courtesy Noako Tosa*)

Crafting work where there are pathways, nodes, links, networks, and connecting loops between visual, sonic, textual, and graphic elements calls for enormous skill. Multifaceted procedures and coding require collaboration, a difficult task in a culture which promotes heightened individualism. Interactive multimedia brings us into the type of collaboration that makes a film, a theater piece, or an opera production a reality. The collaboration can be one where the director/producer is in charge of others, or it can be a more open-ended one where there is equal input and joint decision making by all of the players. The latter, more democratic model is full of difficulties, but on the whole, produces the most innovative work. As the culture changes, increased collaboration will be necessary.

In the future, technological advances will include alternative inputs to the keyboard or the mouse. Video and computer games are not the only models. Virtual Reality (VR) hardware now exists for head and hand motion, for the use

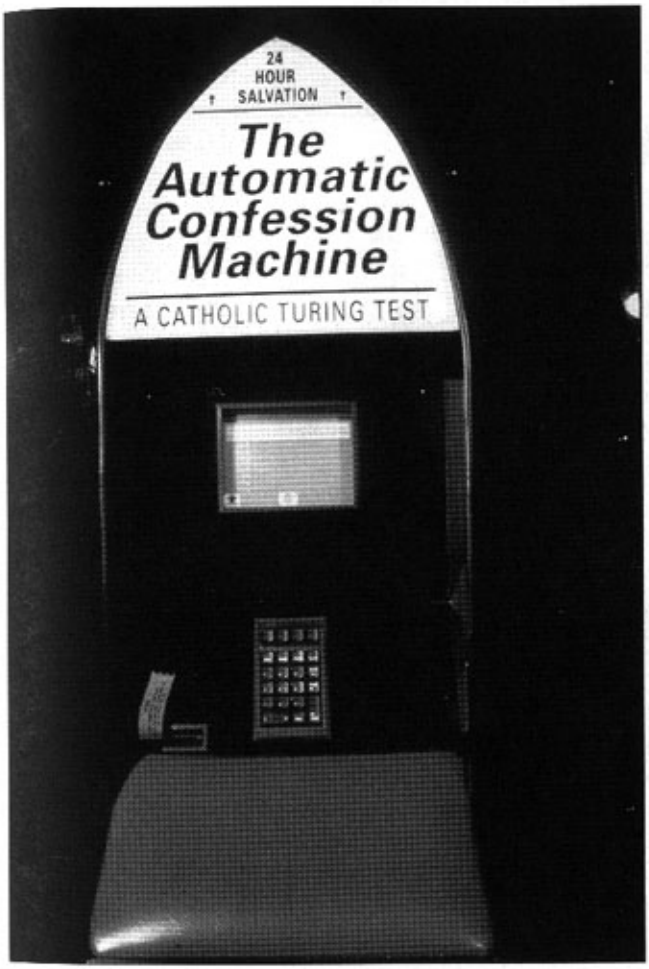


Figure 120. Greg Garvey, *The Automatic Confession Machine (ACM)*, 1993. Wood, plexiglass, fluorescent neon light, interactive computer program. Put off by the commercialization of religion (pay for your sins through offerings with a credit card), Garvey came up with the concept of creating a computing program through which one can make a confession to God through the auspices of a computer. He wants his work to represent a warning against the inexorable intrusion of commercialism which may redefine spritual needs as yet another commodity to be researched, marketed, and packaged. The kneeling penitent uses a keypad to enter any venal or mortal sins or sins against the ten commandments. At the end of the program he or she receives a print-out of the balance of required penance. The sinner is then required to make a digital leap of faith and surrender to the belief in the power of "Silicon Absolution." (*Courtesy Greg Garvey*)

