ART IN THE INFORMATION AGE: CYBERNETICS, SOFTWARE, TELEMATICS AND THE CONCEPTUAL CONTRIBUTIONS OF ART AND TECHNOLOGY TO ART HISTORY AND AESTHETIC THEORY

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Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Art History in the Graduate School of Duke University

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ABSTRACT

(Art History)

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This dissertation argues that the artistic use of technology demands greater recognition. Scholarship on twentieth century art generally has ignored or disparaged the artistic current otherwise known as Art and Technology. Art History has failed to recognize and incorporate into its canons the rich historical and theoretical underpinnings of this tendency. This oversight is especially conspicuous in the literature's inability to grasp how the sciences and technologies particular to the Information Age have shaped the formal and conceptual development of art since 1945.

The research presented here employs a synthetic method drawing on diverse disciplines, archival research, correspondence, and personal interviews. The work of British artist Roy Ascott and American art critic Jack Burnham furnish central practical and theoretical frameworks and are discussed in detail. Their contributions support the dissertation's thesis that the cultural manifestations of the late twentieth century can be better understood by closely analyzing the scientific and technological developments that have played a central role in shaping society. This study does not privilege science and technology as the engines of discovery that drive subsequent cultural developments, but demonstrates how artists have integrated art with science and technology in a praxis that interrogates key aspects of western epistemology and aesthetics.

The dissertation examines how this praxis seeks to challenge conventional models of communication, such as aesthetic exchanges in which an authorial message is embedded in an object by an artist and decoded by an audience. By contrast, many works
of Art and Technology (and artists' theories about them) explicitly propose that richer forms of meaning can arise from a multi-directional flow of information in discursive networks. Such works stress the processes of artistic creation and audience participation. They emphasize the dematerialized forms of ideation and collaboration rather than the materiality of concrete art objects. The dissertation problematizes these aesthetic theories, but maintains that artistic meaning in the Information Age is not embedded in objects or individuals so much as it is abstracted in the collective production, manipulation, and distribution of information.
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Introduction: A Brief History of Art, Technology, and Art and Technology

Art and technology have been paired together throughout western intellectual history. The concepts signified by these terms have varied widely, and the relationship between them has been subject to much debate. Contemporary notions of art or technology are markedly different from those shared by Plato and Aristotle, who made no distinction between what are now considered the fine arts and the applied arts. The ancient Greeks did differentiate between the liberal arts and the servile arts, though both were subsumed under the rubric of τεχνή (techne). The division between these arts was based on class distinctions and related attitudes towards different types of skills: the liberal arts (such as logic and rhetoric) required intellectual reasoning and were deemed suitable for free citizens, whereas the servile arts demanded manual skills, such as metalworking and painting, that were performed by slaves or members of the lower classes.

According to Aristotle, techne enables what is to be produced to come into being in the absence of reason or judgement. He argued that the virtue of praxis, which is the special work of humankind, cannot be reduced to techne. Plato condemned art for its exclusive concern with appearances (or rather, the appearance of appearances). However, the mimetic standards by which painting and sculpture were judged by the ancients included not only their ability to imitate the appearance of things, but to evoke

states of mind and dispositions of character through psychological association. Roman accounts went further, attributing to Greek art wisdom, intuition, and imagination. Descriptions of Pheidias' sculpture by Cicero and Philostratos, for example, recognized not only the skillful, mimetic reproduction of appearances that can be seen, but the representation of the nature of beauty itself, a quality that they could be envisioned only through the imagination. Thus the Roman understanding of art further elevated its status above that of mere craft.

The source of contemporary distinctions between science, technology, and art has been credited to Aristotle's parsing of theoretical, practical, and creative goals: truth, praxis, and making, though the origin of these contemporary distinctions is not nearly so neat. For example, art and technology were closely aligned in the creation of religious architecture in the Middle Ages, and mathematics, architecture, and art were inseparable in the formulation of the rules of one-point perspective in the Renaissance. The Renaissance also brought a significant reappraisal of the status of art in the hierarchy of human endeavors. Artists became highly regarded in the court and church, and their works became more highly prized.

In the mid-eighteenth century, French philosopher Abbé Batteux's concept of

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beaux-arts contributed to distinguishing the fine arts from the applied arts. Synthesizing this distinction with the Aristotelian division between theory, practice, and making, Denis Diderot's Encyclopédie was divided among the sciences, the mechanical arts, and the fine arts. Diderot's recognition of painter Jacques Louis David as an "artist-philosophe" further manifested a blurring of the ancient distinction between the liberal and servile arts with respect to painting. In 1750, German philosopher Alexander Gottlieb Baumgarten coined the term "aesthetics" (Asthetik), establishing a branch of philosophy that would apply the tools of reason to theorize perception of the beautiful, including the beauty attributed to the arts. While Enlightenment aesthetic values have been challenged by the discourses of experimental art throughout the twentieth century, even in the early 2000s, popular contemporary notions of what constitutes art and its role in society remain closely attached to eighteenth century ideas.

By contrast, the idea of technology (in the broad sense of how the word is used today) did not emerge until relatively recently. From the mid-eighteenth to the late nineteenth century, terms such as the "mechanical arts" commonly referred to various applied arts, including those that used machines (such as the power loom) to facilitate production. According to historian of technology Leo Marx, prior to 1880 the term "technology" was seldom used, and then only when referring to a scholarly study of the mechanical arts, such as a treatise on weaving techniques. Just as the ancient distinction between the liberal and servile arts established a hierarchical opposition, so the habit of

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4 Abbé Batteux, *Les beaux arts réduits a un même principe* (1746).
distinguishing between the fine arts and the mechanical or practical arts inculcated a set of value-loaded discriminations between ideas and things, the mental and the physical, the ideal and the mundane, and so on. Such distinctions had the effect of denigrating the practical arts while elevating the fine arts by comparison.  

The advent of the more abstract and neutral term "technology" in the latter part of the nineteenth century disrupted this categorical distinction. According to Marx, "technology" came into parlance at a moment when the notion of the mechanical arts, as embodied in the discrete machines (such as steam engines) that initially fueled the Industrial Revolution, was being replaced with a grander and more integrated conception of transportation systems, communications networks, and a decentralized notion of power production and distribution. This description suggests that the term "technology" carried with it a proto-cybernetic sense of systemic interconnectedness.

By the time the contemporary sense of "technology" gained wide currency in popular parlance after World War I, it carried few if any associations with the specific materials, artifacts, classes of labor, locales, or institutions of the applied arts, and their déclassé connotations of grease, sweat, steel, and vast, smoke-belching machines. Technology, by contrast, suggested highly integrated systems that were clean, upwardly

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6 Ibid.

7 Ibid. For more on the relationship between technology and spiritualism in late nineteenth-century art, see Asendorf, Batteries of Life.
mobile, corporate, and immaterial. The inclusiveness of technology begged an adjectival modifier: bio-, nuclear-, information-, and so on. Due to this indeterminacy, and given its claim on the legacy of the Enlightenment notion of scientific progress, "technology" often has been imbued with all manner of metaphysical qualities as a causal agent of social change, and indeed, history itself.8

In the following discussions, I use the term "technology" in its common, broad, indeterminate sense, with a range of material, conceptual, and mechanical characteristics ascribed to it. Indeed, given the historical weddedness of the fine arts, the applied arts, and technology, they share a common if tenuous connection with materiality and apparatus. All or nearly all fine art has been and continues to be technological on some level, for artists have always relied on materials, tools, and techniques to practice their craft and fabricate artifacts. However, these materials, tools, and techniques must not be thought of as constituting something pre-existing, autonomous, or external that is then applied to the practice of art-making; for technology is as much the result of artistic practice as works of art are the result of the application of technology. In order to avoid the unwieldy syntax necessary to maintain an acausal understanding of the relationship between art and technology, statements that impute autonomous agency to either art or technology should be interpreted as shorthand for lengthier and more detailed descriptions that acknowledge their hybridity and dependence on a wide range of social

8 Ibid: 249.
factors.\textsuperscript{9}

Indeed, technologies developed primarily by artists in the context of solving artistic problems have contributed to major transformations in the history of art and culture (and vice-versa). The invention of oil-paint in the late Gothic period sparked nothing less than a revolution in painting. The development of one-point perspective in the Renaissance by artist-engineers was a tremendous technological achievement that has arguably had an even greater impact on the history of art and perception.\textsuperscript{10} Through its reification in the technology of photography, perspective has become even more firmly entrenched as the social standard by which the representation of spatial realism is measured. But it must be remembered that perspective, and its recapitulation in photography, are mathematical and technological abstractions, and only approximate human perception, which is not precisely linear, possesses blind-spots, and so on.

These particular examples offer insight into a further aspect of technology as it relates to art, an elusive component that this dissertation claims is predominantly

\textsuperscript{9} This model is taken from Jay David Bolter and Richard Grusin, \textit{Remediation: Understanding New Media} (Cambridge, MA: MIT Press, 1999): 75-78. Bolter and Grusin address the problem of technical determinism and writing about media, noting that "It is difficult … to hold in relief all the aspects of a technology at any one rhetorical moment." 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.")

conceptual. Located between the messy/materiality of oil paint and the precise, mechanical apparatus of photography, perspective is a particular instance of a technology (in the contemporary sense) that emerged from and became central to artistic production. It predates the nineteenth century emergence of "technology" as distinct from the specific materials and mechanical apparatus of the applied arts, yet perspective is itself immaterial and requires no physical tools. In this regard, it has much in common with a central technology of the Information Age: software. Like software, perspective operates behind the scenes like a visual operating system, so to speak, organizing perceptual information according to a programmatic set of instructions.

The use of science and technology in art is not limited to materials (e.g. paint), concepts (e.g. perspective), and machines (e.g. photography). Artists have incorporated cybernetics, chemical reactions, artificial life, and many other components in their work. Such elements do not fit comfortably within the framework of materials, concepts and machines, and a more exhaustive scheme for differentiating amongst the characteristics of artists' use of technology would lend greater precision to its understanding. Moreover, it must be noted that these categories are not mutually exclusive; rather, they each tend to contain aspects of others. This feature is important because much criticism of the artistic use of technology derides its materiality and mechanism without recognizing how the conceptual components of technology inform art both metaphorically and concretely.

The following discussions focus on parallels between the conceptual aspects of technology and the conceptual aspects of art in the late twentieth century. Since the term "technology" emerged in the nineteenth century, it is hardly surprising that, as philosopher Patrick Maynard has rightly noted, "the theme of art and technology" is usually construed "as modern industrial technology, within a very recent kind of market."12 This recognition of the inter-relatedness of technology and economy with respect to art begs updating to account for the particular configurations of the Information Age. The Information Age will be discussed with respect to art at greater length in Chapter 2. For now, it shall be defined as a particular historicization of the period, beginning roughly around World War II and continuing into the present, characterized by an agglomeration of changes in technology, the economy, and social values closely associated with - though not necessarily causally related to - the emergence and expansion of information theory, cybernetics, digital computing and telecommunications prior to 1970, and the convergence of those same sciences, technologies, and practices after that time.13


The term "Art and Technology" is, like the term "technology," inclusive. It commonly refers to the use of any combination of relatively recent scientific or technological materials, concepts, or machines by artists in the twentieth century, especially after World War II. The concerns that Walter Benjamin expressed in his essay on art in the age of technological (technischen) reproducibility (Reproduzierbarkeit)\(^{14}\) remained of significance to many artists working with technology in the late twentieth century, and offered a theoretical ground for interrogating the aesthetic and political ramifications of the potentially infinite reproducibility of images and objects through mechanical means.\(^{15}\) However, as prevailing technologies have shifted from industrial production to information processing, the best Art and Technology has tended to use technology as a symbolic and/or structural component in a critique of, or proposition about, the relationships between art, technology, and society (and the aesthetic or political consequences thereof.) Here the emphasis is less on the reproduction of images or objects than on offering aesthetic models that critique or alter the conventional hierarchical organization of the production and dissemination of information. Thus, the more politically engaged works of Art and Technology tend to challenge traditional

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\(^{14}\) I am grateful to W.J.T. Mitchell and Hans Van Miegroet for each pointing out a separate difference between the common English translation of the title of Benjamin's essay, and the original German title.

\(^{15}\) The ease of reproducing, distributing, and monitoring information in digital networks greatly facilitates their use for democratizing media, spreading propaganda or viruses, and surveying usage. Moreover, the rapidly emerging field of genetic engineering poses new challenges to notions of originality and aura with respect to genetically altered organisms.
epistemological and ontological constructs, offering alternative modes and models of knowledge and being. As will be discussed subsequently, Telematic Art, for example, interrogates standard definitions of authorship by establishing collaborative contexts for enabling interactive creative processes that defy conventional notions of production, objecthood, and reception.

The tendency to use emerging technology in art cuts across stylistic categories, and has included work by artists who are associated primarily with such movements as Kinetic Art, Fluxus, Pop Art, Performance, Conceptual Art, and Video. As a result, the work in this field is disparate formally. There is great variety in the way science and technology has been used by artists. Some works have used recent technologies, such as computer graphics, to render conventional portraits. Other works have expressed recent scientific concepts by using conventional artistic materials. Many other approaches have also been employed.

As will be argued at length, Art and Technology need not embody the materially and semiotically charged machine "aesthetic" of modernism either through the presence or representation of technological apparatus. In general, the artists most closely associated with the history of Art and Technology, such as Nicholas Schöffer, Otto Piene, and Nam June Paik, have in fact utilized recent technological apparatus, such as video.

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sensors, telecommunications, robots, computers, and other electronic devices. Part of the
resistance to Art and Technology derives from a distaste for the bells and whistles that
characterize many of the most banal, but also some of the most interesting, works in the
area. These superficial signs of technology serve as visual markers that commonly define
the "look" of Art and Technology as a more or less discrete movement. However, such a
narrow understanding of the genre's aesthetics - as primarily concerned with visible,
material forms - has occluded critical and historical understanding of the ideational
significance of the artistic use of technology. While there is no strict antinomy between
the formal and the conceptual, the interpretations of Art and Technology herein
emphasize the latter aspects of the tendency. As such, the following discussions diverge
from the conventional usage of "aesthetics" above, employing the term nearly as a
synonym for "artistic," but emphasizing the conceptual and theoretical deliberations that
underlie contemporary art production and the discourses about it.

