Act/React

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nteractivity is the latest tool available to artists for their eternal recreation of the world through their visions and dreams. The world, of course, is a place with which we interact on a minute-by-minute basis. We hunt, we gather, we use tools, we move things hither and yon. We constantly change the environment we inhabit in order to make our lives better. Yet until recently artists could make only passive art. We look at paintings. We look at sculpture. We read books. We watch plays. Art plays, cudgels, or seduces us with an invented reality. We do not change passive art, though it certainly, at its best, changes us.

This essay examines the evolution of interactive installation art and, more specifically, charts the changing interface and its influence on the interactive experience. A similar great change occurred in the visual arts in the early nineteenth century, when the pioneering technology of photography created a crisis in the visual arts. H. W. Janson succinctly described the situation: "The 'pencil of nature' had vindicated the objective truth of Renaissance perspective, but it established a standard of representational accuracy that no hand-made image could hope to rival. Painting needed to be rescued from competition with the camera."[1] Impressionism, cubism, and abstract expressionism are all manifestations of this representational dilemma. How can artistic talent possibly compete with technology? (The alarm, of course, ignored the quiet history of pre-photographic imaging tools—such as the *camera obscura*— that artists had used for centuries.) The invention of photography raised an additional question that persisted throughout the twentieth century: Did making a photograph with a machine require a talent that raised the image to

interactive artist and the viewer/user must work together to create the aesthetic experience, mediated by the art itself. It comes down to a simple verbal distinction: With non-interactive art we are, with interactive art we *do*. While interactive artists may cede some control, it is they who create the world, the rules, and the aesthetic environment that the viewers/users must navigate in order to define their experience. To put a theological spin on it, in a linear art form, the artist operates like a medieval God, creating a deterministic world in which the receiver's route is ordained. In interactive art, the artist can give the visitor free will, the freedom to explore a world of the artist's imagination, and to find (or miss) all the wonders that might lie within it.

Interactive installation art has its origins in video art, which emerged in the early 1960s. In 1963, in Wuppertal, Germany, the thirty-year-old Korean-born Nam June Paik first exhibited, as art, television sets with images modified by electronic means.[6] Paik had traveled to Germany to study music with avant-garde composer Karlheinz Stockhausen, and there made the pivotal acquaintance of John Cage, the famously radical American composer. In his first solo show at the Galerie Parnass in Wuppertal, *Exposition of Music—Electronic Television*, Paik paid homage to Cage's *Imaginary Landscape No. 4* (1951), in which twelve radios are "played" by two musicians according to a score (one performer changes the station and the other the volume). In Paik's presentation, the pictures of twelve

television sets could be scrambled by sine wave and audio interference.

After the transport from Bensberg-Refrath to Wuppertal, however, two of the televisions suddenly appeared to be defective. One of the two . . . Paik simply placed . . . with the screen facing the floor. On the other television, the picture was reduced to a horizontal line. This inspired Paik to turn the television 180 degrees and call it Zen for TV.[7]

Thus, video art was born. A short time later, with Cage's encouragement, Paik moved to New York. At that time, and indeed for the first two decades of its existence, television was known as the "great wasteland." In his book *Seven Glorious Days, Seven Fun-filled Nights* (1968), Charles Sopkin described television as "dreadful, make no mistake about that. If I did not convey that feeling throughout this book, then I have failed rather badly. I naively expected that the ratio would run three to one in favor of trash. It turned out to be closer to a hundred to one."[8] Anomalous bursts of creativity, such as the work of Ernie Kovacs, occasionally surfaced, but the vast majority of broadcast television was an impoverished, commercially driven reflection of the culture. Though the medium transformed contemporary life, becoming the most powerful form of communication in the world, television initially remained off-limits to the imagination of artists. But when small portable video equipment, primarily the Portapak by Sony, became available in 1967, artists gained access to the defining medium of their time. They could create an instant recording of what they observed or performed. Self-performance was an important early genre in video art. Video artists using small-format equipment could enact and perfect in their studios a performance that no one would ever see in the flesh.

Video also afforded a sense of intimacy usually not realizable in film. In the hands of artists like Vito Acconci and Bruce Nauman, who literally

turned the camera on themselves in fabricated situations (Acconci) or in their studio (Nauman, Howard Fried), video became an extension of the artistic gesture so long associated with painting, and especially with the Abstract Expressionist, who had emphasized the physical act of painting itself. With video, the artist's gesture could be recorded and his or her body could be observed in the act of creation.[9]

The history of video art and then digital interactive art traces the development of technological tools. As companies developed new devices for inputting, manipulating, and outputting data, artists found new structures for their work, as well as new meanings and metaphors. An early example is the television monitor, which prior to the video projector was the only display option for video art. This piece of furniture, present in every living room, was the porthole though which the artist's vision was revealed. Some went to great lengths to hide the monitor and suppress its domestic associations. Shigeko Kubota's *Duchampiana: Nude Descending a Staircase* (1976), an homage to Duchamp, features four 13-inch monitors inserted into the risers of a plywood staircase. Electronically modified videotape showing a nude woman walking down Kubota's stairs is looped every three minutes. Dan Reeves, in his 1993 installation *Eingang/The Way In*, hid the monitors completely, burying them face-up within seven tree stumps, beneath a layer of water and rice. Others celebrate the monitor: Paik piled them on top of one another to build walls and floors of video light. His *Tricolor Video* (1982) is comprised of 384 monitors installed screen-up on the floor, and covered an entire gallery of the Centre Pompidou in Paris.