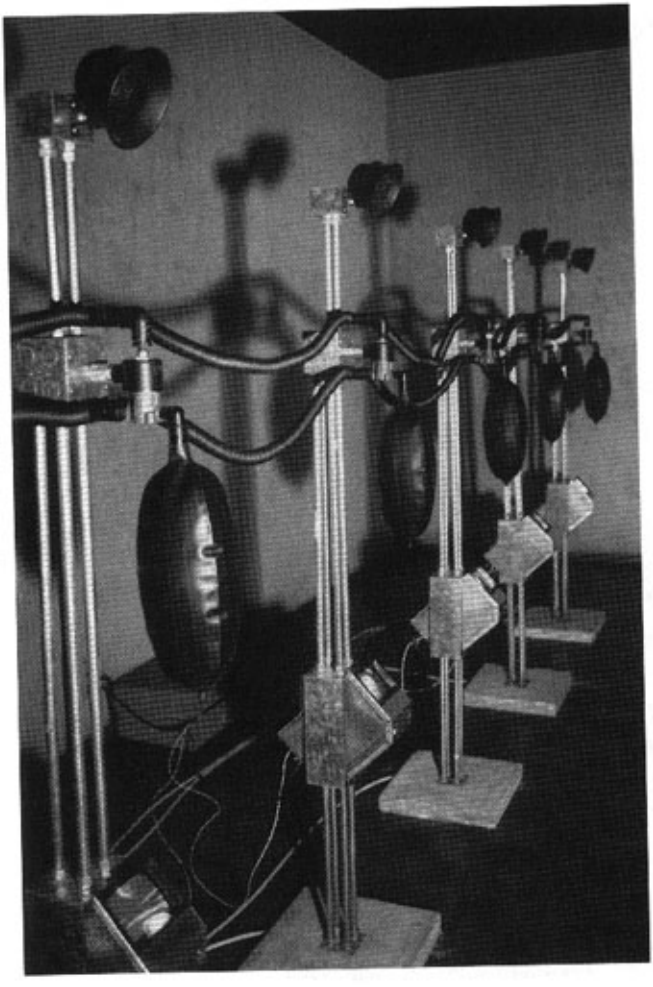


Figure 121. Simon Penny, *Big Father,* 1993. Interactive robotic installation. This work is meant as a commentary on new global system of digital communication and how it has become a colonial-type phenomenon in the sense that millions of sensor and effector nodes for gathering information are hooked into its system and thus become a sense organ of it. Operating on a vast range of scales, from the galactic to ground-based observatories and local surveillance and medical systems, this database can seem to invade and control our lives—not like Orwell's "Big Brother"—but more ominously as "Big Father." The viewer entering the interactive installation is confronted with five stations that individually breathe and sense the visitor's presence, triggering the transmission of audio and video material. *(Courtesy Simon Penny)*

of body characteristics such as touch, motion, eye focus, gesture/speech, and brainwaves. These possibilities as yet have been little tapped by artists. Access to robotics and artificial intelligence labs is still problematic. New ways of compressing and representing complex information and the procedural tools needed for users/audience to navigate are being developed rapidly, particularly in relation to the Internet and the World Wide Web. (Chapter Six)

Like most technological advances, interactive media offers hope for new forms of communication and for a new epistemology. However, cultural critics see that multimedia will also become a force for seducing and manipulating the public mind. (The public is already exposed to the fantasy of choice as the bedrock of market-place rhetoric even though choices are limited to ones between products or to events in video games. This kind of "choice" leads to a false sense of empowerment.) Already interactive multimedia hype has turned off many potential users. A danger is that the new forms could function as TV has. Viewers without critical consciousness or information are lulled into complacency. Unaware, they miss many of the information source options available to them.

Figure 122. Tamas Waliczky, *The Garden: 21st Century Amateur Film*, 1993. By combining 16 mm color film footage about his daughter with 3-D models of a garden, Waliczky has created a poetic animation about childhood. The work entailed an arduous frame-by-frame process of releasing the figure from its background and then positioning the perspective coordinates in the computer model so that the background environment jibed with the child's movements. Because he wanted to make perceptible the atmosphere of a real garden he also entered coordinates for air movement, for changing light, and for wind blowing. In a garden everything is in motion. The final recording is on videodisk. *(Courtesy Tamas Waliczky)*

