ROY ASCOTT

TELEMATIC EMBRACE

VISIONARY THEORIES OF ART, TECHNOLOGY, AND CONSCIOUSNESS

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FROM CYBERNETICS TO TELEMATICS

The Art, Pedagogy, and Theory of Roy Ascott

EDWARD A. SHANKEN

— INTRODUCTION

Overview: Synthetic Vision

Roy Ascott is recognized as "the outstanding artist in the field of telematics," according to Frank Popper, the foremost European historian of art and technology (Popper 1993, 124). Telematics integrates computers and telecommunications, enabling such familiar applications as electronic mail (e-mail) and automatic teller machines (ATMs). Ascott began developing a more expanded theory of telematics decades ago and has applied it to all aspects of his artwork, writing, and teaching. He has defined telematics as "computer-mediated communications networking between geographically dispersed individuals and institutions . . . and between the human mind and artificial systems of intelligence and perception" (page 232 below). Telematic art challenges the traditional relationship between active viewing subjects and passive art objects by creating interactive, behavioral contexts for remote aesthetic encounters. Ascott's expertise extends beyond his own discipline and has been acknowledged internationally by numerous governmental and institutional organizations for which he has consulted. Synthesizing recent advances in science and technology with experimental art and ancient systems of knowledge, Ascott's visionary theory and practice aspire to enhance human consciousness and to unite minds around the world in a global telematic embrace that is greater than the sum of its parts.

This is the first collection of Ascott's writings to be published in English.[1] The essays selected make available more than three decades of this artist's theories on the relationship between aesthetics and electronics, love and interactivity, and the sense of self and community in a telematic, cyberspacial world. These essays constitute a unique archaeology of ideas and trace the intertwined

cultural history of art, technology, and consciousness from the 1960s to the present. Given the increasing role of the Internet and the World Wide Web (WWW) in the creation of commerce and community, Ascott's writings will benefit artists, entrepreneurs, scholars, policy-makers, and laymen alike. They offer perceptive insights into the past, present, and future implications and possibilities of human-machine relationships, especially with respect to networked telecommunications.

Throughout the 1990s, Ascott's writings addressed the social implications of telematics, nanotechnology (engineering at the atomic level), artificial and post-biological life, and the role of museums in digital culture. In "Telenoia" (1993; chapter 19 below) and "The Architecture of Cyberception" (1994; chapter 23), he explored the relationship between the cybernated individual, the telematic community, and the role of "intelligent architecture" as a medium for the expansion of perception and the exchange of individual and communal information/consciousness, theorizing that the resulting experience of omnipresence and simultaneity transforms conventional notions of space, time, and subjectivity. In "Back to Nature II: Art and Technology in the Twenty-First Century" (1995; chapter 24) and "Art @ the Edge of the Net" (2000; chapter 27), Ascott proposed that from the dry silicon of digital computers, emergent self-organizing systems and nanotechnologies will become increasingly "moist" and more closely related to the wetness of organic biocomputers such as the human brain. He considered, moreover, how the artistic use of post-biological forms of life and intelligence might affect the evolution of organic life. In "The Mind of the Museum" (1996; chapter 25), Ascott noted that cultural institutions must be responsive to these imminent social transformations, which he foresaw as underlying new forms of expression in the future. Such forward-looking theories aspired to push the limits of human consciousness and imagination as part of the ongoing creative process of constructing culture and society.

The futuristic character of Ascott's writings demands that they be described as visionary. By the term "visionary," I mean to suggest a systematic method for envisioning the future. Ascott has described his own work as "visionary," and the word itself emphasizes that his theories emerge from, and focus on, the visual discourses of art. While the artist draws on mystical traditions, his work is more closely allied to the technological utopianism of Filippo Marinetti than to the ecstatic religiosity of William Blake. At the same time, the humanism, spirituality, and systematic methods that characterize his practice, teaching, and theorization of art share affinities with the Bauhaus master Wassily Kandinsky. In the tradition of futurologists like Marshall McLuhan and Buckminster Fuller,

Ascott's prescience results from applying associative reasoning to the serendipitous conjunction, or network, of insights gained from a widely interdisciplinary professional practice. Joining reason and spirit with technique and drawing on diverse ideas from a variety of disciplines and applying them to art, Ascott's work has anticipated and responded to the possibilities and problems of interactivity and networked communications, issues that have become increasingly central to art and culture. The recent growth of widespread commercial, governmental, and public interest in these topics provides a vantage point from which Ascott's early artistic and theoretical research on interactivity, cybernetic art, and telematics now may be interpreted as visionary.

In using the terms "visionary," "prescient," "presaging," and "anticipating," I do not mean to suggest that Ascott wielded supernatural powers that have allowed him to see into the future. What I do mean is that his work as an artist has contributed to the material processes by which ideas from diverse fields feed into one another, subsequently becoming concretized and historicized in particular cultural configurations. I believe that artists play an important role in developing ideas that have broad cultural ramifications, even though the process of historicization generally does not occur in the visual forms of art (which lack cultural authority in such matters and do not "speak" a common language). Rather, using formulae and words, scientific, historical, and other forms of literature are the primary sites where more commonly accepted languages concretize emergent cultural configurations in historical narratives. As a result, scientific and philosophical models are commonly taken to be the precursors to subsequent developments in the visual arts. However, as I hope to show, the process of cultural formation depends on an interrelated exchange of ideas across disciplines such that in many cases it may be spurious to credit one field or another with originating any general concept.

Ascott's synthetic method for envisioning the future is exemplified both by his independent development of interactive art and by the parallel he subsequently drew between the aesthetic principle of interactivity and the scientific theory of cybernetics. His interactive *Change Paintings*, begun in 1959, joined together divergent discourses in the visual arts, along with philosophical and biological theories of duration and morphology. The *Change Paintings* featured a variable structure that enabled the composition to be rearranged interactively by viewers, who thereby became an integral part of the work. In 1961, Ascott began studying the science of cybernetics and immediately recognized its congruence with his concepts of interactive art. The artist's first publication, "The Construction of Change" (1964; chapter 1), reflected an integration of these

aesthetic and scientific concerns, and it proposed radical theories of art and education based on cybernetics. For Ascott and his students, individual artworks—and the classroom alike—came to be seen as creative systems, the behavior of which could be altered and regulated by the interactive exchange of information via feedback loops.

By the mid 1960s, Ascott began to consider the cultural implications of telecommunications, another example of how his interdisciplinary practice presaged subsequent developments in art and culture. In "Behaviourist Art and the Cybernetic Vision" (1966–67; chapter 3), he discussed the possibilities of artistic collaborations between participants in remote locations, interacting via electronic networks. McLuhan's prophetic theories of media had not yet become a technological reality; nonetheless, Ascott's proposals advanced artistic discourses towards the idea of global collaboration. At the same time that the initial formal concerns of conceptual art were being formulated under the rhetoric of "dematerialization," Ascott was considering how the ethereal medium of electronic telecommunications could facilitate interactive and interdisciplinary exchanges.

The sort of electronic exchanges that Ascott had envisioned in "Behaviourist Art and the Cybernetic Vision" were demonstrated in 1968 by the computer scientist Doug Engelbart's NLS "oN Line System." This computer network based at the Stanford Research Laboratory (now SRI) included "the remote participation of multiple people at various sites" (Myers 1996). In 1969, ARPANET (precursor to the Internet) went into operation, sponsored by the U.S. government, but it remained the exclusive province of the defense and scientific communities for a decade.[2] Ascott first went online in 1978, an encounter that turned his attention from making art objects to organizing his first international artists' computer-conferencing project, "Terminal Art" (1980). Since that time, Ascott has been at the forefront of the practice and theory of telematic art, organizing and collaborating on dozens of online projects that have explored the ramifications of networked communication on behavior and consciousness, the consequences of which extend far beyond the realm of aesthetics.

Ascott's early experiences of telematics resulted in the theories elaborated in his essays "Network as Artwork: The Future of Visual Arts Education" (1978; chapter 8) and "Art and Telematics: Towards a Network Consciousness" (1984; chapter 11). Drawing on diverse sources, in the latter essay, he discussed how his telematic project "La Plissure du Texte" (1983) exemplified Roland Barthes's theories of nonlinear narrative and intertextuality. Moreover, noting parallels between neural networks in the brain and telematic computer networks (see,

e.g., Bateson 1972; Teilhard de Chardin 1955; Russell 1983), Ascott proposed that global telematic exchange could expand human consciousness. He tempered this utopian vision by citing Michel Foucault's book *L'Ordre du discours* (1971), which discusses the inextricability of texts and meaning from the institutional powers that they reflect and to which they must capitulate. Consequently, the artist warned that in "the interwoven and shared text of telematics . . . meaning is negotiated—but it too can be the object of desire. . . . We can expect a growing . . . interest in telematics on the part of controlling institutions" (pages 191–92 below).

Science and technology, for Ascott, can contribute to expanding global consciousness, but only with the help of alternative systems of knowledge, such as the *I Ching* (the sixth-century B.C. Taoist *Book of Changes*), parapsychology, Hopi and Gnostic cosmologies, and other modes of holistic thought that the artist has recognized as complementary to Western epistemological models.[3] Ascott's composite and associative way of thinking has challenged conventional systems of knowledge, crossed the boundaries of traditional artistic media and modes of reception, and attempted to merge categories that are commonly considered incommensurable (East and West, science and mysticism, technology and art). Added to the general antipathy of cultural institutions towards electronic art in the 1970s and 1980s, the complexity of Ascott's thought helps to explain why this internationally distinguished artist had not yet received wider acclaim by the end of the century. Indeed, the full ramifications of his ideas can be difficult to comprehend, but in their theoretical richness and compelling purposiveness, his writings offer persuasive insights into the future. As has been the case with many artists and visionaries who ultimately achieved historical recognition, Ascott's importance may not be broadly recognized until the future validates his contribution.

In his combination of science, art, and esoteric knowledge, Ascott sought no unequivocal resolution to seemingly irreconcilable methods of understanding. Rather, the artist recognized the paradoxical nature of knowledge and the contradictions inherent in formal epistemologies. Like an appropriate response to a koan, an enigma that cannot be resolved by any logical formula, his multifaceted theoretical approach to art broadened comprehension of the underlying systems by which visual meaning is culturally constructed. This synthetic and nonhierarchical way of thinking was already manifest in Ascott's art in the early 1960s, and it is made explicit in his essay "The Psibernetic Arch" (1970; chapter 5), where he identifies parallels between scientific and esoteric modes of understanding. In 1982, Ascott's telematic art project "Ten Wings" (chapter 10)

produced the first planetary throwing of the *I Ching* using computer conferencing. More recently, Ascott's contact with Kuikuru *pagés* (shamans) and initiation into the Santo Daime community in Brazil resulted in his essay "Weaving the Shamantic Web" (1998; chapter 26). Here the artist's concept of "technoetics" again acknowledges the complementarity of technological and ritualistic methods for expanding consciousness and creating meaning.

Ascott's theories propose personal and social growth through technically mediated, collaborative interaction. They can be interpreted as aesthetic models for reordering cultural values and recreating the world. As much as these theories depend on the same technologies that support global capitalism, they stand in stark contrast to the profit-motivated logic that increasingly transforms the complexion of social relations and cultural identity into a mirror-reflection of base economic principles.

Throughout the late twentieth century, corporations increasingly strategized how to use technology to expand markets and improve earnings, and academic theories of postmodernity became increasingly anti-utopian, multicultural, and cynical. During this time, Ascott remained committed to theorizing how telematic technology could bring about a condition of psychical convergence throughout the world. He has cited the French philosopher Charles Fourier's principle of "passionate attraction" as an important model for his theory of love in the telematic embrace. Passionate attraction constitutes a field that, like gravity, draws together human beings and bonds them. Ascott envisioned that telematic love would extend beyond the attraction of physical bodies. As an example of this dynamic force in telematic systems, in 1984, he described the feeling of "connection and . . . close community, almost intimacy . . . quite unlike . . . face-to-face meetings" that people have reported experiencing online (pages 186–87 below). Telematics, the artist believed, would expand perception and awareness by merging human and technological forms of intelligence and consciousness through networked communications. He theorized that this global telematic embrace would constitute an "infrastructure for spiritual interchange that could lead to the harmonization and creative development of the whole planet" (page 245 below).

Although not all of Ascott's optimistic prophecies have come to fruition yet, many of his prognoses for the future of art and culture have been validated by the advent of the World Wide Web and the deluge of online artistic experimentation that has resulted in its wake. Ascott's response to these developments was customarily synthetic and visionary. Joining his long-standing concerns with cybernetics, telematics, and art education, he founded the Centre for Advanced

Inquiry in the Interactive Arts (CAiiA). In 1995, CAiiA became the first online Ph.D. program with an emphasis on interactive art. Some of the most prominent international artists in this field have enrolled in its unique curriculum. CAiiA exemplifies the prescience with which Ascott has synthesized cybernetics and telematics with the discourses of art and testifies to the consistency with which he has continued to apply his visionary theories to all aspects of his artwork, writing, and teaching.

Beginnings: Victor Pasmore, Richard Hamilton, and the Synthesis of Art, Pedagogy, and Theory

Ascott's training as a student of Victor Pasmore and Richard Hamilton between 1955 and 1959 offers many insights into his mature work. Both of these leading postwar British artists were actively involved in artistic practice, art theory, art exhibitions, and art education. They passed on their broad-based concern with these overlapping professional interests to Ascott. Although his teachers' approaches to art diverged, both drew on a wide range of aesthetic and nonaesthetic sources. The synthetic quality of their methodologies can also be seen as playing an important role in Ascott's artistic development.

Pasmore and Hamilton were at the center of the movement to reform art education in England in the 1950s. They both taught at King's College in Newcastle upon Tyne, then part of the University of Durham. During 1956–58, along with Ian Stephenson and others, they created the basic design course that Ascott attended. The curriculum was predicated on the principles of biological morphology that the scientist D'Arcy Wentworth Thompson elaborated in his book *On Growth and Form*, which had earlier informed Hamilton's exhibition "Growth and Form" at the Institute of Contemporary Art, London (1951). The course developed a model of how aesthetic forms might emerge from processes akin to organic development. An etching Ascott made in 1957, entitled *Development*, exemplifies this method. Ascott's artistic application of biological metaphors was reinforced by the exhibition "Developing Process" that Pasmore organized at Newcastle and London in 1959 and formalized in his book *A Developing Process in Art Teaching* (1959). The interdisciplinary models of art education that Pasmore and Hamilton developed can be seen as precursors to Ascott's creation of cybernetic and telematic pedagogies.

Pasmore is known as an artist-theoretician, a title that Ascott came to earn for himself as well. In the 1940s, Pasmore had gained an outstanding reputation as a painter for his poetic landscapes and figure studies. His abrupt shift to

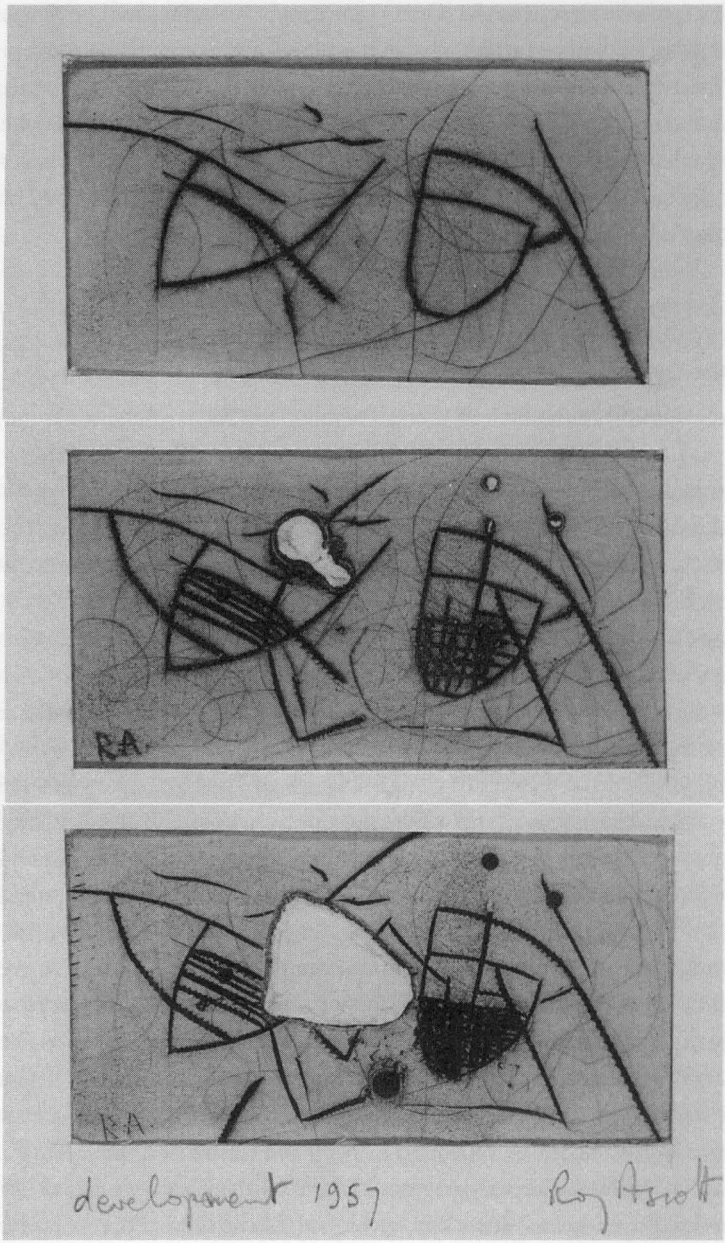


Figure 1. *Development*. 1957. Etching. Three elements, each $2\frac{7}{8} \times 1\frac{1}{2}$".

abstraction around 1948 has been referred to as "one of the most dramatic events in post-war British art" (Tate Gallery 1965, introduction). In 1951, Pasmore organized the first postwar exhibition of abstract painting and sculpture in London. Later, he became deeply influenced by the constructivist principles of "structuralism" espoused in the American artist/theorist Charles Biederman's seminal book *Art as the Evolution of Visual Knowledge* (1948). Pasmore's work of the mid 1950s was also influenced by the vitalist organic forms of the Alsatian artist Jean Arp. By the time Ascott arrived at Newcastle as his student, Pasmore had abandoned two-dimensional painting and had begun making constructivist relief sculpture. The divergent aesthetic principles of abstract expressionism, constructivism, and vitalism could all be linked through the biological metaphor central to Pasmore's work.[4] Complementing his artistic and pedagogical practices, Pasmore also wrote aesthetic theory. Ascott credited his mentor for "opening up the idea of . . . the artwork as a developing process" and for his insights into "the integration of art, architecture, and technology."[5] Indeed, Pasmore's theoretical approach to art and his agglomeration of diverse aesthetic, philosophical, and scientific ideas foreshadowed the sorts of associations that Ascott would apply in synthesizing his own method.

Hamilton is acknowledged as the father of pop art, and he co-founded the Independent Group in London. His artwork, teaching, and theory have all explored the relationships between art, technology, and popular culture. Works like *Hommage à Chrysler Corp.* (1957) and *$he* (1958–61) integrate a 1950s shapely female figure with the modern design of automobiles, refrigerators, and other mass-produced consumer appliances. These images draw on the heritage of dada to suggest a proto-cyborgian confluence of human and machine. As a curator, Hamilton also organized several highly influential exhibitions, including "Man, Machine and Motion" (Hatton Gallery, Newcastle upon Tyne, 1955) and "This is Tomorrow" (Whitechapel Art Gallery, London, 1956). He also wrote aesthetic theory. Like his artwork and curatorial projects, his theories of art and popular culture anticipated the multidisciplinary writing and research associated with cultural studies. Ascott stated that Hamilton's "intellectual posture, his championing of the place of ideas in art, his questioning of all the certainties, in life as much as art . . . influence[d] me a great deal."[6] Hamilton also increased his sensitivity to the process of art-making and introduced him to the semantic and conceptual complexities of Marcel Duchamp. Duchamp's work had begun to influence Hamilton when he was a student at the Slade School of Art. Like Duchamp, Hamilton and his student (Ascott) were

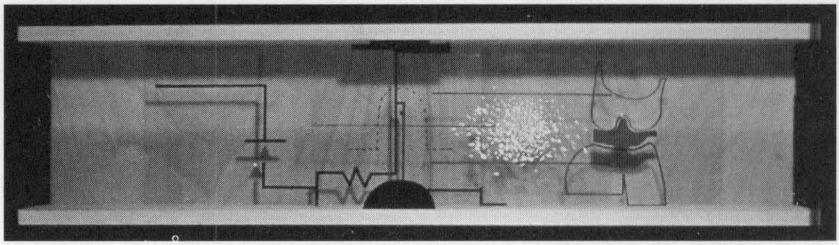


Figure 2. LOVE-CODE. 1962. Diagram box. Cellulose on glass, wood, 13 × 48 × 3". Note the influence of Richard Hamilton's *$he* and Marcel Duchamp's *Large Glass* in Ascott's integration of female and technological forms, and the "seed cloud" between them.

equally fascinated by technology, although each approached it differently. Hamilton incorporated mass media images of technology and popular culture into his canvases (an appropriation of popular imagery into fine art). Ascott later came to utilize mass media technology as the interactive, collaborative "canvas" of telematic art (the appropriation of fine art into popular media). Similarly, Hamilton's abiding interest in formal techniques and finish, as well as his continued adherence to traditional media, diverged from his student's experiments in expanded media, which focused on the conceptual and behavioral aspects of art as an interactive process and system. And, unlike his mentor, Ascott (like Duchamp) fused his interest in technology with esoteric and hermetic forms of knowledge.

After completing his studies in 1959, Ascott was hired by Pasmore as studio demonstrator, a two-year post the favored graduate received as part of a "grooming process." The protégé was expected to spread his mentor's pedagogical principles to other institutions in Britain. In 1961, just before taking a distinguished position Pasmore had secured for him at Ealing College of Art in London, Ascott discovered F. H. George's *Automation, Cybernetics and Society* (1959), Norbert Wiener's *The Human Use of Human Beings: Cybernetics and Society* (1948), and W. Ross Ashby's *Design for a Brain* (1952). The work of these and other authors writing about cybernetics, artificial intelligence, and information theory captivated his imagination, catalyzing what Ascott described as an Archimedean "'Eureka experience'—a visionary flash of insight in which I saw something whole, complete, and entire."[7] Ascott's insight was a sweeping yet subtle vision of the systematic application of cybernetics to art. While still deeply influenced by Pasmore and Hamilton, the young artist's approach to art and to art education had come under the influence of a new way of thinking

about the world, predicated on the ideas of information, feedback, and systemic relationships.

Art and Writing Artists' Writings

Theoretical writing became an integral part of Ascott's artistic practice, as it had been for his teachers Pasmore and Hamilton. Ascott's first publication, "The Construction of Change" (1964), discussed how his work in the classroom complemented his work in the studio. "All art is . . . didactic," he wrote, based on his experience of developing a cybernetic art curriculum at Ealing; the artist's "creative and pedagogic" activities interacted, "each feeding back to the other" (page 98 below). Ascott's theoretical writings reinforced and enriched both his practice and his teaching. Indeed, he came to conceive of these independent elements as increasingly interrelated components of a cybernetic system.

In "The Construction of Change," Ascott renounced the idea that the essence of art could be crystallized in material objects, arguing that art was, rather, characteristic of the behavioral processes by which such objects are generated. For Ascott, art possessed value only to the extent that it enabled a mental, conceptual shift—a transformation of consciousness that altered the relationship of artist, artwork, and audience, thereby changing the behavior of the system they constituted. If art is taken to be a conceptual process manifested in the behavior of the artist within a system of meaning, then Ascott's theoretical work, including the act and process of writing, can be considered part of his artistic oeuvre. This position coincides with the emphasis placed on artistic processes at that time by some other British artists, including John Latham, Mark Boyle, and Gustav Metzger, and by artists working at the intersections of concrete poetry, happenings, Fluxus, and conceptual art.

In the 1960s, Ascott did not conceive of his writings as art per se, but rather, like his teaching, as having a symbiotic relationship with his art-making activity. While writing was part of what he did as an artist, it remained distinct in his mind from his works of art. However, he had begun to consider the processes of ideation and writing as artistic acts. Recalling that period and the liberation that creating texts afforded him, he later observed: "[T]here's nothing you can't do when you're writing as an artist."[8] In relation to other British artists coming of age in the early 1960s, Ascott conceived of his own artistic identity as being that of a "man of ideas."

In 1963, the thesaurus became a primary explanatory metaphor for Ascott's practice as a visual artist, and text became a more integral part of his artwork.

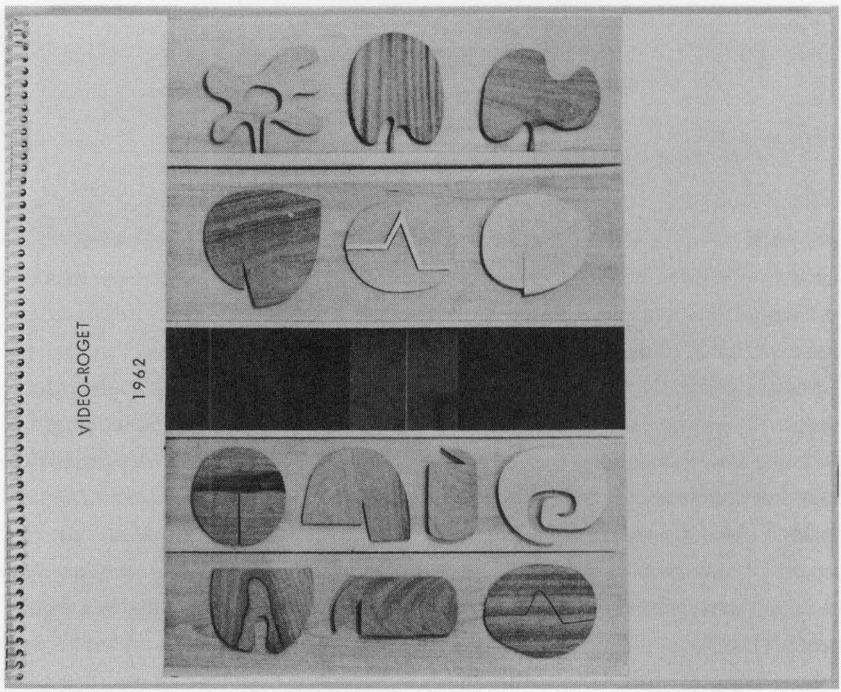


Figure 3. *Video Roget*. 1962. Analogue structure. Plexiglas, wood, and glass, 50 × 35". Illustration from Molton Gallery exhibition catalogue (Ascott 1963).

In the catalogue for his exhibition at the Molton Gallery in London that year, *Diagram Boxes and Analogue Structures*, Ascott reproduced his work *Video Roget* (1962). This relief sculpture was inspired in part by Pasmore's mix of constructivist and vitalist teachings, but also incorporated an interactive element that reflected the young artist's commitment to the principles of cybernetics. On the page preceding *Video Roget*, Ascott provided a related diagram on tracing paper, entitled *Thesaurus*. By placing *Thesaurus* over *Video Roget*, words on the former were superimposed on the visual forms of the latter. Together, they suggested relationships between words and shapes, and indicated various feedback loops between them.