The Portapak was not the only camera that suddenly became accessible to artists. A number of practitioners took advantage of inexpensive new closed-circuit cameras to create the first truly interactive installations. Besides being cheap and readily available, these cameras raised provocative metaphorical questions concerning surveillance and privacy: Who is watching whom? Bruce Nauman in his *Performance Corridor* (1969; fig. 1) used closed-circuit video to shock. At the end of a long, narrow passage between two walls, scarcely wide enough to pass through, the participant can see two television monitors, one on top of the other. The only way you can get a close look at them is by squeezing through the corridor far enough to realize that they show live surveillance footage of your efforts, shot from different angles. Having voluntarily entered into a physical relation with the work, you are psychologically, even viscerally, assaulted by the realization that you are its subject. As video critic Michael Rush has remarked:

American critic Margaret Morse wrote at the time, "To me it was as if my body had come unglued from my own image, as if the ground of my orientation were pulled out from under me," while New York critic Peter Schjeldahl called it "ruthless" and "somber." Nauman's work took inspiration from the confined worlds created by playwright Samuel Beckett (1906–89), who, in many works like Endgame and Not I to Worstward Ho, placed anonymous characters in desolate surroundings.[10]
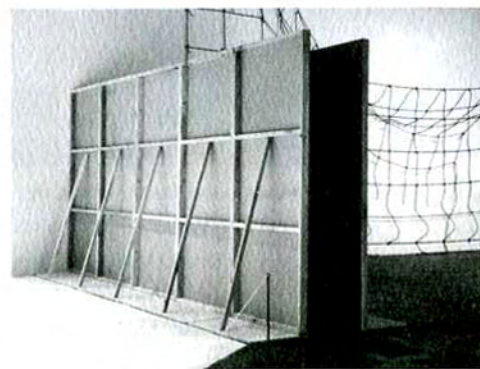

FIG. 1 Bruce Nauman, *Performance Corridor*, 1969

Another famous instance of the use of surveillance cameras during this period was Frank Gillette and Ira Schneider's *Wipe Cycle* (1969; fig. 2), which mixes television broadcasts, video recently recorded by cameras in the gallery, and a live video feed in a constantly shifting collage on nine monitors. Media arts theorist Gene Youngblood described the work at the time:

> These were displayed through alternations of four programmed pulse signals every two, four, eight, and sixteen seconds. Separately, each of the cycles acted as a layer of video information, while all four levels in concert determined the overall composition of the work at any given moment.

> "The most important function of Wipe Cycle," Schneider explained, "was to integrate the audience into the information. It was a live feedback system which enabled the viewer standing within its environment to see himself not only now in time and space, but also eight seconds ago and sixteen seconds ago. In addition he saw standard broadcast images alternating with his own delayed/live image. And also two collage-type programmed tapes, ranging from a Closed-Circuit Television and Teledynamic Environments 343 shot of the earth, to outer space, to cows grazing, and a 'skin flick' bathtub scene. . . . Thus in Wipe Cycle several levels of time and space were synthesized into one audio-visual experience on many simultaneous frequencies of perception. What is, what has been, and what could be, were merged into one engrossing teledynamic continuum and the process of communication was brought into focus."[11]

Because of the tape delay in *Wipe Cycle*, the shock of seeing yourself in the work is especially disconcerting. Is that you now or you a few minutes ago? Other artists, notably Peter Campus and Les Levine, also inserted the viewer within the work through the device of closed-
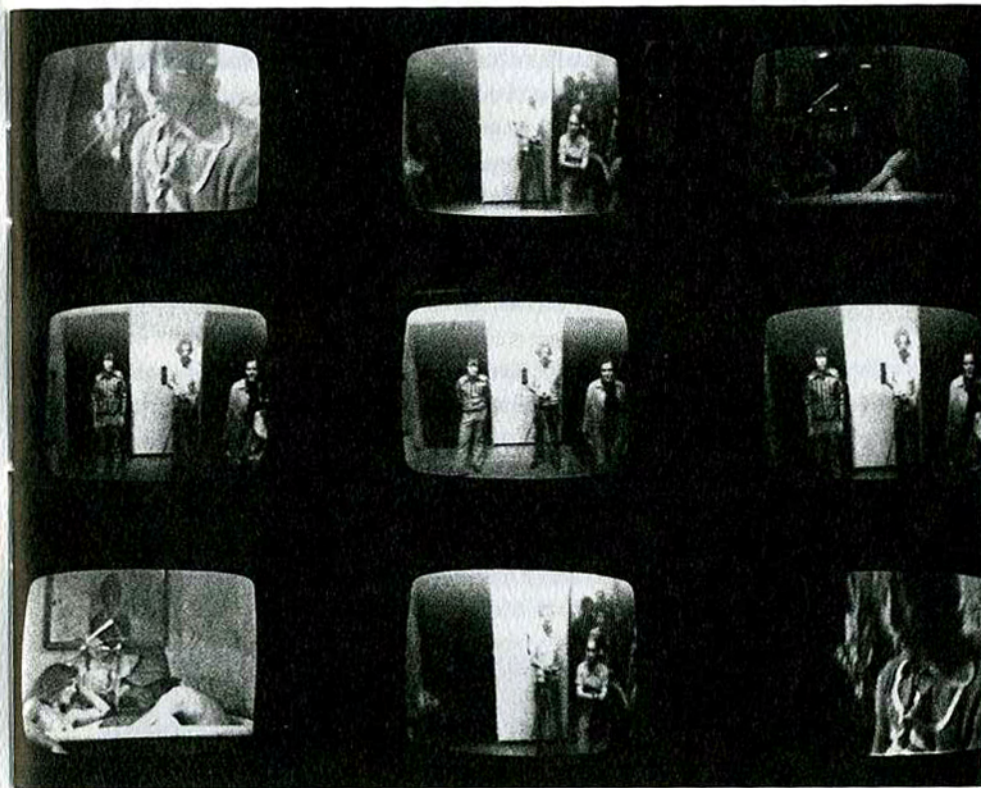

FIG. 2 Frank Gillette and Ira Schneider, *Wipe Cycle*, 1969

circuit television. The art you were seeing could exist only with you in it, at that moment. When you left, it turned into something else. Perhaps the last word on this idea is Nam June Paik's *TV Buddha* (1974; fig. 3), in which an antique Buddha statue faces a television monitor showing the live feed from a video camera trained on the figure itself. As you walk behind the knee-high installation, you can see your own pants legs, but you do not thereby enter the work as a subject. The point is that the Buddha contemplates his own image forever in a perfect feedback loop of spirituality. The eternal now is made manifest by the video signal.