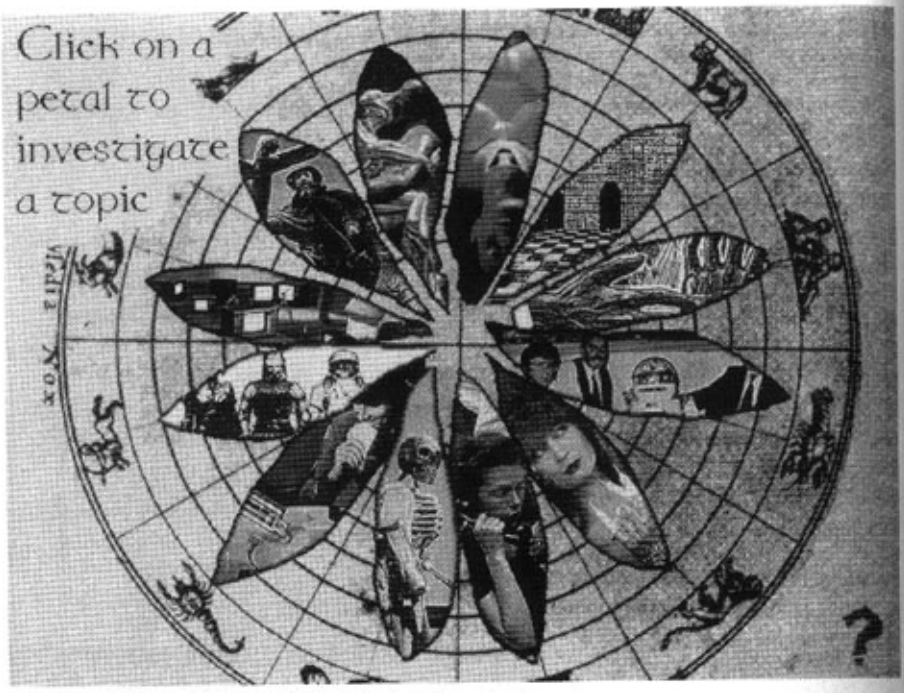


Figure 123. Christine Tamblyn, *She Loves It, She Loves It Not: Women and Technology*, 1993. This CD-ROM explores the historical exclusion of women from the technological realm while it also attempts to construct a revisionist history where women can play a major role in cyberspace. The (potentially) hour-long work involves a breaking down of boundaries between body and machine and between issues of art and theory. The viewer clicks on the author/artist's face or mouth to receive navigational advice throughout the work. Viewer's choices of sites include Quick-time movie clips, animated texts, and specific information about a particular topic. *(Courtesy Christine Tamblyn)*

The new interactive media require a better educated, well-informed, demanding public, and artists who are ready to deal with extended audiences beyond traditional settings. Artists must have far greater knowledge and grasp of the content that they are presenting—its history, mythologies, and psychological effects—as well as greater creativity in making decisions as to its form and its presentation. Creating a CD-ROM, for example, is similar to organizing a film production in its use of theatrical lighting, script-writing, work with actors, music and story board. Because CD-ROM is not linear, (although it may be narrative), it cannot evoke the suspension of disbelief that is the goal of most films. When we are comfortable with the form of representation whether it is film or painting, we accept the conventions of that form and enter into its arena of illusion. However, when there is constant interruption through acts of choice, there is a rupture of concentration and a need to leave the narrative space being inhabited.

Parameters of Artist Control: The Viewer Interface

The most common multimedia interactive works are designed for presentation on computer screens, although some take the route of immersive virtual reality environments because they feel computer screens confine their access to create new experiences with materials and spatial relationships. However, similar problems confront both types of interactive producers. For example, the interface with the viewer: How does communication take place to indicate how interaction should occur? How can the viewer be motivated to interact and to want to continue? What most interactive producers have found is that the interaction itself must be intuitive, meaningful, simple, attractive, familiar feeling, and noticeably responsive to the user.

Most artists are interested in providing as much freedom of exploration as possible while still taking control of shaping the experience cohesively. Those who have been struggling the longest with the media speak of the need for a rich lode of source material as content for the construction of the work.

Figure 124. Pattie Maes, *Alive, An Artificial Life*, 1994. Virtual immersive environment. The goal of *Alive* is to present a virtual immersive environment in which a real participant can interact in natural and believable ways with autonomous semi-intelligent artificial agents whose behavior appears to be equally natural and believable. Normally, navigation through a virtual space requires the wearing of gloves, goggles, or a helmet—cumbersome equipment tethered to a computer workstation. However, in *Alive*, a single CCD camera obtains color images of a person which are then composited into a 3-D graphical world where 3-D location and the position of various body parts are contained. This composite world is then projected onto a large video wall which gives off the feeling and effect of a "magic mirror." *(Courtesy Pattie Maes)*

Challenged by the relationship between interaction and creativity, Peggy Weil in a children's CD-ROM *Silly/Noisy House* created for Voyager, a major CD-ROM publisher, encourages exploration. Weil motivates creativity and curiosity by leaving "holes to fill" and providing as many possibilities as possible for manipulating images and concepts. She feels that "learning is not a game, it's a quest." Her work, although complex, is amusing and easy to use.

The dominant commercial mode of production for CD-ROM's is generally a "choice" system utilizing standard branching structures activated by a limited menu of predetermined options (like those used for electronic ATM banking operations). Other examples are as a CD-ROM book where the "reader" "chooses" between different roles for the characters or as in an encyclopedia with regard to which aspect of information they wish to retrieve. Alternatives to this mode are most often explored by artists who are trying to invent new forms. Pluralistically, applications for the computer open out to important new avenues to art-making beyond rigid categories.