Immediately following *Thesaurus* and *Video Roget* in the catalogue, a two-page diagram (drawn like an electrical circuit) declared Ascott's bid to use text in an art context: "This *Thesaurus* is a statement of my intention to use any assembly of diagrammatic and iconographic forms within a given construct as seems necessary" (Ascott 1963). Ascott's *Video Roget* and *Thesaurus* drew an explicit par-

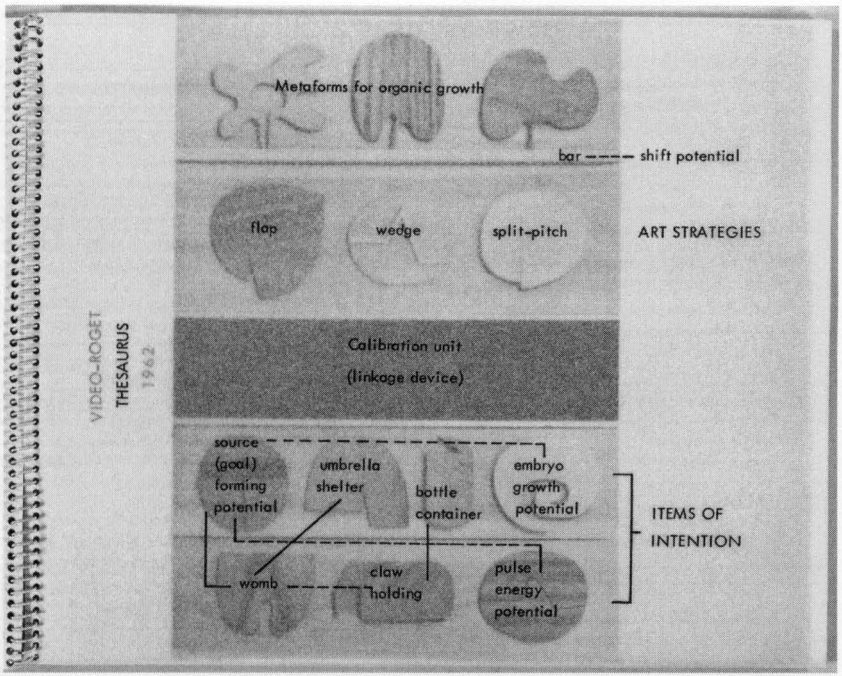


Figure 4. *Video Roget* (1962) and *Thesaurus*. 1963. Tracing paper overlay designed by Noel Forster, in Molton Gallery exhibition catalogue (Ascott 1963).

allel between the semiotics of verbal and visual languages. It proposed that the universe of potential meanings of his art could be derived taxonomically and discursively. In this multilayered process, meaning was contingent on the flow of information between the artist, the object, the semantic systems that govern the reception of works of art, and the actual responses of viewers. Such concepts, including the explicit use of the thesaurus, were concerns that became central to conceptual art, as in Joseph Kosuth's *Second Investigation, Proposition 1* (1968) and Mel Ramsden's *Elements of an Incomplete Map* (1968). Moreover, since *Thesaurus* and the diagram were largely textual, Ascott expressly put in writing his intention to use language in and as art. It must be noted, however, that aside from the catalogue itself, the objects in the exhibition did not contain textual elements, although many of them were diagrammatic.

The discursive relationship between art and text in Ascott's work took on a variety of other forms as well. His "Statement" (chapter 2) published in the first issue of the avant-garde journal *Control* (1966) was designed as a circle, conflat-

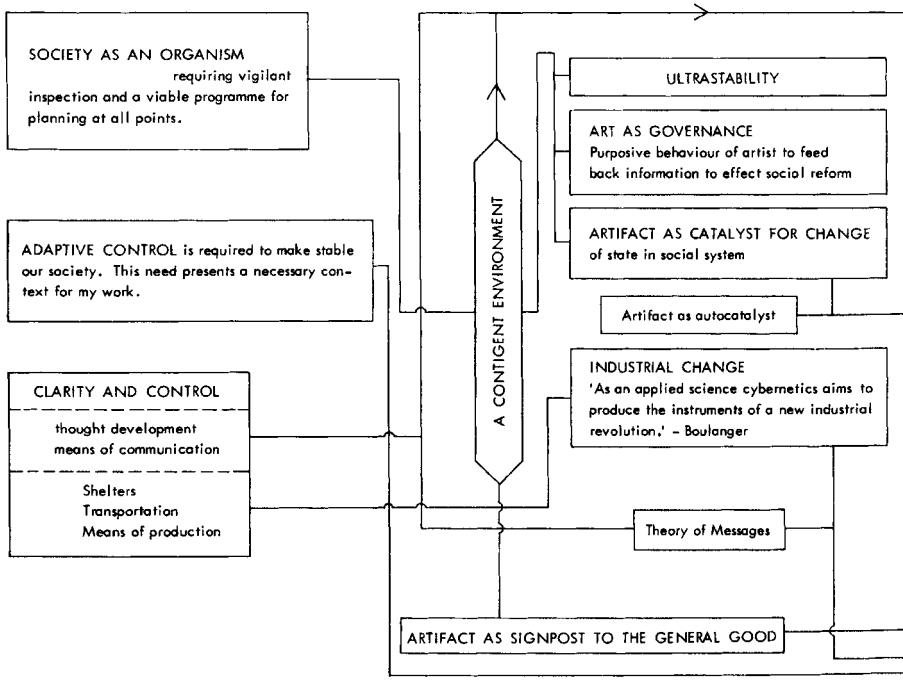
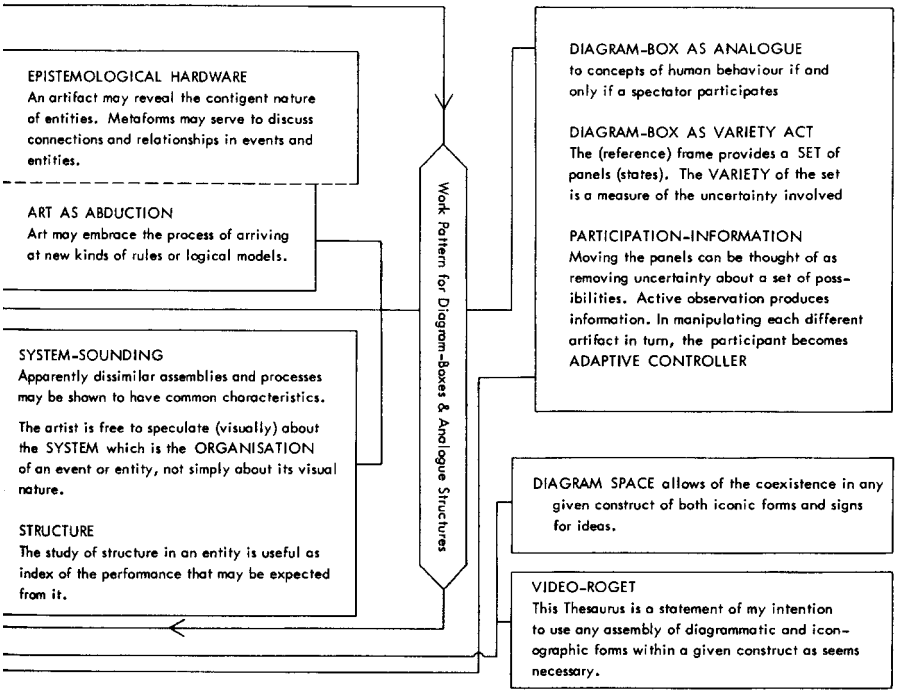


Figure 5. Untitled diagram. 1963. Illustration designed by Noel Forster, from Molton Gallery exhibition catalogue (Ascott 1963).

ing word and image in a manner parallel to that of concrete poetry. In 1967, the artist produced the manifesto "Behaviourables and Futuribles" (chapter 4) as a broadside, also explicitly utilizing text in a graphic work. Consistent with his perceived artistic role as a "man of ideas," and in recognition of the freedom that writing offers an artist, Ascott strategically expanded the range of what justifiably could be utilized as artistic media to include diagrammatic, iconographic, and textual forms.[9]

Ascott's use of text in an artistic context was arrived at independently of, and yet in tandem with, the development of conceptual art. The first artist to expressly state the idea that language and mathematical systems of notation could be art was the American Henry Flynt. "Since 'concepts' are closely bound up with language, concept art is a kind of art of which the material is language," Flynt observed in his 1961 essay "Concept Art" (Flynt 1975, 125). Experimental artists' books like Mel Bochner's exhibition "Working Drawings and Other



Visible Things on Paper Not Necessarily Meant to Be Viewed as Art" (1966) emphasized "the ideational processes from which discrete objects emerge" (Stiles and Selz 1996, 807). High-profile texts like Sol Lewitt's "Paragraphs on Conceptual Art" (1967) and Joseph Kosuth's three-part essay "Art after Philosophy" (1969) later contributed to the theorization of conceptual art and helped historicize it as a canonical movement in the history of art. In Britain, discussions between the artists Terry Atkinson and Michael Baldwin in 1966 laid the foundation for the emergence of the Art & Language collective, which published the first issue of *Art-Language: The Journal of Conceptual Art* in May 1969. Kosuth and Art & Language were perhaps the most persistent advocates of the use of text as a viable medium in visual art.

A useful comparison can be made between the marginal status of media art (art employing electronic media) within the context of mainstream art institutions, and artists' writings, which have been marginalized within the context of

art history and criticism. Like media art, which is often perceived as too technological to be appreciated under conventional canons of aesthetics and too artistic to be appreciated according to the scientific methods of engineering, artists' writings are often perceived as too much like criticism to be appreciated as art and too artistic to be appreciated as criticism. Working at the intersection of art and technology, both as an artist and a theorist, Ascott has been especially subject to these dual prejudices.

Conceptual artists have argued that theory is not the exclusive domain of philosophers and scientists, and that the written word, or the language of mathematics, for that matter, are not the sole legitimate forms of theoretical exegesis. It is insufficient to say that works of art can be the plastic embodiment of philosophical, scientific, or other theories. In both written texts and works of art (which, again, are not mutually exclusive categories), contemporary artists have proclaimed their work to be not just highly theoretical but to be theory itself.[10] At the same time, conceptual art demands that linguistic, mathematical, and other symbolic carriers of information be regarded as an appropriate medium for visual art. These theoretical positions interrogate the relationship between visual and verbal systems of meaning and problematize the categorical distinctness of art and art criticism.

Despite the aforementioned attempts by artists to deconstruct the binary opposition between art and writings about art, the disciplines of art history and criticism have tended to preserve this discrete categorical division. As a result, within the canon of art history, artists' writings occupy an ambiguous position, straddling the conventional domains of art and theory and lacking authenticity as either. Joseph Kosuth has identified this "bias against artists who write" as originating "in the anti-intellectualism of American society" and claims that, with regard to his own writing, "this conservative mechanism is being exploited for the purposes of discrediting [my] authenticity as an artist. . . . Artists are expected to 'stay in their place' and keep to the model of the artist which has been internalized within modernism: the Expressionist, producer of enigmas."[11] Artists are thought to lack critical distance from their subject matter, and their writings have been interpreted as a means of self-promotion. Such objections are suspicious, for they fail to acknowledge the myriad ways in which the imagined objectivity and "critical distance" attributed to the critic may be just as clouded by self-promotional impulses.

Texts written by artists have played a central, although underrecognized, role in the critical and theoretical development of art and its discourses. This is especially the case in experimental art, where artists often anticipate art histori-

cal and critical appraisal by many years and then serve as uncited references in subsequent writings by critics and historians. Nonetheless, artists' writings occupy a relatively minor and ambiguous position in modern and postmodern art criticism and history. The publication of the collected essays of individual artists—including Kosuth, Robert Morris, Carolee Schneemann, Yvonne Rainer, Allan Kaprow, and now Ascott—and collections of artists' theoretical writings, such as *Blasted Allegories*, edited by Brian Wallis, and *Theories and Documents of Contemporary Art*, edited by Kristine Stiles and Peter Selz, may begin to redress this endemic bias.

CYBERNETICS

The Hungarian-born artist Nicolas Schöffer created his first cybernetic sculptures *CYSP O* and *CYSP I* (the titles of which combine the first two letters of the words "cybernetic" and "spatio-dynamique") in 1956 (Schöffer 1963, 10–17). In 1958, the scientist Abraham Moles published *Théorie de l'information et perception esthétique*, which outlined "the aesthetic conditions for channeling media" (Burnham 1968, 344). Subsequently, "Cybernetic Serendipity," an exhibition curated by Jasia Reichardt in London (1968), Washington, D.C. (1969), and San Francisco (1969–70), popularized the idea of joining cybernetics with art. Not surprisingly, much artistic research on cybernetics had transpired between Schöffer's initial experiments of the mid 1950s and Reichardt's landmark exhibition over a decade later. "A dream of technical control and of instant information conveyed at unthought-of velocities haunted Sixties culture," the art historian David Mellor writes of the cultural attitudes and ideals that cybernetics embodied at that time in Britain. "'The wired, electronic outlines of a cybernetic society became apparent to the visual imagination—an immediate future . . . drastically modernized by the impact of computer science. It was a technologically utopian structure of feeling, positivistic, and 'scientistic'" (Mellor 1993, 107). However, these early inquiries into the aesthetic implications of cybernetics took place primarily in Europe, and the United States lagged behind by "five or ten years," the American artist and critic Jack Burnham notes (Burnham 1968, 343).

Evidence of the sentiments described by Mellor could be observed in British painting of the 1960s, especially among a group of artists associated with Roy Ascott and the Ealing College of Art, such as his colleagues Bernard Cohen and R. B. Kitaj and his student Steve Willats, who founded the journal *Control* in 1966. Eduardo Paolozzi's collage techniques of the early 1950s likewise "em-

bodied the spirit of various total systems," which may possibly have been "partially stimulated by the cross-disciplinary investigations connected with the new field of cybernetics" (Kirkpatrick 1971, 19). Cybernetics offered these and other artists a scientific model for constructing a system of visual signs and relationships, which they attempted to achieve by utilizing diagrammatic and interactive elements to create works that functioned as information systems.

The Origin and Meaning of Cybernetics

The scientific discipline of cybernetics emerged out of attempts to regulate the flow of information in feedback loops in order to predict, control, and automate the behavior of mechanical and biological systems. Between 1942 and 1954, the Macy Conferences provided an interdisciplinary forum in which various theories of the nascent field were discussed.[12] The result was the integration of information theory, computer models of binary information processing, and neurophysiology in order to synthesize a totalizing theory of "control and communication in the animal and the machine" (Wiener 1948). Although a collaborative exchange of ideas led to the emergence of cybernetics, it was the American mathematician Norbert Wiener who coined the term from the Greek word *kubernētēs*, or "steersman" (also the root of the English word "governor"). Wiener has been described as the "visionary . . . who articulate[d] the larger implications of the cybernetic paradigm and its cosmic significance" (Hayles 1999, 7).

Cybernetics offered an explanation of phenomena in terms of the exchange of information in systems. It was derived, in part, from information theory, pioneered by the mathematician Claude Shannon. By reducing information to quantifiable probabilities, Shannon developed a method to predict the accuracy with which source information could be encoded, transmitted, received, and decoded (Shannon and Weaver 1949). Information theory provided a model for explaining how messages flowed through feedback loops in cybernetic systems. Moreover, by treating information as a generic substance, like the zeros and ones of computer code, it enabled cybernetics to theorize parallels between the exchange of signals in electro-mechanical systems and in the neural networks of humans and other animals. Cybernetics thus held great promise for creating intelligent machines, as well as for helping to unlock the mysteries of the brain and consciousness. W. Ross Ashby's *Design for a Brain* (1952) and F. H. George's *The Brain as Computer* (1961) are important works in this regard and suggest the early alliance between cybernetics, information theory, and the field that would come to be known as artificial intelligence. The parallels that could be drawn by using a cybernetic

model allowed the theory to be applied to a wide variety of disciplines, including political science, physiology, anthropology, and, in Ascott's case, art.

Indeed, one of the early criticisms of cybernetics was that it was "not really a new science but was merely an extended analogy" (Hayles 1999, 97). This mere analogy, however, effectively challenged essentialist notions of mechanical and biological entities, replacing them with a probabilistic model of relational information systems and feedback loops. Cybernetics has become so entrenched in scientific methodology and social theory alike that many of its underlying principles have come to be taken for granted. It can be seen, moreover, as part of larger epistemological transformations. Acknowledging the historical importance of new scientific models, Wiener called probability theory the "first great revolution of 20th century physics," representing a fundamental shift from conventional Newtonian physics predicated on precision to the "radical . . . new idea . . . that . . . physics . . . cannot escape considering uncertainty and the contingency of events" (Wiener [1950] 1967, 14–15). In this respect, cybernetics is indebted to theoretical physics, such as Albert Einstein's special theory of relativity and Werner Heisenberg's uncertainty principle. Hayles has noted that by replacing an essentialist notion of physical phenomena with one predicated on the contingency of relationality, Wiener's work contributed to a way of thinking about information and knowledge that later became historicized as poststructuralism (Hayles 1999, 91).

While this sweeping generalization remains speculative, a more concrete example of how cybernetics has been applied in practice may help elucidate its general function as well as the significance of its social implications. Wiener offered the following description:

> When the great control rooms at the locks of the Panama Canal are in use, they are two-way message centers. Not only do messages go out controlling the motion of the tow locomotives, the opening and closing of the sluices, and the opening and closing of the gates; but the control room is full of telltales which indicate not merely that the locomotives, the sluices, and the gates have received their orders, but that they have in fact effectively carried out these orders. . . . This principle in control applies not merely to the Panama locks, but to states, armies, and individual human beings. . . . This matter of social feedback is of very great sociological and anthropological interest. (Wiener [1950] 1967, 68–69)

In other words, information in a cybernetic system is dynamically transferred and fed back among its constituent elements, each informing the others of its status, thus enabling the whole to regulate itself in order to maintain a state of operational equilibrium, or homeostasis. As Wiener suggested, cybernetics could

be applied not only to industrial systems, but to social, cultural, environmental, and biological systems as well.

Wiener was deeply concerned about the misuse of science and acknowledged that much research leading to cybernetics, information theory, and computer decision-making was either explicitly or implicitly directed towards (or applicable to) military applications. During World War II, Wiener collaborated with Julian Bigelow on developing an anti-aircraft weapon that could predict the behavior of enemy aircraft based on their prior behavior. After the war, Wiener took an anti-militaristic stance and refused to work on defense projects. The universal applicability of cybernetics also threatened sacrosanct boundaries between the human and the machine. Concerned that his theory would be taken too far, in *The Human Use of Human Beings: Cybernetics and Society,* Wiener advocated the use of cybernetics to improve social conditions and cautioned about the dehumanizing potential of technology. Much to his dismay, cybernetic research and development during the Cold War contributed to the ongoing buildup of the U.S. military-industrial complex.[13] Indeed, the high-tech orchestration of information-processing and computer-generated, telecommunicated strategies employed by the U.S. military suggests nothing short of a cybernetic war machine (Virilio and Lotringer, 1983; Virilio 1991).

To summarize, cybernetics brings together several related propositions: (1) phenomena are fundamentally contingent; (2) the behavior of a system can, nonetheless, be determined probablistically; (3) animals and machines function in quite similar ways with regard to the transfer of information, so a unified theory of this process can be articulated; and (4) the behavior of humans and machines can be automated and controlled by regulating the transfer of information. If phenomena are uncertain and contingent, then it follows that information and feedback are contingent, that the behavior of animals and machines is contingent on their relationships to one another, to the dynamic unfolding of information, and to other environmental elements. There is, in cybernetics, a fundamental shift away from the attempt to analyze either the behavior of individual machines or humans as independent phenomena. What becomes the focus of inquiry is the dynamic process by which the transfer of information among machines and/or humans alters behavior at the systems level.

Cybernetics and Aesthetics: Complementary Discourses

Writing about Ascott's early interactive works shown in the 1961 exhibition "Bewogen Beweging" ("Moving Movement"), Popper noted that, "In the work of

Agam and Ascott, who were perhaps the first to launch an appeal to total participation, the strict antinomy between action and contemplation was entirely abolished."[14] Although Ascott's innovative exploration of the interactive and temporal potentials of art preceded his awareness of cybernetics, his work was not without precedent or parallel in his own discipline. Many twentieth-century artists experimented with process, kinetics, audience-participation, systems, and environment. Cybernetics proposed a universal theory that potentially could be applied to any field, but it was not the cart that pulled the horse. Rather, it articulated a concrete system of knowledge that elegantly united a broad range of disciplinary ideas and methods that had been percolating for many years. However, any common ground that cybernetics and art may have shared at mid-century cannot be attributed to essential underlying qualities. Parallels between them were not manifest, just waiting to be discovered. The bridge between art and cybernetics had to be constructed by creating metaphorical parallels. In other words, the application of cybernetics to artistic concerns depended on the desire and ability of artists to draw conceptual correspondences that joined the scientific discipline with contemporary aesthetic discourses.

The merging of cybernetics and art must be understood in the context of ongoing aesthetic experiments with duration, movement, and process. Although the roots of this tendency go back further, the French impressionist painters systematically explored the durational and perceptual limits of art in novel ways that undermined the physical integrity of matter and emphasized the fleetingness of ocular sensation. The cubists, reinforced by Henri Bergson's theory of *durée*, developed a formal language dissolving perspectival conventions and utilizing found objects. Such disruptions of perceptual expectations and discontinuities in spatial relations, combined with juxtapositions of representations of things seen and things in themselves, all contributed to suggesting metaphorical wrinkles in time and space. The spatio-temporal dimensions of consciousness were likewise fundamental to Italian futurist painting and sculpture, notably that of Giacomo Balla and Umberto Boccioni, who were also inspired by Bergson. Like that of the cubists, their work remained static and only implied movement. Some notable early twentieth-century sculpture experimented with putting visual form into actual motion, such as Marcel Duchamp's *Bicycle Wheel* (1913) and *Precision Optics* (1920), Naum Gabo's *Kinetic Construction* (1920), and László Moholy-Nagy's *Light-Space Modulator* (1923–30). Gabo's work in particular, which produced a virtual volume only when activated, made motion an intrinsic quality of the art object, further emphasizing temporality. In Moholy-Nagy's kinetic work, light bounced off the gyrating object and reflected onto

the floor and walls, not only pushing the temporal dimensions of sculpture, but expanding its spatial dimensions into the entire environment.

By the 1950s, experimentation with duration and motion by sculptors such as Schöffer, Jean Tinguely, Len Lye, and Takis gave rise to the broad, international movement known as kinetic art. Schöffer's *CYSP I*, for example, was programmed to respond electronically to its environment, actively involving the viewer in the temporal experience of the work. In this work, Schöffer drew on constructivist aesthetic ideas that had been developing for three-quarters of a century and intentionally merged them with the relatively new field of cybernetics. In Paris, in 1959, the Romanian-born artist Daniel Spoerri founded Éditions MAT (Multiplication d'Art Transformable), which published affordable multiples of works by artists such as Duchamp, Man Ray, Tinguely, and Victor Vasarely. Vasarely's "participative boxes," for example, included a steel frame and magnetized colored squares and circles that "enabled the buyer to assemble his own 'Vasarely'" (Davis 1973, 52, 55–56). The interactive spirit of kinetic art gave birth in the 1960s to the Nouvelle Tendance collectives. Groups such as the Groupe de Recherche d'Art visuel (GRAV) in Paris and ZERO in Germany, for example, worked with diverse media to explore various aspects of kinetic art and audience participation. Taking audience participation in the direction of political action, after 1957 the Situationist International theory of *détournement* (diversion) offered a strategy for how artists might alter pre-existing aesthetic and social circumstances in order to reconstruct the conditions of everyday life.

Through cross-pollination, the compositional strategy of audience engagement that emerged in Western concert music after World War II also played an important role in the creation of participatory art in the United States. Although not directly related to cybernetics, these artistic pursuits can be interpreted loosely as an independent manifestation of the aesthetic concern with the regulation of a system through the feedback of information among its elements. The most prominent example of this tendency, the American composer John Cage's *4′33″*, premiered in 1952. Written for piano but having no notes, this piece invoked the ambient sounds of the environment (including the listener's own breathing, a neighbor's cough, the crumpling of a candy wrapper) as integral to its content and form. Cage's publications and his lectures at the New School influenced numerous visual artists, notably Allan Kaprow, a founder of happenings (who was equally influenced by Pollock's gestural abstraction), George Brecht, and Yoko Ono, whose "event scores" of the late 1950s anticipated Fluxus performance.

Stiles has noted that the emphasis on the twin processes of artistic creation and reception had become an increasingly central focus of experimental visual art from gestural abstraction to happenings, Fluxus, and minimalism:

> What had begun in the late 1940's as attention to gesture in painting increasingly became a consciousness of how process informs practice at all levels from the studio to the support systems and institutions of art. Through this awareness, artists were able to demonstrate how formal aesthetics and social projects and goals of the modernist avant-gardes formed an inherent synthesis even though they had been theorized as different and independent. (Stiles and Selz 1996, 577)

For example, Robert Morris's *Box with the Sound of Its Own Making* (1961) explicitly incorporated the audible process of the object's coming into being as an integral part of the work. Morris's 1964 exhibition at the Green Gallery featured unitary forms that invoked the viewer as an active component in the environment.

In his provocative essay "Art and Objecthood," the art historian Michael Fried wrote disparagingly of the way minimalist sculpture created a "situation." He interpreted this "theatrical" quality as antithetical to the essence of sculpture (Fried 1967). But as Burnham ironically noted in *The Structure of Art*, such formalist orthodoxy was "tantamount to an archbishop accusing heretics of having . . . forsaken the rules of the Church" (Burnham 1971, 36). Although Fried's criticism has been influential, much of the most interesting art of the postwar period has challenged the categorical absolutism it advocated. Indeed, the interactive quality that Fried denigrated and Burnham supported is at the heart of Ascott's *Change Paintings* and his later cybernetic artworks of the 1960s. These works focused attention on creating interactive situations in order to free art from aesthetic idealism by placing it in a more social context.

By the 1960s, cybernetics had become increasingly absorbed into popular consciousness. Schöffer's work had helped introduce it into artistic discourses. The French artist Jacques Gabriel exhibited the paintings *Cybernétique I* and *Cybernétique II* in "Catastrophe," a group show and happening organized by Jean-Jacques Lebel and Raymond Cordier in Paris in 1962. Gabriel's text published on the poster publicizing the event stated, "L'Art et le cybernétique, c'est la même chose" (Art and cybernetics are the same thing). Also in 1962, Suzanne de Coninck opened the Centre d'Art cybernétique in Paris, where Ascott had a solo exhibition in 1964. Wen-Ying Tsai's *Cybernetic Sculpture* (1969) consisted of stainless-steel rods that vibrated in response to patterns of light

generated by a stroboscope and to the sound of participants clapping their hands.

In 1966, Nam June Paik drew a striking parallel between Buddhism and cybernetics:

> Cybernated art is very important, but art for cybernated life is more important, and the latter need not be cybernated. . . .
>
> Cybernetics, the science of pure relations, or relationship itself, has its origin in karma. . . .
>
> The Buddhists also say
>
> Karma is samsara
>
> Relationship is metempsychosis.
>
> (Paik 1966, 24)

In this short poetic statement, Paik suggested that Eastern philosophy and Western science offered alternative understandings of systematic phenomena. Buddhist accounts of cosmic cycles such as samsara (the cycle of life and death) and metempsychosis (the transmigration of souls) could also be explained in terms of scientific relations by cybernetics. In this respect, Ascott and Paik shared a common understanding of the simultaneously paradoxical and complementary nature of scientific and metaphysical explanations. Neither artist privileged one method over the other; both rather sought to develop insights into how phenomena are systematically interrelated at the most basic and profound levels.

Audio feedback and the use of tape loops, sound synthesis, and computer-generated composition reflected a cybernetic awareness of information, systems, and cycles. Such techniques became widespread in the 1960s, following the pioneering work of composers like Cage, Lejaren Hiller, Karlheinz Stockhausen, and Iannis Xenakis in the 1950s. Perhaps most emblematically, the feedback of Jimi Hendrix's screaming electric guitar at Woodstock (1966) appropriated the National Anthem as a countercultural battle cry. The visual effects of electronic feedback became a focus of artistic research in the late 1960s, when video equipment first reached the consumer market. Woody and Steina Vasulka, for example, used all manner and combination of audio and video signals to generate electronic feedback in their respective or corresponding media. As Woody remarked, "We look at video feedback as electronic art material. . . . It's the clay, it's the air, it's the energy, it's the stone . . . it's the raw material that you . . . build an image with" (Yalkut 1984, 128–30).