In the case of video, twenty years of technological invention elapsed before devices were small and cheap enough for artists' use. The computer, however, showed signs of its creative potential relatively quickly. The reason is likely that while television was under the control of corporations with rigid rules of conduct, mainframe computers initially belonged to research and educational institutions, which allowed for a sense of play to emerge.
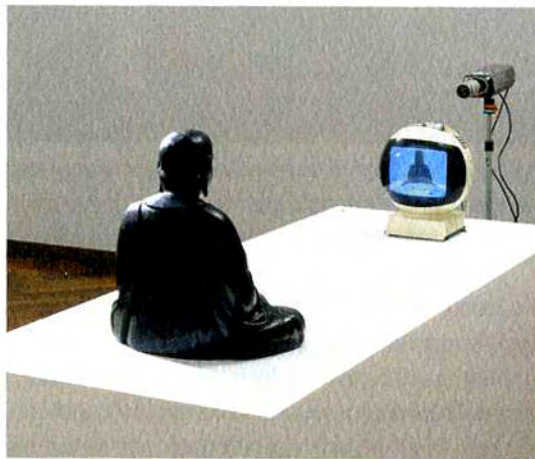

FIG. 3 Nam June Paik, *TV Buddha*, 1974

The first video game was made on a mainframe computer in 1958 at the Brookhaven National Laboratory, a U.S. nuclear research lab in New York State. William A. Higinbotham designed a rudimentary version of what would later be called Pong. Tennis for Two was played with two controllers, each with a dial and button. Despite the small size of the display—a 5-inch oscilloscope screen—the game was a big hit at the Brookhaven open house. Subsequent advances led to Spacewar!, created by students at the Massachusetts Institute of Technology in 1962, which introduced the joystick as its interface, and the text-based Adventure, created by Willie Crowther at Bolt, Beranek and Newman, and Don Woods at the Stanford Artificial Intelligence Lab at Stanford University. Interactivity and the computer were launched through play.

The early examples of interactivity were limited to simple animations and text-based literary games, and called for computer screens, keyboards, and joysticks. Myron Krueger developed the first interactive environment. He began his research in 1969, and by 1974 had developed *VIDEOPLACE* (see fig. 1, p. 39), a complex, room-sized installation in which viewers' outlines are recorded by a video camera and run into a computer. The computer then projects virtual objects along with the visitors' silhouettes onto a large screen. The viewers' movements are replicated in those of their projected images, and they can thereby play with the objects/images on the screen. As Söke Dinkla explained:

> In Videoplace *there are a number of different interactions, in which Krueger subverts the rules of narcissistic self-reflection and self-control of the traditional video closed-circuit and lets the user play with constantly changing versions of themselves. In the most famous interaction called Critter a green figure appears on the screen and tries to make contact with the visitor. It steers towards an exposed part of the visitor's body and lands there. Then Critter begins to climb up the arm,*

shoulder and neck until it reaches the highest point of the head. Once there, it performs a joyful dance. Since Critter is programmed to reach the highest point of the visitor's outline, the aim of the players is to outwit Critter, that is, to subvert the program and develop their own rules. Thus, the interactions of Videoplace *are not only a joyful game but are also concerned with the probing of power distribution between user and system.*[12]

What was phenomenal about *VIDEOPLACE* was that there was no other interface—no keyboard, no joystick. There were over fifty interactions besides *CRITTER*, including *FINGER PAINTING*, *DIGITAL DRAWING*, and *BODY SURFACING*. *VIDEOPLACE* was fun—like being inside a room-size arcade game—simple to use, and easy to understand. But as the space itself was the interface, it could only be acted on and viewed by one or two people at a time.

Many forms of digital interactivity emerged over the years. Video/computer games became ubiquitous in arcades and private homes. On the personal computer, in addition to games, the text-based Internet and its graphic progeny, the World Wide Web, exploded with hyperlinks, images, Flash, and sound. The home computer was at first the realm of the geeky and the young, as the learning curve was high. Virtual Reality and its proponents made promises of a brave new world where three-dimensional avatars inhabited virtual buildings, had virtual adventures, and engaged in virtual sex. However, the VR equipment was prohibitively expensive and generally confined to research laboratories; most people's awareness was gained from *Time* magazine. All these digital interactive experiences involved background knowledge of the process and a highly technical interface. In order to be experienced by an art-going public, interactive installation art had to succeed in museum spaces. This audience might not be technologically savvy and their attention span might not allow for the absorption of complicated operating instructions.

The development of interactive installations in part responded to the quest for an interactive cinema. Could audience choice affect the outcome of cinematic experience as it did with hyperlinked text and early computer graphic simulations? A very early experiment in film premiered at the 1967 Montreal Expo, where Czechoslovakian filmmaker Radúz Çinçera showed what he called a *Kinoautomat*, or vending-machine movie. The theater seat arms were equipped with two buttons. At various points, the two leading actors emerged onstage to ask members of the audience which of two events should happen next. They responded by pressing the button of their choice. As Rudolf Frieling described it:

> *The film,* One Man and His Jury, *told the story of an "average apartment house," with turbulent goings-on between tenants. In one scene, a young woman slams her door shut after checking to see who rang her doorbell. Since she was in the shower, nothing covers her body except a towel. In her panic she rings her neighbor's door and asks for help. Here the film is stopped. The audience is asked whether the neighbor should let her in or not. In almost every case the majority of the viewers answered yes. Only once, at the Expo, did the viewers vote no—when the scene involved a large group of nuns.*[13]

The story line did not truly ramify. At every decisive moment, no matter what the audience chose, the scene played out in such a way that the

next pair of choices was always the same. Two projectors ran simultaneously, with a lens cap replaced on one or the other at each pivotal point. This way Çinçera could shoot double the amount of film footage and no more.