With roots in Futurism, Constructivism, and the Bauhaus, Art and Technology
attained a degree of momentum alongside Kinetic Art in the 1950s, becoming quite
widespread in the 1960s. However, for many reasons, Art and Technology has not
achieved general recognition by critics and historians as a bona fide art historical style.
This failure of Art History to acknowledge the importance of Art and Technology
indicates a shortcoming in the discipline's emphasis on style (as defined by shared visual
properties) as the primary criterion for distinguishing coherent units of art-making
activity for potential inclusion in the cannon. In addition, Art and Technology has been
caught in a double-bind of appearing to be too technological to be appreciated under
conventional canons of aesthetics, and too artistic to be appreciated according to the
criteria of science or engineering. This problem extends beyond the failure of Art and
Technology to appeal to inherited codes of visual signification. For, as shall be argued,
much work in this field has theorized a more systemic concept of art as a dynamic
process, a notion that not easily compatible with conventional art objects or the
institutions that are the stewards for such objects. There are other institutional hurdles,
particularly with respect to maintenance and restoration. Given the rapid cycles of
programmed obsolescence, it is difficult for museums to manage the custodianship of
artworks that rely on hardware and software platforms that will inevitably become
outdated and irreplaceable. Art and Technology has also suffered from an inability to
access the latest technology and a dependence on hand-me-downs and consumer
electronics. As a result, it has been unable to compete on a technological basis with the
spectacularity of scientific demonstrations, mass media, or Hollywood special-effects.
For an artform with futuristic aspirations, Art and Technology often and disappointingly
appears to be more like old news. The lack of official recognition for Art and
Technology has freed it from the constraints of academic (and journalistic) historicizing,
while at the same time marginalizing it with respect to other concurrent artistic
movements that have gained canonical status. Because this dissertation historicizes the
artistic use of technology in such a way that counters the tendency's marginalization, Art
and Technology and its subcategories, such as Cybernetic Art and Telematic Art, will be
capitalized so that they appear to have parity with canonical styles. The aim is not
necessarily to advocate the inclusion of Art and Technology in the art historical canon,
for canonicity is itself problematic and warranting deconstruction. In the absence of other generally accepted criteria for historicizing artistic excellence, however, it appears that only canonization has the cultural authority to assure the recognition that I argue Art and Technology deserves.

While the term, "Art and Technology" fails to distinguish between science and technology, few artists actually practice science as an integral part of their artistic praxis, but rather apply science or scientific ideas to their work, either materially or metaphorically. In this respect, "Art and Technology" is consistent with common distinctions made between scientists and technologists in the 1960s. As historian Cyril Stanley Smith observed in 1970, "I regard … the activities of the technologist as having much in common with those of the artist, and, until recently, interacting rather less with those of the scientist."17 Smith's observation supports usage of the term "Art and Technology." However, certain forms of artistic research more closely parallel science than technology, especially those that pursue and create knowledge without particular regard for practical applications (i.e., the production of aesthetic "widgets.") In Beyond Modern Sculpture (1968), Burnham had already observed that neat distinctions between science and technology can not be made. Indeed, the term "technoscience," which suggests their inextricable co-dependency, a concept that has been researched and popularized through the work of sociologist Bruno Latour and others in the field of

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The dissertation is divided into four chapters. Each of the first three chapters addresses a major science or technology of the post-World War II period; namely, cybernetics, computer information processing, and telematics (computer networking.) These fields are mapped onto parallel developments in visual art. The concluding chapter offers a critical appraisal and theorization of Telematic Art. Interpreting cultural developments through close attention to concomitant technological and scientific developments is not a particularly common method in art historical literature, though there are notable examples that support its validity: Reyner Banham, 's *Theory and Design in the First Machine Age*, Jack Burnham's *Beyond Modern Sculpture*, Linda Henderson's *The Fourth Dimension and Non-Euclidean Geometry in Modern Art*, Jonathan Crary's *Techniques of the Observer*, and Barbara Stafford's *Body Criticism*.  

Important models from other disciplines that inform the following discussions include Walter Benjamin's "Art in the Age of Mechanical Reproduction," Christof Asendorf's *Batteries of Life*, Friedrich Kittler's *Literature, Media, Information Systems*, and

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Katherine Hayles' *How We Became Posthuman.* Over the last decade, a growing number of monographs have utilized this heuristic, suggesting an increasing acceptance of the interpretive method.

The following discussions are anchored primarily on the ideas of two individuals: artist/theorist Roy Ascott and art critic Jack Burnham. Ascott and Burnham approach the artistic uses and ramifications of technology with a mutual focus on the conceptual ideas that underlie a given technology rather than on the formal qualities that are manifest in technological apparatus. As such, their work contributed to the increasing challenges that mounted in the 1950s and 1960s to conventional theories of art as constituted by the formal qualities embodied in static objects, and helped reconceptualize art in terms of dynamic processes and systemic relationships. Given their mutual influence by cybernetics, information processing, structuralism, and the proto-conceptualism of Marcel Duchamp, they also share an understanding of art as a semiotic system, in which meaning is accrued as a result of exchanges and negotiations within discourse.

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21 While much art prior to mid-century may be seen to embody dynamic processes and systemic relationships, such qualities were not central to the discourses of art history and criticism until the 1950s and 1960s. Even then, much mainstream history and criticism was preoccupied with extending and preserving the formalist aesthetics of Greenbergian modernism, as for example the championing of various forms of abstract painting: Color Field, Geometric Abstraction, and so on.
networks.\textsuperscript{22}

While Ascott and Burnham remain peripheral to mainstream discourses regarding late-twentieth century art, this dissertation places them in a central role in the practice and theorization of art in the Information Age. These arguments are propelled by several related theses: 1) art history and criticism have not focused sufficient attention on technology in general; 2) the emergence of individual technologies must be analyzed with respect to concomitant economic, cultural, and social shifts; and 3) such an analysis offers a strong basis for reassessing contemporary art. The discussions that follow are meant as a step towards justifying those theses and drawing further conclusions from them.

Chapter 1 argues for the parity and complementarity of research in art, science, and technology with respect to the origins of ideas that emerge from and contribute to the shifts, shapes, and relationships known as culture and society. Science and technology frequently are designated as the engines of discovery that drive subsequent cultural developments.\textsuperscript{23} An extended historical discussion of cybernetics and art, exemplified in Ascott's work, identifies artistic ideas and practices that emerged co-synchronously with that scientific field. This aesthetic foundation, it is argued, provided the preconditions that made it possible for cybernetics to be assimilated into artistic discourses, and guided the particular ways in which that occurred. This chapter also argues that the discourses of

\textsuperscript{22} This approach to understanding art as process is not unique to cybernetics, for that science itself was synthesized from many disciplines including mathematics, engineering, computer science, psychology, and anthropology, to name just a few.

\textsuperscript{23} See, for example, Henderson, \textit{The Fourth Dimension}.  

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art play an important role as a conduit for disseminating and popularizing ideas that emerge in rarified intellectual contexts.

Chapter 2 examines several large museum exhibitions on the topic of art and technology between 1960-1971. It argues that this unprecedented dedication of cultural resources was fueled by ideological motives (including corporate and political interests), and analyzes some of the salient philosophical, political, economic, and cultural issues surrounding them. Particular attention is focused on the *Software* exhibition curated by Burnham. The convergence of experimental art, information technology, and structural theory manifested in *Software* are interpreted as harbingers of what has been theorized as postmodernity.  

Burnham's concept of software as a metaphor for art is discussed at some length. This metaphor forms the basis for a more elaborate argument that draws parallels between societal shifts from an industrial to a service economy and the artistic tendency towards formal dematerialization that emerged concurrently. Art critical and historical literature on this tendency, and particularly with respect to Conceptual Art, has focused on mid- and late-twentieth century artists' challenges to Modernism, primarily in terms of formal issues and institutional critique.  

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24 The formulations of postmodernity I have in mind here are those constructed by Jameson, Baudrillard, Lyotard, which explicitly tie cultural production to economic and technological conditions, but also the more explicitly aesthetic theories of postmodernism as characterized by appropriation, relativism, and reproducibility. While the discourses surrounding the various theorizations of postmodernity appear to be waning in popularity amongst scholars, it remains of historical interest to note parallels between concepts that emerged at the nexus of art, art theory, and technology in the 1960s and the widespread dissemination of those ideas throughout culture in the 1980s and 1990s. Such observations help to position Art and Technology as an avant-garde movement, further substantiating its art historical significance.

impact of technology on Conceptual Art. Several key works included in Software by artists central to the formation of that movement are re-interpreted with respect to technology and Burnham's notion of software as a metaphor for art. Based on the insights provided by this reading, the chapter argues that the concepts associated with information technology share much in common with the aesthetic principles of Conceptual Art and the tendency towards dematerialization, and that these technological and cultural factors can best be understood as related manifestations of larger social shifts pertaining to the Information Age.

Chapter 3 describes a history of artists' use of telecommunications, from precursors such as László Moholy-Nagy's Telephone Pictures (1922) to Telematic Art (art that uses computer-networking as its primary medium, since 1978.) The discussion of Telematic Art focuses again on Ascott who, in the second phase of his career, extended his cybernetic art principles to cyberspace in his pioneering use of this medium for artistic research. The chapter argues that the use of telecommunications technology by artists has challenged conventional aesthetic values by desubstantalizing the material necessity of precious, original objects and emphasizing, instead, the ephemeral processes of information exchange. Further, in contrast to what Ascott and other artists perceived as a binary subject-object relationship central to Renaissance and Enlightenment epistemology (and several centuries of art and art historical writing), it has shifted emphasis to a multiplex subject-subject aesthetic model, explicitly engaging audiences as active agents in dialogical artistic contexts.

Chapter 4 offers a more critical analysis of Telematic Art. It begins by comparing
Telematic Art with Telerobotic Art. This discussion addresses the question of agency-at-a-distance in telematic systems, discusses several examples of telerobotic art, theorizes a distinction between active-active and active-passive forms of agency, and argues for the particular significance of the active-active model within artistic contexts. Next, Ascott's theory of the "telematic embrace" is discussed at length and compared with various theories of media and responsibility. The artist's utopian ideals are challenged with regard to social praxis, and retheorized within the context of avant-garde aesthetics in general and Conceptual Art in particular. Here, it is argued, they constitute artistic models for envisioning the future of human consciousness, and function as blueprints for building it in the present.
Chapter 1. Cybernetics and Cybernetic Art

Hungarian-born artist Nicolas Schöffer created his first cybernetic sculptures \textit{CYSP 0} and \textit{CYSP I} (the titles of which combined the first two letters of “cybernetic” and “spatio-dynamique”) in 1956 (Figure 1.1).\footnote{Guy Habasque, “From Space to Time,” in Marcel Joray, ed., \textit{Nicolas Schöffer}, Haakon Chevalier, trans., (Neuchatel, Switzerland: Editions du Griffon, 1963), pp. 10-17.} In 1958, scientist Abraham Moles published \textit{Théorie de l’Information et Perception Esthétique}, which outlined “the aesthetic conditions for channeling media.”\footnote{Jack Burnham, \textit{Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of this Century.}, (New York: George Braziller, 1968), p. 344.} Curator Jasia Reichardt’s exhibition \textit{Cybernetic Serendipity} popularized the idea of joining cybernetics with art, with venues in London (1968), Washington, DC (1969) and San Francisco (1969-70). 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. American artist and art critic Jack Burnham noted that these early inquiries into the aesthetic implications of cybernetics took place primarily in Europe, whereas the United States lagged behind by “five or ten years.”\footnote{Burnham, \textit{Beyond Modern Sculpture}: 343.} Of the cultural attitudes and ideals that cybernetics embodied at that time in Britain, art historian David Mellor has written,

\begin{quote}
A dream of technical control and of instant information conveyed at unthought-of velocities haunted Sixties culture. The wired, electronic outlines of a cybernetic society became apparent to the visual
\end{quote}
imagination—an immediate future ... drastically modernized by the impact of computer science. It was a technologically utopian structure of feeling, positivistic, and “scientistic.”

Evidence of such sentiments could be observed in British painting of the 1960s, especially by a group of artists associated with Roy Ascott and the Ealing College of Art such as Bernard Cohen, R.B. Kitaj, and Steve Willats. Similarly, art historian Diane Kirkpatrick has suggested that Eduardo Paolozzi’s collage techniques of the early 1950s “embodied 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.” 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.

This chapter begins by addressing the origin and meaning of cybernetics. A broad historical account of artistic tendencies at mid-century provides a framework for examining the aesthetic preconditions that made it possible and desirable to apply cybernetics to artistic practice. The work of Roy Ascott serves as the primary example for a discussion of how cybernetics was adopted for art, art education, and art theory. The chapter concludes with some further reflections on the cultural implications of

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5 Cohen and Kitaj taught with Ascott at Ealing, where Willats was a student.

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 1943-1954, the Macy Conferences provided an interdisciplinary forum in which various theories of the nascent field were discussed. 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.”

Despite the collaborative exchange of ideas that led to the emergence of cybernetics, American mathematician, Norbert Wiener is acknowledged as the father of the discipline. Wiener, who has been described as the “visionary … who articulate[d] the larger implications of the cybernetic paradigm and its cosmic significance,” coined the term from the Greek word kubernetes or “steersman” - the same root of the English word “governor.”

The first wave of cybernetics offered an explanation of phenomena in terms of the

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7 This definition is taken from the title of Norbert Wiener’s *Cybernetics: or Control and Communication in the Animal and the Machine*. Cambridge: MIT Press, 1948.