Not all artists were so enamored with cybernetics. Whereas Ascott, like Schöffer and others, genuinely believed in its potential as a "practical and in-

tellectual tool," the artists associated with Art & Language were much more skeptical. They applied scientific principles to art in a tongue-in-cheek manner, suggesting a parallel between the dogma of cybernetics and the dogma of modernist aesthetics. For example, in the key to *22 Predicates: The French Army* (1967), Terry Atkinson and Michael Baldwin offered a legend of abbreviations for the French Army (FA), the Collection of Men and Machines (CMM), and the Group of Regiments (GR). Using logic reminiscent of Lewis Carroll, the artists then described a variety of relationships among these elements as part of a system (of gibberish): "The FA is regarded as the same CMM as the GR and the GR is the same CMM as (e.g.) 'a new order' FA (e.g. morphologically a member of another class of objects): by transitivity the FA is the same CMM as the 'new shape / order one'" (Harrison 1991, 52).

This ironic description—through a looking glass, so to speak—mocked the manner of cybernetic explanations. It reduced to absurdity the systematization of relationships among individuals, groups, and institutions that Ascott employed in defining his theory of a cybernetic art matrix (CAM) in the essay "Behaviorist Art and the Cybernetic Vision" (1966–67). Similarly, in Harold Hurrell's *The Cybernetic Art Work That Nobody Broke* (1969), a spurious computer program for interactively generating color refused to allow the user to interact beyond the rigid banality of binary input. If the user inputted a number other than 0 or 1, the program proffered the message: YOU HAVE NOTHING, OBEY INSTRUCTIONS! If the user inputted a non-number, *The Cybernetic Art Work That Nobody Broke* told him/her that there was an ERROR AT STEP 3.2 (Harrison 1991, 58).

Charles Harrison has interpreted these experiments as "flailing about—products of the search for practical and intellectual tools which had not already been compromised and rendered euphemistic in Modernist use" (Harrison 1991, 56). But they may also be taken as ironic critiques of the technocratic ideology of progress, the incommensurability of science and art, and the rigid confines within which claims for interactive participation might transpire. At the same time, the resistance of Art & Language to the purposeful conjunction of art and technology can be interpreted as a reactionary manifestation of their rejection of media-based art. The unity of art and technology in the 1960s was perceived to be complicit with what Harrison has theorized as the "beholder discourse" of modernism. But this interpretation failed to acknowledge the theoretical intersections and shared goals between such work and the practices of conceptual art and Art & Language (Shanken 2001). Moreover, the cryptic conceptualism of Art & Language arguably constituted an elitism that was equally complicit

in reifying the modernist values of hierarchy and privilege that cybernetic art sought to undermine by involving the audience in interactive encounters.

In this regard, Ascott's work has contributed to vital tendencies of twentieth-century experimental art: to focus on temporality, to put art into motion, to utilize the concept of feedback, and to invoke interaction with the viewer. In general, such art emphasized the artistic process, as opposed to the product, and accentuated the environment or context (especially the social context), as opposed to conventional subject matter or style. These tendencies helped to form a point of convergence between scientific and aesthetic contexts, cybernetics, and art. By constructing metaphorical parallels between the two disciplines, artists were able to utilize cybernetics as a model for aesthetic research, and as a paradigm for reconceptualizing the notion of art itself.

Cybernetics and Ascott's Art

Between 1960 and 1970, Ascott was the subject of eleven solo exhibitions in England and France, and he participated in over twenty-five group exhibitions throughout Europe during the same period. Through his numerous exhibitions, his formulation of a cybernetic art pedagogy, and his theoretical essays on cybernetics and art, Ascott became the British artist most closely associated with cybernetics in the 1960s.[15] At the same time, his work of that period examined the semantic relationships among verbal, scientific, and visual languages. Lucy Lippard prominently quotes his essay "The Construction of Change" (1964) on the dedication page of her seminal *Six Years: The Dematerialization of the Art Object from 1966 to 1972* (Lippard [1973] 1997), placing Ascott in the context of conceptual art.[16]

Cybernetics offered Ascott a new paradigm for his artistic practice and pedagogy. The titles of his works *Homage to C. E. Shannon* (1964), *Analogue Table: Wiener-Rosenblueth* (1964), *Bigelow* (1965), and *Fourier* (1966) honor mathematicians and scientists who contributed to the discipline that played an important role in forming Ascott's first mature aesthetic theory. Art itself became a cybernetic system, consisting of feedback loops that included the artist, the audience, and the environment. This dynamic field of interacting processes and behavior constantly transformed the system as a whole. As he wrote in his 1967 manifesto "Behaviourables and Futuribles": "When art is a form of behaviour, software predominates over hardware in the creative sphere. Process replaces product in importance, just as system supersedes structure" (page 157 below). Ascott envisioned the interactive, systematic processes of cybernetic art as in-

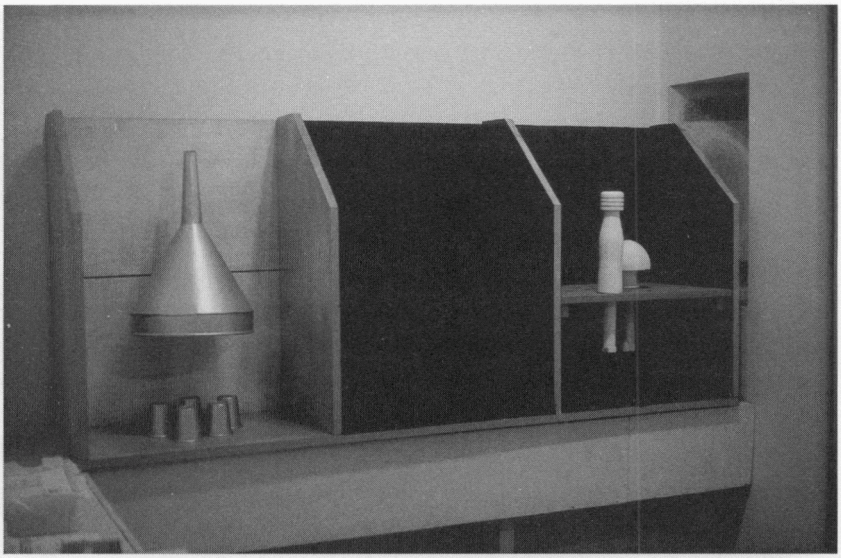


Figure 6. *Homage to C. E. Shannon.* 1964. Painted tin and wood, 24 × 54 × 12".

terconnected components in the larger system of feedback loops that constitute culture. Culture, in turn, he theorized as one of many nodes in the network of feedback loops that constitute society. In this way, Ascott's integration of cybernetics into aesthetics proposed that art, culture, and society were interconnected systems of feedback loops.

Ascott's concern with the temporal aspects of art as a durational process predates his awareness of cybernetics. Some of the artist's earlier conceptual influences help explain the evolution of ideas that ultimately led to his particular formulation of cybernetic art in the 1960s. Wentworth Thompson's biomorphological theories and Bergson's vitalist philosophy are central in this regard. Wentworth Thompson's *On Growth and Form* ([1942] 1968), which illustrates the transformation of biological matter through stages of development, became a sourcebook for artistic approaches to the genesis of visual forms, such as in Ascott's etching *Development* (see fig. 1). Ascott also drew on Bergson's concepts of the *élan vital*—an immaterial animating factor essential to life—and *durée*—the consciousness linking past, present, and future, dissolving the diachronic appearance of categorical time, and providing a unified experience of the synchronic relatedness of continuous change (Bergson 1911).

Although Bergson himself refused to endorse cubism, a number of the movement's leading theorists, including Albert Gleizes and Jean Metzinger, "thought

of themselves as 'Bergsonists,'" Mark Antliff observes (Antliff 1993, 3). In *Beyond Modern Sculpture* (1968), Jack Burnham sketches a critical history of the vitalist (i.e., Bergsonian) tendency in sculpture, identifying its manifestation in the biomorphic work of Jean Arp (an important source for Pasmore) and its particularly strong influence on Henry Moore, Barbara Hepworth, and other British artists beginning in the 1930s. Vitalism also had a strong impact on British art historians such as Sir Herbert Read, and it became a primary inspiration for Ascott, for whom *Creative Evolution* was a favorite philosophical text.

When Ascott was studying art history under Sir Lawrence Gowing, Bergson's ideas influenced his understanding of modern painting, and of the work of Paul Cézanne in particular. Although typically discussed in terms of the construction of space, Ascott suggested Cézanne's paintings were equally evocative of time. As evidence, he identified the simultaneous and shifting points of view from which the artist represented his subject. Drawing on the notions of *élan vital* and *durée*, he concluded that Cézanne's canvases exemplified the constant flux that characterizes the durational phenomenon of consciousness. From this perspective, Ascott extrapolated a general principle for painting in which the essence of reality is embodied in change. "To the painter who is dependent principally upon his visual researches for a greater perception of reality, it is the visual change in the state of things (either in themselves or in his consciousness) which will reveal their essential reality," he wrote (Ascott 1959, 30).

The genealogy from gestural abstraction to happenings and the performative elements of interactive art also offers insight into the growing concern, in the 1960s, with the temporal dimension of art, which Ascott shared. David Mellor has observed that "the notion of the art work as notated event in time underlay John Latham's first theory of the 'event-structure'" around 1954.[17] Another root of this tendency may be traced to the performative aspects of *art informel*, first demonstrated to large audiences by Georges Mathieu in Paris in 1954, and later in various locations around the world, including London at the Institute of Contemporary Arts in 1956 (Stiles 1987 and 1998). Indeed, the work of the New York School, and Jackson Pollock's weblike compositions, in particular, had earned great acclaim internationally by the 1950s. While the abstract expressionist ethos of unbridled expression of the unconscious was too emotional for Ascott's temperament, Pollock's physical, corporeal involvement in and around his paintings established a model for Ascott's research into the process by which art comes into being. In addition, the interconnecting skeins of Pollock's dripped and poured paint came to suggest, for the younger artist, ways in which art functioned metaphorically within connective networks of meaning (see chapter 16).

Figures 7-8. *Change Painting.* 1959. Plexiglas, wood, and oil, 66 × 21". Two different states.

"Interchangeable elements, each with an individual identity, may, by the physical participation of the spectator, be brought into a series of relationship, each one adding up to a whole which is more directly related to the manipulator of the parts, than if it were static and at a distance. The act of changing becomes a vital part of the total aesthetic experience of the participant."—ROY ASCOTT, *statement from the exhibition brochure* Change-Paintings and Reliefs, *St. John's College, York, 1960*

For example, on each plexiglas panel of Ascott's *Change Paintings* was a painterly gesture that the artist conceived of as a "seed" or "ultimate shape." Seeking to capture the essence of the phenomena of potentiality, these morphological art works may also be related to the ideas of organic development described in Wentworth Thompson's *On Growth and Form* and to the ideas of élan vital and durée developed by Bergson. The *Change Paintings* can be seen as an interactive visual construction in which the vital essence of the work can creatively evolve, revealing the multiple stages of its nature (as in the growth of a biological organism), over the duration of its changing compositional states. The infinite combination of these compositional transformations constituted an aesthetic unity, a metaconsciousness, or Bergsonian durée, including all its possible states in the past, present, and future.

Ascott's 1963 solo exhibition at the Molton Gallery in London, "Diagram Boxes and Analogue Structures," offers an early example of how the artist combined cybernetics and art. By this time, Ascott had assimilated cybernetics as a primary theoretical foundation for merging Bergsonian ideas with constructivism and audience interaction, while at the same time employing the use of

diagrams and text as a formal element. In so doing, he developed an original way of applying artistic and scientific theories to generate visual form.

Ascott's "Analogue Structures," such as *Video Roget*, can be interpreted in part as pushing the constructivist legacy to yet another level of complexity. Charles Biederman interpreted the artistic lineage spanning from Monet to Mondrian as systematically freeing color and form from the demands of mimesis. Biederman's structurist works, like the work of the English constructivists, including Pasmore and Nicholson, sought to extend this lineage by freeing form and color from the two-dimensional picture plane and placing it in three-dimensional relief. But whereas their work remained stationary, Ascott's *Change Paintings* and later kinetic works added a durational, interactive element that further liberated form and color by allowing it to move and change over time. Thus, while there are important formal similarities between Ascott's constructions and those of Pasmore and his colleagues,[18] the younger artist disavowed what he referred to as his mentor's "platonic ideals of 'pure form'" and his "refus[al] to link Constructivism with a social context" (Hastings 1963). Like Schöffer's "spatiodynamic" sculptures of the early 1950s, Ascott's work of the early 1960s experimented with placing constructivist principles in a social context by engaging the viewer's active physical and mental participation in determining the composition and meaning of the work.[19] The viewer became an integral part of the artwork, which Ascott conceived of as a cybernetic system, consisting of feedback links between artist, object, and audience.

Ascott's statement in the *Diagram Boxes and Analogue Structures* exhibition catalogue exemplifies how cybernetics had become part of a complex amalgam of aesthetic, philosophical, and scientific ideas that led to his creation of interactive, changeable works of art:

> Cybernetics has provided me with a starting point from which observations of the world can be made. There are other points of departure: the need to find patterns of connections in events and sets of objects; the need to make ideas solid . . . but interfusable; an awareness of change as fundamental to our experience of reality; the intention to make movement a subtle but essential part of an artifact. (Ascott 1963)

In this passage, the artist explicitly stated that cybernetics provided a conceptual framework for interpreting phenomena artistically. His recognition of "change" as fundamental to "the experience of reality" recapitulated a Bergsonian concept he had applied in his interpretation of Cézanne and in his *Change Paintings*. Finally, the "need to make ideas solid . . . but interfusable" suggested

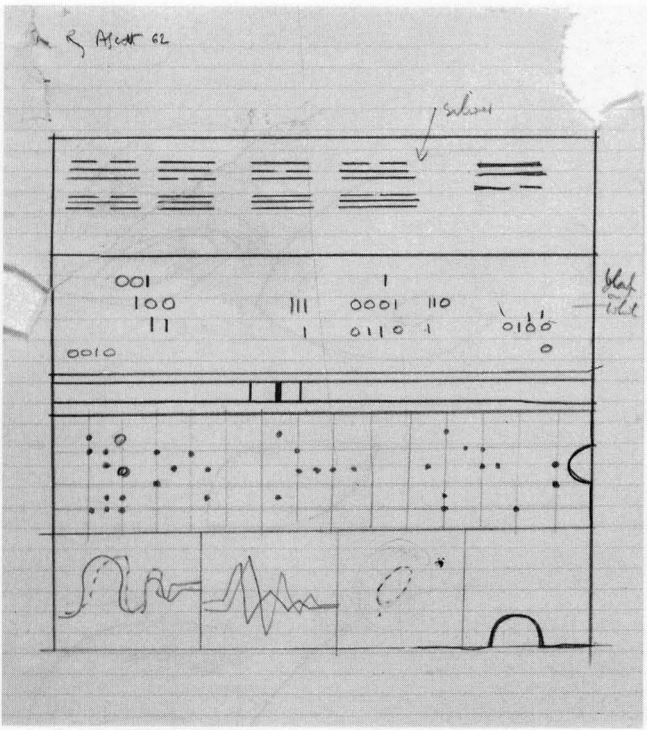


Figure 9. Untitled drawing. 1962. $7\frac{7}{8} \times 9$" approx. Note *I Ching* hexagrams in upper register, followed by binary notation, scatter-plots, and wave-forms. A "calibrator" in the middle suggests the ability to juxtapose or combine various permutations of these systems of information representation.

the modular, concrete aesthetic of constructivism. The "intention to make movement a subtle but essential part of an artifact" reflected a concern he shared with diverse strains of twentieth-century art, which sought to vitalize visual form through motion, enactment, and performative elements.

Ascott extended the parallel he drew between the forms of art and science to include non-Western systems of knowledge as well. The phrase "To programme a programming programme" appears on a 1963 sketch for the 1964 construction *For Kamynin, Lyubimskii and Shura-Bura*, dedicated to the Russian computer scientists. Yet despite the scientific jargon, in this work and others from the 1960s and 1970s, Ascott visually suggests equivalences between *I Ching* hexagrams, binary notation of digital computers, scatterplots of quantum probability, wave forms of information transmissions, and biomorphic shapes.

A similar convergence of methods characterizes works like *Cloud Template*

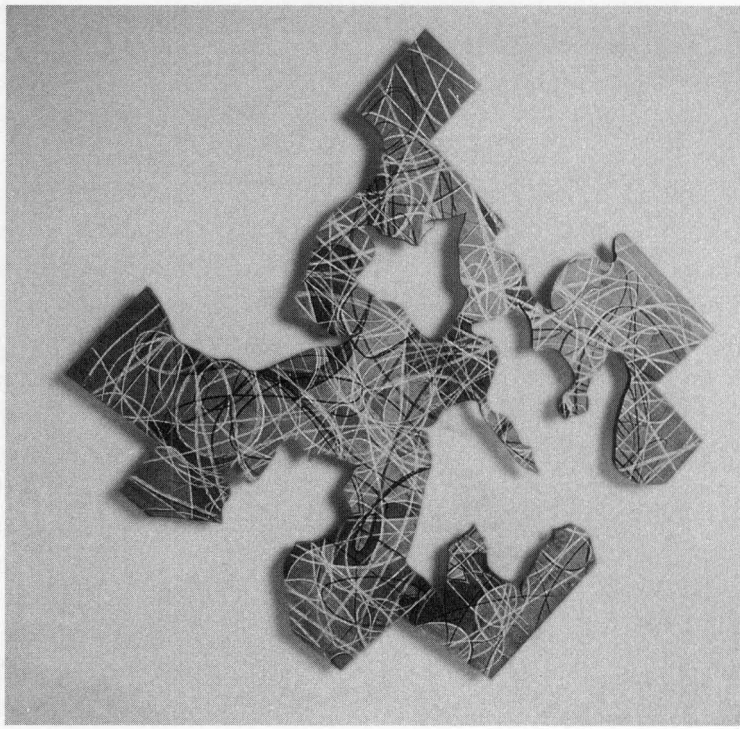


Figure 10. *Change Map*. 1969. Wax and crayon on stained wood, 80 × 80".

(1969; fig. 26) and *Change Map* (1969). Ascott created these sculptural paintings using aleatory methods. By throwing coins (as in casting the *I Ching*) on top of a sheet of plywood, chance patterns developed. The artist drew lines and curves connecting the points marked by the coins, then cut through the wood, progressively removing segments and creating an unpredictable shape. Ascott's use of chance methods is related both to dada and surrealism and to the techniques of Cage, who determined parameters of his musical compositions by casting the *I Ching*.

At the same time, the verticality of this method shares affinities with the cartographic and horizontal qualities in the work of Pollock and Duchamp. Pollock's decision to remove the canvas from the vertical plane of the easel and paint it on the horizontal plane of the floor, for example, altered the conventional, physical working relationship of the artist to his or her work. Similarly, Ascott's corporeal orientation to his materials became horizontal, whereby the artist looked down on the canvas from a bird's-eye view. This shift embodied and made

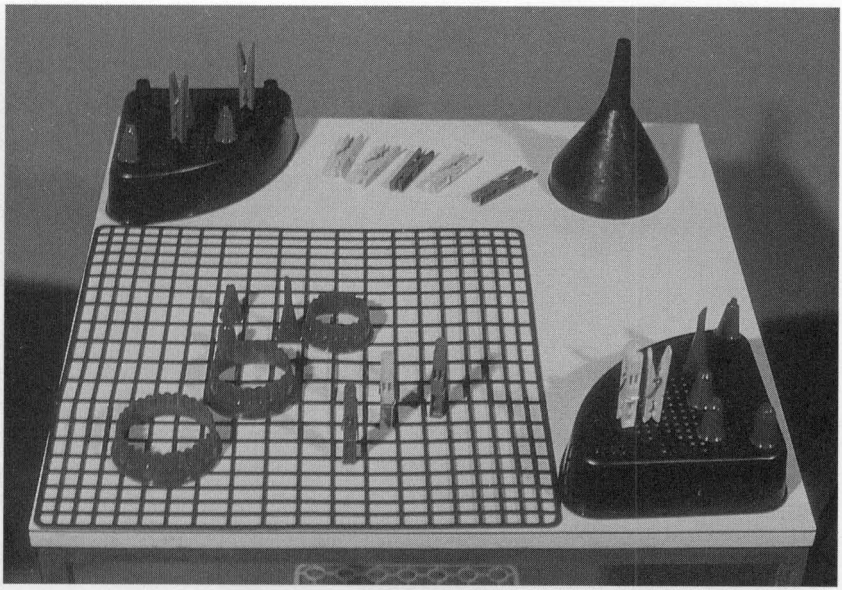


Figure 11. *Transaction Set*. 1971. Found objects, dimensions variable.

explicit the ongoing reconceptualization of painting from a "window on the world" to a cosmological map of physical and metaphysical forces. The random method that Duchamp used for creating *3 Standard Stoppages* (1913–14) also demanded a horizontal relationship between artist and artwork. Duchamp's related *Network of Stoppages* (1914), which can be interpreted as a visual precursor to the decision trees of systems theory, further offered a diagrammatic model for the interconnected visual and semantic networks of Ascott's transparent *Diagram Boxes* (ca. 1962–63).[20] Later, Ascott created interactive works on an explicitly horizontal plane, such as *Transaction Set* (1971), which made use of a table as a "canvas," on which various "table-top strategies" could be played out.

In works like *For Kamynin, Lyubimskii and Shura-Bura* and *Parameter V*, Ascott joined twentieth-century aesthetic concepts of chance, horizontality, and cartographic imagery with Bergsonian notions of vitalism and change, the *I Ching*, cybernetics, and artificial intelligence. For thousands of years the *I Ching* has been consulted on choosing a path toward the future; much more recently cybernetics emerged in part from Wiener's military research, which attempted to anticipate the future behavior of enemy aircraft. Similarly, Ascott's experience as a radar officer in the Royal Air Force may have contributed to his artistic predisposition towards a horizontal bird's-eye view and the use of carto-

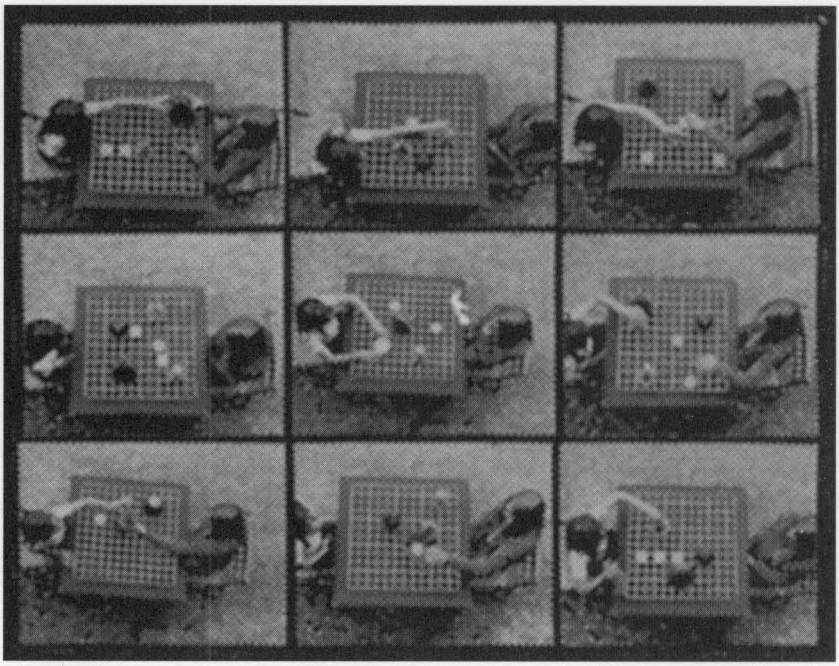


Figure 12. *Table-Top Strategies.* 1971. Composite photograph of interactions with a Transaction Set.

graphic forms that triangulated information to predict the future. In this way, Ascott's cybernetic art combined aesthetic, scientific, and mystical models to create his own visionary practice.

Cybernetics and Art Pedagogy

Ascott extended his theory and practice of cybernetic art into his work as an art educator. As head of Foundation Studies at the Ealing College of Art in London (1961–64), he created what might be called a cybernetic art pedagogy. He described how the continuum between his work in the studio and his work in the classroom made the two complementary: "In trying to clarify the relationship between art, science and behaviour, I have found myself able to become involved in a teaching situation without compromising my work. The two activities, creative and pedagogic, interact, each feeding back to the other. Both, I believe, are enriched" (page 98 below).

It is no coincidence that he used the language of cybernetics to suggest how his art practice and pedagogy interacted, "each *feeding back* to the other" in a

mutually reinforcing system. One might even say that the classroom became a cybernetic studio, in which the artist could experiment with behavioral interactions among his students, and in which his students could learn some of the most advanced aesthetic theories firsthand, by participating in them. "I do not know of any other artist/teacher who projects such a high incident of integration between his teaching ideas and the art-hardware that he makes," noted the British artist and critic Eddie Wolfram (Wolfram 1968).

Throughout his career, Ascott has held a strong conviction, not just about the role of the educator in teaching art, but about the role of art in teaching culture. In the Foundation Studies curriculum he instituted at Ealing, the study of conventional artistic skills transpired within a context where theoretical concerns and the broader implications of art were foregrounded. "All art is, in some sense, didactic: every artist is, in some way, setting out to instruct," he wrote. "For, by instruction, we mean to give direction, and that is precisely what all great art does. . . . Through [the] culture it informs, art becomes a force for change in society" (page 98 below).

This conviction about the positive social function of art as an instrument of education and transformation has been a consistent feature of Ascott's theory, practice, and pedagogy for some forty years. The success of his pedagogical methods and his belief in the role of art in culture in general has led to numerous international positions as an arts educator, consultant and administrator (see Appendix I).

In the classroom, cybernetics offered a clear model for reconceptualizing art and education—and their roles in a larger social system—by suggesting the organization of art education curricula in terms of a behavioral system of feedback and control. The course of study Ascott implemented at Ealing beginning in 1961 focused on these cybernetic principles. Students collaborated together as elements of a system that regulated their artistic behavior as an integrated whole. As Ascott explained, forming groups of six, each student would be "set the task of acquiring and acting out . . . a totally new personality, which is to be narrowly limited and largely the converse of what is considered to be their normal 'selves'" (page 105 below).