In *Media Band*, a CD-ROM music work, the users can control the parameters of both the music and the video. Scott Rundgren has created an interactive music work in which viewer/listeners make changes in parts of the music.

The Most Advanced Form of Interactivity Is Hypermedia: Virtual Reality

Most artists attracted to work with virtual reality[29] as a medium want to create imaginative interactive environments where they can control all the objects or all the spatial coordinates and sound in order to achieve an aesthetic effect. Powerful computers are used to generate visual experience and to track body movements through the use of prosthetic devices such as data gloves, head-mounted displays and body suits which encase the body in fiber-optic cabling. Fully immersed in a completely controlled artificial environment, the visual, aural, and tactile capabilities of the body become totally absorbed in following three-dimensional representations which are continuously modelled and tracked through computer monitoring of the body's every movement. Participants experience environments which seem to be located in three dimensional real space. The effect is that of a technological invasion of the body's senses and a relocation of what can be seen and experienced to the realm of a synthetic private world severed from other potential observers. Jeffrey Shaw, artist-director of the Center for Media in Karlsruhe, Germany, describes it:

> "Now with the mechanisms of the new digital technologies, the artwork can become itself a simulation of reality, an immaterial 'cyberspace' which we can literally enter. Here the viewer is no longer consumer in a mausoleum of objects, rather he/she is traveler and discoverer in a latent space of audio visual information. In this temporal dimension the interactive artwork is each time re-structured and re-created by the activity of the viewers."

Figure 125. Perry Hoberman, *Bar Code Hotel*, 1994. Interactive environment. *Bar Code Hotel* participants receive 3-D glasses before positioning themselves behind long tables plastered with the familiar black and white bar codes which are such an unpleasant fact of contemporary life. By running a light pen over one of them, viewers find that the ugly black and white bars can be energized digitally to release the most wondrous colorful shapes which are shown as large wall projections. Some of the bar codes release every which way the word "jump" or "flee" and with those, the viewer can send the fantastic objects—a rolling spiral, a lightbulb surrounded by pulsating globes, a strange porcupine sphere. Other commands include ones which make the whole room grow smaller or larger, turn 360 degrees or change color completely. The *Bar Code* turns out to be the means for inhabiting an exotic virtual world. (*Courtesy Perry Hoberman*)

A small band of artists[30] in Europe and North America are challenging the potential of virtual reality by exploring it as an imaginary space. Some project their "virtual images" in space; some employ head-gear connected to sensing devices which control the flow and placement of images within the space. There are no guidelines for these new kinds of work—no vocabulary, no blueprints, because the medium, not in existence until very recently, has been approached by relatively few artists to create new works. It is a wide-open medium without boundaries. There is little, critical writing about its use.

Brenda Laurel, Perry Hoberman, and Tony Dove were all invited in the period 1993–1994 to create works produced through a one-of-a-kind artist-centered high-tech program at the Banff Center for the Arts supported by the Canadian government, where costly, complex equipment exists with an unusually knowledgeable staff necessary to build and operate it. The works are experimental, like upper echelon scientific research, because of the specialized environment, and are not likely to be widely seen in the near future. The artists