8 Hayles, *How We Became Posthuman*: 7. Hayles offers a critique of the underlying premises of cybernetics, which she suggests have contributed to the “posthuman” condition of disembodiment.
exchange of information in systems.\textsuperscript{9} It was derived, in part, from information theory, pioneered by mathematician and electrical engineer Claude Shannon, working at Bell Labs. 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, as in a telephone network.\textsuperscript{10} By disembodying information from its material substrates and reducing it to a generic signal (as in analog waveforms or the binary code of digital computers), information theory offered a flexible and practical method that could be applied to immediate engineering concerns. While Shannon did not consider information theory to offer a universal principle, cybernetics used it to theorize parallels between the exchange of signals in electro-mechanical systems and in the neural networks of humans and other animals. Wiener, for example, argued that there were no essential differences between the flow of information in animals and machines.\textsuperscript{11} Cybernetics thus held great promise for creating intelligent machines, for helping to unlock the mysteries of the brain and consciousness, and for

\textsuperscript{9} Subsequent waves of cybernetics will not be considered here because their broader cultural impact did not occur until somewhat later. However, the reflexivity that characterized second-order cybernetics (as advocated by Heinz von Foerster), can be interpreted in forms of interactive art. In works such as Ascott's \textit{Change Paintings}, the viewer is no longer an objective observer of the art system, but becomes an inextricable component of it. This convergence offers another example of how aesthetic concepts either anticipated, or offered the preconditions for the application of scientific ideas in art.


creating hybrid, cyborgian forms of intelligence 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 a field that would come to be known as artificial intelligence.¹²
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 the case of Ascott, art.

Indeed, Katherine Hayles has pointed out that one of the early criticisms of
Cybernetics was that it was “not really a new science but was merely an extended
analogy.”¹³ This mere analogy, however, effectively challenged essentialist notions of
mechanical and biological entities, and replaced 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. Cybernetics can be seen, moreover, as part
of larger epistemological transformations. Acknowledging the historical importance of
new scientific models, Wiener stated that probabilistic theory is the “first great revolution
of 20th century physics” and represents a fundamental shift from conventional

Newtonian physics predicated on precision to the “radical ... new idea ... that...physics...


¹³ Hayles, How We Became Posthuman: 97.
cannot escape considering uncertainty and the contingency of events.”\textsuperscript{14} In this respect, cybernetics is indebted to theories of quantum physics, such as Albert Einstein’s special theory of relativity and Werner Heisenberg’s uncertainty principle. Hayles has also 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 post-structuralism and post-humanism.\textsuperscript{15} While Hayles' analogy may be disputed, cybernetics has offered contemporary scholars a wealth of ideas with which to construct a narrative of their own time in relation to mid-century ideas.

An 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.\textsuperscript{16}


\textsuperscript{15} Hayles, \textit{How We Became Posthuman}: 91.

\textsuperscript{16} Norbert Wiener, \textit{The Human Use of Human Beings}: 68-69.
In other words, information in a cybernetic system is dynamically transferred and fed back amongst 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 with 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 craft based on prior behavior.\(^\text{17}\) After the war, Wiener took an anti-militaristic stance, and refused to work on defense projects. Due to its universality, cybernetics also threatened sacrosanct boundaries - not just between academic disciplines, but 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.\(^\text{18}\)

Much to his dismay, cybernetic research and development during the Cold War

\(^{17}\) Hayles, *How We Became Posthuman*: 107.

\(^{18}\) Ibid: 84-85.
contributed to the ongoing build-up of the US military-industrial complex.\textsuperscript{19} Indeed, the high-tech orchestration of information-processing and computer-generated, tele-communicated strategies employed by the US military suggests nothing short of a cybernetic war machine.\textsuperscript{20} The nexus of military technology and art, is, of course, at least as ancient as the Trojan Horse, and Leonardo Da Vinci famously engineered all manner of military devices. Many contemporary artists have conducted research under the aegis of military contracts, used military technology in their artwork, and/or used art as a means to interrogate military technology.

To summarize, cybernetics brings together several related propositions: 1) phenomena are fundamentally contingent; 2) the behavior of a system can, nonetheless, be determined probabilistically; 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 and that the behavior of animals and machines is contingent on their relationships to each other, to the dynamic unfolding of information, and to other environmental elements. Cybernetics focuses on understanding the dynamic processes by which the transfer of information amongst

\textsuperscript{19} For more on the political and sociological aspects of the development of computers and cybernetics in the context of the Cold War, see Paul N. Edwards, \textit{The Closed World: Computers and the Politics of Discourse in Cold War America}. Cambridge, MA: MIT Press, 1996.

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 ("Movement Movement"), Frank 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.” While 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. 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 latent, just waiting to be discovered. Rather, the bridge between art and cybernetics had to be constructed by creating metaphorical parallels. The application of cybernetics to artistic concerns ultimately depended on the desire and ability of artists to draw conceptual

Frank Popper. Art: Action and Participation (London: Studio Vista, 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
correspondences that joined the scientific discipline with contemporary aesthetic discourses.\textsuperscript{22}

A statement by artist Hans Haacke regarding the relationship of his work to general systems theory illustrates how art absorbs cosynchronous developments in science and technology into its own aesthetic structures:

Sometime in '65 or '66 … I heard about systems analysis, and the related fields of operational research, cybernetics, etc. The concepts used in these fields seemed to apply to what I had been doing and there was a useful terminology that seemed to describe it more succinctly than the terminology that I and other people had been using until then, so I adopted it. But using a new terminology doesn't mean that the work described has changed. A new term is nothing holy, so it can serve as a union label. On the other hand, a clear terminology can help stimulate thinking.\textsuperscript{23}

In this regard, artists play an important role in developing new ideas that have broad cultural ramifications, even though the processes by which such ideas become historicized generally do not occur in the visual forms of art (which lack cultural authority in such matters and do not “speak” a common terminological language necessary for the construction of historical narratives). The arts often fail to receive credit for their conceptual innovations, even though they may predate or occur contemporaneously with parallel developments in other disciplines. Using formulae and words, scientific, historical, and other forms of literature are the primary sites where a

\textsuperscript{22} Given the hierarchical nature of western epistemology, highly valued scientific disciplines like cybernetics would not reinforce their validity by drawing parallels between their practices and those of art. Art, on the other hand, might conceivably gain validity by modeling itself on cybernetics.

shared language serves to concretize and historicize emergent cultural configurations in a readily identifiable medium.\textsuperscript{24} As a result, scientific and philosophical models commonly are often erroneously taken to be the precursors to subsequent developments in the visual arts. The following discussion sketches out the historical aesthetic context in which cybernetics gained currency amongst artists who, like Ascott, were experimenting with duration and interaction. This case demonstrates how the process of cultural formation depends on an inter-related exchange of ideas across disciplines such that in many instances it may be spurious to credit one field or another with originating any general concept.

The merging of cybernetics and art must be understood in the context of ongoing aesthetic experiments with duration, movement, and process. While the roots of this tendency go back further, the French Impressionist painters first 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. Picking up where Post-Impressionist Paul Cézanne left off, the Cubists, reinforced by Henri Bergson’s theory of \textit{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. Also inspired by Bergson, the spatio-temporal dimensions of

consciousness were fundamental to Italian Futurist painting and sculpture, notably that of Giacomo Balla and Umberto Boccioni. While Cubist and Futurist art theories explicitly sought to draw the viewer's intuition into an aesthetic experience characterized by a Bergsonian sense of durational consciousness, their work remained static, and implied movement. This aesthetic achievement was followed by the production of visual forms that actually moved: Duchamp’s Bicycle Wheel (1913) and Precision Optics (1920), Naum Gabo’s Kinetic Construction (1920), and Moholy-Nagy’s Light-Space Modulator (1923-30), for example. Gabo’s sculpture, which produced a virtual volume only when activated, made motion an intrinsic quality of the art object, further emphasizing temporality. In Moholy's kinetic work, light bounced off the gyrating object and reflected onto the floor and walls, pushing not only 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 1959 Romanian-born artist Daniel Spoerri

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founded Editions M-A-T (an anagram for “Multiplication Arts Transformable”) which published affordable multiples. Victor 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.’”  

The interactive spirit of Kinetic Art gave birth in the 1960s to Nouvelle Tendance collectives. Groups such as Groupe 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 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 U.S. While 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 amongst its elements. The most prominent example of this tendency premiered in 1952, American composer John Cage’s 4’33”. Written for piano but having no notes, this piece


27 The theory of détournement suggested the "integration of present or past artistic production into a superior construction of a milieu… détournement within the old cultural spheres is a method of
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) and George Brecht and Yoko Ono, whose “event scores”
of the late 1950s anticipated Fluxus performance. 28

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. 29

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” (1967), art historian Michael Fried wrote disparagingly of the way

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Minimalist sculpture created a "situation." He interpreted this “theatrical” quality as antithetical to the essence of sculpture. But, as Burnham ironically noted, such formalist orthodoxy was "tantamount to an archbishop accusing heretics of having … forsaken the rules of the Church." The interactive quality that Fried denigrated is at the heart of Ascott’s *Change Paintings* and his later cybernetic artworks of the 1960s and focused attention on creating interactive situations that emphasized an active relationship between artwork and audience, in an effort to free art from aesthetic idealism and place it in a more social context. While Fried’s essentialism has been an influential aesthetic ideology, much of the most interesting art of the post-war period (to say nothing of the pre-war period) has challenged the categorical absolutism it advocated.

By the 1960s, cybernetics had become increasingly absorbed into popular consciousness. Schöffer’s work had helped introduce it into artistic discourses. French artist Jacques Gabriel exhibited the paintings *Cybernétique I* and *Cybernétique II* in *Catastrophe*, a group show and happening organized by artist Jean Jacques-Lebel and gallerist 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, Belgian-born gallerist Suzanne de Coninck opened the *Centre d’Art Cybernétique* in Paris, where Ascott had a solo-

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exhibition in 1964. Artist Wen-Yeng Tsai’s *Cybernetic Sculpture* (1969), exhibited at the Howard Wise Gallery in New York, was comprised of stainless-steel rods which vibrated in response to patterns of light generated by a stroboscope and to the sound of participants clapping their hands.\(^{32}\)

In 1966, Korean-born artist Nam June Paik drew a striking parallel between Buddhism and cybernetics:

> Cybernetics, the science of pure relations, or relationship itself, has its origin in karma.
> The Buddhists also say: Karma is samsara
> Relationship is metempsychosis\(^{33}\)

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 be interpreted as analogous to the systemic accounts of phenomena suggested 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, but rather sought to develop insights into how phenomena are systematically interrelated at the most basic and profound levels.

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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 (1969) appropriated the National Anthem as a counter-culture 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 a building material for an image. It’s totally abundant in its electron nature. It’s the clay, it’s the air, it’s the energy, it's the stone ... it’s the raw material that you simply use and then build an image with it. And video feedback is very much what audio feedback is about... Feedback... demonstrated all phases of video, ... giv[ing] us the clues to the behavior of an electronic image... It just gives you the ability to see what you can expand into.\(^\text{34}\)

As art historian Marga Bijvoet has noted, the conjunction of video and cybernetics could also be politically charged. In 1971, the alternative television and video journal *Radical Software* included a statement by artist Paul Ryan who proposed the idea of "Cybernetic Guerilla Warfare … because the tool of portable video is a cybernetic extension of man and because cybernetics is the only language of intelligence and power that is

ecologically viable." Ryan's proposition drew together a Marxist analysis of power, McLuhan's theories of media, and Wiener's concept of cybernetics, into an artistic critique of information systems and communication. With contributions by leading cyberneticians and artists, ranging from Gregory Bateson to Nam June Paik, Radical Software itself served as an important forum for making the ideas of cybernetics and systems theory known to artists, and for combining them with "new theories about mass media and communication technologies." Not all artists were so enamored of cybernetics. Whereas Ascott, like Schöffer and others, genuinely believed in its potential as a "practical and intellectual tool" the artists associated with Art & Language were much more skeptical. As will be discussed at greater length in Chapter II, 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. Their work 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 an overdetermined manifestation of their blanket rejection of object-oriented art in general and media-based art in particular. Moreover, the cryptic conceptualism of Art & Language arguably constituted an elitism that was equally


36 Bijvoet, Art as Inquiry: 75.
complicit in reifying the modernist values of hierarchy and privilege that the interactive, audience involvement of Cybernetic Art sought to undermine.

Ascott’s alliance of cybernetics and aesthetics took part in and 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. By constructing metaphorical parallels between art and cybernetics, artists were able to utilize that science as a model for aesthetic research, and as a paradigm for reconceptualizing the notion of art itself.

Cybernetics and Ascott’s Art

From 1960 to 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. At the same

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37 Despite his prominence in this area, Ascott was not included in Reichardt’s *Cybernetic Serendipity* exhibition at the ICA in 1968. This oversight can be explained in part by the fact that his art, though 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 non-art, and emphasized the use of technological apparatus either as an object, or as a means for producing objects. Jasia Reichardt, interview with the author, July 30, 1998, London.
time, his work of that period examined the semantic relationships among verbal, scientific, and visual languages. Lucy Lippard prominently quoted his essay “The Construction of Change” (1964) on the dedication page of her seminal *Six Years: The Dematerialization of the Art Object from 1966-1972*, placing Ascott in the context of Conceptual Art.

> Cybernetics offered Ascott a new paradigm for his artistic practice and pedagogy. He titled his works, like *Homage to C. E. Shannon* (1963), *Analogue Table: Wiener-Rosenbluth* (1964, Figure 1.2), *Bigelow* (1965, Figure 1.3), and *Fourier* (1966) in dedication to the mathematicians and scientists whose work contributed to the discipline that played such an important role in forming his 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.” Ascott envisioned the interactive, systematic processes and of cybernetic art as interconnected components in the larger system of feedback loops that comprise 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 theorized that art, culture, and society were interconnected systems of feedback loops.
Ascott’s concern with art as a durational process predated 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. The biomorphological theories of D’Arcy Wentworth Thompson and the vitalist philosophy of Henri Bergson are central in this regard. Thompson’s *On Growth and Form* illustrated the transformation of biological matter through stages of development, and became a sourcebook for artistic theories on the growth of visual forms. The influence of Bergson’s vitalist philosophy has been equally if not more profound on countless artists. As expounded in *Creative Evolution*, the notion of *élan vital* refers to the immaterial vital force the philosopher theorized as the animating factor essential to life. *Durée* refers to a form of consciousness that conjoins past, present, and future, dissolving the diachronic appearance of categorical time, and providing instead a unified experience of the synchronic relatedness of continuous change.