Ascott's pedagogy threw into question a student's preconceptions about his or her personality and strengths and weaknesses as an artist, as well as about the nature of art itself. Students were actively encouraged to mature through the experimental adoption of different behavioral characteristics and a rethinking of art-making and art as process and system. Students created aleatory devices, such as the *Calibrator for Selecting Human Characteristics*, in order to determine

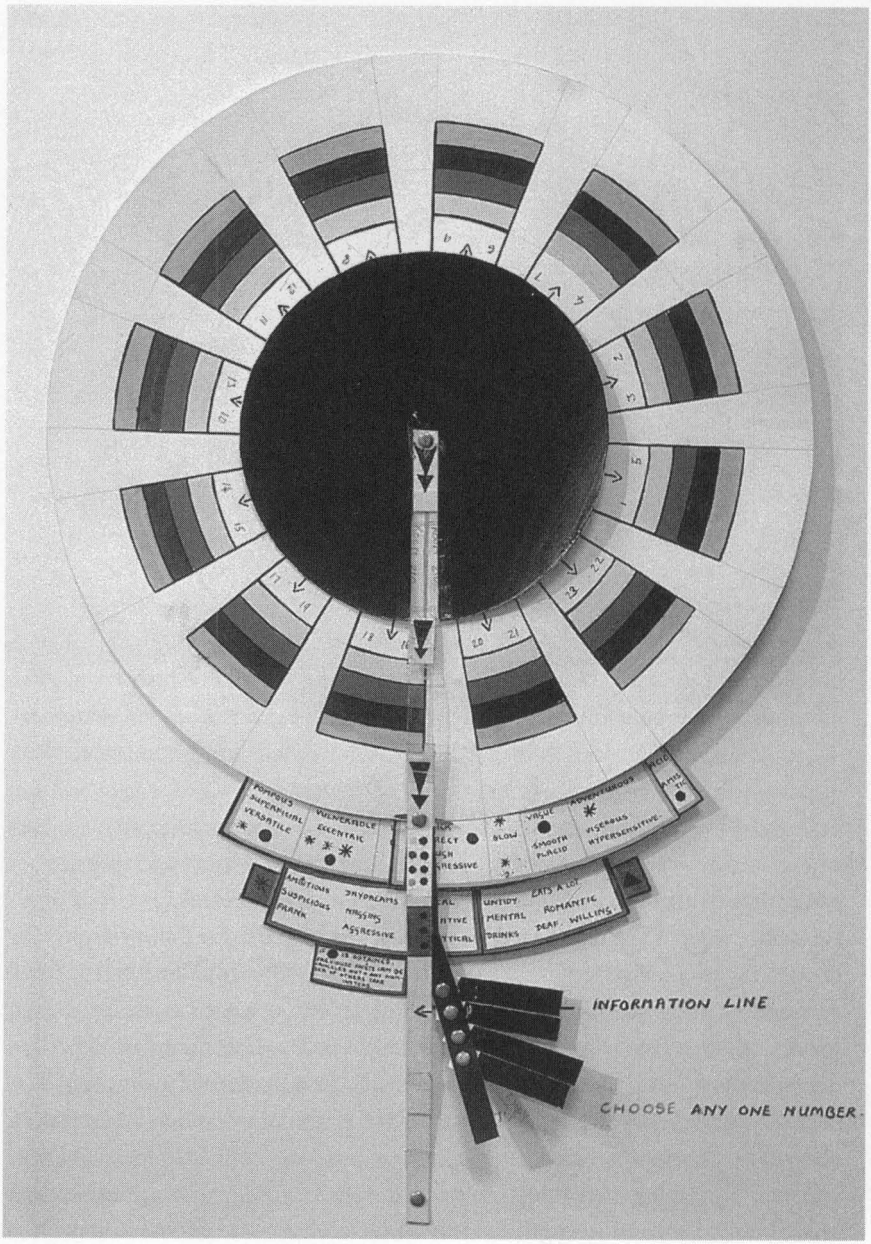


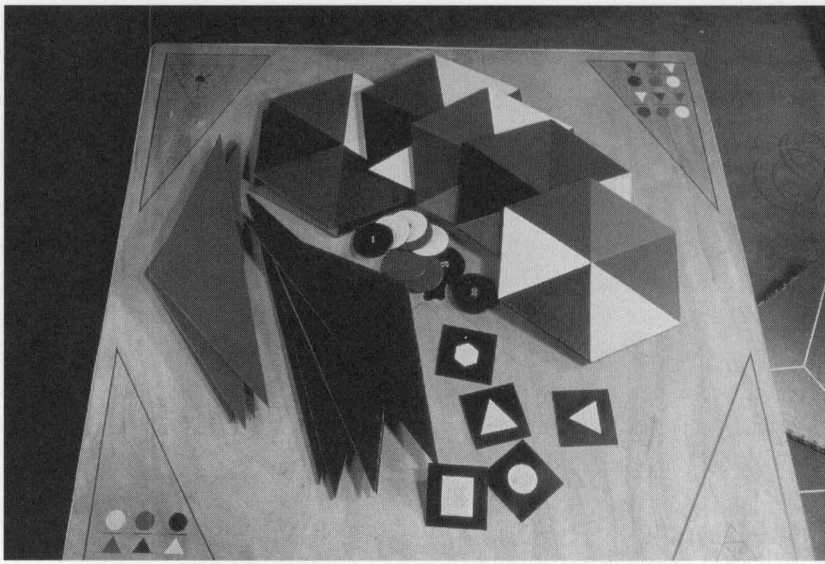
Figure 13. *Calibrator for Selecting Human Characteristics.* Ca. 1963. Student work from Ealing College of Art, London.

behavioral alterations in a random but systematic manner. Because their individual behaviors had to be integrated into a coherent group process, all members would have to be "interdependent and highly conscious of each other's capabilities and limitations" in order to accomplish together the "goal of producing . . . *an ordered entity*" (page 106 below). In one exercise, Peter Townshend (who later founded the rock band The Who) was restricted to transporting himself about the school on a trolley. He and the other members of his group had to compensate for one another's abilities and disabilities in order to make the collective function as an integrated organism. In this way, students learned about the principles of cybernetics as applied to art through their own behavioral interactions in a cybernetic art system in which the controlled exchange of information organized the overall structure.

In Ascott's "Ground Course" (the first-year curriculum for developing foundational artistic skills), students were introduced to other radical artists and intellectuals in a variety of disciplines. Gustav Metzger's presentation of his theory of "destruction in art" is a powerful example of the influence of Ascott's guest lecture program. Townshend has credited Metzger's theory of autodestructive art with giving him the idea of destroying musical instruments onstage at concert performances by The Who—a performative gesture that visually symbolized the anger of the generation that rebelled against the Vietnam war (Stiles 1987). Stiles has theorized this transference of ideas from Metzger to Townshend as an illustration of the process by which the most advanced and rarified conceptual developments in experimental visual art become assimilated into popular culture. In a similar vein, might not Townshend's experience of immobility in Ascott's cybernetic classroom have inspired the "deaf, dumb, and blind" pinball wizard in his rock opera *Tommy*? Such migrations of concepts from art to culture and society substantiate Ascott's notion that "art is . . . didactic" and that "through culture it informs . . . and becomes a force for change in society" (page 98 below).

Between 1964 and 1967, Ascott was head of the Department of Fine Art at Ipswich Civic College in Suffolk. His emphasis on art as behavior and system resulted in a variety of interesting student exercises. One in particular seems to have anticipated the popular parlor game *Twister*.

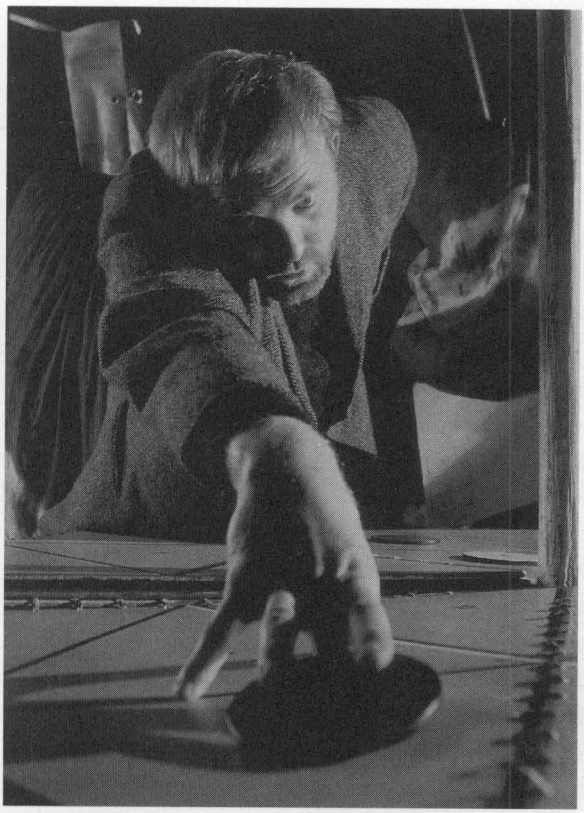
Ascott's cybernetic, behavioral art curriculum at Ipswich was as rigorous and challenging as it had been at Ealing. Brian Eno, who was one of his students there and later gained renown as a musician and composer, has provided a firsthand account of his teacher's pedagogical methods and their impact on him:



Figures 14-15. Student behavioural experiments at Ipswich Civic College, Suffolk, 1965. A precursor to the parlor game Twister? Photos by Roy Beston.

> One procedure employed by Ascott and his staff was the "mindmap." In this project each student had to invent a game that would test and evaluate the responses of the people who played it. All the students then played all of the games, and the results for each student were compiled in the form of a chart—or mindmap. The mindmap showed how a student tended to behave in the company of other students and how he reacted to novel situations. In the next project each student produced another mindmap for himself that was the exact opposite of the original. For the remainder of the term he had to behave according to this alternative vision of himself. (Eno et al. 1986, 40–41)

Eno notes that "[f]or everybody concerned this was an extraordinary experience . . . [which] was instrumental in modifying and expanding the range of interaction each student was capable of." He also recounts another educational experiment, later dubbed the "Quadrangle Incident" in which the students were locked in the courtyard by the staff: "They said nothing and would not answer our questions . . . for more than an hour. During this time, our mild amusement at this situation changed to uneasiness and then complete perplexity. We all had an idea that we were expected to do something, but none of us knew what." As Eno's biographer Rick Poynor has noted, this "object lesson in 'the tension that



arises from being plunged into a novel situation' . . . would come to assume increasing importance in Eno's ideas about the function of art" (41).

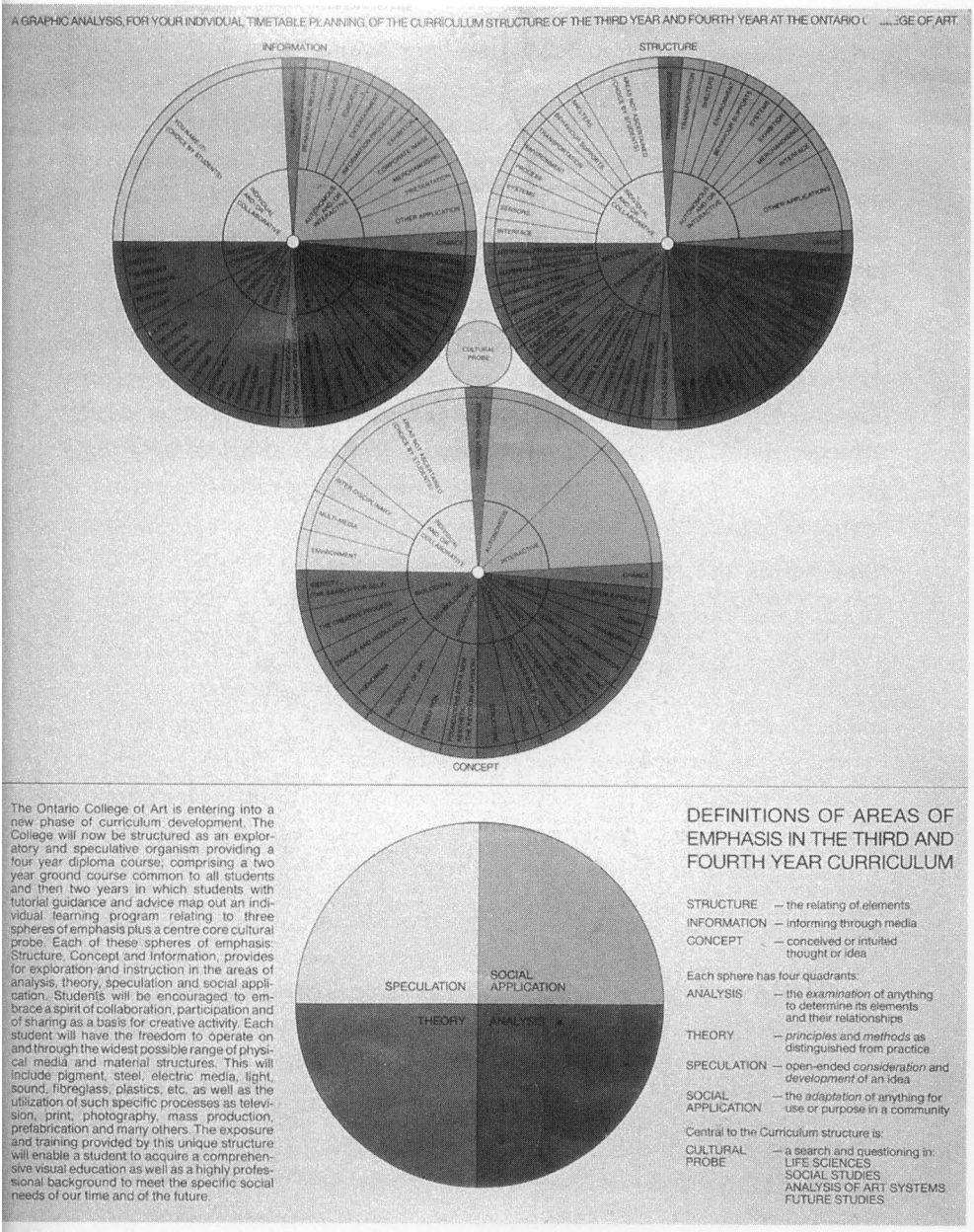
The reputation Ascott gained as a progressive art educator using experimental methods rooted in cybernetics led to a number of distinguished positions, including those of president and chief executive officer of the Ontario College of Art (OCA) in 1971–72. Coincidentally, and ironically, it was there, in Toronto, the hometown of the visionary media theorist Marshal McLuhan, that Ascott encountered the most serious resistance to his cybernetic art pedagogy. The art education curriculum Ascott attempted to implement at the OCA was predicated on many of the ideas he developed at Ealing, and later at Ipswich and at Wolverhampton Polytechnic, where he was head of Painting between 1967 and 1971. Ascott elaborated his art teaching method in his essay "Behaviourist Art and the Cybernetic Vision" and created an innovative curriculum for OCA based

on those principles, triangulated in a diagram whose components were information, concept, and structure.

The OCA was a beleaguered institution that had "been in constant turmoil" for several years prior to Ascott's appointment. In July 1971, before the revamped curriculum could begin to yield its intended results, tensions were already beginning to mount. An enthusiastic Toronto newspaper headline read, "Revolution at Ontario College of Art." By December, another headline read, "Students and faculty are confused as 'future shock' hits our art college." Ascott ultimately was dismissed in 1972, but his departure met with great resistance, especially on the part of the students. A local art journal reported: "The walls were plastered with posters by the students, 'We want Roy,'" and one student said, "'For the first time we've wakened [*sic*] up to the WONDER in life. . . . and Roy did it."[21] According to Norman White, an OCA faculty member, Ascott's lasting impact on the school was substantial. Among other influences, he created the innovative Photoelectric Arts Department, where White was still teaching in 1999, and which was still directed by Richard Hill, whom Ascott had appointed during his tenure.[22]

After leaving the OCA, Ascott became head of the Department of Fine Art at the Minneapolis College of Art & Design (1974–75) and then vice president and academic dean of the College at the San Francisco Art Institute (1975–78). In the 1980s, his pioneering research in telematic art (art projects using computer-mediated telecommunications networks as their medium) led to positions as founding head of the Department of Communications Theory at the University of Applied Arts, Vienna (1985–92), and head of the Field of Interactive Arts at Gwent College, Newport, Wales (1991–94). Ironically, ten years after Ascott's dismissal, the OCA participated as one of the nodes in Ascott's art project "La Plissure du Texte." By the mid 1990s, the World Wide Web had made routine the artistic and multidisciplinary collaborations Ascott had been proposing for decades, validating his initiatives to expand art education curricula in unconventional ways. Indeed, the struggle to balance traditional skills and aesthetic concerns with new techniques, media, and values is one of the most difficult issues now facing art education.

In this regard, perhaps Ascott's greatest accomplishment as an art educator was his founding of the Centre for Advanced Inquiry in the Interactive Arts (CAiiA, echoing "Gaia," or Earth) at the University of Wales, Newport, in 1994. In this program, his cybernetic and telematic aesthetic theories have been applied as an integrated pedagogical method. In the 1995–96 academic year, CAiiA gained accreditation for the world's first Ph.D. program focusing on interactive



igure 16. Curriculum diagram, Ontario College of Art, 1972.

art—a course of study that has transpired largely online. CAiiA graduates include such internationally renowned artists as Victoria Vesna (U.S., Ph.D. 2000), Bill Seaman (U.S., Ph.D. 1999), Joseph Nechvatal (U.S./France, Ph.D. 1999), Jill Scott (Switzerland/Australia, Ph.D. 1998), and Dew Harrison (U.K., Ph.D. 1998). Other renowned students include Eduardo Kac (Brazil/U.S.), Christa Sommerer (Austria/Japan, Ph.D. 2002), Laurent Mignonneau (France/Japan), Miroslaw Rogala (U.S./Poland, Ph.D. 2001), Marcos Novak (U.S.), and Char Davies (Canada). In the 1997–98 academic year, a joint degree program was developed between CAiiA and the Science, Technology and Art Research center (STAR), in the School of Computing, University of Plymouth. The combined research institute has been named CAiiA-STAR. CAiiA-STAR regularly makes presentations on technology and culture to educational and civic institutions internationally, and has organized an annual "Consciousness Reframed" conference since 1997.

Cybernetics and Ascott's Writings from the 1960s

Two of Ascott's essays from the 1960s exemplify his theories on the application of cybernetics to art: "The Construction of Change" (1964) and "Behaviourist Art and the Cybernetic Vision" (1966–67). In these early publications, Ascott emphasized how the processes of artistic production and reception had come to occupy center stage in his conceptualization of art as a cybernetic system. As noted above, the emergence of this emphasis on "process" may be traced to the gesturalism of postwar painting, and it became an increasingly pervasive area of artistic inquiry in the late 1960s and 1970s. Stiles has suggested, moreover, that this aesthetic shift laid the conceptual groundwork for the popular use of interactive electronic media that would follow:

> In their writings and works, many artists became increasingly aware of how process connects the superficially independent aspects and objects of life to an interdependent, interconnected network of organic systems, cultural institutions, and human practices. However awkwardly these artists' works anticipated the end of a century that witnessed the advent of massive electronic communication systems like the Internet, their research was vital in visualizing process as a means to align art with the future. (Stiles and Selz 1996, 586)

In this context, Ascott's texts of the 1960s are remarkable for the ways in which they not only theorized an artistic project based on the ideas of process and behavioral interaction but also explicitly envisioned the future application of communications technologies (which would not become available for nearly two

decades) to this project. This genealogy of ideas illustrates how concepts that emerged in the liminal space of experimental art often become popularized later in other modes of cultural production. Interactivity, for example, has become a cornerstone of the communications, electronics, and entertainment industries' development and marketing of online services, computer games, and multimedia in the 1990s and 2000s (Stiles and Shanken 2002). And the term "multimedia" has been credited to the Fluxus artist Bob Watts, who coined it in 1958 (Simon 1999, 71).

The types of changes that Ascott identified in "The Construction of Change" and "Behaviourist Art and the Cybernetic Vision" also share many similarities with postmodern discourses that identify themselves as heralding a new epistemological paradigm emerging from the deconstruction of the ideas underpinning modernism. In particular, Ascott's cybernetic aesthetic theory was predicated on the relativism of probabilistic theory, the negotiation of behavior contingent on feedback, the determination of meaning as the result of the dynamic flow of information through a system, and the emphasis on process as opposed to product. All of these ideas are consistent with poststructuralist theories of knowledge and being. These parallels are presented only to suggest that Ascott's aesthetic theory (derived from experimental art, cybernetics, and other sources) reached conclusions that were very similar to those emerging contemporaneously in various critical discourses in diverse disciplines, and which later became historicized under the rubric of postmodernism. There are many differences as well. For example, Ascott was antagonistic to the recycling of historical styles and believed strongly in the possibility and importance of originality, of creating the world anew. But his anticipation of appropriation as an aesthetic strategy indicates how Ascott's thinking was very much at the vanguard of intellectual history in the 1960s.

Ascott's first theoretical text, "The Construction of Change," emphasized the importance of science and technology as models for informing artistic practice in a socially constructive way. It joined Ascott's conceptual roots in Bergsonian concepts of duration and his more recent embrace of cybernetic theory, balancing metaphysical intuition with scientific rationalism. Written while he was teaching at Ealing, the essay asserted the didactic power of art. Ascott observed that technology changes the world, not just by physically altering the objects of experience, but by transforming the way those objects are perceived and experienced. In other words, he suggested that technology alters human consciousness. He argued that artists have a responsibility to comprehend those technologically induced changes so that they can create models of knowledge and

behavior that offer alternative visions and possibilities for shaping the world. "Technology . . . is not only changing our world, it is presenting us with qualities of experience and modes of perception that radically alter our conception of it. . . . The artist's moral responsibility demands that he attempt to understand these changes" (page 98 below). With regard to the artist's role in overcoming the challenges of technological society, he wrote: "The artist functions socially on a symbolic level . . . [and] stakes everything on finding the unfamiliar, the unpredictable. His intellectual audacity is matched only by the vital originality of the forms and structures he creates. Symbolically, he takes on responsibility for absolute power and freedom, to shape and create his world" (page 98 below). In this passage, Ascott asserted that the artist fulfills a social need to take chances, to seek out the unknown, to freely play and experiment with ideas and structures that are unproven and perhaps dangerous but nonetheless a vital source of inspiration and direction for the future.

In "The Construction of Change" Ascott contended that art provides a virtual world in which models of prospective futures may be tested prior to being approved for more general applications, what Burnham later referred to as a "psychic dress-rehearsal" for the future. In this way, Ascott suggested, artistic models can make the transition from ephemeral idea to a transformative behavior that shapes and creates the world. Quoting Goethe, he further claimed that the artist's "'capacity to create what is to be'" takes on a moral imperative, for, "'man's highest merit . . . is to control circumstances as far as possible.'" Such a declaration overstates the case, for Ascott himself had asserted the importance of chance and play as artistic strategies, both in his theoretical writings and in his artworks. But perhaps there is no necessary contradiction between using chance methods to arrive at a form of control. Indeed, the cybernetic art matrix (CAM) Ascott elaborated in "Behaviourist Art and the Cybernetic Vision" prescribed a highly defined and structured system as the precondition for expanding creative play throughout society. Throughout his writings, Ascott has consistently restated his sense of responsibility as an artist to envision alternative futures, overcoming the limited confines of formalist aesthetics, to shape the way people think, live, and interact.

"BEHAVIOURIST ART AND THE CYBERNETIC VISION" (1966-67)

Building on the theories he laid out in "The Construction of Change," in his next major piece of theoretical writing, "Behaviourist Art and the Cybernetic Vision," Ascott attempted to define a way of enhancing creative behavior

throughout society by inventing an educational system according the principles of cybernetics. This dense and lengthy text was published in two parts in consecutive issues of the Belgian journal *Cybernetica*. In it, Ascott proposed a new paradigm of "modern art," which he claimed "differs radically from [the determinism of] any previous era" and is distinguished by its emphasis on ambiguity, mutability, feedback, and especially behavior. While hopeful about this new aesthetic model, Ascott anticipated (with apprehension) the recycling of artistic styles that would come to characterize certain aspects of postmodernist art and architecture. He offered a prospective description of interactive artworks involving human-computer interfaces, and suggested some possibilities of remote artistic collaboration via telecommunications.

In order to promote creative behavior in a technological society, Ascott proposed an educational model that he called the cybernetic art matrix (CAM), consisting of an elaborate, integrated system for promoting a cybernetic model of information feedback and exchange throughout culture. Anticipating a time in which cybernetics and robotics would have created a world in which human beings had substantially greater amounts of leisure time, Ascott envisioned that CAM would provide an educational structure in which people could focus their energies on expanding their intellectual and artistic capabilities and collectively participate in forms of creative behavior that would enhance the quality of life.

Behaviorist Art, Cybernetics, and Behaviorism

In "Behaviourist Art" (the first part of "Behaviourist Art and the Cybernetic Vision"), Ascott sought to differentiate between prior artistic models, and an art based on ideas from cybernetics and behavioral psychology. In this regard, it is tempting to draw parallels between the behavioral psychologist B. F. Skinner's self-proclaimed "technology of behavior" and the roughly contemporary science of cybernetics (Skinner 1971). Though Skinner himself might have denied any connection between the two fields, behaviorism offered an experimental mechanism for measuring the effect of conditioning on behavioral modifications that a cybernetician might describe in terms of feedback loops. The methodology of behaviorism functioned by bracketing out or, in cybernetic terms, "black-boxing" the internal mechanisms operating in the organism. In this way, difficult problems (in psychology or engineering) could be simplified by allowing the complex internal mechanism inside the "box" to remain unexplained.

Similarly, Ascott conceived of behaviorist art as functioning, in part, like a

cybernetic black box. The transformative potential of the artwork as an input would result in the alteration of the viewer's information and behavior. But whereas the state of the black box of cybernetics or behavioral psychology necessarily was meant to remain unchanged in order to enable predictive control and replicability, Ascott's cybernetic, behavioral artworks were themselves meant to be transformed (within a certain range of possibilities) by the interaction of the viewer with them. It must also be noted that Skinner believed that behavior could be understood on the basis of environmental conditioning alone. As such, he conceived of the organism itself as a black box whose internal processes offered no significant clues to predicting behaviour. Ascott, on the other hand, ascribed great significance to the ability of the internal processes of his artworks and those who participated in them to transform the behavior of the system as a whole. By merging cybernetics and behaviorism, his work countered Skinner's deterministic conception by striking a balance between how internal and external factors affected the behavioral dimensions of art.

The idea of art as a system capable of transforming behavior and consciousness was fundamental to Ascott's paradigm for the art of the future. Such an art had to be interactive, allowing the viewer to become actively engaged with it. In "Behaviourist Art," Ascott claimed that this two-way exchange of information was fundamentally different from the passive one-way path of traditional art:

> The dominant feature of art of the past was the wish to transmit a clearly defined message to the spectator, as a more or less passive receptor, from the artist, as a unique and highly individualised source. This deterministic aesthetic was centred upon the structuring, or "composition," of *facts*, of concepts of the *essence* of things, encapsulated in a factually correct visual field. Modern art, by contrast, is concerned to initiate *events*, and with the forming of concepts of *existence*. The vision of art has shifted from the field of objects to the field of behaviour. . . .
>
> . . . The artist, the artifact, and the spectator are all involved in a more behavioural context. . . . [T]hese factors . . . draw the spectator into active participation in the act of creation; to extend him, via the artifact, the opportunity to become involved in creative behaviour on all levels of experience—physical, emotional, and conceptual. A feedback loop is established, so that the evolution of the artwork/experience is governed by the intimate involvement of the spectator. (Pages 110–11 below)

Contrary to Ascott's strong claim for the radicality of his work vis-à-vis traditional art, it may be argued that works of art have always demanded interac-

tion from viewers and that the networks of signification by which visual forms attain meaning presuppose a two-way exchange of meaning. If what Ascott proposes is not "new" in the sense of offering a fundamentally different model of perception for visual art, then his art and theory may be interpreted as emphasizing and making explicit a bi-directional model of aesthetic information exchange in which the viewer becomes an active participant in determining the work. While Ascott's claims overstate the case and create a binary opposition between conventional art and his own work, that lack of subtlety does not, however, completely undermine his argument for the historical aesthetic shifts he identified. Rather, it suggests that those shifts may be more usefully explained in terms of changes in emphasis and awareness. In this sense, his studio practice and theoretical work can be seen as extending the growing recognition by artists and aestheticians of the active experiential processes involved in creating and viewing art, and in visual perception in general.

A further note on terminology is in order here, because the terms that Ascott used to distinguish between the "art of the past" and "modern art" may now confuse his point. As was customary in the 1960s, Ascott conceived of modern art as new or contemporary art, opposed to prior aesthetic conventions. Over the past forty years, however, the term "modern art" has come to refer to art produced during the historical period of modernism.[23] What Ascott described as the "art of the past" shares principles in common with what scholars now refer to as modern art. And his description of modern art as "forming concepts of existence" and shifting "the vision of art . . . from the field of objects to the field of behaviour" anticipated what became widely recognized as a postmodern artistic and critical strategy: the deconstruction of categorical distinctions such as those between artist, artwork, and audience. At the same time, the reliance of Ascott's argument on binary oppositions (e.g., past vs. present, objects vs. events) and his faith in scientific progress suggest continuities with the liberal humanist values associated with modernism. Since systems of knowledge are hardly univocal or monolithic, such a commingling of values is the inevitable and persistent condition that pertains to the transition, overlap, and negotiation of epistemological models. In other words, Ascott's cybernetic art theories of this period straddle modernism and postmodernism, and manifest the tension between them.