The first technology to fully exploit video interactivity was the laserdisc player. From 1979 to 1982, Lynn Hershman Leeson produced *Lorna* (fig. 4), the first interactive videodisc made by an artist. Within a recreation of a cheesy apartment, a television shows a similar apartment inhabited by Lorna, an agoraphobic woman obsessed with her television. By controlling the laserdisc with a device similar to Lorna's remote, the viewer can navigate the branching paths of a story that might lead to her committing suicide, conquering her agoraphobia by leaving the apartment, or shooting the television. The resemblance of the real and depicted control devices create an immediate empathy with the character. Objects in her room are numbered, and when the viewer inputs the numbers into the device the story jumps to one of thirty-two chapters about Lorna's present life, her history, and her psychological state. Leeson has remarked: "Lorna's passivity (presumably caused by being controlled by the media) is in counterpoint to the direct action of the viewer. As the branching path is deconstructed, players become aware of the subtle yet powerful effects of fear caused by the media, and my hope is that they become more empowered (active) through this perception."[14] The interface of the artwork/game allows one viewer at a time to make these empowering choices.

Another important laserdisc artwork exploring the potential of interactive cinema is Roberta Friedman and Grahame Weinbren's *The Erl King* (1983–86). The piece retells Johann Wolfgang von Goethe's poem "Der Erlkönig," and associates its content with Sigmund Freud's famous "dream of the burning child" recorded in his *Interpretation of Dreams* (1900). *Erl King* comprises a small touch-screen monitor, at the time a new technology

for interactivity, and a number of laserdisc players. One viewer sits in front of the touchscreen while others can observe the results on another. There is no keyboard, no menu, and no instructions. Jeff Rothenberg described the piece:

> The backbone of the work consists of a video presentation of a filmed 1983 performance by soprano Elizabeth Arnold (accompanied by pianist Dean Johnson) of the Schubert lied [inspired by Goethe's poem]. However, if the user touches the screen, this output is modified in various ways. For example, a touch may cause video or still images of New York City street scenes to be displayed while the Schubert continues to play on the audio track, or the display may continue to show the performance of the lied while the audio track delivers bagpipe music or alternative narrative (for example, the Freudian dream analysis). In other cases both video and audio may change at the same time, multiple video images may be superimposed, or text may appear on the screen, overlaying the video imagery. These interactive responses are controlled by a computer program that was designed by the artists and written by a small programming team. [15]

Weinbren's conception of an interactive cinema gave the viewer control over the sound and image in a way that traditionally had been reserved for the film editor. The interface of the touchscreen color monitor reflected the growing importance of non-linear computer-based video editing systems, such as the early CMX 600, first introduced in 1971. As Weinbren explained:

> A standard linear unit of cinema has an A-B-A structure: e.g., the Kuleshov point-of-view cutaway, the shot-reverse-shot of a dialogue scene, or the performer-audience-performer of the Musical. This atomic structure defines continuity of time and space in the cinema. The equivalent in my interactive cinema is formed by a sequence in which the middle term is produced by an action of the viewer. If the viewer does not act, the first shot continues. But on action by the spectator the B-shot appears, then, after an appropriate period, the A-shot reappears, perhaps transformed by the interspersed shot, perhaps unchanged. . . . Because the new image or scene was produced, i.e., brought on screen, by the viewer, he is forced into connecting to the image it replaces—an act of association, rather than spatio-temporal suturing. [16]

Again, control of the artwork was limited by this interface to a single operator.

At this time, the video projector, until then a prohibitively expensive technology, became affordable for artists and changed the face of interactive video art installations. With the projector, the installation could become an immersive environment. Unlike the monitor, which, however well disguised remained a piece of furniture in the gallery, the projected image made the entire room into art, as in the video art of Bill Viola and, later, Pipilotti Rist. The projector's immersive capability enabled interactive artists to create virtual stage sets and otherworldly media orbs for the viewer to experience.

In their exploration of interactive cinema, some artists offered roles to the user other than that of editor. Jeffrey Shaw, an Australian working in Germany, produced a series of works in which the participant functions as cinematographer. One of his best-known works includes a video projector and

perhaps the most curious single-user interface yet—a stationary bicycle. Tending to be technical in nature, interfaces demand mastery by the viewer before he or she can interact with the art. But anyone who has ridden a bicycle can explore Shaw's *The Legible City* (1989; fig. 5), in which the conveyance is positioned in front of a large projected image of what appears to be a city street. The buildings of these cities, however, are formed by letters. Mounted just in front of the handlebars, a small monitor displays a map that traces the participant's "movement." A computer is wired to the handlebars and pedals, and as one operates the bicycle, one travels through the virtual city just as one would through a real one. Shaw developed three cities, modeled on Manhattan (1989), Amsterdam
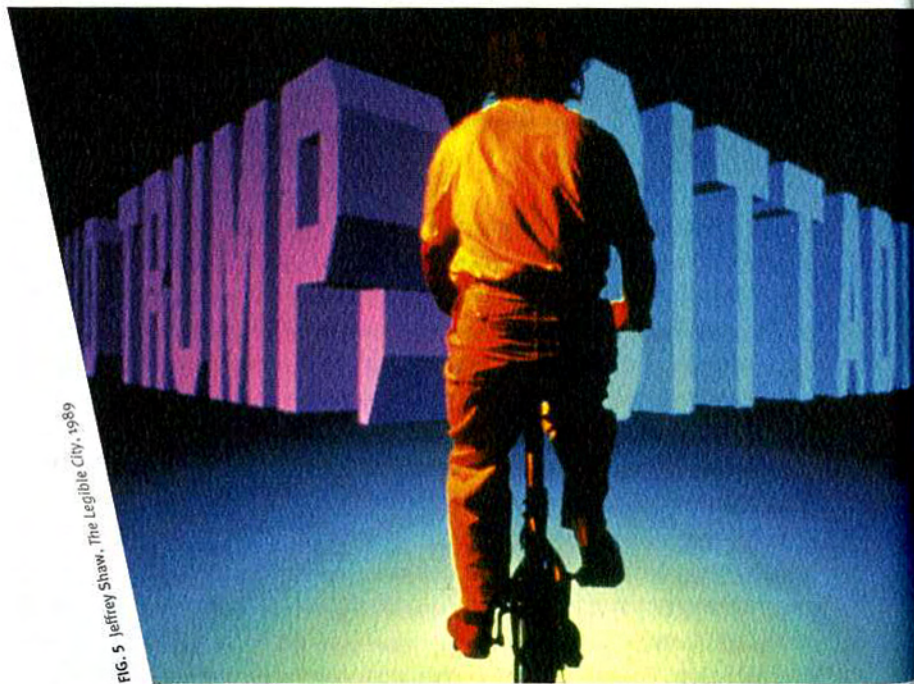