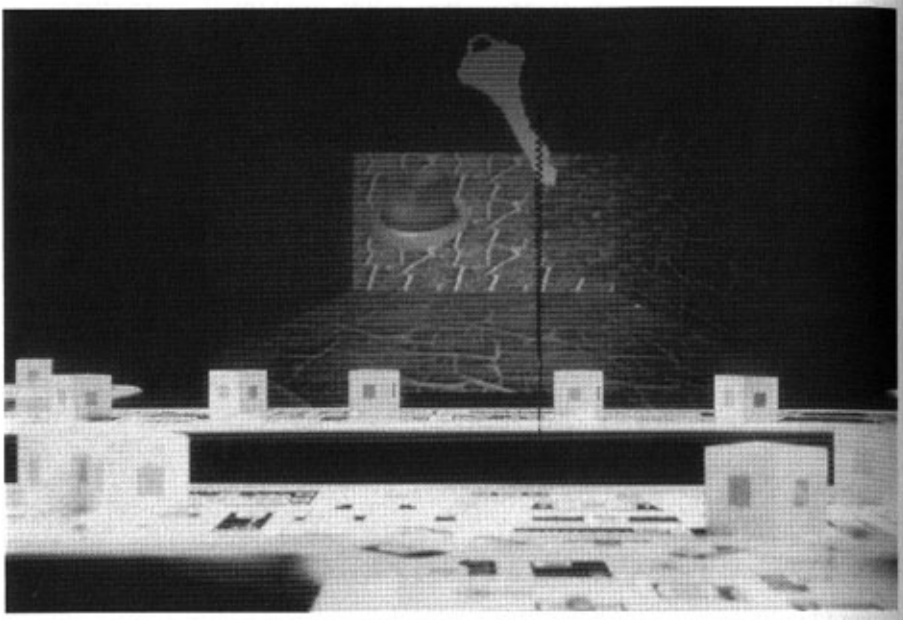


Figure 126. Perry Hoberman, *Bar Code Hotel*, 1994 Interactive environment.

were invited to produce their works in a structure that became lab-like in its devotion to finding solutions to problems presented by the artists.

Artist Brenda Laurel is drawn to VR because she believes that adults, unlike children, need a certain anonymity or ability to change hats to mask out reality in order to play. They need enhanced props and tend to like the electronic "smart costumes" they must wear in order to explore the interesting dramatic potential of the immersive narrative environments she creates. She believes in a mixture of freedom and constraint in her work. She calls VR costumes "prosthesis for the imagination." Laurel observes that "the relationship between human and machine has ceased to be purely technical and has entered the ancient realm of theater."[31]

On entering the exhibition space of Laurel's "Placeholder," participants find themselves in an environment featuring two ten foot circles surrounded by river rocks. On donning the headmount display, participants first experience darkness and then find themselves located inside a "virtual" cave where creatures—a spider, a crow, a snake, and a fish—talk, and seem to entice the visitor toward their locations as petroglyphs on the cave wall. On approaching each, the participants "become" the creature, assuming its physical features, and experience spatialized distortion of their own voice through the HMD speakers. A character called "The Goddess" offers advice, although her voice, unlike the other sounds, is not spatialized.

To create the work, Laurel collaborated with Rachel Strickland. They shot video footage near Banff National Park of a natural cave, a waterfall, a sulphur hot spring, and a fantastic rock formation. They digitized their images, added high quality spatialized sound, and created simplified character animation of the creatures.

Although sophisticated VR simulation technology was developed by the military during the Cold War, it was directed solely at the concept of a sedentary operator following the movement of a vehicle through a 3-D virtual world. Myron Kreuger, one of the artists who pioneered VR, comments that it is artists who have pushed farther in the imaginary uses of the medium.

> The sense that virtual reality was of fundamental importance came from artists who communicated it immediately to the public through their work. In addition, many aspects of virtual reality including full-body participation, the idea of a shared telecommunication space, multi-sensory feedback, third-person participation, unencumbered approaches and the data glove all came from the arts, not from the technical community.[32]

In Perry Hoberman's *Bar Code Hotel* viewers see objects within real space juxtaposed against 3-D representations of virtual objects projected in a virtual space. The virtual ones can be controlled interactively by the participants acting from

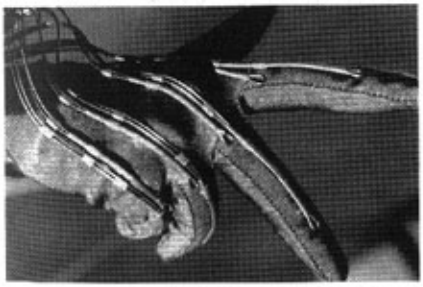


Figure 127. *Virtual Reality Gloves*, ca. 1994.

Figure 128. *Virtual Reality Headset*, ca. 1994. These wired virtual reality sensor accoutrements contain the sensors which make visible to the viewer changes triggered by the body's movements within a specifically wired environment. (*Courtesy NASA*)