In "Behaviourist Art," Ascott warned that resistance to technology might hinder the social advances he envisioned. He foresaw that if such resistance prevailed, a superficial pastiche of historical styles would come to dominate art:

> This incipient malaise finds its strength in a circular pattern of events, an endless repetition of past styles and artful recombinations of formal traits that have

> already served their purpose for the earlier artists who originated them. Art feeds on art, it is true, but the disease results from a preoccupation with the superficial visual style of a culture object from the past, and develops out of ignorance of the processes of creative thought that produced it. (Page 130 below)

Whether or not one agrees with Ascott's diagnosis of this condition as a "disease," he forecast a significant cultural trend of the subsequent quarter century—an era obsessed with recycling historical styles in art, architecture, music, and fashion. Again, his prescience is notable. For who, in the mid 1960s, could have imagined that artists would achieve art historical fame and commercial success by "appropriating" or copying the images or styles of previous generations of artists?[24] Or that a neo-baroque mélange of historical stylistic references in architecture—what Jean Baudrillard (echoing Walter Benjamin) theorizes as a "procession of simulacra"—would constitute a requiem for the modernist concept of originality and become celebrated as distinctively postmodern?

Ironically, the advent of digital technologies has intensified both the ethos of appropriation Ascott warned of and the ethos of interactivity he promoted. It has accomplished this dual role by facilitating wholesale copying of images, sounds, texts, and other data. Simultaneously, telematic technology has begun to enable the popular and widespread dissemination and transformation of multimedia content, bypassing the conventional corporate structures that control marketing and distribution from the top down.

Significant examples in this regard are the pervasive use of sampling in hip-hop music and the widespread exchanging of music and other media through peer-to-peer file-sharing services such as Napster, recently ruled as a violation of copyright law. Given the complexity of intellectual property law, the financial interests of media producers, and the demand of consumers for free downloads (particularly since the proverbial cat has already been let out of the bag), it is unclear to what extent the utopian goals Ascott foresaw have been realized or will be realized (or curtailed) in the future.

The Cybernetic Vision: The CAM, Computers, and Remote Collaboration

In "The Cybernetic Vision," the second part of the essay, Ascott conceived of the cybernetic art matrix as an interrelated system of feedback loops designed to serve professional artists, as well as the general public. He envisaged that the flow of information and services would be self-regulating throughout the whole. The CAM was intended to provide a variety of functions, including: facilitate

interdisciplinary collaboration among geographically remote artists and scientists, enable a pragmatic art education curriculum for the young, and enrich the lives of "the new leisured class" by offering amenities and modes of creative play. Ascott used symbolic formulae, and numerous acronyms, to identify particular niches within the CAM, and to explain methodically how the various layers are connected to the system. Looking back from a historical distance of nearly four decades, the formulaic structure and scientism of the CAM can be seen as part of its stylistic charm. For along with the overdetermined rigidity of its form and the unmitigated utopianism of its goals, the CAM attempted to employ cybernetic theory in the design of a social system that would solve a practical problem: to serve human needs in the future, when people would be freed from the demands of labor and could focus their energies on developing their intellectual, creative, and ludic capacities.

Ascott envisioned technology as playing a vital role in implementing his cybernetic vision, both as a means to enhance human creativity at the individual level and by enabling collaborative interaction between participants from diverse fields and geographic locations. In this regard, Ascott conceived of the computer and the potential relationship between art and computers in the following terms:

> [The computer] is a tool for the mind, an instrument for the magnification of thought, potentially an 'intelligence amplifier.' . . . [T]he interaction of artifact and computer in the context of the behavioural structure is equally foreseeable. . . .
>
> The computer may be linked to an artwork, and the artwork may in some sense *be* a computer. (Page 129 below)

Extrapolating from ideas W. Ross Ashby described in "Design for an Intelligence Amplifier" (Ashby 1956), Ascott suggested an unconventional use of computers in an artistic context. Ascott's concept of the artistic application of computers had little in common with the two-dimensional pictures of rigidly geometric computer graphics or the psychedelic organicism of fractal images. Instead, Ascott envisioned the computer as a means for controlling environments and triggering events, regulating a variety of visual parameters, and allowing for audience interaction in real time. Among his artistic models, he cited the work of Nicholas Schöffer, whose studio he visited in Paris in 1957.

By the late 1960s, Ascott's theoretical concerns with audience involvement had expanded from the localized artistic environments of his earlier interactive work, and he began to consider the potential of geographically dispersed interaction. Over a quarter century before the advent of Web-based graphical interfaces, "Behaviourist Art and the Cybernetic Vision" anticipated the emergence

of art created interactively with computers, and remote artistic/interdisciplinary collaborations via telecommunications networks:

> Instant person-to-person contact would support specialised creative work. . . . An artist could be brought right into the working studios of other artists . . . however far apart in the world . . . they may separately be located. By means of holography or a visual telex, instant transmission of facsimiles of their artwork could be effected and visual discussion in a creative context would be maintained. . . . [D]istinguished minds in all fields of art and science could be contacted and linked. (Page 146 below)

In this description, Ascott cited McLuhan's media theories as offering a vision for how electronic media could enable "instant and simultaneous communication . . . [through] electric extensions of the central nervous system . . . produc[ing] a 'global village' of social interdependence" in the realm of art.[25] McLuhan's *Gutenberg Galaxy* (1962) and *Understanding Media* (1964) were already in wide circulation at the time, but Ascott's proposition must nonetheless have seemed like science fiction in the realm of art. Indeed, it would be many years before the artist could gain access to the technology that would make possible such collaborative computer-networking projects, a domain Ascott later dubbed telematic art.

— TELEMATICS

Telematics, or the convergence of computers and telecommunications, is rapidly becoming ubiquitous in the developed world. Anyone who has corresponded using e-mail, surfed the World Wide Web, or withdrawn money from an automatic teller has participated in a telematic exchange. The term *télématique*, later anglicized as "telematics," was coined by Inspector General Simon Nora and Finance Inspector Alain Minc in *L'Informatisation de la société: Rapport à M. le président de la République* (1978). Written at the request of President Valéry Giscard d'Estaing, this official government report outlined France's level of development in computerization and telecommunications vis-à-vis other international powers at that time. Nora and Minc further anticipated the directions of future global expansion in these areas and proposed policies for governmental management of technological growth. Comparing telematics with the technologies that fueled the industrial revolution (the steam engine, the railroads, and electricity), the authors described the impending telematic revolution, which they envisioned as follows: "[It] will have wider consequences. . . . Above all,

insofar as it is responsible for an upheaval in the processing and storage of data, it will alter the entire nervous system of social organization. . . . This increasing interconnection between computers and telecommunications—which we will term 'telematics'—opens radically new horizons" (Nora and Minc 1980, 4–5). Although effusive about the potential impact of telematics, Nora and Minc were keenly aware of the desire of governments and other powerful interests to monitor access to technologies strictly in order to control constituencies, and that historically those same constituencies had become increasingly intolerant of such hierarchical control. Of this tension, they asked: "Are we headed . . . toward a society that will use this new technology to reinforce the mechanisms of rigidity, authority, and domination? Or, on the other hand, will we know how to enhance adaptability, freedom, and communication in such a way that every citizen and every group can be responsible for itself?" (10–11).

Which scheme (centralized or decentralized) would come to be realized, they argued, depended on which model of society was desired and chosen. While the question of who would do the choosing remained unanswered in their text, they recognized that it was no more likely that society would spontaneously produce a condition of decentralization than that the government would willingly promote its own demise. Nevertheless, they believed that telematics could help facilitate a productive transformation of the social order. "The challenge," they wrote, "lies in the difficulty of building the system of connections that will allow information and social organization to progress together" (Nora and Minc 1980, 11).[26]

Similarly, Ascott's theorization of telematic art embraced the idea that any radical transformation of the social structure would emerge developmentally as the result of interactions between individuals and institutions in the process of negotiating relationships and implementing new technological structures. This concept reinforced his belief in the artist's "responsibility . . . to shape and change the world." For while Ascott noted some of the potential hazards of telematics, he took as his primary task the development of artistic models for the future, models that parallel Nora and Minc's vision of how telematics could "enhance adaptability, freedom, and communication" in society.

Like a cybernetic system (in which information can be communicated via feedback loops between elements), telematics comprises an extensive global network in which information can flow between interconnected elements. Drawing a parallel between cybernetics and computer telecommunications, William Gibson coined the term "cyberspace" in his 1984 novel *Neuromancer.* Cyberspace applies a virtual location to the state of mind an individual experiences in tele-

matic networks. Telematics implies the potential exchange of information among all nodes in the network, proposing what might amount to a decentralized yet collective state of mind. Whereas cyberspace emphasizes the phenomenology of individual experience, telematics emphasizes the emergence of a collective consciousness.

In this context, Ascott's anticipation of the convergence of cybernetics and telematics in "Behaviorist Art and the Cybernetic Vision" in the mid 1960s is all the more prescient, because in that essay, the artist explicitly articulated plans for utilizing computers and telecommunications in order to enable remote, collaborative exchanges. More than a decade passed before computer networking finally became accessible to artists. When it did, Ascott was one of the first to experiment with how telematics enabled artists at remote locations to collaborate in the creation of electronic artworks that emphasized the immateriality of process rather than the production of objects.

As of now, telematic art is only beginning to gain canonical status. In contrast, Schöffer's joining of art and cybernetics in his *CYSP* series of sculptures has been absorbed into the history of art. This disparity is not surprising, given the relative youth of telematics compared to cybernetics and the challenges that telematic art has posed to aesthetic conventions and institutional practices. Paradoxically, while Ascott's theories of telematic art have proposed the unification of minds in a global field of consciousness, ARPANET (the precursor the Internet, which is the backbone of telematic exchanges) emerged out of the Cold War struggle between the superpowers for technological dominance (Edwards 1996). Given this pedigree, perhaps it is all the more urgent that artists, like Ascott, continue to advocate and experiment with the most collaborative global applications of technologies that were designed to support competition for military superiority.

Definitions of terms such as "telematics," "virtual reality," and "cyberspace" are unstable and overlap in complex, if not confusing, ways. The applications and manifestations of any given technology, like the terminological distinctions that apply to it throughout the course of its use, are highly variable, contextual, and historical. This is especially the case in the so-called information age, when rapid development and production cycles have resulted in the accelerated evolution of technologies and the terminologies applied to them. For example, the integration of computers and telecommunications has become so widespread that the term "telematics" itself can refer to a much wider range of applications than it initially did. Similarly, hybrid forms incorporating telematics, robotics, and virtual reality complicate terminological distinctions. There is also a polit-

ical component to the use of terminology, for the particular definition of any given term may vary to include or exclude elements supporting a personal or institutional agenda (Gieryn 1999). Finally, historians of science and media theorists have questioned the autonomy of technology as a historical agent, pointing out that technological media, such as computer telecommunications, are inextricably related to the political, economic, and cultural contexts in which they emerge and operate. From this perspective, technology possesses no agency independent of the hybrid social practices of which it is a co-constituent (Bolter and Grusin 1999).[27]

Telematics and Art

Telematics enables tremendous artistic freedom. It permits the artist to liberate art from its conventional embodiment in a physical object located in a unique geographic location. Telematics provides a context for interactive aesthetic encounters and facilitates artistic collaborations among globally dispersed individuals. It emphasizes the process of artistic creation and the systematic relationship between artist, artwork, and audience as part of a social network of communication. In addition to these qualities, Ascott argues that a distinctive feature of telematic art is the capability of computer-mediated communications to function *asynchronously.*[28] Early satellite and slow-scan projects enabled interactive exchanges between participants at remote locations, but they had to take place in a strictly synchronous manner in real time; that is, all participants had to participate at the same time. In Ascott's telematic artworks of the same period, information could be entered at any time and place, where it became part of a database that could be accessed and transformed whenever a participant wished, from wherever there were ordinary telephone lines. He anticipated this aspect of telematic art in his 1966 description of a "pillar of information [that would] store and record data . . . available for everyone's use in various areas, [with] links to workshops, studios, . . . exhibition spaces, or . . . directly to the central nervous system of any individual" (page 143 below).[29]

Ascott's telematic art expanded on his theory and practice of cybernetic art and the parallels he had already drawn between science, philosophy, non-Western cosmologies, and experimental art. For example, the asynchronicity of networked exchange—its capability to bend time, so to speak—led Ascott to draw parallels between networked communications and alternative systems of knowledge and divination, such as the *I Ching*, as exemplified in "Ten Wings" (1982; chapter 10). In "Beyond Time-Based Art: ESP, PDP, and PU" (1990; chapter 15),

he expanded on the sorts of connections between cybernetics and parapsychology he had made twenty years earlier in his essay "Psibernetic Arch" (1970), identifying correspondences between telematic consciousness and parapsychology, parallel distributed processing, and the parallel universes theory, in which the processing and exchange of information occur in atypical or anomalous temporal modalities. Like the concomitance of interests that led to Ascott's particular development of cybernetic art in the 1960s, so his practice, pedagogy, and theorization of telematic art, beginning in the 1980s, was the result of a combination of technological and cultural factors that had been percolating for decades. Some of these precursors to telematic art are discussed below, because they raised many of the same conceptual questions that the uses of telecommunications by artists continue to pose to traditional art media and aesthetic values.

Telematic art draws on the heritage of diverse currents in experimental art after World War II, including various strains of art and technology, such as cybernetic art, kinetic art, and video art, happenings and performance art, mail art, and conceptual art. As one might expect, many of the artists who have made telematics an important, if not primary, component of their practice have roots in one or more of these other genres. What, after all, could be more kinetic and performative than an interactive exchange between participants? What could be more technological than computer-mediated global telecommunications networks? And what could be more conceptual than the semantic questions raised by the flow of ideas and creation of meaning via the transmission of immaterial bits of digital information? It is easy to see, as well, how the interactive two-way transfer of information would appeal to video and performance artists alike, and how the immediacy of international exchange could equally open up new frontiers for artists using mail, fax, or television as a medium. This convergence of interests brought great energy and richness to the use of telecommunications for art. By framing Ascott's theory and practice of telematic art within these larger artistic and art historical contexts, the following discussion offers insight into the unique quality of his work, as well as the place of telematic art in a continuity of aesthetic research in the history of art.

PRECURSORS

The first use of telecommunications as an artistic medium may well have occurred in 1922, when the Hungarian constructivist artist and later Bauhaus master László Moholy-Nagy produced the works known as his *Telephone Pictures.* By his own 1947 account, he "ordered by telephone from a sign factory five

paintings in porcelain enamel" (Moholy-Nagy 1947, 79). Whether or not the pictures were, in fact, ordered over the telephone is a matter of dispute. Their commercial method of manufacture, however, implicitly questioned traditional notions of the isolated, individual artist and the unique, original art object. Moreover, by 1925, Moholy-Nagy was writing about the importance of "photo-telegraphy" and "wireless telegraphed photographs" (Moholy-Nagy 1987, 38–39, and Kac 1992). It is not known whether he attached much conceptual significance to telecommunications as an artistic medium in itself (as distinct from his explicitly stated concern with the formulation of a visual idea and its concretion in an image). Nonetheless, collaboration on and exchange of images between geographically dispersed individuals was well within the artist's theoretical realm.

The idea of telecommunications as an artistic medium is made more explicit in Bertolt Brecht's theory of radio. The German dramatist's manifesto-like essay "The Radio as an Apparatus of Communication" (1932) has offered ongoing inspiration not only to experimental radio projects but to artists working with a wide range of interactive media. As Peter D'Agostino has noted, Brecht sought to change radio "from its sole function as a distribution medium to a vehicle of communication [with] two-way send/receive capability" (D'Agostino 1980, 2). Brecht's essay proposed that media should

> [L]et the listener speak as well as hear . . . bring him into a relationship instead of isolating him. On this principle the radio should step out of the supply business and organize its listeners as suppliers. . . . [I]t must follow the prime objective of turning the audience not only into pupils but into teachers. It is the radio's formal task to give these educational operations an interesting turn, i.e. to ensure that these interests interest people. Such an attempt by the radio to put its instruction into an artistic form would link up with the efforts of modern artists to give art an instructive character. (Brecht 1986, 53–54)

Written in the midst of the rise to power of the Nazi dictatorship, Brecht's theory of two-way communication envisioned a less centralized and hierarchical network of communication, such that all points in the system were actively involved in producing meaning. In addition, radio was intended to serve a didactic function in the socialist society Brecht advocated. Ascott has been similarly committed to the pedagogical role of art. Furthermore, in "Art and Telematics" (1984), he began theorizing that the decentralized and nonhierarchical structure of telematic networks was "subversive," in that it "breaks the boundaries not only of the insular individual but of institutions, territories, and time zones" (page 199 below).

As a variant on the two-way communication that Brecht advocated for radio, artists have utilized the postal service. While such work does not explicitly employ electronic telecommunications technology, and reaches a much smaller potential audience, it anticipated the use of computer networking in telematic art. In the early 1960s, the American artist George Brecht mailed "event cards" in order to distribute his "idea happenings" to friends outside of an art world context (Dreher 1995). The precise date when such practices became historicized as the genre known as mail art is not known. However, in 1968, Ray Johnson organized the first meeting of the New York Correspondence School, which expanded to become an international movement.[30] Like telematic art,

> This postal network developed by artists explored non-traditional media, promoted an aesthetics of surprise and collaboration, challenged the boundaries of (postal) communications regulations, and bypassed the official system of art with its curatorial practices, commodification of the artwork, and judgement value. . . . [It] became a truly international . . . network, with thousands of artists feverishly exchanging, transforming, and re-exchanging written and audiovisual messages in multiple media. (Kac 1997)

Mail art was especially important to artists working, not only in remote parts of South America, and even Canada, but in countries where access to contemporary Western art was severely limited, such as those of Eastern Europe. Many such artists also embraced telecommunications technologies, such as fax, which expanded the capabilities of mail art. In Hungary, for example, György Galántai and Júlia Klaniczay founded Art Pool in the mid 1970s in order to obtain, exchange, and distribute information about international art, which was forbidden behind the Iron Curtain. Art Pool maintains an extensive physical and online archive of mail and fax art.

Some of the earliest telecommunications projects attempted by visual artists emerged from the experimental art practice known as "happenings." In *Three Country Happening* (1966), a collaboration between Marta Minujin in Buenos Aires, Kaprow in New York, and Wolf Vostell in Berlin, a telecommunications link was planned to connect the artists for a live, interactive exchange across three continents. Ultimately, funding for the expensive satellite connection failed to materialize, so each artist enacted his or her own happening and, as Kaprow has explained, "imagined interacting with what the others might have been doing at the same time."[31]

Three years later Kaprow created an interactive video happening for "The

Medium Is the Medium," a thirty-minute experimental television program produced by Fred Barzyk for the Boston public television station WBGH. Kaprow's piece *Hello* (1969) utilized five television cameras and twenty-seven monitors, connecting four remote locations over a closed-circuit television network. As Gene Youngblood has described it:

> Groups of people were dispatched to the various locations with instructions as to what they would say on camera, such as "hello, I see you," when acknowledging their own image or that of a friend. Kaprow functioned as "director" in the studio control room. If someone at the airport were talking to someone at M.I.T., the picture might suddenly switch and one would be talking to doctors at the hospital. (Youngblood 1970, 343)

Through his interventions as director, Kaprow was able to provide a critique of the disruptive manner by which technology mediates interaction. *Hello* metaphorically short-circuited the television network—and thereby called attention to the connections made between actual people.[32]

Indeed, many early artistic experiments with television and video were, in part, motivated by a Brechtian desire to wrest the power of representation from the control of corporate media and make it available to the public. In the mid 1970s, Douglas Davis noted that "Brecht . . . pointed out that the decision to manufacture radio sets as receivers only was a political decision, not an economic one. The same is true of television; it is a conscious (and subconscious) decision that renders it one-way" (Ross 1975). Davis's *Electronic Hokkadim* (1971) enabled television viewers to participate in a live telecast by contributing ideas and sounds via telephone. As David Ross wrote in 1974, this work, "linked symbiotically with its viewers whose telephoned chants, songs, and comments reversed through the set, changing and shaping images in the process" (Ross 1974). Davis later commented: "My attempt was and is to inject two-way metaphors—via live telecasts—into our thinking process. All the early two-way telecasts were structural invasions. . . . I hope [to] make a two-way telecast function on the deepest level of communication . . . sending and receiving . . . over a network that is common property" (Ross 1975). Davis's work exemplifies the long and distinguished history of artistic attempts to democratize media by enabling users to participate as content-providers, rather than passive consumers of prefabricated entertainment and commercial messages.

In *Expanded Cinema* (1970), a classic and perceptive account of experimental art in the 1960s, the media historian Gene Youngblood has documented how some of the first interactive video installations also challenged the unidirec-

tionality of commercial media. In works like *Iris* (1968) and *Contact: A Cybernetic Sculpture* (1969) by Les Levine and *Wipe Cycle* (1969) by Frank Gillette and Ira Schneider, video cameras captured various images of the viewer(s), which were fed back, often with time delays or other distortions, onto a bank of monitors. As Levine noted, *Iris* "turns the viewer into information. . . . *Contact* is a system that synthesizes man with his technology . . . the people are the software" (Youngblood 1970, 340). Schneider amplified this view of interactive video installation, saying: "The most important function . . . was to integrate the audience into the information" (342–43). *Wipe Cycle* was related to satellite communications, Gillette further explained: "[Y]ou're as much a piece of information as tomorrow morning's headlines—as a viewer you take a satellite relationship to the information. And the satellite which is you is incorporated into the thing which is being sent back to the satellite" (343). While these works were limited to closed-loop video, they offered an unprecedented opportunity for the public literally to see itself as the content of television.

Significant museum exhibitions in 1969–70 also helped to popularize the use of interactive telecommunications in art. Partly in homage to Moholy-Nagy (who emigrated to Chicago after World War II), the Chicago Museum of Contemporary Art organized the group exhibition "Art by Telephone" in 1969. Hank Bull describes some of the more memorable works: "Artists were invited to telephone the museum with instructions for making an artwork. Dick Higgins asked that visitors be allowed to speak into a telephone, adding their voices to an ever denser 'vocal collage.' Dennis Oppenheim had the museum call him once a week to ask his weight. Wolf Vostell supplied telephone numbers that people could call to hear instructions for a 3-minute happening" (Bull 1993). In 1970, Jack Burnham's exhibition "Software, Information Technology: Its New Meaning for Art" examined how information processing could be interpreted as a metaphor for art (Shanken 1998). "Software" included Hans Haacke's *News* (1969), consisting of teletype machines connected to international news service bureaus, which printed continuous scrolls of information about world events. Ted Nelson and Ned Woodman displayed *Labyrinth* (1970), the first public exhibition of a hypertext system. This computerized work allowed users to interactively construct nonlinear narratives through a database of information. Burnham's exhibition afforded the museum audience an opportunity to interact in an aesthetic context with online data communications and hypertext—two of the key elements that would make possible the construction of the World Wide Web some twenty years later.

On July 30, 1971, the group Experiments in Art and Technology (E.A.T.) or-

ganized "Utopia Q&A," an international telecommunications project consisting of telex stations in New York, Tokyo, Ahmedabad, India, and Stockholm. Telex enabled the remote exchange of texts via specialized local terminals. Participants from around the world posed questions and offered prospective answers regarding changes that they anticipated would occur over the next decade. "Our hope is that this project will contribute to recognition of and contact between different cultures," E.A.T.'s co-founder Billy Klüver noted in one of the early communications posted during the event. "We have chosen a medium which was invented in 1846 which is essentially mechanical, and which was not developed since the late nineteenth century. Like print, its very simplicity provides access. We believe that this is the first worldwide people-to-people project, imagining their future."[33] "Utopia Q&A" poignantly utilized telecommunications to enable an interactive exchange across geopolitical borders and time zones, creating a global village of ideas about the future.

This broad range of artistic activity may have been a catalyst for "the flurry of excitement in the commercial telecommunications world as well as education and government" about the potential of interactive media in the mid 1970s. "A wired nation appeared just around the corner and with it came a promise of a technological promised land in which every home would have a two-way link to virtually unlimited information and entertainment" (Carey and Quarles 1985, 105). Ascott has similarly described telematics as a condition in which "the individual user of networks is always potentially involved in a global net, and the world is always potentially in a state of interaction with the individual" (page 232 below). Indeed, access to computer conferencing and other telecommunications media in the 1980s paved the way for the realization of Ascott's visionary proposals of the mid 1960s.

THE PIONEER DAYS: 1977-1986

Lobbying by grass-roots community organizations enabled limited public access to satellite communications in the late 1970s, just as artists started gaining access to computer-conferencing networks, the backbone of telematics. Given the history of interactive art and the aesthetic goal of utilizing communications media for two-way exchanges, it is no surprise that artists were quick to seize these opportunities. Although communications via satellite, cable, and computer conferencing enable different types of experiences, there is much overlap between them in the development of artists' use of telecommunications in general. As such, each medium must be understood in relation to the other, and as

part of broader aims to create interactive aesthetic exchanges between remote participants. While a few artists had used satellite technology to reach broader audiences (following a traditional, unidirectional telecast model), "the first artists' live, bi-directional, transcontinental satellite transmission" took place in 1977 (Sharp 1980). Two independently conceived and produced projects used satellites to connect artists on the east and west coasts of the United States. These simultaneous efforts suggest how pressing it was for artists in the mid 1970s to utilize advanced telecommunications to support two-way interactive exchanges among remote participants.

As an outgrowth of their "Aesthetic Research in Telecommunications" projects begun in 1975, Kit Galloway and Sherrie Rabinowitz organized the "Satellite Arts Project: A Space with No Boundaries" (1977). With the support of the National Aeronautics and Space Administration (NASA), the artists produced composite images of participants, thus enabling an interactive dance concert amongst geographically disparate performers, two in Maryland and two in California. On video monitors at these locations was a composite image of the four dancers, who coordinated their movements, mindful of the latency, or time-delay, with those of their remote partners projected on the screen. The "Send/Receive Satellite Network" (1977) emerged from Keith Sonnier's idea to make a work of art using satellite communications and Liza Bear's commitment to "gaining access to publicly funded technology . . . [and] . . . establishing a two-way network among artists" (Furlong 1983). Bear brought the project to fruition, orchestrating the collaboration between the Center for New Art Activities and the Franklin Street Arts Center in New York, Art Com / La Mamelle Inc. in San Francisco, and NASA.

Given the proliferation of the Internet and community access cable in the 1980s and 1990s, it may now be hard to imagine how difficult it was for artists to obtain the use of telecommunications equipment, and how it was almost inconceivable for them to consort with NASA in the creation of an artwork.[34] Indeed, Bear was particularly mindful of the sociological import of this aspect of "Send/Receive." This project serves, moreover, to illustrate that the industriousness and agility required of artists who attempt to utilize cutting-edge technologies can result in innovative applications unattempted by industry or the government. The San Francisco coordinator, Sharon Grace, was aided by Carl Loeffler, who helped gain access to a fully equipped studio at the NASA Ames Research Center in Mountain View. In New York, however, Willoughby Sharp and Duff Schweniger were forced to rig a military infrared transmission system between a mobile satellite transceiver (affectionately known as the "Bread

Truck") at the Battery City Park landfill and the Manhattan Cable system downlink at the Rector Street subway station. According to Sharp, this experiment was the first time that a Manhattan Cable downlink box was used to uplink information, a technique the cable provider later used with great commercial success for live broadcasting of the New York Marathon.[35]

For three and one-half hours, participants on both coasts engaged in a two-way interactive satellite transmission, which was shown live on cable television in New York and San Francisco. An estimated audience of 25,000 saw bi-coastal discussions on the impact of new technologies on art, and improvised, interactive dance and music performances that were mixed in real time and shown on a split screen. Of the videotapes *Phase I and Phase II: Send/Receive Satellite Network* (1978), produced by Bear and Sonnier to document the event and the organizational hurdles leading up to it, Lucinda Furlong wrote that "*Phase II* resembles a cross between a disorganized artists' teleconference and an interactive performance that never really got off the ground" (Furlong 1983). Although the artistic quality may not have been consistent or even very good in this experimental demonstration, Bear has insisted that "the process was paramount." Since they were working with unfamiliar technological media, it was crucial to "let the materials speak for themselves," she added.[36] Here it is important to note that these first satellite works emphasized the primacy of process that Ascott had articulated in the mid 1960s and that has remained central to the theory and practice of telematic art.