FIG. 5 Jeffrey Shaw, *The Legible City*, 1989

(1990), and Karlsruhe (1991). By bicycling through the virtual streets following the map, the user can read the texts that the letters spell out. The experience produces the equivalent of a long tracking shot in a movie, controlled by the viewer. The text itself is not so significant: Manhattan is composed of fictional monologues by Ed Koch, Frank Lloyd Wright, Donald Trump, and others. Amsterdam and Karlsruhe's "buildings" describe various historical events in Dutch and German.[17] What is compelling is the metaphor of a city built of stories and language, and the invitation to physically explore it block-by-block and street-by-street.

Shaw examined the cinematic participation of the viewer further in *Place – a user's manual* (1995; fig. 6). The participant—and again there could be only one—stands on a raised platform surrounded by a huge 360-degree panoramic screen. Others can come along for the "ride," watching from inside or outside the circle as the active visitor manipulates a video camera that controls the projection. As only 120 degrees of the image can be seen at a time, to view the entire 360 degrees the user has to rotate and zoom the camera. The space within the image is a combination of virtual and real landscape photographs. Manipulating the camera, the viewer can travel through the virtual landscape to circles of panoramic photographs from Australia, Japan, Bali, Germany, and elsewhere. Sound and text play a part in the discovery of this grand expanse. In *Place – a user's manual*, the video camera
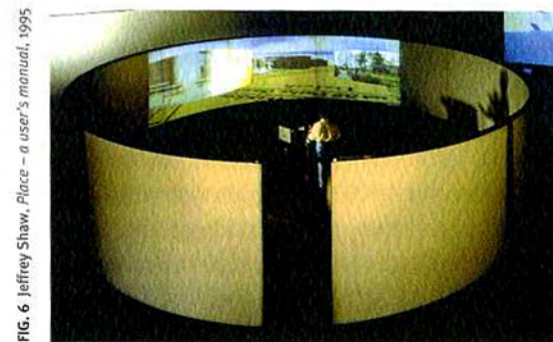

FIG. 6 Jeffrey Shaw, *Place – a user's manual*, 1995

is both the actual interface of the experience and a metaphor for the role of the viewer as cinematographer. By the time Shaw made the piece, he could assume that the VHS video camera was a customary part of the audience's life experience and that most, if not all, would understand intuitively how to engage with the work.

Montreal artist Luc Courchesne casts viewers in the role of actors whose choices mobilize and modify the script. For his works he writes branching story lines and then videotapes actors reading all script possibilities. The interface is a simple controller with which the viewer can choose between two or three responses or questions put up on the screen at the story's branching points. Although Courchesne's questions and answers might not be what the viewer is really interested in at the moment, the effect is surprisingly natural. One is simply having a conversation, as one might with strangers, asking questions and getting to know them better. In his first conversational works, *Portrait One* (1990) and *Family Portrait* (1993), Courchesne furthers the illusion by reflecting individuals' images from the monitor onto a large vertical sheet of glass, suggesting that the viewers and virtual characters occupy the same space.
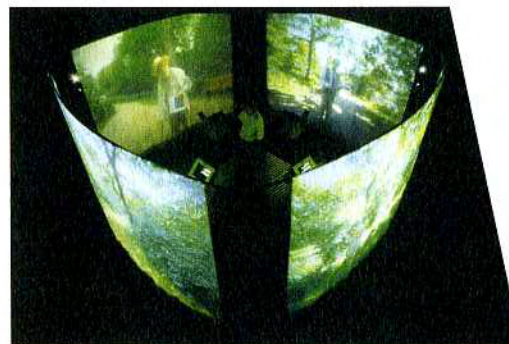
Courchesne's masterpiece is a four-wall rear projection, *Landscape One* (1997; fig. 7). Using four projectors, he situates the viewer within a 360-degree panoramic view of a park in Montreal on a summer's day. Various people pass through the park—a jogger and his dog, young lovers on bicycles, a family on a picnic—and the visitor can engage all of them in conversation and even limited action, such as throwing a ball for the dog to retrieve. Each choice the viewer makes from a menu of questions or comments provokes a reaction or response that leads the story in a new direction.[18] The variable outcomes of each encounter take the participant to different parts of the park. The space contains four interaction stations and accommodates about a dozen audience members, permitting several to drive the story line at any one time.

By the 1990s, while some artists were imposing interactivity on the linear form of cinema, this was not the only inspiration for gallery installations. The interactivity of humans with the real world also stimulated interest. The new communicative medium of the World Wide Web enticingly created a potential audience of thousands. Ken Goldberg's *The Telegarden* (1995), which combined a real-world garden with machines within a gallery space, was operated by online viewers. For seven years, first in California and then in Linz, Austria, through a complex interface the tiny ecosystem could be tended, watered, and even planted by a community of Web-savvy tele-gardeners from around the world.
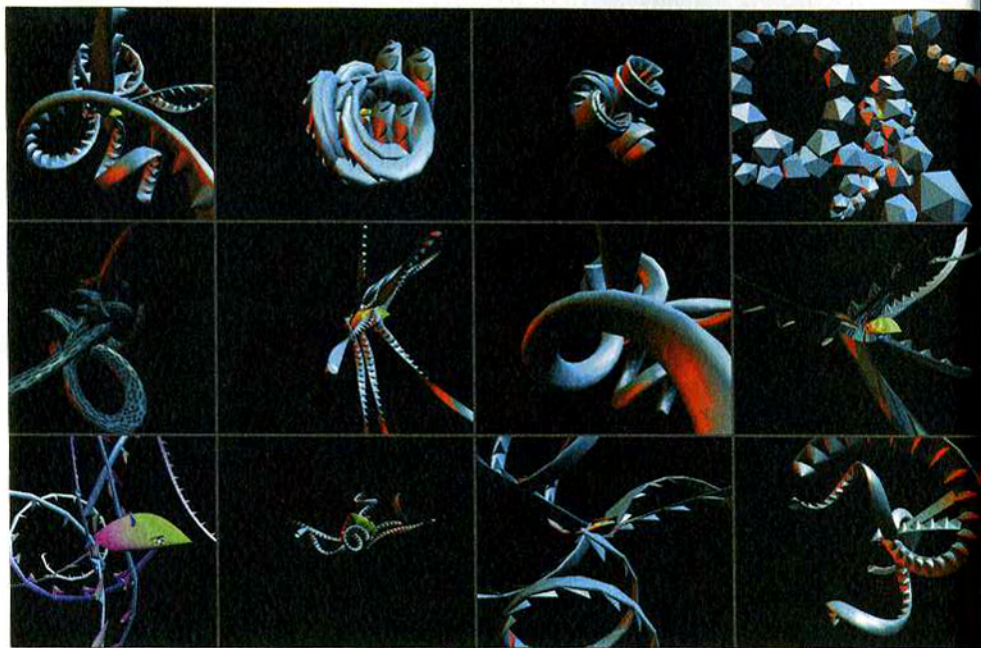
FIG. 8 Karl Sims, *Galápagos*, 1997 (monitor images)