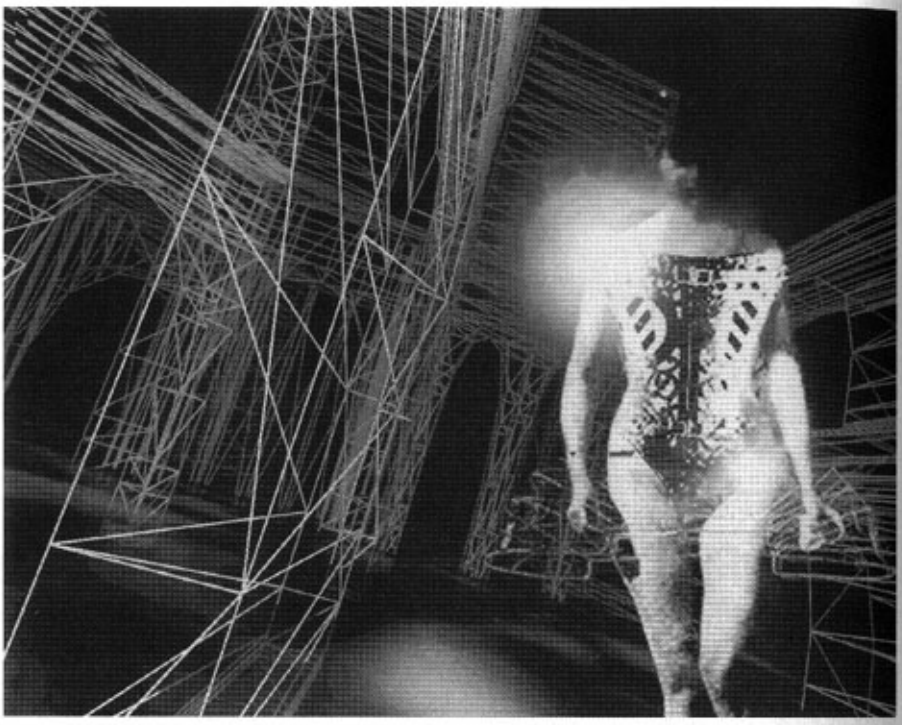


Figure 129. Toni Dove, *The Coroner's Dream* from *Archaeology of a Mother Tongue*, produced in collaboration with Michael MacKenzie, 1993. A virtual reality installation with interactive computer graphics, laserdisk video, and slides. Developed at the Banff Center for the Arts, Canada, this piece is an interactive narrative comprised of three navigable environments. The *Coroner's Dream* is the first section—a dream sequence in which the audience and/or interactive users are in the point of view of the dreamer. Segments of spoken text and sound are attached to sections of the architecture and are triggered by touching animated figures that follow narrative paths.

their position in the real space. Hoberman believes that there should be a "one-to-one predictable relationship between a user's action and a system's response. It should work like a light switch. . . . With interactivity, it's better to have nothing to say than to try to say something. It's better for meaning to come out of the interaction rather than controlling the experience."[33] This model is favored by many contemporary artists over older ones based on choice modes or interactive narratives. Hoberman feels that the best scenario for interaction is not a model that interrupts the action by offering choice and interactive stories, but rather one that initiates action in a program structure which is totally responsive.

When interactive technology is combined with three-dimensional virtual reality modeling, the viewer can be projected and immersed into the narrative space itself, far from the confines of the computer or film screen—more like an environmental theater. Experimenting with collaborator Michael McKenzie at

Banff's Art and Virtual Environments program, multimedia artist Toni Dove[34] created *Archaeology of a Mother Tongue* in 1994, which involved a theater-sized rear-projection screen with interactive computer graphics, video and 3D scrims for animated slide projections. In an article published in *Leonardo* she writes about her experience as an artist in creating an interactive Virtual Reality Immersion environment.

> I approached the concept of interactivity with some resistance, wondering why I should replace intellectual challenge with multiple choice . . . I saw it as more of an extension of the passive television metaphor than an engagement with options that have substantial ramifications. What I discovered was a world of possibilities that I feel I have barely begun to explore.[35]

What she finally decided on was a system for producing a potentially vast number of nonlinear unpredictable responses based on her interest in the alternative concepts of immersion. Contrary to film, the experience offers a variety of entry points, a different, fuller sense of real-time passing, particularly when it is decided on by the viewer. For her, the potential of an immersive interactive environment was to create a work that is more fluid than linear, a multilayered structure which accessed text, both the written and the spoken, with visual elements and responsive sound. She describes the immersion experience as "a movie sprung free from the screen . . . In film, time passes with a cut. VR is continuous space." In virtual reality it is possible to have multiple streams of different media bombard the viewer in a "field of constantly changing experience."

One of her first decisions focused on choosing the best interface for presenting the work. It meant examining various response mechanisms such as whether to use a VR headset with liquid crystal display or data gloves. (Other tracking devices can also be added to the body through a headset fastened by cords to the control unit.) Because the forty-minute piece was too long to be seen comfortably in a VR headset, and because she was more interested in providing a more dimensional experience than that allowed by the headset, she decided on using the data glove as a more open type of interface. Once wearing the glove, the viewer was allowed to touch, move forward, or backward and was allowed to make choices. Guided by the glove's graphic icon, and by a Polheus tracking device, contained within a toy camera, which allowed observation within graphic space, the viewer became the "driver."