As art historian Mark Antliff has shown, though 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.” In *Beyond Modern Sculpture* (1968), Burnham sketched a critical history of the vitalist (i.e. Bergsonian)

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tendency in sculpture. He identified its manifestation in the biomorphic work of Jean Arp and its particularly strong influence on British artists including Henry Moore and Barbara Hepworth beginning in the 1930s, and extending to Ben Nicholson and Victor Pasmore, Ascott's primary mentor at King's College, Newcastle. Vitalism also had a strong impact on British art historians, such as Sir Herbert Read, and became a primary inspiration for Ascott, for whom *Creative Evolution* was a favorite theoretical text.

Ascott's mentors at Newcastle, and the aesthetic debates in Britain to which they contributed, had a lasting impact on their student's formation as an artist, notably the influences of constructivism, vitalism, and technologically inflected conceptualism of Marcel Duchamp. Pasmore part of a circle of artists associated with the journal *Circle: International Survey of Constructive Art*, edited by Nicholson, J. L. Martin, and Naum Gabo, and to which Read contributed. This journal was an important forum for the theorization of British constructivism, and contained articles that drew for parallels between science and art and between organic and man-made forms. Such amalgamations may also be interpreted in the work of Ascott's secondary mentor, British pop artist Richard Hamilton. *Homage a Chrysler Corp.* (1957) and *She* (1958-61), for example, integrate a 1950s shapely, female figure with the modern design of automobiles, refrigerators, and other mass-produced consumer appliances. By contrast to constructivism, these images draw on the heritage of Dada, and Marcel Duchamp in

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particular, to suggest a proto-cyborgian confluence of human and machine. Hamilton had become fascinated Duchamp as a student at the Slade School of Art, an interest that reached a culminating point in his reproduction of *The Large Glass* in 1965-66 for the Tate Gallery's Duchamp retrospective in 1966. Ascott has credited Hamilton with introducing him to the semantic and conceptual complexities of Marcel Duchamp, a lasting influence that is particularly manifest in Ascott's work of the early 1960s.

Ascott also studied art history under Sir Lawrence Gowing, who applied Bergson’s ideas to the interpretation of modern painting, and the work of Paul Cézanne in particular. While Cézanne's paintings were then typically discussed in terms of the construction of space, Ascott's honors thesis suggested that they were equally evocative of time. For 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*, Ascott concluded that Cézanne’s canvases exemplified the constant flux that characterizes the durational phenomenon of consciousness. From this perspective, he extrapolated a general principle for painting in which the essence of reality is embodied in change. He wrote,

> 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

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(either in themselves or in his consciousness) which will reveal their essential reality.44

The genesis of Ascott’s interactive art built on these morphological and vitalist models, and the insights into the durational aspect of visual forms that they offered.

Ascott shared the growing concern with the temporal dimension of art that emerged full-force in the 1960s. The genealogy from gestural abstraction to Happenings, and to the performative elements of interactive art, offers insight into the various developments that contributed to this broad tendency. 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 1954.45 Another root of this tendency may be traced to the performative aspects of Informel painting first demonstrated to large audiences by Georges Mathieu in Paris in 1954, and later in various locations around the world, including London at the ICA in 1956.46 Indeed, the work of the New York School, and Jackson Pollock’s web-like compositions in particular, had earned great acclaim internationally by the 1950s. While the Abstract Expressionist ethos of unbridled expression of the subconscious was too emotional for Ascott’s temperament, Pollock’s

44 Roy Ascott, “Paul Cézanne”: 30. Author’s emphasis. Of course, with this Bergsonian interpretation of Cézanne, one must question if the durational element was in the painting or in the interpretation.


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.

For example, on each Plexiglas panel of Ascott’s Change Paintings (Figure 1.4) was a painterly gesture, which the artist conceived of as a “seed” or “ultimate shape.” Seeking to capture the essence of the phenomena of potentiality, these morphological art works embodied the ideas of organic development described in Thompson’s On Growth and Form, and to the ideas of élan vital and durée developed by Bergson. The Change Paintings constituted interactive visual constructions in which the vital essence of each work could 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 comprised an aesthetic unity, a metaconsciousness or Bergsonian durée, including all its possible states in the past, present, and future.

Ascott’s 1963 solo exhibition, Diagram Boxes & Analogue Structures, at the Molton Gallery in London, exemplifies how the artist combined cybernetics and art. By this time, Ascott had assimilated cybernetics as a primary theoretical foundation for merging Bergsonist ideas with Constructivism and audience interaction, while at the

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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 Analog Structures can be interpreted in part as pushing the Constructivist legacy to yet another level of complexity. American artist Charles Biederman interpreted the artistic lineage spanning Monet to Mondrian as systematically freeing color and form from the demands of mimesis.\textsuperscript{48} Biederman’s Structurist works, like the work of the English Constructivists including Pasmore and Ben 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 and was meant to be observed without any physical intervention by a viewer, Ascott’s Change Paintings and later kinetic works further liberated form and color by allowing these elements to move and change, and involved the viewer as an active participator that played an integral role in physically altering the compositional state of the work. Thus, while there are important formal similarities between Ascott’s constructions and those of Pasmore and his colleagues,\textsuperscript{49} the younger artist disavowed himself of what he referred to as his mentor’s “platonic ideals of ‘pure form’” and his “refus[al] to link Constructivism with a

\textsuperscript{48} Charles Biederman, \textit{Art as the Evolution of Visual Knowledge} (Red Wing, Minn.: C. Biederman, 1948).

Ascott’s statement in the *Diagram Boxes & Analogue Structures* exhibiton catalog 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.51

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” repeated a Bergsonian concept he had applied to painting in his interpretation of Cézanne, and in his *Change Paintings*. Finally, the “need to make ideas solid . . . but interfusable” suggested 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 that 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

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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 (Figure 1.5).

A similar convergence of methods characterizes works like Cloud Template (1969) and Change Map (1969, Figure 1.6). 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 may be related to Dada techniques first employed by Arp, and later by Cage, who determined parameters of his musical compositions by casting the I Ching. As noted above, Paik had drawn parallels between eastern and western epistemological models in his comparison of Buddhism and cybernetics.

At the same time, the horizontal orientation of this method (as opposed to the vertical relationship of the artist to a canvas on an easel) 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/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 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 (1913-4) also demanded a horizontal relationship between artist and artwork. Duchamp’s related Network of Stoppages (1914) - a visual precursor to the decision-trees of systems theory - offered a diagrammatic model for the interconnected visual and semantic networks of Ascott’s transparent Diagram Boxes, such as Logical Conditions (1962, Figure 1.7), and LOVE-CODE (1962, Figure 1.8). Later, Ascott created interactive works on an explicitly horizontal plane, such as Transaction Set (1971, Figure 1.8), 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 Bergsonist notions of vitalism and change, the I Ching, cybernetics, and artificial intelligence. Notably, the I Ching, or ancient Chinese “Book of Changes,” has been used to help divine wise advice for choosing a path towards the future. As will be recalled, cybernetics emerged, in part, from Wiener’s wartime efforts to anticipate the

future behavior of enemy craft by creating machines that could learn. Similarly, Ascott’s experience as a radar officer for the Royal Air Force in the mid-1950s may have contributed to his artistic predisposition towards a horizontal bird’s-eye-view and towards the use of cartographic 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. At the Ealing College of Art in London, he created what might be called a cybernetic art pedagogy. In 1964, he described the continuum between his work in the studio and his work in the classroom, which he felt complemented each other:

> 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.53

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,” as part of a mutually reinforcing system. One might even say that the classroom became a cybernetic studio in which the artist could experiment with behavioral interactions amongst his students, and in which his students could learn some of the most advanced aesthetic theories first hand, by participating in them. In this regard, British art critic Eddie Wolfram noted in 1968

53 Ibid.
that, “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.”

Throughout his career, Ascott has held a strong conviction not just in the role of the educator in teaching art, but in 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. As he wrote,

All art is, in some sense, didactic: every artist is, in some way, setting out to instruct. For, by instruction, we mean to give direction, and that is precisely what all great art does...Through culture it informs, art becomes a force for change in society...

This conviction in the positive social function of art as an instrument of education and transformation has been a consistent feature of his theory, practice, and pedagogy for some forty years.

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.’”

Ascott’s pedagogy threw into question a student’s preconceptions about his or her personality, strengths and weaknesses as an artist, and 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 (c. 1963, Figure 1.10), in order to determine behavioral alterations in a random but systematic manner. Because their individual behaviors had to be integrated into a coherent group process, each member would be “of necessity interdependent and highly conscious of each other’s capabilities and limitations” in order to accomplish together the “set goal of producing... an ordered entity.”

In one exercise, Peter Townshend (who later founded the rock band, the Who) was restricted to transporting himself about the school in a trolley. He and the other members of his group had to compensate for each other’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 “Groundcourse” (the first-year curriculum for developing foundational artistic skills), students were introduced to other radical artists and intellectuals in a

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variety of disciplines. For example, Gustav Metzger presented his theory of “destruction in art.” His presentation offers a powerful example of the influence of Ascott’s guest lecture program. For Townshend has credited Metzger’s theory of Auto-Destructive Art for giving him the idea to destroy musical instruments onstage at Who concert performances - a performative gesture that visually symbolized the anger of a generation that rebelled against the repressive social mores of the 1950s. 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.”

Between 1964-67, 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 such exercise from 1965 seems to have anticipated the popular parlor game Twister (Figure 1.11). In both the student work and in Twister, the participants use aleatory methods to determine particular bodily behaviors, such as placing one's right foot on a blue circle, and left hand on a red circle. Aside from


its function as a behavioral experiment exemplifying cybernetic principles, the purpose of the student work is unknown. *Twister*, was a "touching" game for adolescents, in which multiple participants ultimately found themselves wrapped around, or fallen on top of, each other. Marketed by the Milton Bradley company, the patent for *Twister* was filed on April 14, 1966, and accepted July 8, 1969. This example offers another instance in which experimental art anticipated the popularization of ideas in broader social contexts.

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

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.59

Eno has noted that “For everybody concerned this was an extraordinary experience... [which] was instrumental in modifying and expanding the range of interaction each student was capable of.” He recounted 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

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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.60

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.”61

The reputation Ascott gained as a progressive art educator using experimental methods rooted in cybernetics led to a number of distinguished positions, including President and Chief Executive Officer of the Ontario College of Art (OCA, 1971-72). Coincidentally, and ironically, it was there in Toronto, the hometown of 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 Wolverhampton Polytechnic, where he was Head of Painting between 1967-71. Ascott elaborated his art pedagogical method in his essay “Behaviourist Art and the Cybernetic Vision” and created an innovative curriculum for OCA based on those principles and triangulated in a diagram whose components were information, concept, and structure (Figure 1.12).

The OCA was a beleagured institution that had “been in constant turmoil” for several years prior to Ascott’s appointment. In July 1971, before the revamped

60 Ibid.

61 Ibid.
cybernetic curriculum could begin to yield its intended results, tensions were 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.” While Ascott ultimately was dismissed in 1972, his departure met with great resistance, especially on the part of the students. A local art journal reported that “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.” According to artist and OCA faculty member Norman White, Ascott’s lasting impact on the school was substantial. Amongst other influences, Ascott created the innovative Photoelectric Arts Department, where White was still teaching in 1999, and which was still directed by Richard Hill, whom Ascott appointed during his tenure.62

Ironically, ten years after Ascott's dismissal, the OCA participated as one of the nodes in Ascott's *Plissure du Texte*. By the mid-1990’s, the World Wide Web (WWW) has made routine the artistic and multi-disciplinary collaborations Ascott had been proposing for decades, validating his initiatives to expand art education curricula in unconventional ways. As will be discussed in Chapter 3, Ascott joined his cybernetic pedagogical principles with the WWW in the creation of an innovative, international Ph.D. program for media art professionals, combining online exchanges with intensive

workshops.

Cybernetics and Ascott’s Writings from the 1960s

Two of Ascott’s essays from the 1960s exemplified his theories on the application of cybernetics to art: “The Construction of Change” (1964) and “Behaviourist Art and the Cybernetic Vision” (1966-7). In these early publications, Ascott emphasized how the processes of artistic production and reception have come to occupy centre-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 post-war 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 established 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.63

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 (that would not become available for nearly two decades) to this project. While this artistic

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tendency was, indeed, vital for visualizing process as a means to align art with the future, Ascott immediately made the further connection between process, technology, and the future. 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. And the term "multimedia" has been credited by Kaprow to Fluxus artist Bob Watts, who coined it in 1958.64

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 post-structuralist 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 itself indicates how Ascott's thinking was very much at the vanguard of intellectual history in the 1960s.

"The Construction of Change"

Ascott’s first theoretical text, "The Construction of Change" (1964), 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 the use of intuition as a scientific method with his more recent embrace of cybernetic theory. This inclusive approach accommodated his attraction to the apparent intuitionism of Pollock's cartographic networks and his equal admiration for the analytic techno-metaphysics of Duchamp's Large Glass, balancing the relative romanticism and rationalism of divergent aesthetic strategies. 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
Technology...is not only changing our world, it is presenting us with qualities of experience and modes of perception which radically alter our conception of it... The artist’s moral responsibility demands that he should attempt to understand these changes.

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.

Drawing on the heritage of Dada and Surrealism, 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 which are 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 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 indeed, Ascott had asserted the importance of chance and play as artistic strategies, both in his theoretical writings as well as in his
artworks. But perhaps there is no necessary contradiction between using chance methods to arrive at a form of control. Indeed, as the Cybernetic Art Matrix Ascott spelled out in his essay "Behaviourist Art and the Cybernetic Vision" suggests, a highly defined and structured system is proposed as the precondition for the elaboration of creative play throughout society. Ascott's writings consistently restated his conviction that art function as a model for envisioning alternative futures, overcoming the limited confines of formalist aesthetics to more directly 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 theoretical writing, “Behaviourist Art and the Cybernetic Vision,” Ascott attempted to define a system for 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 also anticipated (with apprehension) the recycling of artistic styles that would come to characterize certain aspects of postmodernist art and architecture. He also 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). CAM comprised an elaborate, integrated system for promoting a cybernetic model of information feedback and exchange throughout culture. Anticipating a time in which cybernetics and robotics had created a world in which human beings had substantially greater amounts of leisure time, Ascott envisioned that CAM would provide the training and 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.