Another real-life interactive system that attracted the attention of artists was the process and structure of evolutionary genetics. Karl Sims's installation *Galápagos* (1997; fig. 8) is composed of twelve monitors arranged on pedestals in a semi-circle, each with a footpad on the floor in front of it. Each screen shows a three-dimensional creature generated by a mathematical equation. The viewer is expected to "choose" one by stepping up to its monitor, and those not chosen fade from the other screens. At the beginning of the program, the creatures are very simple in shape and color, with lifelike characteristics such as articulated body parts and the ability to move. Once one is selected, a group of small bubbles radiate from it to the blank screens from which the other creatures have been removed. From these seeds a second generation grows, bearing characteristics derived from their parent. But they are not identical; the computer introduces random mutations to the equation (the genotype) that formed the parent creature, some of which produce minimal changes while others create obviously different offspring, which may display a unique color or shape or movement. As the viewer again chooses, stepping on a different footpad, the generations of creatures not only change form, but, as Darwin predicted, quickly become highly complex. Since the interface is so simple, just a single step, collaboration can lead to sexual reproduction. That is, two viewers stepping on two footpads can create a new generation that mixes the genes of the two sibling parents. The computer and viewers are now engaged in a dance as old as life. The computer is performing the necessary random mutations within the gene pool while the viewer is acting as natural selection, choosing (perhaps for aesthetic reasons) which organism will survive and reproduce. The results are beautiful and otherworldly. Some are recognizably lifelike, as if Dale Chihuly glass anemones were suddenly to spring to life, growing and breathing. Others are more crystalline, with faceted shapes and grasping metallic appendages. Two truths become clear: The creatures that the viewer creates have never existed before, and the process of selection generates beings with great

individual resonance. They are, after all, the viewer's creation, a collaboration between human and computer. Sims has created a remarkable allegory of the mechanism that four and a half billion years ago began the most complex design of all—life.

Another beautiful interactive work based on biology is A-Volve (1993–94; fig. 9) by Christa Sommerer and Laurent Mignonneau. A-Volve is a large pool filled with swimming digital creatures. Visitors can fabricate organisms by drawing shapes on a touchscreen monitor. The creature is immediately put into the pool. Its shape determines its capacities—can it move fast, is it large? As the artists note: "Behavior in space is, so to speak, an expression of form. Form is an expression of adaptation to the environment. Form and movement are closely connected; the creature's capability to move will decide its fitness in the pool. The fittest creature will survive longest and will be able to mate and reproduce. The creatures will compete by trying to get as much energy as possible. Thus predator creatures will hunt for prey creatures, trying to kill them."[19] Viewers can affect the evolutionary course by waving their hands over the

pool to catch, protect, or shoo away the creatures. As in Sims's Galápagos, the beings in the tank evolve, but here the pressures related to the survival of the fittest are operative. A-Volve is a virtual ecosystem in which artificial organisms hunt, eat (or starve), and reproduce like living creatures. "Human decision in the creation of a new form and the rules of evolution and selection will create an environment that is open to all possible modifications and selections, following the laws of evolution and creation. The visitor becomes part of the evolutionary system, he is a partner of the virtual organisms and gives and promotes their 'artificial life.'"[20] The pool of real water evokes the earliest tidal pools on the planet, the birthing sites of all life. The viewer can play god to new set of lifelike digital organisms. A number of people can interact with the pool at one time and the effect is surprisingly natural.

The elegance of A-Volve's interface leads to the next iteration of interactive installation art. In the examples discussed thus far, with the exception of the early work of Myron Krueger, the experience has been mediated by a mechanical interface, whether esoteric or commonplace. The interface thus far has limited the interaction to one visitor or very few at a time. Many artists became frustrated with the undemocratic separation of the audience into active participants and passive viewers within the museum gallery.

Around the turn of the millennium, video cameras and sophisticated programming in a new generation of installations eliminated the mechanical interface and replaced it with one we are all intimately familiar with—our bodies. Finally, the entire audience could participate simultaneously and enter into collaborations with one another. The possibility of communal interaction gave this work a new power.

Text Rain (1999; fig. 10) by Camille Utterback and Romy Achituv was one of the first examples. What is essentially a video mirror projects visitors' life-size images onto a wall in front of them. In the projection, letters slowly fall from above to land on the viewers' forms. The letters can be bounced, held, or released to continue their fall. It is soon evident that they form words, and total strangers find themselves holding hands at arm's length to see how many they can collect and read. In fact, the letters form the lines of a poem by Evan Zimroth about bodies and communication. In the same way that Jeffrey Shaw's *Legible City* integrates text and space into an interactive environment, *Text Rain* proposes to the viewer an entirely new way of "reading," and leaves the door open to a collaborative reading by everyone present.