> The driver—a combination performer and camera operator who navigates through the adventure for the audience. This mode of presentation had powerful theatrical aspects, but curtailed the experiential possibilities for one person in a virtual space because of the constraints of entertaining an audience. It also kept the audience somewhat outside the interactive experience. For me, the most compelling aspect of this environment is the sense of being immersed in a narrative space.[36]

Working from the premises of a fractured fictional narrative, she takes her viewer through a dream sequence located in a wireframe architectural space. One of the characters, the Coroner, speaks aloud in the dream. The sound reverberates spatially with both local outposts and those attached to special locations within the piece.

Dove hopes to further the possibilities for integrating organic sound in her work such as breathing, or other body sounds as a way of suggesting the sensuality of a human or animal connection to that of a machine. She feels that using response interfaces based on touch rather than choice ones as a means for navigation could tap into different emotional responses.

Interactive Installation Environments

Other forms of interactivity extend beyond the computer monitor to include a room-sized venue as an interactive installation space. Here, various mechanisms of interactivity can be considered, depending on the artist's work. These could include sensing devices such as those for sound, movement, and temperature or those which focus on communications sensibilities, such as speech, touch, gesture. Questions most frequently asked by artists contemplating use of interactive media concern the loss of their usual control over a discrete work. How much control will the viewer have in directing the flow of the piece? How much can be altered or changed in the work? Will its intentions become diluted? At what point does it seem less interesting to artists if there is too much loss to the work's original intent or meaning? What kinds of new programming will evolve? Will they be able to develop modes of interaction which will offer more complexity and flexibility?

Lover's Leap by Miroslaw Rogala is an interactive installation environment in which shifts in the viewer's movements control a continuously evolving perspective. Produced at ZKM (Center for Media Art in Karlsruhe, Germany), Rogala's work comments on aspects of representation itself. His digitized images, (from a bridge intersection in Chicago and a satellite scene in Jamaica), are capable of being turned completely inside out, first showing a digitized fish-eye view taken with a conventional camera, skewed as the viewer moves through the piece (wearing a movement-sensitive helmet) to become a transposed digitally reformulated view from a 360 degree turnabout like a sock being turned inside out, only digitally. The images, projected at each end of a large room with high quality projectors, are impressive in scale and beauty.

Reflecting the intense desire of many artists to represent a reconnection between the organic human with the electronic digital sphere, Paul Sermon interrogates the gendering of electronic spaces in his video telepresence perfor-

mance *Telematic Dreaming*, (also produced at ZKM). The transmissions between two locations were via video monitors which allowed for communication between the viewer and a real-time interactive image of the artist. The image of the artist would stroke the viewer sitting or lying on a bed and the viewer could respond by also stroking. The work evokes a nostalgic re-enactment of sixties "love-ins," as experienced in the erotophobic nineties. Anxieties about AIDS make virtual sex the ultimate experience.

Access

In order to gain access to high-level equipment capable of modeling high-resolution animations of virtual models, artists must gain entrée to specialized centers through fellowships, grants, artist residencies such as at the Banff Center for the Arts in Canada; the American Film Institute's Advanced Technology Program in Los Angeles; the Center for Art and Media in Karlsruhe, Germany; and the Arizona State University Institute for the Arts. In Germany, Austria, and France, particularly where there has been a long tradition of support for the