In “Behaviourist Art” (the first part of the essay), 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 behavioral psychologist B.F. Skinner’s self-proclaimed “technology of behavior” and the roughly contemporary science of cybernetics. 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. Behaviorisms methodology functioned by bracketing out, or, in cybernetics terms - "black-boxing" - the internal mechanisms operating in the organism. In this way, difficult problems (in engineering as in psychology) could be simplified by allowing the complex internal mechanism inside the

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box to remain unexplained. Similarly, Ascott conceived of art as functioning, in part, like a cybernetic/behaviorist 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, he believed, 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 individualized 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 with initiating events and with forming concepts of existence. The vision of art has shifted from the field of objects to the field of behaviour... The artist, the artefact 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; [in order] to extend to him, via the artefact, 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.

Contrary to Ascott's strong claim for the radicalness of his work vis-à-vis traditional art, it may be argued that works of art have always demanded interaction 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 greatly emphasizing and making explicit a bi-directional model of aesthetic information exchange in which the viewer became 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 pushing further the growing recognition by artists and aestheticians after 1900 of the active experiential process of viewing art, and of visual perception in
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,” confuse his point. As was customary in the 1960s, Ascott conceived of Modern Art as new or contemporary and opposed to prior aesthetic conventions. Over the last forty years, the term "Modern Art" has come to refer to art produced during the historical period of modernism. 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: to deconstruct categorical distinctions (such as those between artist, artwork, and audience). At the same time, it must be noted that Ascott's faith that scientific progress would lead to a utopian future, and the binary oppositions (e.g., past

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66 As mentioned above, the work of artists since the late 19th century increasingly has emphasized the activity of the viewer, and works such as John Dewey's *Art as Experience*, while relatively ignorant of trends in early 20th century experimental art that could have strengthened his argument, reinforced this understanding of the active role of the viewer amongst aestheticians, historians, and critics.

67 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... [though] 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 H. H. Arnason, *History of Modern Art: Painting, Sculpture, Architecture, Photography, Third Edition*. Revised and updated by Daniel Wheeler. (New York: Harry N. Abrams, 1986): 13; see also Joseph Leo Koerner, *The Moment of Self-Portraiture in German Renaissance Art*. Chicago: University of Chicago Press, 1993; and see also Charles Harrison, “Modernism,” in Robert Nelson and Richard Schiff, Eds., *Critical Terms for Art History*. Chicago: University of Chicago Press, 1996
vs. present, objects vs. events) that structured his essay, suggest continuities between his praxis and conventional modernist humanism. Since systems of knowledge never appear to be univocal or monolithic, such a commingling of values is the inevitable result of the normal overlap of epistemological models.

In “Behaviourist Art” Ascott warned that resistance to technology would not only hinder the social advances he envisioned, but that it would produce an inbred form of mannerism. If such resistance prevailed, he foresaw that 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 recombinants of formal traits which have already served their purpose for the previous 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 which produced it. Art is thus in danger of becoming an endless synthesis of faded glories, a collage of old ideas.

Whether or not one agrees with Ascott’s diagnosis of this condition as a “disease,” the artist forecast a significant cultural trend of the subsequent quarter century, an era obsessed with recycling historical styles of 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?68 Or that a neo-baroque melange

\[68\] Even pop-artists like Hamilton, Rauschenberg, and Warhol, who recycled media images (an original artistic gesture in the early 1960s) were bound up in creating a personal style, and thus perpetuating the modernist value of originality. For more on the relationship of modernist painting to Pop Art, see, Russell Ferguson, ed., Hand-Painted Pop, American Art in Transition, 1955-62. Los Angeles : Museum of Contemporary Art; New York : Rizzoli, 1992.
of historical stylistic references in architecture - what Jean Baudrillard (echoing Benjamin before him) theorized 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 that Ascott warned of and the ethos of interactivity he promoted. If it has accomplished this dual role, it has done so by facilitating the 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. These new structures continue to function according to the same economic principles, suggesting that what has changed is merely a system of marketing and distribution. Significant examples in this regard are the pervasive "sampling" in Hip Hop music, and the widespread exchanging of music files through Internet services such as Napster.com, recently ruled as a violation of copyright law. Of course, both Hip Hop and Napster have become big-business, so it is unclear to what extent the utopian goals Ascott foresaw have been realized.

In contrast to the art of the past, Behaviorist Art, according to Ascott, would shift attention from “the field of objects” to “the field of behaviour.” Such artwork was not solely created by the artist, but “is governed by... the spectator.” Ascott’s cybernetic vision for art demanded an aesthetic sensibility in which the behavior of systems and processes over time is key:
This implies that our appreciation of the Beautiful, and the delight, stimulation, satisfaction and regeneration which it induces in us, resides in our perception and awareness of a System rather than an Object. There is no reason to suppose that the Art of Process should be any less visual or poetic or musical than the... Art of Object. Beauty can reside in relationships of structured processes as well as in the traditional relationships of fixed parts.... Beauty thus defined, in which Space is shaped by Time and Form relates to Function is the Beauty of a Cybernetic Vision.

While Ascott’s description of Behaviourist Art claimed a radical rupture from the art of the past, the summoning of architect Louis Sullivan’s turn-of-the-century dictum “form follows function” belied continuities with modernism. Indeed, Ascott recognized that a number of artists presaged certain elements of the “new” paradigm. His utopian belief in the ability of science and technology to remedy social problems also can be allied with the modernist ideology of progress and the technological utopianism that it promotes. At the same time, Ascott’s emphasis on the processes of art as opposed to its objects, and on the interactive participation of the spectator (challenging conventional subject–object relationships), suggests a sensibility that does not easily fit in prior historical frames.

In “The Cybernetic Vision,” the second part of the essay, Ascott conceived of the Cybernetic Art Matrix (CAM) as an inter-related system of feedback looks designed to serve professional artists, as well as the general public. In this way, he imagined that the flow of information and services would be self-regulating throughout the whole. CAM was intended to provide a variety of functions, including: facilitate interdisciplinary collaboration amongst 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 CAM, and to explain methodically how the various layers are connected to the system. The awkward scientism of CAM can be seen as part of its charm. For along with the overdetermined rigidity of its formal structure and the unmitigated utopianism of the project, 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 luddic 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, as well as 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 artefact 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.

Extrapolating from ideas H. Ross Ashby described in “Design for an Intelligence Amplifier” (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, whom he had met through the Centre d’Art Cybernétique in Paris, where Ascott had a solo exhibition in 1964.

By the late 1960s, Ascott’s theoretical concerns with audience involvement 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 studio 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.

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.69 While McLuhan’s *Gutenberg Galaxy* (1962) and *Understanding Media* (1964) were already in wide circulation at the time, Ascott’s proposition still must 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.

The Cybernetic Sixties and Its Legacy

The impact of cybernetics on art was mediated by the aesthetic context that coincided with the scientific theory’s emergence in the late 1940s, and by the complementarities between cybernetics and central tendencies of twentieth-century experimental art. Given the emphasis of post-World War II art on the concepts of process, system, environment, and audience participation, cybernetics was able to gain artistic currency as a theoretical model. Here it articulated the systematic relationships and processes among feedback loops including the artist, artwork, audience, and environment. In the absence of that common ground, it is possible that cybernetics might not have been accommodated to art, or that it would have been accommodated in a very different way.

As noted above, Ascott’s early Change Paintings exemplify how ideas derived from aesthetics, biology, and philosophy could result in the creation of a visual analog to cybernetics, even though the artist was not yet aware of that scientific theory. More generally, this example shows how various fields and disciplines can independently produce homologous forms in response to a more or less common set of cultural exigencies. Ascott’s work as an artist, teacher, and theorist also indicates how the flexibility of cybernetics allowed that theory to be applied to a wide range of social
contexts. However, this programmatic quality in the application of cybernetics gives reason for pause: for given that related ideas had already been incorporated into mid-century aesthetics, artists had a wealth of ideas from which to derive and develop formal strategies, pedagogical methods and theoretical exegeses. In other words, the accomplishments that were made in visual art under the banner of cybernetics might very well have been achieved in the absence of that scientific model. Cybernetics, however, possessed the authority of science, and for better or worse, Ascott brought that seal of approval to bear on his work. Ironically, while Ascott’s CAM theory adopted a rigid cybernetic language and organizational schema, his creative imagination was far from limited to the domain of scientifically provable facts and formulas, but incorporated a wide array of ideas from diverse systems of knowledge. As Seurat's theories of perception derived from physiology were applied to the creation of paintings, so cybernetics was transformed in Ascott’s hands from science into art.

Cybernetics also offers a model for explaining how ideas that emerged in the domain of experimental art eventually spread into culture in general. Ascott theorized this transference in terms of a series of interconnected feedback loops, such that information related to the behavior of each element is shared and exchanged with the others, regulating the state of the system as a whole. Such is the case with Ascott’s own theorization in 1966 of interdisciplinary collaborations over computer networks, a concept that became the central focus of his theory and practice in 1980, subsequently popularized through web-based multimedia in the 1990s.

Ascott drew on Bergsonian theory and cybernetics to theorize a model of how art
could transform culture. He was particularly insistent that cybernetics was no simple
prescription for a local remedy to the crisis of modern art, but represented the potential
for reordering social values and reformulating what constituted knowledge and being. In
1968 he wrote:

As feedback between persons increases and communications become more
rapid and precise, so the creative process no longer culminates in the art
work, but extends beyond it deep into the life of each individual. Art is
then determined not by the creativity of the artist alone, but by the creative
behaviour that his work induces in the spectator, and in society at large...
The art of our time tends towards the development of a cybernetic vision,
in which feedback, dialogue and involvement in some creative interplay at
deep levels of experience are paramount. . . . The cybernetic spirit, more
than the method or the applied science, creates a continuum of experience
and knowledge which radically reshapes our philosophy, influences our
behaviour and extends our thought. 70

Whether or not cybernetics really characterized a definitive spirit of the times, as Ascott
suggested, numerous scholarly societies were founded, institutions were established,
artists wrote manifestoes, curators organized exhibitions, and scholars published journals,
all on the application of cybernetic principles to nearly every imaginable facet of human
life. Ascott staked a passionate and ambitious claim for the significance of art conceived
as a cybernetic system. For ultimately he believed that cybernetic art offered an
important critique of conventional cultural values that could play an important role in
altering human consciousness, and thereby transform the way people think and behave on
a social scale. Ascott’s visionary claim is impossible to either prove or disprove.

By the 2000s cybernetics had become so inextricably woven into the fabric of the industrialized West that it is difficult to imagine conceiving of phenomena in terms that are not mediated by the principles of feedback and systems. What does it mean when a concept, such as that expressed by cybernetics, can describe literally *everything*? Indeed, such seemingly universal explanatory concepts are neither rare nor surprising. As will be discussed further at the end of Chapter 2, each such concept is unique, and emerges from and instantiates the epistemological values of a particular social and cultural milieu. Indeed, Ascott ascribed certain values to cybernetics and to the role it could play as a model for constructing the future, values that are not completely different from their precursors, but which do represent a significant shift in emphasis and awareness.
Chapter 2. Informing Software: Art and Technology in the US, 1966-71

Attitudes Toward the Relationship Between Art and Technology

In 1851, in an effort to strengthen British industry, Prince Albert conceived the illustrious Great Exhibition of 1851 at the Crystal Palace in London. According to architectural historian Nikolaus Pevsner, the exhibition was meant to demonstrate to the public how the quality and artistry of machine-made goods equaled or surpassed that of their hand-made counterparts, for a fraction of the cost. Artist William Morris, for one, was not impressed, and the Arts and Crafts Movement has been interpreted, in part, as a reaction against what Morris and his followers perceived as the shoddy quality and poor design of such mass-produced wares.\(^1\) The Great Exhibition thus marks a crucial moment in the history of exhibitions that have attempted to join art and technology, and offers an early example of the perceived tensions between the two fields.

In the wake of the nuclear destruction of Hiroshima and Nagasaki, and following science writer C. P. Snow’s identification in 1951 of the growing breach between “the two cultures,”\(^2\) the ongoing debate about the relationship between art and technology reached a higher pitch, with increasing cultural resources dedicated to the idea of joining them. One of the early postwar European museum exhibitions of art and technology was

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Man, Machine, and Motion at the Institute of Contemporary Art (ICA) in London, organized in 1955 by British Pop artist Richard Hamilton, a mentor of Ascott's at King's College, Newport. Also in 1955, Galerie Denise René in Paris exhibited *Le Mouvement*, a seminal exhibition of Kinetic Art that included work by a highly international group of artists, such as Marcel Duchamp, Alexander Calder, Victor Vasarely, Agam, Pol Bury, Jesús Rafael Soto, Jean Tinguely, and Robert Breer. At the time, Kinetic Art served as a catch-all term that included a wide range of artistic practices, including the use of technology.