The metaphor of the mirror lends itself aptly to this open interaction. Daniel Rozin's *Wooden Mirror* (1999; fig. 11) combines computerized reflection with a meditation on the nature of the pixel. Pixels are the most basic element of computer graphics; variations of their shades and colors create images on the screen. Very early computer graphics used pixels made of symbols and letters (ASCII fonts). In 1965, Ken Knowlton and Leon Harman at Bell Labs used small electronic symbols to make a picture of a nude. Subsequent computer graphics, games like Pong and Breakout, featured low-resolution, clunky blocks of color, now almost nostalgic. Rozin uses

the natural, warm material of wood to stand in for these abstract shapes. A hidden video camera captures the viewer's image and instantly translates it into the requisite number of pixels. The value of each pixel is sent to the corresponding square of wood and a solenoid pushes the square far enough into the light to take on the value required to capture the likeness of the viewer. A gentle ripple of sound accompanies the sliding movement of the wooden parts.

Act/React presents a range of interactive installation art in which the participation of the viewer is intuitive, nontechnical, and performed with the entire body. Rather than requiring visitors to use a mouse, keyboard, or other mechanical device, these installations demand only that the participants move through space, experimenting with the ways their motions affect the image projected on the wall or floor. This encourages not only individual but also collaborative exploration. One of the works, Scott Snibbe's *Boundary Functions* (1998; cat. 7), is activated only when two or more people engage with it.

If in the last century the crisis of representation was resolved by new ways of seeing, then in the twenty-first century the challenge is for artists to suggest new ways of experiencing. Through interactivity, contemporary artists mirror, distort, and confuse the audience's experience, not of representation, but of reality itself.

NOTES

[1] H. W. Janson, *History of Art* (New York: Harry N. Abrams, 1962).

[2] See Arturo Schwartz, *The Complete Works of Marcel Duchamp* (New York: Harry N. Abrams, 1969), 20.

[3] Lev Manovich, *The Language of New Media* (Cambridge, Mass.: MIT Press, 2002), 56.

[4] Roger Ebert, Answer Man, http://www.RogerEbert.com, accessed Nov. 27, 2005.

[5] First outlined in an article by French director François Truffaut, "Une certaine tendance du cinéma français," *Cahiers du Cinéma* 6 (Jan. 1954), 15–29.

[6] See Edith Decker-Phillips, *Paik Video* (New York: Barrytown/Station Hill Press, 1998).

[7] Ibid., 36.

[8] Charles Sopkin, *Seven Glorious Days, Seven Fun-filled Nights* (New York: Simon and Schuster, 1968).

[9] Michael Rush, *New Media in Art*, 2nd ed. (New York: Thames and Hudson, 2005), 90.

[10] Ibid., 32.

[11] Gene Youngblood, *Expanded Cinema* (New York: Dutton, 1970), 342–43.

[12] Söke Dinkla, *The History of the Interface in Interactive Art*, International Society of Electronic Arts (ISEA), 1994 Proceedings, http://www.maryflanagan.com/courses/2002/web/HistoryofInterface.html, accessed Jan. 28, 2008.

[13] Rudolf Frieling, "Radúz Cinçera, Kinoautomat: One Man and His Jury," Media Art Net, http://www.medienkunstnetz.de/works/kinoautomat/ accessed Jan. 15, 2008.

[14] Lynn Hershman [Leeson], "Touch Sensitivity and Other Forms of Subversion: Interactive Artwork," *Leonardo Magazine* 26, no. 5 (1993), 431–36.

[15] Jeff Rothenberg, "Renewing the Erl King," *Millenium Film Journal*, no. 45/46 (Fall 2006), and http://www.bampfa.berkeley.edu/about/ErlKingReport.pdf, accessed Dec. 15, 2007.

[16] Grahame Weinbren, "In the Ocean of Streams of Story," *Millennium Film Journal*, no. 28 (Spring 1995),15–30.

[17] Anne-Marie Duguet, Heinrich Klotz, and Peter Weibel, *Jeffrey Shaw, A User's Manual* (Ostfildern: Edition ZKM Cantz, 1997).

[18] Luc Courchesne, Web Depot, http://www.din.umontreal.ca/courchesne, accessed Feb. 23, 2008.

[19] Christa Sommerer and Laurent Mignonneau, *A-Volve*, Concept Paper, http://www.interface.ufg.ac.at/christa-laurent/WORKS/CONCEPTS/A-VolveConcept.html, accessed Feb. 23, 2008.

[20] Ibid.

FIGURES

1 Bruce Nauman, *Performance Corridor*, 1969. Wallboard, wood, Solomon R. Guggenheim Museum, New York, Panza Collection, gift, 1992. Photo: Courtesy of Sperone Westwater, New York

2 Frank Gillette and Ira Schneider, *Wipe Cycle*, 1969. Surveillance cameras, 9 monitors, broadcast television, 2 time delays. Courtesy of the artists

3 Nam June Paik, *TV Buddha*, 1974. Mixed-media video sculpture, Stedelijk Museum, Amsterdam, Netherlands

4 Lynn Hershman Leeson, *Lorna*, 1979–82. Interactive laserdisc installation: remote control, room with furniture, television set, fish bowl, pictures. Courtesy of the artist, Gallery Paule Anglim, San Francisco, and bitforms gallery, New York

5 Jeffrey Shaw, *The Legible City*, 1989. Interactive video installation: bicycle, video projector, monitor. Courtesy of the artist

6 Jeffrey Shaw, *Place – a user's manual*, 1995. Interactive video installation: video projector, 360° panoramic screen, interface platform, video camera. Courtesy of the artist

7 Luc Courchesne, *Landscape One*, 1997. Interactive panoramic installation: walls, projector, ball, surveillance camera. Photo: Richard Max Tremblay. Courtesy of the artist

8 Karl Sims, *Galápagos*, 1997. Interactive digital installation: 12 monitors, pedestals, footpads. Courtesy of the artist

9 Christa Sommerer and Laurent Mignonneau, *A-Volve*, 1993–94. Interactive computer installation. Supported by NTT-ICC Museum Japan and NCSA, USA © 1994