The first work of art to use computer conferencing was the "Sat-Tel-Comp Collaboratory" (1978). This multimedia telecommunications art project was organized by the Direct Media Association, an artists' group formed by the Canadian artist Bill Bartlett. In 1971, inspired in part by Brecht's theories of media and the potential of an interactive, two-way exchange of information, Bartlett focused his artistic research on promoting "exchange between artists through the 'regeneration, transformation, transportation, communication and transmutation of images'" (Bull 1993). Through the Toronto-based artist Norman White, Bartlett gained access to the I. P. Sharp Associates (IPSA) international computer-timesharing network in 1978.[37] Prior to the advent of PCs beginning in the late 1970s, computers were relatively large, expensive, and rare, requiring users to share time on them. Early telematic exchanges transpired by logging on to such "time-sharing" computers from remote units that had little or no processing or memory capability of their own. The Collaboratory used this precursor to Internet-based e-mail for the telematic exchange of texts between four sites in the United States and Canada. It also used telephone lines for the

transmission of slow-scan video images between the Open Space Gallery in Victoria, British Columbia, and nine sites in Canada and the United States. Slow-scan utilized a picture-scanning device that could send still images over ordinary telephone lines at the rate of one frame every eight seconds.

Also in 1978, Peter D'Agostino proposed using QUBE (Warner Cable's interactive television system) in a video installation that critically interrogated the participation that QUBE claimed to offer users. "The 'interactive' system available to QUBE subscribers takes the form of a console attached to the television set that enables the home viewer to 'participate' in selected programs by pushing one of five 'response' buttons . . . the console feeds a central computer and the results of the home responses are flashed on the screen," he wrote (D'Agostino 1980, 14). D'Agostino noted that in a 1978 program on eggs, "forty-eight percent of the homes had pressed the *scrambled* button." Sarcastically referring to a newspaper headline lauding the QUBE system, he added: "This is how viewers are 'talking back to their television sets.'" Despite claims by Warner Cable's chairman Gustave M. Hauser that, "We are entering the era of participatory as opposed to passive television," D'Agostino argued that such "participation is defined solely by the formal properties of the medium—rather than its content" (15). Given the artist's critical posture regarding QUBE, perhaps it is not surprising that the cable-cast component of his proposal was cancelled "due to 'special programming'" and never rescheduled.

Ascott first experienced telematics in 1978 and organized "Terminal Art," his first telematic artwork, in 1980. Dubbed "Terminal Consciousness" by the press, this three-week computer-conferencing event linked Ascott in Bristol, England, and seven other artists in the United States and the United Kingdom: Eleanor Antin (La Jolla, California), Keith Arnatt (Tintern, Wales), Alice Aycock (New York), Don Burgy (East Minton, Massachusetts), Douglas Davis (New York), Douglas Heubler (Newhall, California), and Jim Pomeroy (San Francisco) (Large 1980). "I . . . mailed portable terminals to a group of artists . . . to participate in collectively generating ideas from their own studios," Ascott later recalled. "Don Burgy chose to take his terminal wherever he was visiting and log in from there" (page 186 below). "Terminal Art" was the first artists' computer-conferencing project between the United States and the United Kingdom, and the first ever to use the Infomedia Notepad System.

As distinguished from telex or electronic mail, which did not offer "control of the conference context or a retrievable group memory," according to the astronomer Jacques Vallée, who founded Infomedia, Notepad was "the first commercial use of a new medium that fully utilize[d] the logical and memory abil-

ities of the modern computer" (Vallée 1981, 5). In addition to being able to retrieve and add to information stored in the computer's memory, users could search the database in a directed and associative manner. The group could, for example, "tell the computer to turn up any mentions of giraffes and ice cream," Ascott explained, adding: "The surrealists could have a field day" (Large 1980).

Because of the diachronic nature and extended duration of this telematic project, it was possible for conversations and exchanges to develop that could not have been sustained in the real-time environment of telecommunications works using satellite. As the media artist and critic Eric Gidney observed, such "early [telematic] projects manifested an important attribute of this new technology: the metaphysical feeling of being in touch with a remote group of people, transcending normal barriers of space and time" (Gidney 1991, 147).

Ascott's earliest attitudes about the experience of telematics and its possibilities as an art medium are reflected in a statement he contributed to "Saturn Encounter," an interdisciplinary computer-conference hosted by Infomedia that overlapped with "Terminal Art":

> For the artist, computer conferencing is both a perfect metaphor of interconnectedness and a new and exciting tool for the realization of many aspirations of twentieth-century art: it is a medium which is essentially participatory; it promotes associative thought and the development of richer and more deeply layered language: it is integrative of cultures, disciplines and the great diversity of ways of being and seeing. In short, I am very optimistic about the potential for art of networking media.[38]

In these early comments, Ascott already identified and theorized how telematics could help experimental artists create aesthetic encounters that would be more participatory, culturally diverse, and richly layered with meaning. Significantly, Ascott emphasized the ephemerality of computer conferencing, suggesting that the psychical experience of networking was of equal if not greater importance to a telematic artwork than the discrete texts and images that emerged from the exchange.

Also in 1980, Kit Galloway and Sherrie Rabinowitz organized "Hole in Space," a satellite project that connected two storefronts in New York and Los Angeles. Sharing Ascott's emphasis on the infrastructure and process of telematics, Youngblood explained that in "Hole in Space," "the connecting armature was important, not the resulting display" (Youngblood 1986, 10). Building on the prior experience of their "Satellite Arts Project," Galloway and Rabinowitz purposely displaced the artwork from an art context and put it into

the flux of everyday life, where it became activated when people happened upon it by chance. As Bull has noted of the video documenting the piece, "The results were astounding and often very moving. . . . People sang songs together, played games, even made contact with long-lost relatives" (Bull 1993).

Ascott's "Ten Wings" (1982) was part of Robert Adrian's "The World in 24 Hours," an extraordinarily ambitious telecommunications project commissioned by Ars Electronica, connecting artists in sixteen cities on three continents. As Ascott describes it in "Art and Telematics," participants in "Ten Wings" were invited to join in the first planetary throwing of the *I Ching*. This work was one of many in "The World in 24 Hours" that utilized the ARTBOX network.[39] Adrian enthusiastically recalled his early collaborations with Ascott: "Roy had already been thinking for fifteen years about the possibilities of what artists could do with computer conferencing and had some really great ideas for using ARTBOX."[40]

"The World in 24 Hours" created a global network of artists and artist groups, each of which organized a contribution that made use of any combination of slow-scan, fax, telephone sound, and computer conferencing via ARTBOX. At the time, the high cost of satellite links, international telephone calls, and computer conferencing imposed severe limits on the creative potential of these media for artists.[41] The creation of ARTBOX (and later ARTEX) spearheaded by Adrian, and the corporate sponsorship of these networks by I. P. Sharp Associates, opened a door to artistic experimentation that previously was possible only with substantial funding or at great personal expense.

Ascott's "La Plissure du Texte" ("The Pleating of the Text") project (1983) explored the potential of computer networking for the interactive, collaborative creation of a work of art. The project was produced as part of the "Electra" exhibition organized in 1983 by Frank Popper at the Musée de l'Art moderne de la Ville de Paris. Adrian, then an artist-in-residence at the Western Front art center in Vancouver, organized the ARTEX (Artist's Electronic Exchange) system. Identified by *Leonardo*'s editor Roger Malina as an unsurpassed landmark in the history of telematic art, "La Plissure du Texte" allowed Ascott and his collaborators at eleven locations in the United States, Canada, Europe, and Australia to experiment with what the artist has termed "distributed authorship." Each remote location represented a character in the "planetary fairy tale," and participated in collectively creating and contributing texts and ASCII-based images to the interactive unfolding, or distributed authorship, of the emerging story (see chapter 14 below).[42] Bull, who participated in the event from the Vancouver node, described "the result of this intense exchange" as a "fat tome of Joycean

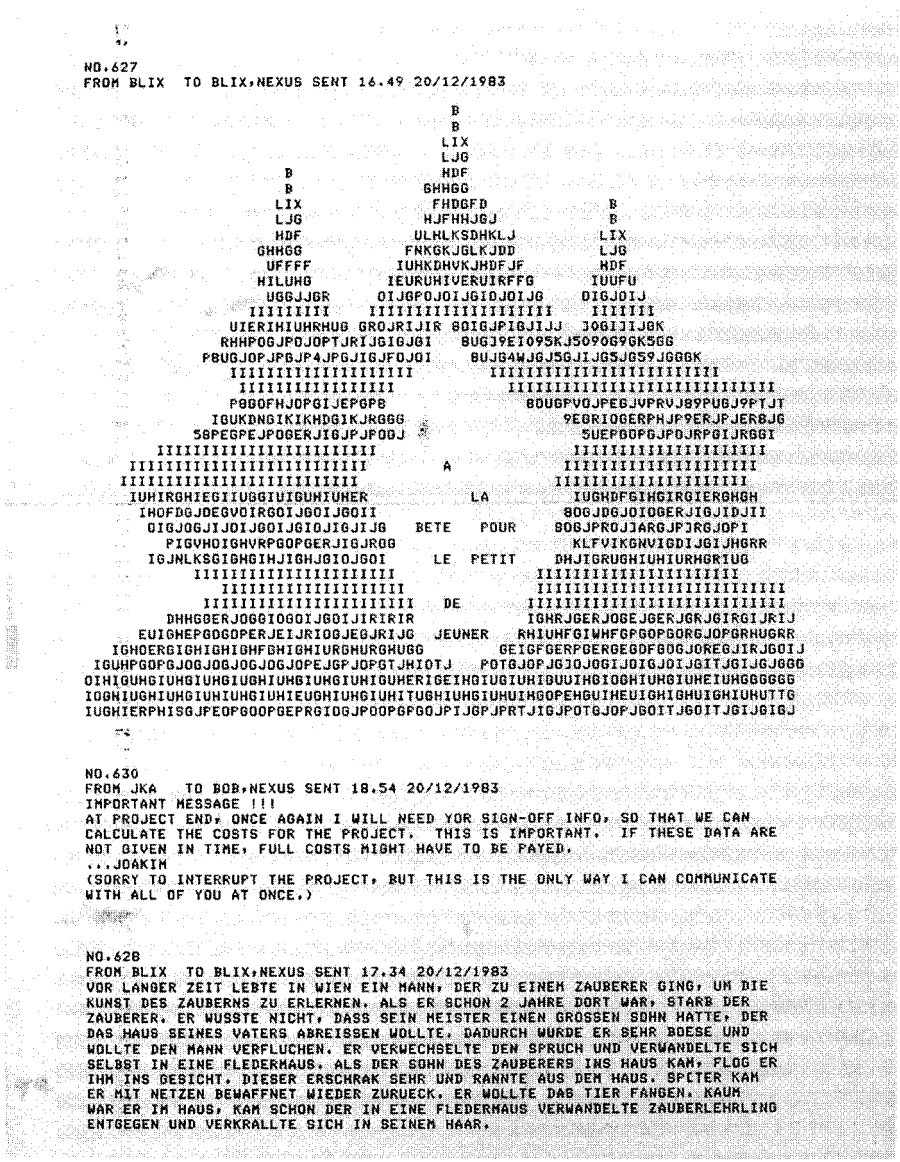


Figure 17. "La Plissure du Texte." 1982. Computer printout from International telematic art project, involving "distributed authorship" through remote, interactive exchanges between artists in eleven locations in Austria, the United Kingdom, the United States, Canada, and Australia.

pretensions that delved deep into the poetics of disembodied collaboration and weightless network rambling" (Bull 1993).[43]

The French artist and media theorist Edmond Couchot has noted similarities between the process of distributed authorship and the surrealist game of *cadavre exquis* (exquisite corpse), in which one artist would begin a drawing, and several others, not knowing what preceded them, would continue it (Couchot 1988, 187). Similarly, each "character" in "La Plissure du Texte" could read the latest additions to the story, printed out or displayed by projection or on a monitor, and add to it—all locations receiving these updates electronically. In this way, the story was continuously supplemented with unpredictable twists that, like the surrealists' experiments, "produced remarkably unexpected poetic associations, which could not have been obtained in any other way," and certainly not as the result of a single, organizing mind (Chipp 1968, 418, n. 1). This collaborative process paralleled Ascott's goal of creating a field of consciousness greater than the sum of its parts.

Telematic art projects like "La Plissure du Texte" have challenged both the conventional categories of artist, artwork, and viewer and the traditional opposition of subject and object. At the same time, in such works, the artist retains authorial control and responsibility for defining the parameters of interactivity and for imbuing them with meaning and significance. Aspects of traditional narrative structure may remain, while others are relinquished in order to allow a more open-ended development, fashioned by participants or "participators" (Ascott's preferred term) involved in a multidirectional creative exchange. In this way, Ascott understood telematics as offering the artist new possibilities to create models for the future that would match Nora and Minc's vision of "building the system of connections that will allow information and social organization to progress together." The title "La Plissure du Texte" punningly alludes to Barthes's book *Le Plaisir du texte* (1973). In contrast to the common perception of text as a tissue that simultaneously veils and permits access to the meaning or truth hidden behind it, Ascott drew inspiration from Barthes's emphasis on "the generative idea that the text is made, is worked out in a perpetual interweaving . . . [in which] . . . the subject unmakes himself, like a spider dissolving in the constructive secretions of its web" (Barthes 1975 quoted on page 187 below). Similarly, Ascott's "La Plissure du Texte" emphasized the "generative idea" of "perpetual interweaving," but at the level of the tissue itself, which is no longer the product of a single author but is now pleated together through the process of distributed authorship. Couchot goes so far as to suggest that telematic networks "offer the artist the only medium really capable of breaking

the barriers of time and space, and that will one day set one free of the limits of individual, national, and cultural intelligence" (Couchot 1988, 187).

The potential of telecommunications to allow such individual and cultural freedom was at the heart of "Good Morning Mr. Orwell," a satellite telecast that Nam June Paik organized on New Year's Day, 1984. It was intended, Paik explained, as a liberatory and multidirectional alternative to the threat posed by "Big Brother" surveillance of the kind that George Orwell had warned of in his novel *1984*:

> Orwell only emphasized the negative part, the one-way communication. I see video not as a dictatorial medium but as a liberating one. That's what this show is about, to be a symbol of how satellite television can cross international borders and bridge enormous cultural gaps . . . the best way to safeguard against the world of Orwell is to make this medium interactive so it can represent the spirit of democracy, not dictatorship.[44]

Broadcast live from New York, Paris, and San Francisco to the United States, France, Canada, Germany, and Korea, the event reached a broad international audience and included the collaboration of John Cage, Laurie Anderson, Charlotte Moorman, and Salvador Dali, among others.

Ascott, too, desired to engage a broader public in telematic exchanges. To this end, he created "Organe et Fonction d'Alice au Pays des Merveilles" (Organ and Function of Alice in Wonderland) for "Les Immatériaux," an exhibition curated by Jean-François Lyotard and Thierry Chaput in Paris in 1985. "Organe et Fonction" was accessible to anyone connected to Minitel (the French national videotex system, begun in 1981). Ascott's use of this system enabled a potential audience of thousands to experience the sort of intertextual pleating the artist had initiated in "La Plissure du Texte." "Organe et Fonction" can be interpreted as an archetypal postmodern artwork. Randomly selected quotations from a French translation of Lewis Carroll's *Alice in Wonderland* were juxtaposed with quotations from a scientific treatise entitled *Organe et fonction*, creating unexpected relationships and associations. Conventional notions of originality, authenticity, objecthood, narrative, and style were supplanted by appropriation, duplication, distribution, juxtaposition, and randomness.

Telematic art was embraced by the 1986 Venice Biennale, at which Ascott, Tom Sherman, Don Foresta, and Tomasso Trini were the international team of commissioners responsible for organizing the "Laboratorio ubiqua" (Ubiquitous Laboratory). Part of this project included a variety of telecommunications stations (fax, slow-scan, computer conferencing) assembled under the title "Plan-

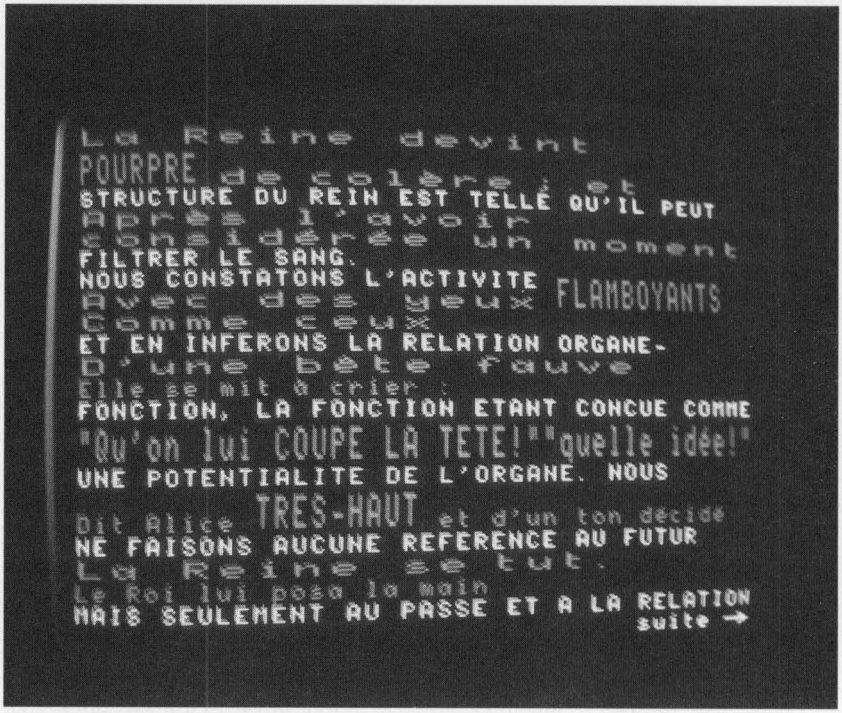


Figure 18. "Organe et Fonction d'Alice au Pays des Merveilles." 1985. Video still from telematic art project using the Minitel network. Part of Jean-François Lyotard's exhibition "Les Immatériaux" at the Centre Pompidou, Paris.

etary Network." Robert Adrian organized the telematic component on ARTEX and traveled around the world to observe the nodes in operation. He later recounted: "The networking of personal computers in BBSs and the increasing presence of FAX and other telephone peripherals in offices and homes made ARTEX and large-scale telecommunications projects superfluous. . . . The pioneer days were over" (Adrian 1995). With entrée into this canonical international exhibition, the pioneer days may indeed have been over. While one senses regret in Adrian's recognition of their passing, technological improvements strengthened the ability of telematic art to develop models of planetary communication and interaction, and to enable a broader audience to experience them. By the late 1980s, public awareness of and interest in computer networking had expanded dramatically, and the newer technologies (and their promotion in the media) were enticing increasing numbers of artists and nonartists alike to participate in telematic exchanges.

EXTENSIONS: TELEMATIC ART AND THE WORLD WIDE WEB

With the proliferation of computer networking in the late 1980s and 1990s, artistic use of the medium likewise expanded, pushing the boundaries of telematic art in new directions. The availability of relatively inexpensive and powerful personal computers, the creation of hypertext markup language (HTML), and the free distribution to consumers of graphical user interfaces (GUI—pronounced "goo-ey"—browsers, such as Netscape Navigator and Microsoft's Internet Explorer), all contributed to enabling the multimedia capabilities of the World Wide Web in the early 1990s. As a result, the number of adults connected to the Internet in the United States and Canada grew exponentially, from 37 million in 1995 to over 90 million in 1999. The WWW is used in many ways that support artistic ends. It serves as a venue for digital exhibitions and as an archive of images. In the tradition of telematic art, it is used as an artistic medium in itself. Moreover, the development of various interfaces that connect remote users to robots, artificial life forms, virtual reality simulations, and other devices and environments extends the domain of telematic art to incorporate hybrid forms of technology.

Many of Ascott's early networking projects (e.g., "Terminal Art" and "La Plissure du Texte") employed computer-conferencing systems to take advantage of the medium's unique qualities, experimenting with remote collaboration and alternative modes of narrativity. Subsequently, many artists have utilized the hyperlinking capability of the Web in order to create nonlinear text and multimedia narratives. Melinda Rackham's "Line" (1997), for example, subtly integrated visual and textual elements. Using a simple and intuitive interface, the seventeen screens of this hypermedia fairy tale about identity in cyberspace incorporated both associative connections via text and random elements via the image. A map allowed the participator to visualize where she or he was in relation to the other screens. Users were invited to submit their own personal views via e-mail, which were incorporated into the work, adding intimacy and complexity.

Paul Sermon, Ascott's student at Newport, created "Telematic Vision" (1994). In this piece, an ISDN line connected two remote sites, each of which was identically fitted with a sofa facing a large monitor with a video camera mounted on top of it. The video images captured at each site were simultaneously superimposed on the two monitors so that people sitting on the sofa at site A could see themselves sitting on the sofa with the people at site B, and vice-versa. The powerful emotional and intellectual impact of this telematic exchange is difficult to grasp unless one experienced it directly. One participant

reported feeling rejected by another at the remote location, who sat next to him virtually on the sofa but would not respond and soon left. In another case, one person wanted to be more intimate than the remote counterpart did. Feeling violated by a phantom image, the less demonstrative participant felt compelled to leave. Because this work functioned in real time, and was not asynchronous, it technically would not fit Ascott's definition of telematic art. However, by its title and conceptual content, Sermon's work, like that of many other artists, paid homage to Ascott's theorization of telematic art, expanding the field in new directions.

Ascott's "Aspects of Gaia: Digital Pathways across the Whole Earth" (1989) combined the disembodied experience of telematics and cyberspace with the corporeal experience of concrete reality in physical space. In this regard, it formed a vital link between the "pioneer days" and subsequent forms of telematic art that have incorporated hybrid technological media. "Aspects of Gaia" brought together a global network of telematic participators to collaborate in the creation and transformation of texts and images related to the British chemist James Lovelock's holistic "Gaia hypothesis," which suggests that the Earth (Gaia) is a unified living organism, and that its climates, atmosphere, geography, plants, and animals have co-developed in a way that sustains the vitality of the planet (Lovelock 1979). Participators could access and contribute information to a global flow of data via several interfaces and on two levels of the Brucknerhaus (the work's central site at the Ars Electronica festival in Linz, Austria). What emerged was a portrait of the Earth "seen from a multiplicity of spiritual, scientific, cultural, and mythological perspectives" (page 241 below).

On the upper level of the Brucknerhaus, a large horizontal screen purposely conflated the conventional vertical orientation of a computer monitor and allowed viewers to gaze down on a data stream of images and texts contributed remotely from all over the world. (This bird's-eye view is related to the horizontal working relationship between artist and the artwork that influenced Ascott's cybernetic works of the 1960s and 1970s.) The horizontal computer screen was set into what Ascott referred to as an "information bar," a metaphorical cocktail lounge, in which the consumption of data was intended to result in greater clarity of mind, rather than an alcohol-induced stupor. The networked images that appeared in the information bar could be altered either by acoustic sensors, which responded to the sounds of the users, or by a computer mouse on the counter.

In the dark, exterior space below the Brucknerhaus, viewers could ride a trolley (also in a horizontal position), which drove past LED screens that

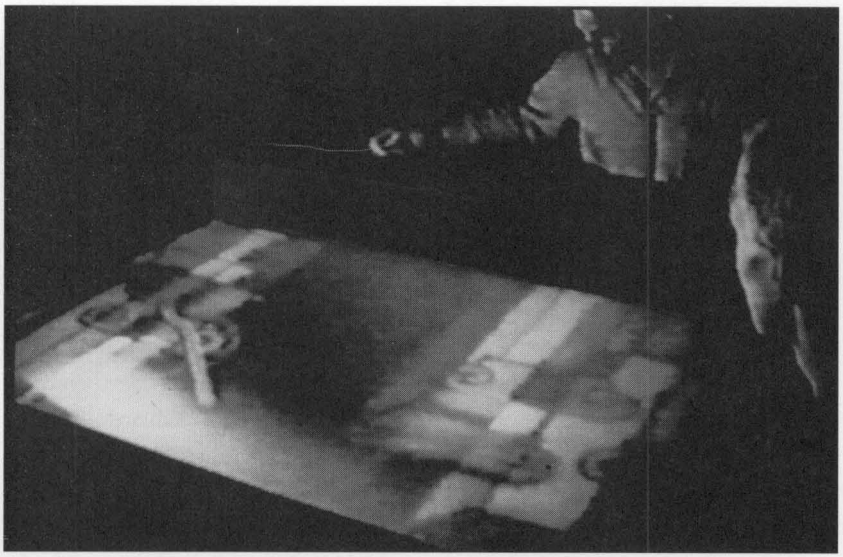


Figure 19. "Aspects of Gaia." Upper level ("Information Bar"). 1989. Video still from telematic art project with multimedia installation. Ars Electronica, Brucknerhaus, Linz. Courtesy Österreichische Rundfunk.

Figure 20. "Aspects of Gaia." Lower level (trolley). 1989. Video still from telematic art project with multimedia installation. Ars Electronica, Brucknerhaus, Linz. Courtesy Österreichische Rundfunk.

flashed messages about Gaia. The viewer became physically engaged in an experience that conveyed ideas about the emergent quality of telematic consciousness as it relates to the Earth as a living organism. As Ascott describes in "Is There Love in the Telematic Embrace?" (1990; chapter 16), the elements of the work co-evolved like Gaia, such that distinctions between artist, viewer, and artwork, nature (Earth), and culture (technology) became blurred as they were united in the unfolding duration of their harmoniously negotiated mutual self-creation.

The idea of combining the ephemerality of telematic exchange with the bodily experience of physical space has subsequently been explored by a number of artists. Like Ascott's "Aspects of Gaia," their work has also challenged conventional relationships between human and nonhuman agents.[45] Eduardo Kac and Stelarc offer compelling examples of two very different approaches to this area of telematic art.

Kac has created numerous "telepresence" works involving the interaction between humans, machines, plants, and animals. He defines "telepresence" as the experience of being physically present and having one's own point of view at a remote location. His "Essay Concerning Human Understanding" (1994), created in collaboration with Ikuo Nakamura, used telematics in a telepresence installation in order to facilitate remote communication between nonhumans, in this case, a canary in Kentucky and a philodendron plant in New York. As Kac explained:

> An electrode was placed on the plant's leaf to sense its response to the singing of the bird. The voltage fluctuation of the plant was monitored through a [computer] running software called Interactive Brain-Wave analyzer. This information was fed into another [computer] . . . which controlled a MIDI sequencer. The electronic sounds [sent from the plant to the bird] were pre-recorded, but the order and the duration were determined in real time by the plant's response to the singing of the bird. (Kac 1996, 137)

Although the work spotlighted the prospect of communication between the bird and the plant, Kac noted that humans interacted with the bird and the plant as well, causing the bird to sing more or less, and the plant to activate a greater or fewer number of sounds. In this way, humans, plant, and bird became part of a cybernetic system of interrelated feedback loops, each affecting the behavior of the other and the system as a whole.