*Le Mouvement* exemplifies the considerable international and transatlantic exchange between artists, curators, and institutions engaged in the creation and presentation of works joining art and technology. Bauhaus master László Moholy-Nagy emigrated to the US to direct the New Bauhaus in 1937, which later became the Chicago Institute of Design. His former assistant in Berlin and London between 1930-37, Gyorgy Kepes, joined him there as head of the Light and Color Department. In 1946, Kepes became Professor of Visual Design at MIT, where he founded the Center for Advanced Visual Studies in 1967. In 1960, German-born art historian Peter Selz, then chief curator of the Museum of Modern Art, New York, invited Swiss artist Jean Tinguely to construct *Homage to New York*, a mechanical work of art that self-destructed in the museum's sculpture garden on March 17, 1960. Swedish engineer Billy Klüver, a laser researcher

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3 This exhibition was the occasion for the publication of the *Yellow Manifesto*, by Vasarely and Hultén, which played an important role in popularizing the term, "Kinetic Art."
at Bell Labs in nearby Murray Hill, New Jersey, collaborated with Tinguely on the
technical aspects of the work, and American artist Robert Rauschenberg contributed an
artistic component to it as well. In 1961, Swedish curator K.G. Pontus Hultén, Director
of the Moderna Museet, Stockholm, also relied on Klüver to help select the American
contribution to Rörelse I Konsten (Art in Motion). This show was the Swedish
incarnation of the landmark exhibition of Kinetic Art, Bewogen, Beweging (or,
Movement Movement), co-organized by Romanian/Swiss artist Daniel Spoerri and
Tinguely at the Stedelijk Museum in Amsterdam. In 1965, the Jewish Museum
organized the exhibition Two Kinetic Sculptors: Nicholas Schöffer and Jean Tinguely.

The growing tensions between art and technology and the corresponding desire to
fuse them was concretized and given public expression in the unprecedented number of
major exhibitions on this theme that took place in the US between 1966 and 1972. These
shows included: nine evenings: theatre and engineering; Software, Information
Technology: Its New Meaning for Art; The Machine as Seen at the End of the
Mechanical Age; Cybernetic Serendipity; Art and Technology; Some More Beginnings;
and Magic Theater. They took place at such prestige institutions as The Museum of
Modern Art, New York; The San Francisco Museum of Modern Art; The Los Angeles
County Museum of Art; the Institute of Contemporary Art, Boston; the Chicago Museum
of Contemporary Art; the Corcoran Gallery; The Walker Art Center; the Brooklyn
Museum of Art; the William Rockhill Nelson Gallery; and the Jewish Museum. Clearly,
these exhibitions were neither without precursors, nor unique to the US in the post-war
period. However, their scale, conception, prominence, and sheer number constitute a singular moment that demands further examination.

This chapter presumes that these exhibitions were not simply the fruition of an idea whose time had come. Instead, it asks why dedicating tremendous resources to joining art and technology was such a compelling idea at the time. In other words, it examines the ideological issues that underlay these efforts. Towards this end, the following discussion considers a number of statements by some central figures in the American discourses of art and technology in the 1960s: artists John Cage and Robert Rauschenberg, engineer Klüver, and curators Hultén and Burnham. This analysis intends to bring into relief some of the buried presumptions, ideological underpinnings, and institutional interests that motivated attempts to join art and technology during this volatile period.

nine evenings: Cage, Klüver, Rauschenberg, and E.A.T

nine evenings: theatre and engineering was held October 13-16, 19-23, 1966 at the 69th Regiment Armory in Manhattan (Figure 2.1).4 A total audience of some ten thousand witnessed Nine Evenings, which consisted of work by ten artists collaborating with 30 engineers. In the technical development of their work, the artists (Rauschenberg

4 Originally, the works were commissioned for a festival of art and technology in Stockholm. According to Klüver, the European organizers refused to invite the collaborating American engineers - who were crucial to the works’ success - to attend the event, the US contingent declined to participate and decided instead to organize its own festival. Billy Klüver, Interview with the author, Murray Hill, NJ, August 22, 1997.
and artists, dancers, and composers associated with the Judson Theater: Steve Paxton, Alex Hay, Deborah Hay, David Tudor, Yvonne Ranier, John Cage, Lucinda Childs, Robert Whitman, and Oyvind Fahlstrom) benefited from 8500 engineering hours (worth an estimated $150,000) provided mostly by Klüver and his colleagues at Bell Laboratories. It was during the process of organizing nine evenings that Klüver and Rauschenberg incorporated the foundation, Experiments in Art and Technology (E.A.T.), in order to make “materials, technology and engineering available to any contemporary artist.” While the event received support and sponsorship by a number of individual and corporate patrons, including some unauthorized “midnight requisitions” from Bell, it was funded largely by Rauschenberg and Klüver themselves, and organized by the artists and engineers who created it, independent of any formal institutional structure.

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5 Billy Klüver, “Theater and Engineering, an Experiment: 2. Notes by an engineer,” Art Forum (February, 1967). Klüver's boss at Bell Labs, the eminent scientist John Pierce, permitted the engineers to work on the art projects, so long as it was not on company time.

6 E.A.T. News 1:1 (January 15, 1967); 2. Interestingly enough, the name was selected by their attorney, Franklin Konigsberg, when he applied for incorporation as a charitable organization on August 24, 1966. (Billy Klüver, Interview with the author, August 22, 1997.) Neither Klüver nor Rauschenberg ever liked the name, which is why they tended to use the acronym, E.A.T., and did not use the words “experiment,” “art,” or “technology” in the title of the event. Klüver wrote: “The name of the performances at the Armory came out of long arguments about what we were doing. The day “Art and Technology” was left behind was a day of relief for everyone.” Billy Klüver, “Theater and Engineering.” Because E.A.T. had not yet been granted not-for-profit status in time for the event, nine evenings was presented by Jasper Johns’ non-profit organization, The Foundation for Contemporary Performance Arts.

7 There were two components of engineering involved in the event: 1) the development of technical support for each individual artist’s work; and 2) the development of the wireless master control system, known as the Theater Electronic Environmental Modular system (TEEM). TEEM used ten FM radio transmitters and receivers to remotely send sound or control signals to amps, tone encoders and decoders, SCR circuits, relays, and other devices. It included a proportional control system which could regulate volume, light intensity, motor speed, and so on. A commercially available card-reading unit and patchboard produced by AMP, Inc., allowed each performer’s technical specifications to be preset, and
The following statement by American composer John Cage (Figure 2.2), made in the context of his participation in *nine evenings*, exemplifies some of the prevalent attitudes held by artists toward art and technology in the 1960s.

I want to remove the notion of the separation between the artist and the engineer. I think that the engineer is separate from other people simply because of his very highly specialized knowledge. If the artist can become aware of the technology, and if the engineer can become aware of the fact that the show must go on, then I think that we can expect not only interesting art, but we may just very well expect an interesting change in the social order. The most important aspect of this is the position of the engineer as a possible revolutionary figure. And it may very well come [to pass] as a result of the artists and engineers collaborating. Because the artists, for years now, have been the repositories of revolutionary thought. Whereas the engineers, in their recent history, have been employees of the economic life. But in relating to the artists, they become related to a revolutionary factor.\(^8\)

According to Cage, the artist was the progenitor of a revolutionary heritage who, through collaborations between artists and engineers, would transfer this revolutionary element to the technical servants of commerce and industry. Cage seemed to believe that this collaboration might contribute to transforming the social order. Yet, even while claiming to remove the separation between artists and engineers, the composer oversimplified the categorical distinctions between them and reduced the characteristics of each to a caricature. Cage unabashedly celebrated the artist while condescending to the engineer automatically patched in at the right moment. According to Klüver, the components of TEEM, were designed to be “as small as possible ... battery-powered ... [and] portable.” (Klüver, Notes from an Engineer) “The idea,” he said, “was to have onstage a portable electronic system which could be carried in one’s pocket.” Douglas Davis, “Art and Technology Conversations, Billy Klüver: The Engineer as a Work of Art.” *Art in America* 56:1 (Jan - Feb, 1968): 42.

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\(^8\) Experiments in Art and Technology, “Trailer Introducing Ten Documentary Films from *nine evenings: theatre & engineering, October 13-23, 1966*.” VHS. Author’s transcription of Cage’s oral statement.
(the skilled worker bee in need of artistic direction) and never explained how this transfer of revolutionary spirit from the one to the other would come about, to say nothing of his elision of the role of artists as employees of economic life.

Cage does, however, express a common sentiment of the 1960s: that the world was out of balance, and that some kind of revolution was eminent. All signs pointed in that direction, with the heating up of the Cold War, made visible in the space race (spanning the Sputnik’s launch (October 4, 1957) to the Apollo 11 lunar landing (July 20, 1969)), the installation of the Berlin Wall (August, 1961), the Bay of Pigs invasion (1962), the escalating US engagement in and violence of the Viet Nam War during the Johnson and Nixon administrations. While the ideological conflict between capitalism and communism was the central political battleground for this crisis, technology was widely embraced in the US as the means by which the so-called American way of life would be preserved. Technology became inseparable from the growing “military-industrial complex” of which President Eisenhower had warned in his 1961 farewell address. In this way, international relations, technology, and capitalist industry constituted an allied ideological front in America. And artists like Cage sought to counteract what they perceived as the deleterious effects of technology - such as the destructiveness of war and the pollution of the environment - by appropriating it for purportedly beneficent aesthetic purposes which would infiltrate engineering and reform
industry.9

Artists like Cage were not alone in holding such humanistic views on art and technology. In a 1997 interview, Klüver agreed with Cage’s position of 1966, even if he considered it “tame” compared to his own much more enigmatic point of view.10 For example, in 1968, the engineer said that, “Art and technology go well together in a world run by people who consider boredom the greatest virtue.”11 While the meaning of this statement is ambiguous, thirty years later Klüver explained that as he increasingly became involved with artists, he had begun to find science “boring.” As a result of their training, he argued, engineers are “locked into a very restricted way of looking at the world,” which prevents them from “using their brains to change the environment, to make a more human environment, as they should.”12 He consistently has maintained that artist-engineer collaborations might yield “technology [that] is for pleasure, variety, change, respect for individual choice and human relationships.”13

Klüver, however, did not believe in art and technology as a unified concept because, in his opinion, each field is a separate and distinct entity, the protocols and goals


10 Billy Klüver, Interview with the author, September 19, 1997.

11 Douglas Davis, “Art and Technology Conversations,: 42.

12 Billy Klüver, Interview with the author, September 19, 1997.

13 Davis, “Art and Technology Conversations”: 42. Klüver maintained this position in the September 19, 1997 interview with the author.
of which are not translatable, much less compatible. When asked about the utopian ideal of fusing art and technology (which characterized Cage’s view and much other discourse on the subject), Klüver stated in 1968, “I don’t know what John’s feelings are about Utopia. To me it has always sounded like a pretty dull place.” For Klüver, it is the difference between art and technology that makes the result of their interaction worthwhile, while the idea of unifying them is a prescription for boredom. His position delimits the range of belief and skepticism that coexist at this conflicted cross-roads of art and technology.

In the program notes that Klüver wrote for nine evenings, he emphasized the importance of improving the status and respectability of artists in society, and of the benefits resulting from “feedback to industry from the interaction between artists and engineers.”14 In correspondence with his friend Niels Hugo Geber (Swedish scholar of violence and society), Klüver argued that “technology can be non-destructive, but only if it is created to be that way.”15 He came to believe that he “could change technology, and that art was a vehicle for that.”16 There is no better proof of his commitment to this idea than the fact that in 1968 he left the security of his prestigious job at Bell Labs in order to pursue that quest full-time as president of E.A.T.

For the November 1, 1967 issue of E.A.T. News, Klüver and Rauschenberg

14 Billy Klüver, “9 evenings: theatre and engineering” (program of performance) 1966, no page numbers.
15 Billy Klüver, Interview with the author, August 22, 1997.
16 Billy Klüver, Telephone interview with the author, September 19, 1997.
collaborated on a statement that expressed the “urgency we feel about the need for a new awareness and sense of responsibility” regarding the relationship between art and technology, and the long-range goals of E.A.T.

MAINTAIN A CONSTRUCTIVE CLIMATE FOR THE RECOGNITION OF THE NEW TECHNOLOGY AND THE ARTS BY A CIVILIZED COLLABORATION BETWEEN GROUPS UNREALISTICALLY DEVELOPING IN ISOLATION.

ELIMINATE THE SEPARATION OF THE INDIVIDUAL FROM TECHNOLOGICAL CHANGE AND EXPAND AND ENRICH TECHNOLOGY TO GIVE THE INDIVIDUAL VARIETY, PLEASURE AND AVENUES FOR EXPLORATION AND INVOLVEMENT IN CONTEMPORARY LIFE.

ENCOURAGE INDUSTRIAL INITIATIVE IN GENERATING ORIGINAL FORETHOUGHT INSTEAD OF A COMPROMISE IN AFTERMATH, AND PRECIPITATE A MUTUAL AGREEMENT IN ORDER TO AVOID THE WASTE OF A CULTURAL REVOLUTION.  

Here the authors asserted that it was unrealistic for art and technology to develop separately. But wouldn’t that contradict Klüver's belief in the importance of their distinctness? Moreover, wouldn’t a “civilized collaboration” be a menu for ennui - in other words, boring? Did the authors imagine that each could remain separate while collaboratively co-developing alongside one another? If so, it remains unclear how disciplinary distinctions would be maintained amidst such an arrangement, or what the advantages of retaining them would be. Perhaps an “uncivilized collaboration” - such as pirate radio and television, or other guerilla art tactics - would provide more of the

“variety, pleasure, and avenues for exploration...” that Rauschenberg and Klüver sought. As Jasia Reichardt, curator of the 1968 British exhibition *Cybernetic Serendipity* argued, “artists like Takis, Tinguely,... Paik [and others] ... have consistently made use of technology without the help of any specific organization.” Even Paik, the most celebrated artist associated with Art and Technology, struggled well into the 1980s, so remains unknown what further accomplishments he and other artists might have achieved had they received more institutional support.

Klüver and Rauschenberg’s conclusion is especially striking in that it reveals a belief, or veiled threat, that if industry did not change its ways, there would inevitably be a revolution. Such a struggle would be “wasteful,” the anathema efficient engineering. In this sense, their statement can be interpreted as transforming Cage’s idea of the artist as revolutionary into the idea of the artist as the key to efficiency and the prevention of revolution, as an agent of change short of revolution. Reversing the terms of the official US ideological front referred to earlier, in which technology and capitalist industry were allied against the perceived Soviet threat, Klüver and Rauschenberg allied art and technology with the ideological concerns percolating amongst Leftist intellectuals and artists (the sexual revolution and the anti-war, civil rights, and environmental movements) against the perceived repression and alienation of the military industrial complex. Ironically, their alliance of art and technology was a double-edged sword, for as will be discussed, industry was eager to support such ventures as a means of

developing a more positive corporate image, thereby co-opting the transformative potential of art and using it to reify the status quo.