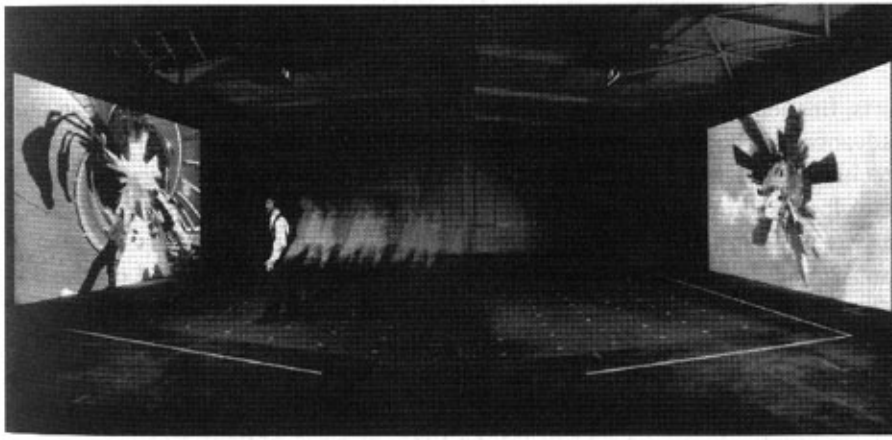
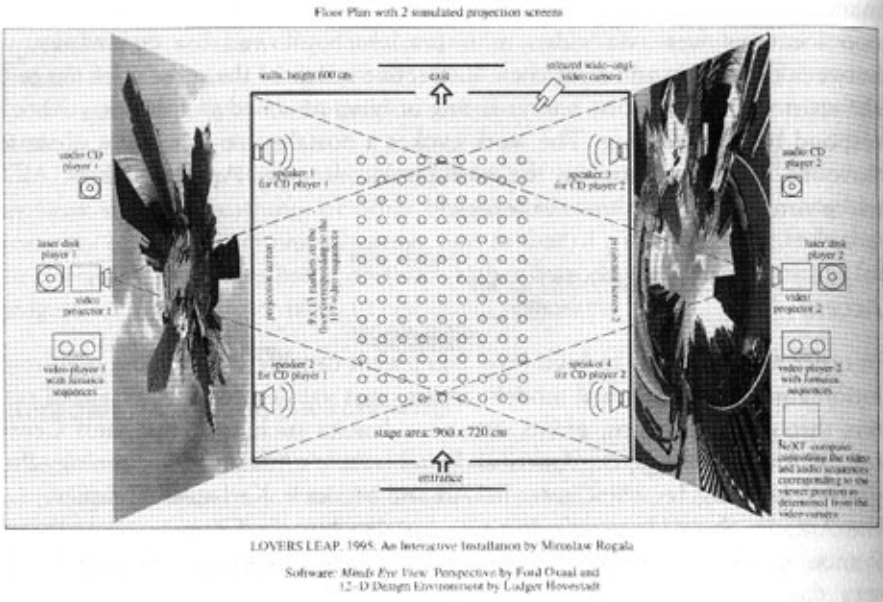


Figure 130. Miroslaw Rogala, *Lover's Leap*. 1995. A design environment produced in collaboration with Ludger Hovestadt. In Rogala's interactive installation, a collision takes place between emotion and technology. As in a leap of trust and faith, Rogala explores the totally untried frontiers of representation. He questions the very parameters of perspective by turning its space 360 degrees in upon itself through digital means. The installation consists of two synchronized screens displaying opposite perspectival views with four layers, each with a different set of photographic information. When the viewer enters the space, he or she is aware that their movements are changing what is seen. If the viewer keeps moving through the environment, a series of abrupt shifts is created—the same relationships from a dramatic new perspective—which leap over the lover/viewer. Once the viewer/lover stands still or exhausts the relationship, there will be a sudden thrust into a new landscape—a vista that is out of the viewer's control.



LOVERS LEAP. 1995. An Interactive Installation by Miroslaw Rogala

Software: *Mind's Eye View: Perspective* by Ford Oxaal and *3-D Design Environment* by Ludger Hovestadt

Figure 131. Miroslaw Rogala, *Lover's Leap*. 1995. Floor Plan with two simulated projection screens.

arts, financing of such centers has reached a significant level. One of the most advanced is the previously mentioned Center for Art and Media in Karlsruhe, a technology center for Germany. The center has thrived through an amalgam of city local industry, and state support. It is able to offer artist-in-residencies to artists to design and produce works with the help of programmers. Its plan for an Art and Technology Museum includes a design school modeled on the concept of the Bauhaus—a meeting ground for art, technology, and industry. The museum houses an art and technology collection but acts primarily as a site for exhibiting new work, which tends to be a mixture of virtual reality, modeling, animation, and interactive installation. It publishes "artintact," a magazine about art and technology as a CD-ROM, and acts as an important meeting and production ground for artists from around the world (Chapter 7).

Recent advances in new computer chip development point to further miniaturization of equipment, adding to its lightness, its low cost, and its more sophisticated possibilities for integration with other electronic media. However, "state-of-the-art" pictures are created with the newest, most advanced large systems. Of all the electronic media we have been discussing, the computer most strongly represents the split between this "have" power group and the "have not" artists. This distinction raises a question which has long plagued artists using electronic media—whether the aesthetic cutting edge need be tied to high-tech innovation. Without a store of ideas and strength of conviction, the

artist can become subservient to technology and its high costs. Crucial to the independence of committed, technologically based artists is access to costly production and postproduction media technology. This is a major political and economic issue for those who need to innovate and thus take risks as they rethink existing artistic forms and invent new ones. Control and direction of the creative process is the artist's essential task. Artists will need resources as they seek to find forms "appropriate to the energy of our time."