Since commencing his controversial suspension performances in 1976, perhaps no artist has challenged the physical limits of the human body with respect

to technology more than Stelarc. In *Ping Body*, first performed on April 10, 1996, in Sydney, he wired his body and his robotic "Third Hand" to the Internet, and allowed variations in the global transfer of online information to trigger involuntary physiological responses. The artist's arms and legs jerked in an exotic and frightening dance. As he explained:

> The Internet . . . provide[s] . . . the possibility of an external nervous system which may be able to telematically scale up the body to new sensory experiences. For example when, in the *Ping Body* performance, the body's musculature is driven by the ebb and flow of Internet activity, it's as if the body has been telematically scaled up and is a kind of "sensor" or "nexus" manifesting this external dataflow.[46]

Ping Body conflated the standard active-passive relationship of human to machine. While, ultimately, the artist was the master of his work, he permitted his body to be a slave to the more or less random exchange of amorphous data on the Internet. At the same time, Stelarc retained control over a robotic arm activated by muscle contractions in his body. As in most of Stelarc's work, the artist remained the central performer/subject of the piece. This strategy is quite different from Ascott's emphasis on distributed authorship in his telematic projects. However, in *Ping Body*, remote individuals could telematically influence Stelarc's behavior.

As a final example of Web-based art beyond the Internet, "TechnoSphere," spearheaded by Jane Prophet beginning in 1995, combined telematics and artificial life, using the Web as an interface to an evolution simulator that enables users to create their own creatures and monitor them as they grow, evolve, and die in a virtual three-dimensional environment. A series of menus allowed users to select attributes to create an artificial life form that entered the virtual world of "TechnoSphere" and competed for survival and reproduction. Users selected various physical features (eyes, mouths, motility, and so on), chose between herbivorous or carnivorous feeding, and assigned a name to the creature they had parented. The condition and activities of each creature—its weight, battles with other creatures, reproductive success, and so on—were calculated using natural selection algorithms, and the creator was periodically e-mailed updates on his or her offspring's status. "TechnoSphere" shared many concerns in common with Ascott's work over the past four decades, including biological morphology, interactivity, systematic feedback, and telematic connectivity.

Finally, Ascott's creation of "CAiiA-STAR" is worth considering in the context of Web-based art beyond the Internet. Although "CAiiA-STAR" is not a

work of art per se, it constitutes a massive telematic project that supports the creative development of art and artists around the world. Three decades before founding the program, Ascott had stated the fluidity between his artistic and pedagogical practice and had already envisioned international, interdisciplinary exchanges transpiring via telecommunications. The program focuses on developing analytical skills for theorizing and textual articulation of aesthetic ideas related to interactive works of art. It promotes artists' writings and elevates their authorial authority to the Ph.D. level. As a result, "CAiiA-STAR" is helping to dismantle the social misconception of the artist as a "producer of enigmas" and replace it with a concept of the artist as an intellectual with highest academic credentials. In these ways, "CAiiA-STAR" represents a certain culminating point of Ascott's interrelated pursuits as an artist, educator, and writer, extending his research on telematics into social praxis. At the same time, as he describes in "Art @ the Edge of the Net" (2000; chapter 27), "CAiiA-STAR" is itself a stepping stone to his larger conception of a "Planetary Collegium," a global network of centers for advanced research at the cutting edge of art and technology.

Roy Ascott's Theory of Love in the Telematic Embrace

AN INTERDISCIPLINARY EMBRACE OF GLOBAL CONSCIOUSNESS

Reflecting on a decade of telematic art, "Is There Love in the Telematic Embrace?" (1990) integrates many of Ascott's ideas about art, technology, and consciousness in an exceptionally lucid and provocative text. By raising the rhetorical question of whether or not electronic forms of art can possess loving content, Ascott addresses the concern that technology will overwhelm and dehumanize the arts, a last bastion of humanist values. Metaphysical philosophy, quantum physics, and avant-garde aesthetic theories join forces in Ascott's explanation of how telematics extends human perception and creates a form of global consciousness. The artist argues, moreover, that telematics' capacity to cultivate love offers "the very infrastructure for spiritual interchange that could lead to the harmonization and creative development of the whole planet."

"Is There Love in the Telematic Embrace?" welcomes the challenge that telematic art poses to conventional aesthetic values, while maintaining that the electronic medium serves humanist ends. Ascott's argument melds seemingly incompatible systems of knowledge and being, suggesting their complementarity. For example, he asserts a universal principle of love that promotes collaboration and unification in telematic networks. At the same time, Ascott character-

izes his project in Derridean terms as "pure electronic *différance*" (deferral of interpretation). He celebrates telematic art as a "site of interaction and negotiation for meaning" that heralds a "sunrise of uncertainty . . . a joyous dance of meaning . . . [and suggests] a paradigm shift in our worldview, a redescription of reality" (page 235 below). Telematic art in this sense thus embraces both the transcendence of romanticism and the contingency of relativism.

Although he proclaims the inevitability of change, Ascott conforms to neither a modern nor a postmodern epistemological worldview. His insistence on sustaining paradox, on permitting and encouraging the simultaneous coexistence of incongruous modes of thought, is a particularly challenging aspect of his work and arguably one of his important theoretical achievements. This position is consistent with the way artists have imagined the confluence of philosophical rationalism, science, and technology, on the one hand, with metaphysics, intuition, and art, on the other. Ascott belongs, moreover, in the company of those intellectuals and visionaries who have created synthetic methods of constructing alternate ways of knowing and being.

Ascott's notion of telematic love is derived from the theory of "passionate attraction" advanced by the French utopian philosopher Charles Fourier (1772–1837), who described it as "the drive given us by nature prior to any reflection . . . [t]oward the coordination of the passions . . . and consequently toward universal unity" (Fourier [1971] 1983, 216). Ascott similarly defines love as a natural, intuitive force that draws human beings towards one another, transforming multiplicity into unity. He applies the notion of passionate attraction to Marcel Duchamp's *The Bride Stripped Bare by Her Bachelors, Even*, or *Large Glass* (1915–23), which he interprets as embodying love and prophetic of telematic art. Generating energy and emotion from the "tension and interaction of male and female, natural and artificial, human and machine," Ascott writes, Duchamp's vitreous sculpture "always includes both its environment and the reflection of the observer." By observing the work, he explains, the viewer becomes implicated as a participant in it and thus a progenitor of the love that is "contained in this total embrace" (page 235 below).

Ascott's theory of the telematic embrace gained insights from second-wave cybernetics and quantum physics as well. Whereas cybernetics initially considered experimental systems as autonomous entities, second-order cybernetics, as theorized by Heinz von Foerster, raised the question of reflexivity; that is, how to account for the role of the observer with respect to the behavior of a system. Systems came to be understood as contingent on observers and their means of measurement, which influenced the observation of behavior both be-

cause of the subjectivity of interpretation and through the physical alteration of matter at the quantum level (Foerster 1981). In this regard, Ascott cites the physicists John Wheeler and Wojciech Zurek's contention that, "[t]o describe what has happened one has to cross out that old word 'observer' and put in its place 'participator.' In some strange sense the universe is a participatory universe" (Wheeler and Zurek 1983, 6). Similarly, Ascott had long considered art to be a participatory process (as opposed to a discrete object or event), defined not by formal parameters but by behavioral relationships in which artist, observer, and environment (later including global telematic networks) were inextricably integrated into an emergent, distributed, interactive system.

Ascott joined these ideas with the prophecies of global consciousness expounded by the French paleontologist and theologian Pierre Teilhard de Chardin, who theorized the existence of a "noosphere," the British futurologist Peter Russell's speculations about a "global brain," the anthropologist and cybernetician Gregory Bateson's theory of "mind at large," and James Lovelock's "Gaia hypothesis." Such visionary thinking offered Ascott important examples for theorizing how telematics could stimulate the creation of aesthetic models that envisioned a future of heightened global connectivity and consciousness.

TRANSCENDENCE, TRANSPARENCE, AND TELEMATIC ART

Ascott's claim that passionate attraction in telematic systems expands perception and creates a unified global consciousness demands further scrutiny, especially since it is partially based on theories that are not generally accepted. The following critical examination of the artist's concepts of telematic love and consciousness locates his theories of telematics within the context of visual art and the visionary practice of avant-garde artists unrestrained by conventional systems of knowledge.

Teilhard's model of expanded consciousness, the "noosphere" (from the Greek *nous*, or mind) hypothesizes the dawning of a new stage of human evolution. Teilhard reasoned that just as matter gave rise to life (from which consciousness emerged), so consciousness itself would be succeeded by the noosphere, the ultimate stage in human development: "With and within the crisis of [self-]reflection, the next turn in the [evolutionary] series manifests itself . . . a higher function—the engendering and subsequent development of all stages of the mind, this grand phenomenon . . . is the noosphere" (Teilhard de Chardin 1955, 181–82). One may rightly be suspicious of Teilhard's unscientific and teleological explanation of the evolution of consciousness. Nonetheless, his description of the

noosphere as an expanded field of consciousness offered a visionary model for contemplating the future of the human mind in a global context.[47]

Peter Russell built on Teilhard's notion of the noosphere in his "global brain" theory, which also appealed to Ascott, who had theorized in "Behaviourist Art and the Cybernetic Vision" (1966–67) that a "highly interactive network [cybernetic art matrix] on an international level might form the embryonic structure of a world brain" (page 146 below). Based on the trend of data-processing capacity doubling every two and a half years, Russell argued that by the year 2000, the global telecommunications network would equal the complexity of the human brain. He theorized that this global brain (the neurons of which would be individuals, all telematically interconnected, like a neural network) could give rise to an emergent form of consciousness (Russell 1983). According to Russell, this structural system, modeled on that of biological organisms, would provide the essential prerequisites for a new evolutionary level, the emergence of a cyborgian superorganism integrating human consciousness and global computer-networking technology.

Again, as with Teilhard's notion of the noosphere, Russell's theory of the global brain is problematic. For example, it draws parallels between the brain and global telecommunications networks without rigorously considering the material, contextual, and functional dissimilarities between these two systems. Although many scientists and philosophers believe that there are materialist explanations for the operations of the human mind, the role that neuronal complexity plays in the production of consciousness remains subject to speculation.

An expanded form of planetary consciousness, such as the noosphere, may not be attainable, either by evolution or telematics. Computer networks have yet to reach the computational complexity of a global brain and may never achieve the type of consciousness manifested in humans. Criticisms of Teilhard and Russell apply only partially to Ascott's work, however, because art need not comply with the academic conventions of biology, neuroscience, and philosophy. Indeed, conventional scientific methods may not be able to prove or disprove the phenomena of networked consciousness that Ascott reported and conceptualized in an artistic context. But that hardly means they are not possible in fact, much less that they are not meaningful as art and as theory. The concepts of the noosphere and the global brain, like Ascott's theory and practice of telematic art, imagine potentials for the future of consciousness. As a form of experimental research established simultaneously adjacent to, and apart from, other disciplinary protocols, art often utilizes unconventional systems of knowledge that are deemed unacceptable by other fields. Far from lapsing into an irredeemable form of intu-

itionism, however, art exercises this intellectual freedom in order to expand the limits of knowledge and the understanding of human existence.

Such a synthetic, intellectual method apparently was also at work in Duchamp's enigmatic *Large Glass*, which, like Ascott's work, has invoked art historical interpretations running the gamut from mysticism to science. In "Is There Love in the Telematic Embrace?" Ascott proposes the *Large Glass* as a model for the passionate attraction he theorizes as operating in telematic art. He interprets Duchamp's magnum opus as embodying and generating love by drawing viewers into a hybrid field made up of its passionate imagery, its environment, and the viewer's own reflection, and claims that telematic art similarly draws participators into the hybrid field of cyberspace, which they collaboratively create and transform in a process of unification that embodies and generates love. Although much of his discussion of love apropos of the *Large Glass* focuses on its dynamic form, Ascott also identifies the element of attraction in the glass sculpture's sexualized imagery. But alongside whatever attraction might be interpreted in Duchamp's work, the exchange between male and female depicts a proto-cyborgian confluence of mechanical technology and bio-organic aesthetics. The machine-like anonymity and ambivalence of the eroticized intercourse between these aspects might be interpreted as creating a perverse tension rather than a loving embrace.

Like the vitreous surface of a computer terminal, the *Large Glass* resists a consistently transparent view because it includes the reflection of the observer and his or her environment in its image. Ascott advocates this quality for its inclusiveness and claims that it promotes the dissolution of traditional epistemological models based on binary oppositions, in particular the subject-object model of Western art since the Renaissance. Contrary to Ascott's description of the relational intimacy of telematics vis-à-vis the *Large Glass*, skeptics may question whether or not a passionate bond can really be consummated through a computer monitor, which arguably disrupts the total engagement of love. Like Duchamp's transparent sculpture, the eroticism of the telematic embrace is seductive and appealing, perhaps all the more so because of its elusiveness—the impossibility of possessing it; its insistence on keeping the relationship tantalizingly connected, but always at a distance.

While enabling new conditions for, and qualities of, mutual exchange, such hyaline interfaces may equally transform communication into monologue, unification into narcissism, passionate attraction into solitary confinement. Might not the persistent self-reflection one experiences on a computer screen inter-

rupt the mantric union of technological apparatus and human consciousness, network and node? Do not the many delays, bugs, viruses, and crashes to which computer networks are prone remind the telematic participant that she or he is inevitably a perpetual observer, a voyeur whose electronic relationships are subject to autoerotic soliloquy?

Such questions are neither new nor unique to telematics. "The loved object is simply one that has shared an experience at the same moment of time, narcissistically . . . like reflections in different mirrors," Lawrence Durrell writes, and such skeptical assertions have a long history in philosophy and literature (Durrell [1957] 1961, 42). Similar issues have been raised in the context of film theory to interrogate the limits of a viewer's ability to identify with dramatic characters and the unfolding cinematic narrative. Drawing parallels between cinema screens and computer screens, the media theorist Lev Manovich has argued that if, in the context of Western representation, the screen offers the illusion of liberating access into infinite space, it can equally be seen as a prison, because it demands that the viewer be physically present at a precise location.[48]

Ascott has argued that the application of theories about film to the conditions of telematics fails to address the functional dissimilarity of their interfaces, particularly the interactive, relational, multipath potential of computer networks. He rejects the Renaissance idea of art as a window on the world and conceives of it rather as a map of actual and potential relationships. Similarly, Ascott understands computer monitors to be metaphorical "screens of operation," rather than screens of representation. The "telematic screen gives the individual mind and spirit worldwide access to other minds and spirits," he says, enabling expanded "cognitive, affective, and spiritual behavior. It is not at all . . . imprisoning."[49]

Ascott's telematic embrace takes place in the space where love draws together art and technology, where their union becomes consciousness, and where consciousness, in turn, becomes love, allowing the system to cycle and recycle in perpetuity. Indeed, just as he presents telematics as a propositional model merging the instrumentality of technology with the creativity of art, so his concept of love can be seen as a propositional model merging the contingent and the transcendental. If Ascott is correct that the principle of passionate attraction is activated in the form and content of Duchamp's *Bride*, then such love is enigmatic. Similarly, the form and content of telematics are capable both of sustaining life and of violating it; and violation and sustenance are not mutually exclusive. It is this ambiguity that characterizes the dialectical locus of utopian and dystopian visions of the future with respect to technology (Heim 1999).

Toward a Critique of Telematic Art

That emerging technologies extend the hegemony of technocratic institutions, economic systems, and governments is nearly a tautology. As the demands of the evolving military-industrial-media complex push the relationship between human and machine to its limits—not necessarily in the pursuit of any lofty ideal, but in the interests of expanding global control and profit—the question of human values becomes increasingly urgent. Which values are worth keeping? What other types of values might emerge? Ascott proposes perhaps the most obvious, yet unlikely, value—love—as an organizing principle central to telematic culture. Yet, while certain aspects of love may remain stable, others appear subject to change. Similarly, it remains uncertain how the shifts brought about by telematics will transpire and what the costs and benefits will be.

Ascott's polemical query "Is there love in the telematic embrace?" therefore raises further questions: "What will that love be?" "How will it be manifested?" and "Who will benefit from it?" Indeed, the "sunrise of uncertainty" that the artist advocates may not appeal to those whose living circumstances are already tenuous. For no amount of telematic consciousness can result in planetary harmony unless the physical conditions of human life are vastly improved. Moreover, given that only a fraction of the world's population had even a telephone at the end of the second millennium, one must ask how wide the arms of the telematic embrace will be.[50] At the same time, one must remain vigilant that its hugs do not squeeze too tightly.

Cyberspace is a double-edged sword that reproduces the physical world, simultaneously intensifying and dematerializing it. Indeed, online rape, child pornography, terrorism, and computer viruses are part of the economy and structure of the global village, but telematics also offers potential benefits that are unique. Ascott's experiments with interactive art systems, beginning in the 1960s, and with telematic art networks, since the 1980s, can be seen as state-of-the art aesthetic research and design. His early collaborative networking experiments heralded a new paradigm for human interaction that is still in its infancy, the ramifications of which remain a work in progress.

UTOPIAN VALUES AND RESPONSIBILITY

Ascott's theories of telematic art are subject to criticism for their deterministic and utopian attitude regarding technology and the future. However, the artist is keenly aware of the threats that technology potentially poses to society and has expressed concern about how the misuse of technology by empowered in-

stitutions can serve to reinforce the status quo. Perhaps Ascott's service as a radar officer in the mid 1950s, at the height of the Cold War, stimulated his mindfulness of the potency of communications and surveillance technologies. This experience may have influenced his search for alternative scenarios in which these instruments of control promote collaboration, expand perception, and foster more harmonious planetary relations. Indeed, since writing "The Construction of Change" in 1964, he has insisted on the moral responsibility of artists and designers to contribute to shaping society by understanding the implications of technology and envisioning its many cultural possibilities. In this context, Ascott's utopianism is an aesthetic value that reflects his self-defined creative and ethical mission to formulate constructive visions of the future as an inspiration and blueprint for change.

The ethical responsibility of artists' use of telecommunications and the potential ability of art to affect the structure and content of networked communications is a persistent topic of debate (see, e.g., Gigliotti 1993). In general, Ascott has eschewed making explicitly political statements about the potential of telematics. However, in "Art and Telematics," he describes how the aesthetic values of telematic art constitute a subversive paradigm shift that has sweeping ramifications for the social structure:

> . . . [A]rt itself becomes, not a discrete set of entities, but rather a web of relationships between ideas and images in constant flux, to which no single authorship is attributable, and whose meanings depend on the active participation of whoever enters the network. . . .
>
> . . . [T]here is no centre, or hierarchy, no top nor bottom. . . . To engage in telematic communication is to be at once everywhere and nowhere. In this, it is subversive. It subverts the idea of authorship bound up within the solitary individual. It subverts the idea of individual ownership of the works of imagination. It replaces the bricks and mortar of institutions of culture and learning with an invisible college and a floating museum, the reach of which is always expanding to include new possibilities of mind and new intimations of reality. (Page 199 below)

Here, Ascott theorizes how telematics might promote the development of a society that is essentially different from the inherited model of hierarchical, discrete, centralized, individualistic systems of communication. This telematic model is "subversive," he asserts, in as much as it would "replace the bricks and mortar of institutions." In this distinctly political statement, Ascott sanctions not only the expansion of human consciousness but a reconceptualization of reality that involves the replacement of traditional cultural and social institutions.

Indeed, with the exception of the telephone, industry and government have historically restricted public communication transmissions to a one-way model in which the public has been a passive receiver. In the tradition of Bertolt Brecht, it was artists like Ascott who first offered the public models of interactive global communication among multiple, active participants.

It must be noted that hierarchies are not necessarily evil, and that they often serve vital functions of creating order and differentiation. It is unclear to what extent telematics has challenged the conventional hierarchical structure of society. While peer-to-peer file-sharing may be a thorn in the side of the record industry, and cottage industries have sprung up as a result of the economic benefits of the telematic home office, the fundamental structure of power arguably remains the same. Telematics has not proven the ability to bring repressive regimes to their knees, though a good spam, to say nothing of computer viruses, can cripple a corporate or governmental e-mail server.

Youngblood reiterates the ethical responsibility of artists to utilize telecommunications in a socially constructive manner, but is skeptical of how early telematic artworks merely repeated what had become common commercial practices. "A communications revolution is not about technology; it's about possible relations among people," he observes, arguing that this revolution has the potential to invert extant social relations, transforming the centralized, hierarchical structure of geographically discrete nations into one of decentralized, but politically significant, communities defined by "consciousness, ideology and desire." However, Youngblood warns: "The pretension has been that something done every day in business and industry and by subscribers to computer networks, or employed every evening by network newscasters, becomes special because artists are doing it. In fact nothing is revealed that is not already given, obvious, routine—indeed, already politicized by commercial contexts" (Youngblood 1986, 9).

According to this line of reasoning, the artistic use of telecommunications is "special" (i.e., art as opposed to nonart) only if the media are employed in a way that is not "done every day in business and industry," and therefore "given, obvious, routine, . . . [and] politicized." One could argue, however, that in its nascent stage, even the most mundane use of telecommunications in an art context could have significant meaning. By shifting the context from commerce to art, telematic artists have altered the codes of signification that apply to the dialectic between the medium and the message, form and content. As a historical example of this artistic strategy, Marcel Duchamp's *Fountain* (1917) shifted the context of the reception of a plumbing fixture to the domain of art, thereby endowing the common object with a "new idea," and abruptly changing West-

ern aesthetic conventions in the process. Similarly, the use of telecommunications media in the context of art not only imparts a new idea to that technology but raises significant challenges to artistic traditions.

Robert Adrian has also addressed the important process of decentralized exchange, expressing skepticism about the ability of artists to alter the form of telematics, while asserting confidence in their capacity to impart significant content to computer networking. "It is in the ephemeral immediacy of the exchange that the meaning of the work exists," Adrian writes, noting, however, that "the network implicit in the use of such systems ought not to be seen as originating with the technology but rather as the refinement of an existing network" of decentralized artists (Adrian 1979). In other words, the structure of computer networking remediates extant relationships between artists. It is too late for artists "to really change the direction of design development" of electronic media, Adrian has observed, although maintaining that "we can try at least to discover ways to insert human content into [the] commercial/military world floating in this electronic space. And this is where artists are traditionally strong in discovering new ways to use media and materials, in inventing new and contradictory meanings for existing organizations and systems in subverting self-serving power-structures in the interests of nearly everyone" (Adrian 1982).

Although he doubts that artists can influence the structural form of computer networks, Adrian remains optimistic that they might nonetheless use them in unprescribed ways and contribute provocative, and potentially subversive, material. In contrast to Youngblood and Adrian, Ascott's position is closer to Nora and Minc's view that the very structure of telematics holds the potential for a subversive reordering of social relationships and values. Ascott's theories of telematic art emphasize how the structure and process of asynchronous, decentralized, and collaborative interaction results in the transformation of consciousness on a global scale.

Also addressing the question of responsibility in telematic art, Kac questions the ability of telematics to change the conventional relationship between artist and viewer. Kac asks rhetorically whether the artists who produce such works do not "restore the same hierarchy they seem to negate by presenting themselves as the organizers or creators of the events they promote—in other words, as the central figure from which meaning irradiates." Arguing that they do not, Kac explains that the telematic artist creates a context in which networked telecommunications transpire, "but without fully controlling the flux of signs through it." This position closely parallels Ascott's assertion twenty-five years

earlier in "Behaviourist Art and the Cybernetic Vision" that "[w]hile the general context of the art experience is set by the artist, its evolution in any specific sense is unpredictable and dependent on the total involvement of the spectator" (page 111 below). Kac concludes that the artist working with telecommunications media "gives up his or her responsibility for the 'work,' to present the event as that which restores or tries to restore the responsibility (in Baudrillard's sense) of the media" (Kac 1992, 48).

In his essay "Requiem for the Media," the French sociologist Jean Baudrillard theorizes media "responsibility," not in psychological or moral terms, but as a "personal, mutual correlation in exchange . . . restoring the possibility of response" (Baudrillard 1981, 169–70). In contrast to McLuhan's proposition that telecommunications is creating an interconnected global village, Baudrillard insists that the formal qualities and institutional conditions of media embody "*what always prevents response*" and therefore what implicitly undermines any liberatory potential that might be imputed to telecommunications on the basis of its structure. He dismisses, as uncritical and retrograde, the utopian dreams to "liberate the media, to return them to their social vocation of open communication and unlimited democratic exchange," claiming that "what we have here is an extension of the same schema assigned, since time immemorial, from Marx to Marcuse, to productive forces and technology: they are the promise of human fulfillment, but capitalism freezes or confiscates them. They are liberatory, but it is necessary to liberate them." For Baudrillard, the potential for revolution in the media lies in "restoring [the] possibility of response." But he adds that "such a simple possibility presupposes an upheaval in the entire existing structure of the media" (168–70).

Baudrillard's critique of the structural limits of media challenges Ascott's assertion of the liberatory potential of telematics. The media historian and theorist Douglas Kellner has noted some of the shortcomings of Baudrillard's argument, offering a critique that supports Ascott's position with respect to the transformative capabilities of telematic media. Kellner argues that Baudrillard's position is technologically deterministic; it confers potency exclusively on the formal aspects of media, while evacuating their content of significant meaning (Kellner 1989a, 1989b). Like the utopian global village prophesied in McLuhan's *Understanding Media*, the dystopic account of technology in "Requiem for the Media" fails to acknowledge the dialectic between the medium and the message as co-determining elements of social practice. Moreover, because, for Baudrillard, media vitiate the possibility of response, he is unable to entertain the potential of alternative media structures (such as two-way radio and telematics)

to enable response, much less to constitute an "upheaval in the entire existing structure of the media." Finally, Kellner points out that the sociologist's nostalgia for a primitive form of direct response naïvely imagines that communication could be unmediated in some pre- or post-technological context. Ascott has himself repudiated this notion. "Human communication has never been . . . beyond mediation," he wrote, "since it is clear that the constraints and limited range of our biological systems of perception, and the ordering of experience by our languages, involve us in a continual process of constructing our world" (page 268 below). Indeed, communication is arguably always mediated, whether it transpires face-to-face or modem-to-modem, so technological media cannot be isolated out for criticism on this basis.

These various perspectives point to the problematic relationship between form and content in telematic art. D'Agostino and Adrian emphasize the importance of content, while Youngblood and Baudrillard emphasize formal concerns. Kac and Kellner attempt to strike a balance between form and content as inextricably connected components of communication. Ascott's work emerges from an aesthetic tradition that, at least in part, undermines the terms of this polemic.

FORM, CONTENT, PROCESS, AND TELEMATIC AESTHETICS

The relationship between form and content has been a problematic issue throughout the history of art. The practice, theorization, and criticism of telematic art have not refrained from adding to the fray. As noted above, there are divergent opinions regarding form and content in telematic art. However, I believe that telematic art exemplifies the intrinsic interrelatedness of form and content, and, as a result, has made a valuable contribution to the broader art historical discourses on this issue. For example, while Ascott's theories have clearly emphasized the formal aspects of telematics, the subject matter of projects like "La Plissure du Texte," "Ten Wings," and "Aspects of Gaia" all belie the importance of content in his work and in telematic art in general. In these works, form and content are inseparable and mutually co-determining parts of the overall meaning produced.[51]

One must also recall Ascott's emphases—for some forty years—on process, on the phenomenology of interactive participation in aesthetic encounters, and on the discursive production of meaning as the result of information exchanges within systematic contexts. For such concepts transcend the binary theoretical construct of form and content, offering a far richer basis for understanding the relationship between technological media and artistic expression. Form and con-

tent in telematic art can neither be considered in isolation from each other nor outside of considerations of process and context. Form is not a receptacle for content, and content is not an armature for form. The processes by which technological media develop are inseparable from the content they embody, just as the developing content of technological media is inseparable from the formal structures that embody it. Moreover, form, content, and process must be considered within the particular contexts of their creation and interpretation. The telematic embrace does not embody love by virtue of its formal structure, any more or any less than by virtue of the sensitivity and caring that it potentially communicates. If there is love in the telematic embrace, that love emerges as a dialogical process of interaction in which exchanges of information create bonds through shared systems of meaning and value.