10 Camille Utterback and Romy Achituv, *Text Rain*, 1999. Interactive video installation: video projector, surveillance camera, computer. Photo: Kenneth Hayden © 2007

11 Daniel Rozin, *Wooden Mirror*, 1999. Interactive video installation: 830 square pieces of wood, 830 servomotors, control electronics, surveillance camera, computer, wood frame. Courtesy of bitforms gallery, New York, and ITP, Tisch School of the Arts, New York University
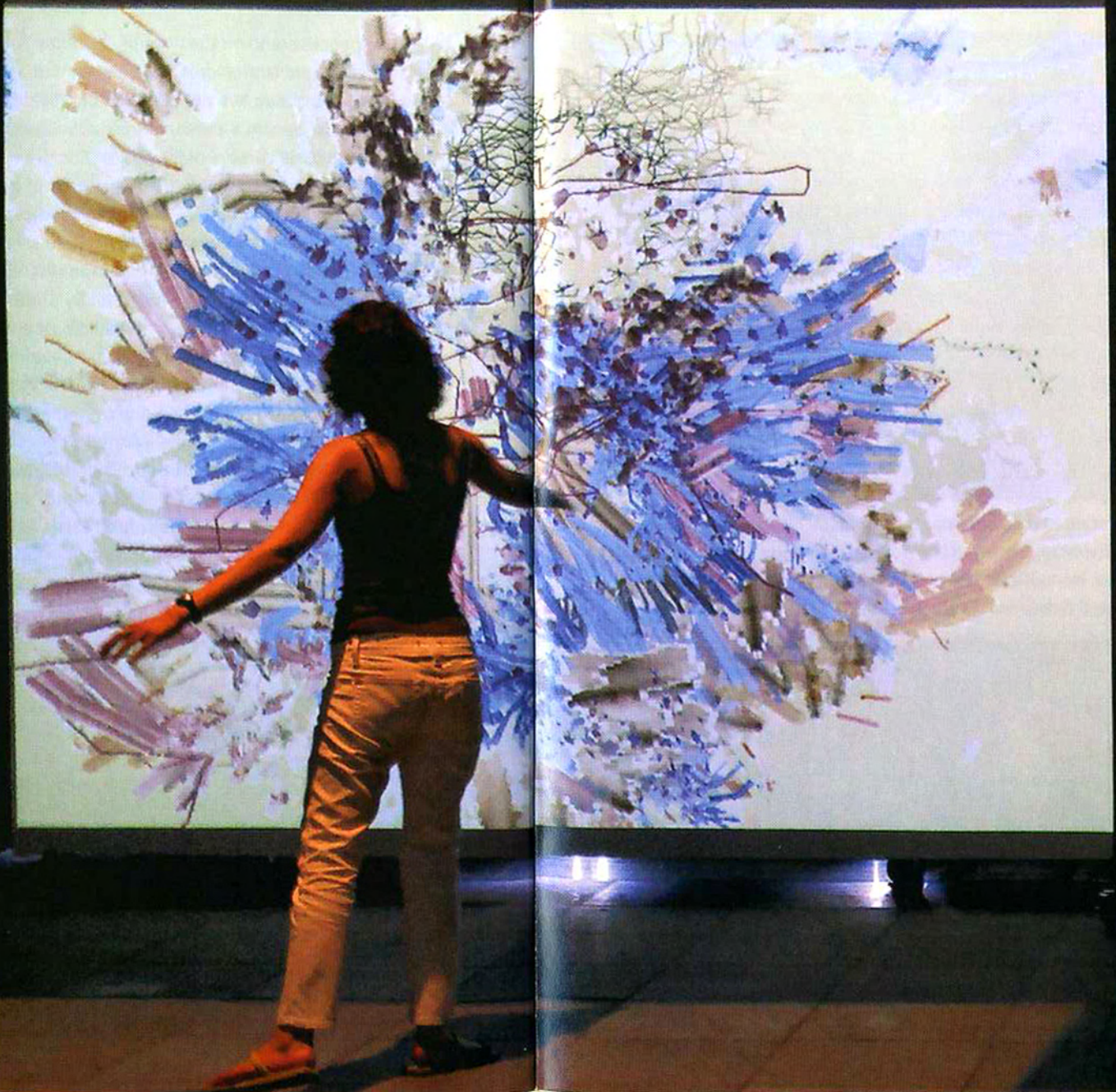
The External Measures series consists of six pieces developed since 2001. These interactive installations form a subset of my larger body of work, in which I use video tracking interfaces to create sensual experiences that engage participants in a process of kinesthetic discovery and play.

Inspired by kinetic sculptures such as Alexander Calder's mobiles, the External Measures series are dynamic aesthetic systems that respond in an intriguing and fluid way to their environment. While traditional kinetic sculptures are composed of physical materials constrained by the rules of gravity and physics, the External Measures installations are entirely composed of and constrained by the software code I write. A kinetic sculpture is influenced by forces like wind and heat, while my installations are affected by human movement.

Because I am trained as a painter, my goal is that the External Measures installations generate visually evocative imagery, but it is equally important to me that each piece provide a rich interactive experience for participants. The installations do not demonstrate a single direct reaction to a participant's movements, but respond in multiple, layered ways from a working "palette" of animated behaviors I write.

CAT. 8 Camille Utterback, External Measures 2003, 2003

CAT. 10 Camille Utterback, Untitled 6, 2005

For each piece, I balance responses that are immediately clear with others whose logic remains slightly mysterious. The behaviors interact with each other and create connections between movements at different times in the space. For example, in Untitled 5, visual "material" added to the system by one person's trajectory can later be pushed around by another individual's movement. The resulting swaths of color occur at the intersections between current and previous motion in the space.

While the specific rules of each system are never explicitly revealed to participants, the internal structure and composition of a piece can be discovered through a process of exploration. Engaging with these works creates a visceral sense of unfolding or revelation, but also a feeling of immediacy and loss as new images emerge and disappear with one's movement through the space. The experience of this work is that of embodied existence itself—a continual flow of unique and fleeting moments. —Camille Utterback

CAT. 9 Camille Utterback, Untitled 5, 2004 (pp. 80–81)