_Hultén, Heidegger, and The Machine_

While _nine evenings_ and E.A.T. represent the more self-organized, grass-roots end of the art and technology spectrum, the 1968 exhibition, _The Machine: As Seen at the End of the Mechanical Age_, represents its measured, institutional end. Hultén curated this large-scale, transhistorical exhibition of art and technology for the Museum of Modern Art (MOMA) in New York. A broad survey, including work by some 100 artists, _The Machine_ represented the historical intersections of art and technology, from Leonardo DaVinci’s drawings of visionary flying machines (c. 1485-90) to a commissioned competition amongst contemporary artist-engineer collaborations, publicized and overseen by E.A.T. (Figure 2.3). Hultén envisioned including approximately ten such contemporary collaborative works. The unexpectedly enthusiastic response to E.A.T.’s call for proposals in the _New York Times_ and _Scientific American_ resulted in approximately two hundred submissions from nine countries.

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19 The show later traveled to the Institute for the Arts, Temporary Exhibition Building at Rice University, Houston, Texas, March 26-May 18, 1969, and opened at the San Francisco Museum of Modern Art, June 27, 1969.


indicating that the interest in joining art and technology was more than a fashionable idea fabricated by curators and art institutions, because individual artists and engineers were extremely interested to participate in such collaborative endeavors.\(^{22}\)

A five-member jury was selected on the basis of their technical knowledge, rather than their interest in or expertise on contemporary art. These employees of IBM, Celanese Plastics, Columbia University, Bell Labs, and the National Science Foundation judged the submissions on the following criteria: "First, how inventive and imaginative is the use of technology? Second, to what extent have the engineer and the artist collaborated successfully?"\(^{23}\) A first prize of $3000 and two second prizes of $1000 were awarded to the winning engineers, NOT to the artists. Hultén, in consultation with the jury, selected nine works, which were exhibited as part of *The Machine*. However, due to the overwhelming number and quality of the submissions, E.A.T. organized an independent exhibition entitled *Some More Beginnings*. This exhibition of 139 works that resulted from the call for proposals was shown at the Brooklyn Museum of Art from November 24 - January 6, concurrently with *The Machine*.

By endorsing the interdependent history of art and technology with MOMA’s seal of approval, Hultén, who had organized a number of important international exhibitions on kinetic art and other experimental media since the 1950s, sought, in part, to overcome

\(^{22}\) The range and number of artists and manufacturing companies that participated in the Art and Technology Program at the Los Angeles County Museum of Art also reinforces this assertion.

\(^{23}\) E.A.T., "Instructions to the Jury for the Competition," Getty Archives.
popular prejudices against the use of technology in art. The curator's introductory essay in the distinctively machine-made, steel-clad catalog (Figure 2.4), offers an example of the “conflicted” (his word) views regarding the relationship between art, technology, and the human, representative of the late 1960’s. On the last page he wrote:

From the mid-'fifties on, ... [artists] have devoted themselves to an attempt to establish better relations with technology. Standing astonished and enchanted amid a world of machines, these artists are determined not to allow themselves to be duped by them. Their art expresses an optimistic view toward man, the creator of machines, rather than toward technology as such. They lead us to believe that in the future we may be able to achieve other, more worthy relations with machines. They have shown that while different aspects of our relations to machines may conflict, they are not necessarily contradictory. Not technology, but our misuse of it, is to blame for our present predicament.24

Hultén’s optimism was buoyed by his faith in human control over technology, even in the face of conflicted “relations with machines,” and the "present predicament" (i.e. The Cold War, environmental pollution, and so on) he acknowledged. Several paragraphs later, Hultén rejected the “frightening... notion that modern technology has an evolution of its own, which is uncontrollable and independent of human will.” Perhaps the quickness with which the curator dismissed this menacing possibility reflected his anxiety about its real potential threat of what Harvard sociologist Langdon Winner later identified as "autonomous technology."25

Hultén’s exhibition also included examples of early photographic and cinematic

24 Hultén, The Machine: 13. Unless otherwise noted all other quotes are from this page of the catalog.

cameras, as well as photographs and films, which he claimed “provided the basis for much of our way of seeing.”\textsuperscript{26} Thus while he recognized the significance of the proliferation and dissemination of mechanical reproduction - which was rare at that time in a museum context - Hultén did not question the nature of that impact, such as the loss of aura, availability to the masses, and political potential, that Walter Benjamin considered. Like Cage, Rauschenberg, and Klüver, but perhaps with even greater sentimentality and idealism, Hultén earnestly urged that “the decisions that shape our society in the future must be based on the same criteria of respect and appreciation for human capacities, freedom, and responsibility that prevail in art.” Hultén argued further that “we must attain a society based on other values than buying and selling,” though the Moderna Museet director did not go so far as to question the complicity of art and artists in the “culture industry” and their promotion of commodity capitalism (to say nothing of technology!), as Horkheimer and Adorno suggested. Neither is it surprising that Hultén did not discuss the spectacle of art and technology manufactured by major art institutions as a consumable commodity, as Guy Debord would have insisted upon.\textsuperscript{27} In short, Hultén's essay in no way constituted a vanguard intellectual statement.

Hultén’s catalog dedication exemplifies the intimacy of his "relation with

\textsuperscript{26} Hultén, \textit{The Machine}: 3.

technology." For the curator dedicated the exhibition not to a family member, but to "the mechanical machine, the great creator and destroyer, at a difficult moment in its life when, for the first time, its reign is threatened by other tools." By doubling the machine into a "mechanical machine" Hultén asserted the particular mechanical quality of its embodiment in contrast to the ephemeral disembodiment of information technology, its apparent successor as the dominant technology. He thus emphasized the material hardware of industrial manufacture, its mechanical body and flesh, so to speak. Not only was the mechanical machine anthropomorphized and eulogized as a sentient being endowed with the properties of “life” and subject to an implied demise, but it was deemed worthy of praise and honor for its contribution to the author’s life and work. Ironically, Hultén claimed that “art expresses an optimistic view toward man, the creator of machines, rather than toward technology as such,” but he nonetheless dedicated the catalog to technology as such, and neither to the men and women who design and use it, nor to those who supported his popularization of it in an artistic context.

Hultén’s dictum that “different aspects of our relations to machines may conflict” applies well to the art discourse on technology in the 1960’s. Cage believed that the revolutionary heritage of artists could be transferred to engineers with whom they worked, giving rise to changes in the social structure. Klüver and Rauschenberg maintained that collaborations between artists and engineers could avert the impending revolution by making the conditions of life more humane and engaging. Hultén held that technology itself was benign, but not the misuse of it; yet, he had faith in the human
ability to control technology, and not be fooled by it.

The Machine took a position at odds with the greater anxiety towards technology expressed by Martin Heidegger, one of the most critical commentators on the relationship between art and technology. Yet even Heidegger found in art the hope for salvation from technology's dehumanizing effects. In his 1953 essay, The Question Concerning Technology (first published in 1954), the German philosopher wrote “Man stands so decisively in subservience to the challenging-forth (Herausfordern) of [technological] enframing (Gestell) that he ... fails to see himself as the one spoken to...” He continued, “The threat has already afflicted man in his essence.”

John Phillips recently has compared Heidegger's dilemma regarding technology to Aristotle's belief that the virtue of praxis cannot be reduced to technē, a "form of the aporia," Phillips explains, that "we cannot make or do anything without a τεχνή, but too literal a τεχνή will destroy all we attempt to make or do." Philosopher Andrew Feenberg succinctly summarized Heidegger's "apocalyptic vision" that "technology is relentlessly overtaking us,"

We are engaged, he claims, in the transformation of the entire world, ourselves included, into "standing reserves," raw materials to be mobilized in technical processes. Heidegger asserts that the technical restructuring of modern societies is rooted in a nihilistic will to power, a degradation of

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man and Being to the level of mere objects.\textsuperscript{30}

Philosopher Philippe Lacoue-Labarthe locates Heidegger's fear of this "irreversible" and "headlong rush of science - …of knowledge or of techne… - towards technicism" in the context of German nationalism and self-affirmation (\textit{Selbstbehauptung}), and the university's failure - as the keeper of science and knowledge - to "radically question" the essence of technology, resulting in nihilism.\textsuperscript{31} According to Lacoue-Labarthe, "With the failure of the project of \textit{Selbstbehauptung} of the University and, thereby, of Germany itself, science (which supported this whole project) gives way to art, in this case to poetic thought" in Heidegger's thinking, for "it is art that is conceived in the first place as harboring within it the capacity of opening up a possibility of historial \textit{Dasein}."\textsuperscript{32} Lacoue-Labarthe explains that Heidegger's theorization of art's ability to surmount technological nihilism draws together relationships between art, poetry (\textit{Dichtung}), language (\textit{Sprache}), and myth (\textit{Sage}). "Only a myth … is able to allow a people to accede to its own language and thereby to situate itself as such in History," in the sense that "Homer's word gave Greece its gods." For Heidegger, the German poet (Höderlin) "is that prophetic or angelic voice which announces the God who is to come and prepares his coming, or in other words, which 'discovers', by naming, the

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\textsuperscript{32} Ibid: 55-56.
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'space-time' of the sacred."\textsuperscript{33}

Anticipating, though with a much more pessimistic interpretation than media theorist Marshall McLuhan, Heidegger believed that technology had infected humanity at its “essence,” becoming part of, and inseparable from, human consciousness. For curator Hultén, the human and the technological remained more highly autonomous entities with respect to consciousness, with the human remaining firmly in control. Though earlier in his essay he enumerated many of the historically and potentially destructive aspects of machines, ultimately the art historian believed that the artist’s (and curator’s) “unduped” use of technology supported progressive concerns, and provided inspiration for loftier human-machine relations.

\textit{Software: Art, Exhibitions, and Corporate Sponsorship}

Despite its problems, Heidegger’s reflection on the relationship between art and technology is insightful. Paralleling the process of technological enframing he described, artists have theorized that art enters into and transforms humanity at its essence, on the level of consciousness. As British artist and self-proclaimed “concept engineer” John Latham has explained in his concept of “time base” (Figure 2.5), this effect of art occurs over variable frames of time.\textsuperscript{34} This elaborate theory includes the postulate that the long-term integration of aesthetic concepts into consciousness occurs at a different rate than

\textsuperscript{33} Ibid: 56-57.

\textsuperscript{34} John Latham, \textit{Time Base and Determination in Events}. London: Tate Gallery, 1976.
the short term ways in which other types of learning become incorporated into behavior.

Time base was put into practice by the founding of the Art Placement Group (APG, later known as Artist Placement Group, Figure 2.6) by Barbara Steveni and Latham in 1966, with fellow artists Jeffrey Shaw and Barry Flanagan. Ostensibly, the mission of the APG was to place artists as observers and consultants within large corporations, where their unique vision and problem-solving capabilities could contribute to the transformation of industry, and ultimately society in general.35 The British Civil Service described APG's aim as, "an attempt to bridge the gap between artists and people at work so that each may gain from the other's perspectives and approaches to an activity."36

While E.A.T. and the APG sought civilized collaborations between artists and industry, the goals of artists and industry are not always commensurable, sometimes precluding the very possibility of collaboration. In some cases, the engineers who donated their time to artistic collaborations organized by E.A.T. felt taken advantage of by the artists with whom they worked, and who generally received more recognition and acclaim. The way APG publicly represented itself to industry did not reveal the group's more revolutionary aims to infiltrate the corporate structure and undermine the instrumentality of short-term, bottom-line thinking by inserting an alternative epistemological model based on long-term, experimental aesthetic principles.


The clash between the interests of artists and those of industry is perhaps nowhere more apparent than in the case of Belgian artist Jean Toche and The American Motors Corporation, which sponsored the exhibition *Software. Information Technology: Its New Meaning for Art* at the Jewish Museum in 1970. Toche, a founding member of the Guerilla Art Action Group, had earned a reputation for politically charged art. In 1969, for example, he performed an action that ridiculed and protested the Metropolitan Museum of Art exhibition “New York Painting and Sculpture: 1940-1970.” Toche’s uninvited action took place on the steps of the venerable institution, and sought to call attention to the hypocrisy of celebrating the greatness of thirty years of American painting while American troops dropped napalm on a five-thousand year old civilization in Asia (Figure 2.7).

Toche’s piece for *Software* was to have been comprised of a “walk-in tunnel of air contaminated by noxious - but non-poisonous - gas, whose daily pollution level would tally with the city’s.”37 When the artist was informed that a major US automobile manufacturer was the primary sponsor of the exhibition, he withdrew from the show, claiming that “it would be hypocritical for him to contribute a work condemning air pollution when the show’s chief backer, American Motors, is [in Toche’s words] ‘one of the major contributors to air pollution.’”38


38 *Ibid.* Artist György Kepes, who published the influential book *The New Landscape in Art and Science* and founded the Center for Advanced Visual Studies at MIT in 1967, was also deeply concerned with the destructive effects of technology on the environment. In 1972, he wrote, "Our cities are our collective self-
Responding to Toche’s pull-out, *Software* curator Jack Burnham replied that “all progressive things are accomplished with the aid of the System, whether [he] likes it or not. If Toche withdraws from the show, he’s missing a big opportunity to use the inherent energy of the system - American Motors and the Museum - to make his point.”39

Later, in an interview with artist and curator Willoughby Sharp, a founder of the Art Worker’s Coalition of which Toche was a member, Burnham noted that during this period, a number of curators made explicit their sources of exhibition funding, so that, the artist is put in the compromising position of making pieces with money whose source he knows. Somehow the fact that the Guggenheim Foundation’s grant come[s] from the copper mines of South America doesn’t bother artists half so much as openly working with American Motors money.”40

Sharp either would have challenged Burnham's contention that all progressive concerns are accomplished through "the system," or disagreed with his definition of "progressive."