In addition to the concerns of form and content, process, interactivity, and the semiotics of meaning in computer networks, there is also a conceptual component to telematic art, which, although it rarely goes unnoticed, has not been given sufficient consideration. Ascott's artistic practice since the early 1960s has shared significant theoretical alliances with what has since become historicized as conceptual art, including a strong emphasis on questioning the way in which art accrues meaning through the interplay of semantic systems. Ascott's interactive constructions have been equally concerned with how a "universe of discourse" can be derived as a result of the exchange or transaction of signifiers between the participant(s) and the work. Ascott's theory and practice of telematic art can be interpreted, then, as an extension of his theory and practice of a form of proto–conceptual art (Shanken 2001). Whereas conceptual art deemphasizes the materiality of art objects to interrogate the semiotic basis of visual meaning, telematic art asks how the semiotic structure of computer networking offers alternative forms of authorship, meaning, and consciousness in the electronic ether of cyberspace.

If telematic art is interpreted as an extension of conceptual art, then a significant aspect of a telematic artwork will be embodied in its own idea. Opposition to what has been termed the "techno-utopian rhetoric" of telematic art may be responsible, in part, for the occlusion of this point (Penny 1995, 47–73). While such critical challenges are important, this so-called rhetoric may, in and of itself, be considered a significant aspect of the art form. In other words, the conceptual idea of Ascott's telematic art—that electronic telecommunications technologies may contribute to the creation of a networked consciousness that is greater than the sum of its parts—is an integral part of his work and the history of the genre.[52]

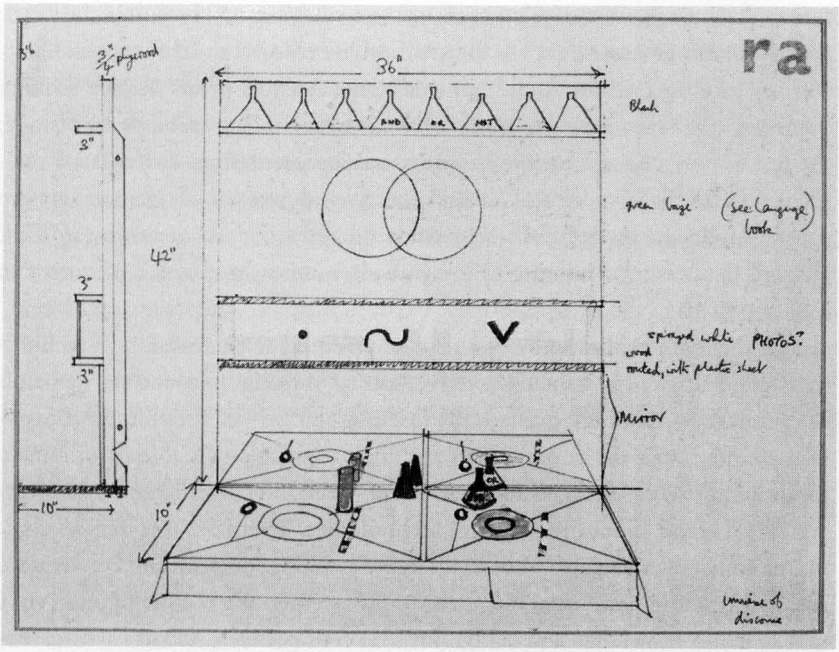


Figure 21. *Universe of Discourse*. 1977. Pen, crayon, and tape on paper, approx. 10 × 14". Note mirror panel indicated above table, and faint drawings of Transaction Tables partially hidden under tape above above it. The words "and," "but," and "or" suggest the conjunctive relationality of discursive interactions.

"Language, mathematics, and systems are an integral part of conceptual art," observes Carl Loeffler, whose involvement with satellite and telematic projects beginning in the late 1970s grew out of his interest in conceptual art. "To take the beauty of a good idea—conceptualism—and to apply it to a computer network is an exploration of language, systems, technology and, what became increasingly important over time, the idea of public art and the social context."[53] Indeed, telematic art, as it emerged in the work of Ascott, Loeffler, and other pioneers, was bound up in the concerns of conceptual art. This common ground is reflected in artistic activities that include the creation of alternative spaces, the impulse to involve the public in a more integrated manner with art, and a general rethinking of the relationship between art and society. Telematic art involves an ideology of interactive collaboration and global connectivity. As such, it both embodies utopian aspirations and constitutes a model for achieving them.

Mindful of both utopian and dystopian attitudes towards technology and the

future, Ascott's theories of telematic art envision "*life-as-we-know-it* in the larger context of *life-as-it-could-be*," as the artificial life researcher Christopher Langton has so eloquently written.[54] In this sense, Ascott's praxis bears a striking affinity to the strategic convictions of avant-garde artists throughout history: the perception, conception, envisioning, and representation of alternative realities and systems of meaning. Ascott's theory and practice of telematic art can most usefully and thoughtfully be considered in the context of avant-garde art. Indeed, the reasoned impulse to imagine alternative futures as a precursor to building them in the present shapes Ascott's desire for a telematic embrace.

The telematic embrace draws on the social force of art as an ally of technology. Unencumbered by the destructive history of technology and the demands of rational epistemology, perhaps the discipline of art—as the cultural convention charged with the embodiment and maintenance of the loftiest of human ideals and the rigorous questioning of them—can offer alternatives to military and commercial applications of new technologies. Telematic art offers an artistic meta-perspective capable of embodying paradox, dismantling convention, and constructing new visual forms that employ emerging technologies in ways that redefine knowledge and being. For over four decades, Ascott's artistic theory, practice, and pedagogy have offered such alternative models of "life-as-it-could-be," inspiring the collective imagination to create it in the present.

NOTES

1 A collection of Ascott's writings has been published in Japanese as *Art and Telematics: Towards the Construction of a New Aesthetics*, trans. Erimi Fujihara (Tokyo: Nippon Telephone and Telegraph Publishing Co., 1998).

2 The Advanced Research Projects Agency (ARPA) was founded in 1958 by the U.S. Department of Defense in response to the successful launching of Sputnik by the USSR. ARPANET, the precursor of the Internet, was an ARPA project initiated in the midst of the Cold War space race to enhance the ability of U.S. researchers to quickly exchange vital scientific and military information. See Myers 1996.

3 The late American composer and mycologist John Cage is probably the most famous artist in the postwar period to merge Eastern mysticism and Western technology and aesthetics. He studied Zen with D. T. Suzuki and used a computer to consult the *I Ching* in order to determine aspects of his musical compositions. See Cage 1961.

4 Charles Biederman's analysis of modern art was predicated on an evolutionary model in which color was progressively freed from form. Arp's organic forms and the developmental process of their creation can be likened to Wentworth Thomp-

son's models of biological morphology. Abstract expressionism relied on the unconscious to create visual forms that resembled the complexity of nature, and could also be interpreted by the structuralist model as freeing color from form.

5 Roy Ascott, "Interactive Art" (unpublished manuscript), 2.

6 Roy Ascott, e-mail correspondence with the author, June 25, 1997.

7 Roy Ascott, interview with the author, Bristol, May 25, 1995.

8 Roy Ascott, interview with the author, Montreal, September 20, 1995. Subsequent quotation from same source.

9 In retrospect, the artist acknowledges that an interpretation of his writings as works of art is justified, given the conceptual framework he had established at the outset for his artistic behavior, which included teaching and writing, and which he has maintained vigilantly since the early 1960s. Roy Ascott, interview with the author, New York, February 13, 1996.

10 See, e.g., Kosuth 1991 and Max Bill, "Concrete Art" (1936, rev. 1949) and "The Mathematical Approach in Contemporary Art" (1949), excerpted in Stiles and Selz 1996, 74–77.

11 Joseph Kosuth, "Vico's Appliance: The Historian as Artist and the Crisis of Certainty" (paper delivered at Duke University, April 1996), 4. See also Kosuth 1996. According to Kosuth, the art historian Benjamin Buchloh, along with his associates at the influential art journal *October*, of which Buchloh is editor, have persistently attacked his work, attempting to undermine the historical importance of his contributions to art and criticism. Kosuth's reply and Buchloh's rejoinder can be found in *October* 57 (Summer 1991): 152–57, 158–61.

12 The Josiah Macy Jr. Foundation "put into practice the belief that discoveries in one field of scientific activity can often result from information gained in quite another, that the increasing isolation of the different branches of science is a serious obstacle for progress" (Stewart 1959). The Macy Conferences on the topic of cybernetics were an outgrowth of its 1942 conference on "Cerebral Inhibitions." Organized by the Macy Foundation's medical director, Charles Fremont-Smith, and chaired by the neurophysiologist Warren McCulloch, the first of these small, invitational meetings, entitled "Feedback Mechanisms and Circular Causal Systems in Biological and Social Systems," took place in March 1946. In 1949, after Norbert Wiener published *Cybernetics*, the meetings became known as the Macy Conferences on Cybernetics.

13 For more on the political and sociological aspects of the development of computers and cybernetics in the context of the Cold War, see Edwards 1996.

14 Popper 1975, 10. The famous "Bewogen Beweging" exhibition was organized by Daniel Spoerri, K. G. Pontus Hultén, and Jean Tinguely at the Stedelijk Museum in Amsterdam. Ascott has claimed that he did not know of other artists who worked with interactive media until he exhibited in that show with Agam. Roy Ascott, interview with the author, Montreal, September 25, 1995.

15 Despite his prominence in this area, Ascott was not included in Reichardt's "Cybernetic Serendipity" exhibition at the Institute of Contemporary Arts in London in 1968. This oversight can be explained in part by the fact that his art, although manifesting a complex, metaphorical relationship with scientific ideas, did not explicitly utilize technological apparatus. Reichardt was aware of Ascott's work with cybernetics in the early 1960s. The artist's theoretical approach to the application of cybernetics to art as process and system did not, however, match Reichardt's vision for "Cybernetic Serendipity," which involved the juxtaposition of art and nonart, and emphasized the use of technological apparatus either as an object or as a means for producing objects. Jasia Reichardt, interview with the author, London, July 30, 1998.

16 Ascott's anticipation of, and contribution to, the formation of conceptual art in Britain has not received proper recognition, perhaps because his work was perceived as too closely allied with technology. See Shanken 2001.

17 Mellor 1993, 19. Mellor dates Latham's theorization of "event structure" to 1959. Latham claims to have conceived of it much earlier, and certainly prior to Georges Mathieu's performance at the Institute of Contemporary Arts in London in 1956. John Latham, interview with the author, Los Angeles, February 8, 1998.

18 In 1962, Ascott was included with Pasmore, Ben Nicholson, and Kenneth and Mary Martin in an exhibition of British constructivist art. See *The Geometric Environment* (exhibition leaflet), A.I.A. Gallery, London, May 10–31, 1962.

19 On the relationship of Schöffer's spatio-dynamic and cybernetic sculptures to constructivism, see Popper 1968, 134–40.

20 Similarly, Duchamp's *Large Glass* (1915–23) has been interpreted as a visual map of the structural foundations of Western art history and the internal semiological functioning of art objects through a diagrammatic and transparent form. See Burnham 1974.

21 See Wolfe 1972 and 2001, as well as *Art* (Journal of the Society of Canadian Artists) 3, 11 (Spring–Summer, 1972): 25.

22 Norman White, telephone interview with the author, October 2, 1998.

23 As H. H. Arnason notes: "Various dates are used to mark the point at which modern art supposedly began. The most commonly chosen, perhaps, is 1863, the year of the Salon des Refusés in Paris . . . [although] other and even earlier dates may be considered . . . even 1784, when . . . in Neoclassical art a fundamental Renaissance tradition was seriously opposed for the first time—the use of perspective recession to govern the organization of pictorial space." More recently, some scholars, such as Joseph Koerner, have located the dawning of modernity in the Renaissance, which they interpret as the moment when artists began to self-consciously and self-reflexively express their identity and role as artists in a critical manner. See Arnason 1986, 13, and Koerner, 1993. See also Harrison 1996.

24 In recycling media images (an original artistic gesture in the early 1960s), even pop artists like Hamilton, Rauschenberg, and Warhol were bound up in creating a personal style, thus perpetuating the modernist value of originality.

25 Here Ascott quotes McLuhan 1964. See also McLuhan 1962.

26 The French response to this dilemma was to put the development of telematics in the hands of the civil service bureaucracy, which was deemed less malignant than corporate interests. See Feenberg 1995, 144–66.

27 Bolter and Grusin (1999) discuss the problem of technical determinism and writing about media, noting: "It is difficult . . . to hold in relief all the aspects of a technology at any one rhetorical moment" (75–78). They suggest that statements that impute autonomous agency to media (e.g., "digital media are challenging the status of television and film") be treated as shorthand for more "lugubrious" descriptions that acknowledge the hybridity of agency with respect to media (e.g., "the individuals, groups, and institutions that create and use digital media treat these media as improved forms of television and film"). I have followed this approach in my text.

28 Roy Ascott, e-mail correspondence with the author, October 11, 1998.

29 Thirty years later, it was reported that doctors at Emory University had succeeded in planting an electrode in the brain of a paralyzed mute stroke victim, which enabled him to communicate directly with a computer. "Implant Transmits Brain Signals Directly to Computer," AP, *New York Times* on the Web, October 22, 1998, <http://www.nytimes.com/library/tech/yr/mo/circuits/articles/22brai.html>.

30 According to Klára Kiss-Pál (1997), "People put various dates to the inception of the NYCS. Mike Crane dates it from 1962; according to Johnson, it already functioned in the fifties. But the name, given by Ed Plunkett (New York Correspondence School), gained recognition only at the end of the sixties, mostly due to the increasingly regular meetings organized by Johnson . . . between 1968 and 1983."

31 Allan Kaprow, telephone interview with the author, July 23, 1998. According to Kaprow, Minujin's happening took place at a television studio. Video clips, ostensibly of the happenings going on simultaneously in New York and Berlin, were displayed on monitors. Although apparently no deception was intended, the audience and the press in Argentina believed that they actually were seeing an interactive, transcontinental performance in real time.

32 In 1971, Kaprow expounded an expanded vision of the possibilities of such communication/noncommunication systems, a combination of video arcade and Internet cafe, which he described as, "A global network of simultaneously transmitting and receiving 'TV Arcades' . . . [e]ach equipped with a hundred or more monitors. . . . A dozen automatically moving cameras . . . will pan and fix anyone or anything that happens to come along or be in view [and] send the same images to all other arcades. . . . Thus what happens in one arcade may be happening in a

thousand, generated a thousand times. . . . Everybody in and out of touch all at once!" ("The Education of the Un-Artist," in Kaprow 1993, 106–7).

33 Transcript of "Utopia Q&A," E.A.T. archive, Getty Research Institute for the History of Art and the Humanities, Los Angeles.

34 The Public Interest Satellite Association (PISA) helped to orchestrate this event with NASA and to obtain use of the jointly owned U.S./Canadian "Hermes" CTS satellite. Liza Bear, telephone interview with the author, October 26, 1998.

35 Willoughby Sharp, telephone interview with the author, September 24, 1998.

36 Liza Bear, telephone interview with the author, October 26, 1998.

37 White had a free account on the IPSA network through his friend Bob Bernecky, who worked there as a systems programmer. The problem for White was that he didn't know any other artists who had access to the network. White and Bartlett met in 1977 or 1978 at a conference on art and technology in Toronto and discussed the possibility of using the IPSA network for an art project. Norman White, telephone interview with the author, October 2, 1998. This conference may well have been the Fifth Network Conference, where Bartlett and Adrian met in 1978.

38 Vallée 1981, entry 34, October 16, 1980. *Saturn Encounter* was organized by Vallée, Stan Kent, and Ren Breck on the occasion of the *Voyager*'s encounter with the planet Saturn on November 11–12, 1980.

39 The history and evolution of ARTBOX is noteworthy, because it was a major technological achievement that enabled many text-based telematic art projects in the 1980s. Adrian (1995) explained that

> In the summer of 1980, Bill Bartlett and I began to put pressure on IPSA [I. P. Sharp Associates] to develop a cheaper and more user-friendly e-mail program for non-corporate and non-institutional users. This resulted in the creation, by Gottfried Bach, of ARTBOX—a cheap and simple version of the IPSA "Mailbox." ARTBOX went through a number of versions until about 1983 when it became formalised as ARTEX—the Artists' Electronic Exchange program—a "user-group" on the IPSA network. ARTEX had about 30 members [including Ascott] and was used for the organization of global projects and as a medium for art projects as well as for personal contact. It existed until about 1990 when IPSA was purchased by Reuters and eventually closed down.

40 Robert Adrian, interview with the author, Plymouth, U.K., December 13, 1999.

41 It is reputed that Bartlett dropped out of telecommunications art after being left to foot a bill he could not afford to pay. This story was independently corroborated by Hank Bull (telephone interview with the author, September 17, 1998) and Robert Adrian (interview with the author, December 13, 1999).

42 The roles were: Alma, Quebec—"beast"; Amsterdam—"villain"; Bristol—"trickster"; Honolulu—"wise old man"; Paris (Roy Ascott)—"magician"; Pittsburgh—"prince"; San Francisco—"fool"; Sydney—"witch"; Toronto—"fairy godmother"; Vancouver—"princess"; Vienna—"sorcerer's apprentice." A

transcript of "La Plissure" compiled by Norman White at the Toronto node is available online at <http://www.bmts.com/~normill/artpage.html>.

43 Bull further clarified this description, stating: "It was like live radio or performance—that the value lay more in the event, the process, the shared experience of the project, than in the literary quality of the final outcome. Nevertheless, a good writer could no doubt make an interesting job of editing it for publication." Hank Bull, e-mail correspondence with the author, September 23, 1998.

44 Nam June Paik quoted by Laura Foti in Lynette Taylor, "We Made Home TV," *Art Com* 6, 23 (1984), cited in Lovejoy [1989] 1997, 220–21.

45 For more on the subject of agency in telematic art, see Shanken 2000.

46 Stelarc, interview with Jeffrey Cook and Gina Fenton, Sydney, October 26, 1996, in Stelarc 1997.

47 It is interesting to note that Teilhard has been resuscitated as a model for networked consciousness and spirituality. See, e.g., Mike King, "Concerning the Spiritual in Twentieth-Century Art and Science" *Leonardo* 31, 1 (February 1998): 21–31, and Jennifer Cobb Kreisberg, "A Robe Clothing Itself with a Brain," *Wired* 3, 6 (June 1995).

48 Lev Manovich, "An Archeology of a Computer Screen," *Kunstforum International* 132 (November 1995–January 1996): 124–35. If the screen is perceived as a prison, however, one wonders what apparatus could not, in some sense, be so conceived of. The term "prison" lapses into a generality in which it begins to lose its significance. Nonetheless, Manovich's point, following the film theorist Jean-Louis Baudry (Baudry 1974–75), is well taken, because the screen certainly demands and restricts behavior as it offers and supplies information.

49 Roy Ascott, e-mail correspondence with the author, January 6, 1999. I have reordered this quotation for clarity.

50 Even if everyone were connected, there is no guarantee that cyberspace would be any less hierarchical than any other space. Licklider and Taylor 1968 anticipated this concern, and it remains a current topic of debate.

51 Two divergent explanations may help illuminate, albeit dimly, the discrepancy between Ascott's theories and artistic practice: (1) the difficulty of maintaining a logically consistent position during times of great cultural and social transition; and (2) Ascott's logically consistent position that "consistency" is an overrated value.

52 That is not to say that artists using telematics as their medium could not, or do not, create work that is critical of that ideology. Certainly Web-based works such as *Jodi* and Julia Scher's *Securityland* are deeply critical of techno-utopianism and make explicit the dangers of telematic surveillance. Indeed, Scher's work is critical of any sort of utopianism, neither utilizing the collaborative potential of telematics nor attempting to offer artistic models for creating desirable alternative futures. But such work is also not the type of artistic application of telematics that would be a relevant model for an international, process-oriented exchange among

art students, unless they wanted to explore the process of being the surveyed and the surveyor within a closed system.

53 Carl Loeffler, interview with the author, September 16, 1998. See also Mark J. Jones, "Email from Carl" (e-mail interview with Carl Loeffler), *Cyberstage* 1, 2 (May 1995), <http://www.cyberstage.org/archive/cstage12/carl12.htm>.

54 Langton 1989, quoted by Ascott, page 311 below.

CHAPTER 16 IS THERE LOVE IN THE TELEMATIC EMBRACE?

1990

The past decade has seen the two powerful technologies of computing and telecommunications converge into one field of operations, which has drawn into its embrace other electronic media, including video, sound synthesis, remote sensing, and a variety of cybernetic systems. These phenomena are exerting enormous influence upon society and on individual behaviour; they seem increasingly to be calling into question the very nature of what it is to be human, to be creative, to think, and to perceive, and indeed our relationship to one another and to the planet as a whole. The "telematic culture" that accompanies the new developments consists of a set of behaviours, ideas, media, values, and objectives that are significantly unlike those that have shaped society since the Enlightenment. New cultural and scientific metaphors and paradigms are being generated, new models and representations of reality are being invented, new expressive means are being manufactured.

"Telematics" is a term used to designate computer-mediated communications networking involving telephone, cable, and satellite links between geographically dispersed individuals and institutions that are interfaced to data-processing systems, remote sensing devices, and capacious data storage banks [Nora and Minc 1980]. It involves the technology of interaction among human beings and between the human mind and artificial systems of intelligence and perception. The individual user of networks is always potentially involved in a global net, and the world is always potentially in a state of interaction with the individual. Thus, across the vast spread of telematic networks worldwide, the quantity of data processed and the density of information exchanged is incalculable. The ubiquitous efficacy of the telematic medium is not in doubt, but in human terms,

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from the point of view of culture and creativity, the question is: What is the content?

This question, which seems to be at the heart of many critiques of art involving computers and telecommunications, suggests deep-seated fears of the machine coming to dominate the human will and of a technological formalism erasing human content and values. Apart from all the particulars of personal histories, of dreams, desires, and anxieties that inform the content of art's rich repertoire, the question, in essence, is: Is there love in the telematic embrace?

In the attempt to extricate human content from technological form, the question is made more complicated by our increasing tendency as artists to bring together imaging, sound, and text systems into interactive environments that exploit state-of-the-art hypermedia and that engage the full sensorium, albeit by digital means. Out of this technological complexity, we can sense the emergence of a synthesis of the arts. The question of content must therefore be addressed to the *Gesamtdatenwerk*—the integrated data work—and to its capacity to engage the intellect, emotions, and sensibility of the observer.[1] Here, however, more problems arise, since the observer in an interactive telematic system is by definition a participator. In a telematic art, meaning is not created by the artist, distributed through the network, and received by the observer. Meaning is the product of interaction between the observer and the system, the content of which is in a state of flux, of endless change and transformation. In this condition of uncertainty and instability, not simply because of the criss-crossing interactions of users of the network but because content is embodied in data that is itself immaterial, it is pure electronic *différance*, until it has been reconstituted at the interface as image, text, or sound. The sensory output may be differentiated further as existing on screen, as articulated structure or material, as architecture, as environment, or in virtual space.

Such a view is in line with a more general approach to art as residing in a cultural communications system rather than in the art object as a fixed semantic configuration—a system in which the viewer actively negotiates for meaning [see Maturana and Varela (1987) 1992]. In this sense, telematic networking makes explicit in its technology and protocols what is implicit in all aesthetic experience, where that experience is seen as being as much creative in the act of the viewer's perception as it is in the artist's production [see Barthes 1977]. Classical communications theory holds, however, that communication is a one-way dispatch, from sender to receiver, in which only contingent "noise" in the channel can modify the message (often further confused as the meaning) initiated at the source of transmission [see Shannon and Weaver 1949]. This is the model

that has the artist as sender and therefore originator of meaning, the artist as creator and owner of images and ideas, the artist as controller of context and content. It is a model that requires, for its completion, the viewer as, at best, a skilled decoder or interpreter of the artist's "meaning," or, at worst, simply a passive receptacle of such meaning. It gives rise to the industry of criticism and exegesis, in which those who "understand" this or that work of art explain it to those who are too stupid or uneducated to receive its meaning unaided. In this scenario, the artwork and its maker are viewed in the same way as the world and its creator. The beauty and truth of both art and the world are "out there" in the world and in the work of art. They are as fixed and immutable as the material universe appears to be. The canon of determinism decrees prefigured harmony and composition, regulated form and continuity of expression, with unity and clarity assured by a cultural consensus and a linguistic uniformity shared by artist and public alike.

The problem of content and meaning within a telematic culture gives added poignancy to the College Art Association [New York] panel "Computers and Art: Issues of Content" for which this essay was developed. "Issue" is open to a plurality of meanings, no one of which is satisfactory. The metaphor of a semantic sea, endlessly ebbing and flowing, of meaning constantly in flux, of all words, utterances, gestures, and images in a state of undecidability, tossed to and fro into new collusions and conjunctions within a field of human interaction and negotiation, is found as much in new science—in quantum physics, second-order cybernetics [see, e.g., Foerster 1981], or chaology [see, e.g., Gleick 1987], for example—as in art employing telematic concepts or the new literary criticism that has absorbed philosophy and social theory into its practice. This sunrise of uncertainty, of a joyous dance of meaning between layers of genre and metaphoric systems, this unfolding tissue woven of a multiplicity of visual codes and cultural imaginations was also the initial promise of the postmodern project before it disappeared into the domain of social theory, leaving only its frail corpus of pessimism and despair.

In the case of the physicists, the radical shift in metaphors about the world and our participation in its creation and redescription mean that science's picture window onto reality has been shattered by the very process of trying to measure it. John Wheeler uses this analogy succinctly:

> Nothing is more important about the quantum principle than this, that it destroys the concept of the world "sitting out there," with the observer safely separated from it by a 20 centimetre slab of plate glass. Even to observe so minuscule an object as electron, he must shatter the glass. He must reach in. He must

> install his chosen measuring equipment. It is up to him whether he shall measure position or momentum . . . the measurement changes the state of the electron. The universe will never afterwards be the same. To describe what has happened one has to cross out that old word "observer" and put in its place "participator." In some strange sense the universe is a participatory universe. [Wheeler and Zurek 1983, 6]

In the context of telematic systems and the issue of content and meaning, the parallel shift in art of the status of "observer" to that of "participator" is demonstrated clearly if in accounts of the quantum principle we substitute "data" for "quanta." Indeed, finding such analogies between art and physics is more than just a pleasant game: the web of connections between new models of the theory and practice in the arts and the sciences, over a wide domain, is so pervasive as to suggest a paradigm shift in our worldview, a redescription of reality and a recontextualization of ourselves. We begin to understand that chance and change, chaos and indeterminacy, transcendence and transformation, the immaterial and the numinous are terms of the centre of our self-understanding and our new visions of reality. How, then, could there be a content—sets of meanings—contained within telematic art when every aspect of networking in data space is in a state of transformation and of becoming? The very technology of computer telecommunications extends the gaze, transcends the body, amplifies the mind into unpredictable configurations of thought and creativity.

In the recent history of Western art, it was Marcel Duchamp who first took the metaphor of the glass, of the window onto the world, and turned it back on itself to reveal what is invisible. We see in the work known as *The Bride Stripped Bare by Her Bachelors, Even*, or *Large Glass*, a field of vitreous reality in which energy and emotion are generated from the tension and interaction of male and female, natural and artificial, human and machine [see Duchamp 1973]. Its subject is attraction, in Charles Fourier's sense,[2] or, we might even say, love. The *Large Glass*, in its transparent essence, always includes both its environment and the reflection of the observer. Love is contained in this total embrace; all that escapes is reason and certainty. By participating in the embrace, the viewer comes to be a progenitor of the semantic issue. As "ground," the *Large Glass* has a function and status anticipating that of the computer monitor as a screen of operations—of transformations—and as the site of interaction and negotiation for meaning. But it is not only through the *Large Glass* that we can see Duchamp as prophetic of the telematic mode. The very metaphor of networking interaction in a field of uncertainty, in which the observer is creator and meaning is unstable, is implicit in all his work. Equally prophetic in