Along with Liza Behr and John Perrault, Sharp accompanied artist Takis to MOMA on January 4, 1969, and removed the Greek Kineticist's work from Hultén’s *The Machine* exhibition. The new works by Takis that the museum had promised to show were not included, but instead - and without the artist's consent - MOMA displayed an older work portraits, images of hollowness and chaos. And if not properly guided our immensely potent technology may carry within itself curses of even more awesome proportions. The yet not understood uncontrolled dynamics of scientific technology could do more than poison our earth; it is capable of wreaking havoc on man's genetic nature.” György Kepes, "Art and Ecological Consciousness," in György Kepes, ed., *Arts of the Environment*, (New York: George Braziller, Inc., 1972): 1-12. Quoted in Bijvoet, *Art as Inquiry*: 24.

39 Ibid.

from its collection. This act of resistance led to the formation of the Art Worker’s Coalition, an advocacy group that supported the rights of artists.\footnote{Willoughby Sharp, Interview with the author, October 1, 1997. For more on the Art Worker’s Coalition and art and politics in the 1960s, see Francis Frascina, \textit{Art, Politics, and Dissent}. Manchester: Manchester University Press, 1999. Frascina’s focus on collective artists’ protest has its merits, but there are some notable gaps. It is unfortunate that Frascina does not address the relationship between technology and politics with respect to art, since some of his own examples lend themselves to such an inquiry. His lengthy discussion of Schneeman’s ”Snows,” for example, ignores the fact that the work was a collaboration with Experiments in Art and Technology (E.A.T.), and he misleadingly suggests that it was produced for the Angry Arts Festival. The Art Worker’s Coalition protest of MOMA’s unapproved exhibition of a work by Takis took place during the ”Machine” exhibition. Sharp is referred to only in a quotation, and as “Willoughby,” while Bear is not even named. Sharp and Bear, as will be discussed in Chapter 3 were instrumental in artists’ use of telecommunications. Oyvind Fahlstrom, one of the most intellectually critical artists explicitly addressing politics at the time, and a participant in E.A.T.’s ”nine evenings: theatre and engineering,” is not mentioned at all.} The Takis work exhibited, \textit{Tele-Sculpture} (1960) was donated by John and Dominique de Menil, collectors who played an important role in bringing \textit{The Machine} to the Institute for the Arts at Rice University, Houston, Texas, where Dominique was chair of the Department of Fine Arts. While it is not surprising for a curator to defend his/her exhibition, it is disappointing that such a subtle thinker as Burnham, who on one hand identified how curators, as a critical gesture, intentionally put artists in a “compromising position,” on the other hand argued against the withdrawal from his show of an artist who reacted explicitly against the practices of its corporate sponsor and, in effect, against the system by which art is exhibited to the public.

On the question of corporate sponsorship, Maurice Tuchman, who initiated the remarkably ambitious Art and Technology Program (A&T) at the Los Angeles County Museum of Art, explained that he had,

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expected resistance from artists ... on “moral” grounds - opposition, that is,
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to collaborating in any way with the temples of Capitalism, or, more particularly, with militarily involved industry. This issue never became consequential in terms of our program, perhaps because the politically conscious artist saw himself, to speak metaphorically, as a Trotsky writing for the Hearst Empire. However, I suspect that if Art and Technology were beginning now [in 1971] instead of 1967, many of the same artists would not have participated.42

While art as a form of protest, and protests by artists against the institutional constraints that bore down upon their practice, were not uncommon, Toche was rare in boycotting an Art and Technology exhibition on the “‘moral’ grounds” that his participation capitulated to the corporate sponsors that his work criticized. Other examples of Art and Technology during the period that took explicitly political stances include Öyvind Fahlström’s performance Kisses Sweeter than Wine at nine evenings and Carolee Schneemann’s performance Snows, engineered by E.A.T. at the Martinique Theater (1967). Both works incorporated relatively complex technology in elaborate performances conceived as artistic protests against the war in Viet Nam. According to Schneemann, "Artists wanted to use technology precisely in opposition to military technology, to do something different with it, to make it art, to give it a new meaning."43


43 Carolee Schneemann, Interview with the Author, September , 1997. Fahlstrom's piece incorporated artificial snow, an anti-missile missile, a spinning head of then-President Johnson that self-destructed, and films edited so that Bob Hope and Mao Tse Tung appeared together in New York street demonstrations, juxtaposed with jet fighters in Indochina. Schneemann's work incorporated a sensing system attached to the seats in the theater, which responded to movements of the audience by altering lighting effects. Five films, including images of Vietnam atrocities, were juxtaposed with a barren winter landscapes and a complexly choreographed performance. For more on Schneemann, see her More Than Meatjoy: Complete Performance Works and Selected Writings. Ed., Bruce MacPherson. New Paltz, NY: Documentext, 1979.
Toche's example raises some important questions. What are the ramifications of Toche’s piece functioning as Tuchman suggested, like “Trotsky writing for the Hearst Empire” in an American Motors-sponsored exhibition? To what extent would it have retained its critical edge? To what extent would its message have benefited the sponsor, by making the automobile manufacturer appear to be concerned not only with art, but with the problem of pollution? Thirty years later Toche, an aristocrat who as a child was a messenger for the Belgian resistance during World War II, defended his decision to withdraw from the show because he could not tolerate the idea of his work connected with the corporations and corporate practices he sought to challenge. Are "all progressive things … accomplished with the aid of the System,” as Burnham claimed? Or, as Toche's position suggests, do things accomplished with the aid of the system reify and reinforce it? While Burnham's terms "progressive" and "the system" may remain rather vague, some fairly concrete historical evidence gives insight into the aforementioned questions.

Because the public reception of Software is difficult to ascertain (in part because of several controversies surrounding the show, ongoing technical difficulties, and other factors), it is hard to gauge to what degree American Motors (AMC) benefited - or suffered - from its association with the exhibition. The New York Times reported that AMC was honored by the New York Board of Trade with an award “for its support of an

44 Jean Toche, Interview with the author, October, 2000, Staten Island, New York.
experimental exhibition, *Software*...”45 Perhaps the automobile manufacturer exhibited remarkable vision in bravely funding a challenging, if not risky, venture, and arguably deserved the award as much as any corporate sponsor. But the plot is thicker. David Finn - principal of Ruder & Finn, the art consulting firm that helped secure funding for, organize, and publicize *Software* - was on the Board of Governors of the Jewish Museum and was also a member of the Business and the Arts Advisory Council of the New York Board of Trade.46 It is no surprise that in art-business partnerships one hand proverbially washes the other. Such a revelation does suggest how “the system” benefits as a result of its support of culturally progressive events, aided in part through its behind-the-scenes connections.

It is arguable that museums benefit from the acclaim received by their corporate patrons for supporting culture, increasing the likelihood of further support. In this light, David Finn succeeded at helping both the Jewish Museum and American Motors achieve their individual goals. But this “win-win” scenario is muddled by the burden of association that particular corporate sponsors bring to bear on works of art exhibited under their aegis. In other words, just as a corporation’s public image is affected by its association with the arts, so the reception and meaning of an artwork is not separable from the institutional context - including the sponsorship - in which it appears. By


46 Finn’s association both with the Jewish Museum and the New York Board of Trade can be traced through documents in the archives of the Jewish Museum.
bringing this association into the gallery, the museum influences the interpretive context for its exhibitions. Apparently both Toche and Burnham were keenly aware of this problem.

Indeed, if one agrees with Althusser’s theory of interpellation, then perhaps things accomplished with the aid of “the system” merely reify and reinforce it. This dilemma plagues the political consequences of art and technology in general. For how can an artist use technology in a way that does not aestheticize it or otherwise reify the elitist social relations of technocracy? Nor is this dilemma unique to art and technology, but rather cuts across many fields of cultural practice, since the sources of funding are rarely made explicit. As Burnham noted, “the esthetic illusion is that as long as artists don’t know where the money is coming from, many latently guilty consciences are relieved... [b]ut as you know, every museum ... has money in trusts, war industries...”

The economic subtext of arts sponsorship perhaps has been most keenly interrogated by artist Hans Haacke. The exhibition he planned for a solo show at the Guggenheim Museum in April, 1971 included Shapolsky et al. Manhattan Real Estate Holdings, a Real-Time Social System, as of May 1, 1971. As Haacke documents in Hans Haacke: Unfinished Business, this work tracked the real-estate holdings (including massage parlors and porno shops) of rent-gouging slum-lord Harold Shapolsky. Not only was the show cancelled by Guggenheim Director, Thomas Messer, but curator Edward

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Fry was fired. While some commentors have suggested that Shapolsky had ties to the Guggenheim Board of Trustees, the artist has stated that there is "no evidence to support such suspicions." According to Burnham, Haacke was essentially black-listed by the museum community for many years. Haacke retaliated in 1974 with *Solomon R. Guggenheim Museum Board of Trustees*, a work that identified corporate affiliations of the museum's board, including major holdings in Kennecott Copper Corporation, a multinational mining interest that had net sales in 1973 of $1.4 billion. Haacke's *Mobilization, Good Will Umbrella* (1976), and *Creating Consent* (1981) demystified the Mobil Oil Corporation's patronage of the Public Broadcasting System. Far from a corporate act of philanthropic good-citizenship, Haacke revealed that Mobil's "affinity marketing" strategy for its sponsorship of "Mystery!" and "Masterpiece Theater" included a budget for promotions that "occasionally come close to the money spent on the programs themselves."

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49 Ibid: 96.


Burnham, through his curatorial strategy of making artists aware of the sources of arts sponsorship, the work of artists like Toche and Haacke, and the public relations initiatives of corporate sponsors like American Motors and Mobil (the former operating through intermediaries such as Ruder and Finn), all point to the uneasy alliance between art and technology with respect to the possibility of artistic freedom under the conditions of capitalism and the so-called military-industrial complex. Freedom in this sense does not mean so much an unbounded ability to create what one pleases, but rather the ability to exhibit and view works of art in a prestigious public context that is not tainted by "filthy lucre." While there may be individuals who attempt to use the inertia of "the system" to support art in the name of "progressive" concerns, the beneficiaries equally may be the brokers of power and capital whose grip on global economic relations might be a primary target of those artistic efforts. In this sense, many otherwise respectable institutions, like the Jewish Museum and the Guggenheim Museum, can be seen as complicit in perpetuating global capitalism. Art sponsorship by technology corporations is particularly problematic because of that industry's contributions to military development and environmental pollution, concerns that were especially relevant in the late 1960s and early 1970s during the Viet Nam War and amidst increasing public awareness of ecology. The publicity generated from corporate support for uniting art and technology served to whitewash the not-unwarranted stereotype of the technology industry, characterized by capitalistic greed and moral indifference to repressive colonial regimes and deteriorating global environmental conditions.
For better or worse, not all artists have found the contradictions of corporate art sponsorship stifling to their work. Ted Victoria, for example, exhibited his *Solar Audio Window Transmission* (1969-70, Figure 2.8) at the *Software* exhibition, his first New York show. Solar panels powered ten radios, which were connected to contact sound reproducers placed on the windows of the building, turning the Jewish Museum into a giant, faintly audible speaker that could be heard only by placing one’s ear very close to or against a window.

In a 1997 interview, Victoria acknowledged that at the time he was not especially concerned with pollution, or with advocating the use of renewable energy sources. On the contrary, his work was based on the idea of transforming the energy of the sun into information, making the museum itself an active component in the piece, and engaging the audience to interact in new ways with the physical structure of the museum. *Solar Audio Window Transmission* stands out as a remarkably subtle and sophisticated use of technology for art that transforms the intangibles of energy, information, and intelligence into visual forms that encourage the reconsideration of conventional categories and relationships. It stood out not only to this author reviewing the documentation of the *Software* catalog a quarter century after the work was realized, but it also retained a place of admiration in the memories of artists including Carolee Schneemann, David Antin, and

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53 Ted Victoria, Telephone interview with the author, September 17, 1997. This work grew out of the artist’s earlier experiments with solar energy, c. 1964-5, when popular awareness of environmental issues was substantially less prevalent prior to the "Keep American Beautiful" campaign beginning in 1968 with the support of the Ad Council and .the founding of Greenpeace in 1971.
Alan Kaprow, who as first-hand witnesses, recalled particular appreciation for the work when they experienced it in the 1970 exhibition.

**Some Intermediate Conclusions on the Relationship Between Art and Technology**

These different positions regarding art and technology have been discussed in order to approach the question of why there was such an unprecedented expenditure of resources to produce public exhibitions dedicated to joining them. This discussion developed into a consideration of the personal and institutional ideological stakes that meet and compete at the crossroads of art and technology. Among the many questions that are raised by even this cursory examination, the most compelling and, simultaneously, the most difficult to answer is: Why did Cage, Rauschenberg, Klüver, Heidegger, Hultén, Latham, Burnham, and others all believe that art possesses special and redemptive powers vis-à-vis technology, even though they could not specify precisely what that redemptive power might be? Klüver, fully recognizing this quandary, said, “I can make no claims about the importance of the art and technology collaboration. It will not give people food and housing, and it will not stop the war in Viet Nam.”

Yet he dedicated his life to it.

Perhaps, as anthropologist and cybernetician Gregory Bateson pointed out, art plays a corrective role in preserving wisdom, which he defined as the holistic understanding of phenomena as simultaneously constituting and constitutive of

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54 Davis, “Art and Technology Conversations,”: 42.
integrated, systemic relationships. He noted that the ways in which art creates knowledge and the types of knowledge it creates are not fully commensurable with those of science and technology, and that is their value; for art offers a necessary complement to the limited epistemological framework of scientific rationalism. In this regard, Bateson compared the strictly conscious mode of scientific inquiry with the synthetic method of artistic creation, in which both the conscious and the unconscious are actively engaged:

[M]ere purposive rationality unaided by such phenomena as art, religion, dream, and the like, is necessarily pathogenic and destructive of life; ...its virulence springs specifically from the circumstance that life depends upon interlocking circuits of contingency, while consciousness can see only such short arcs of such circuits as human purpose may direct.  

As a regulatory mechanism offsetting the destabilizing instrumentalism of scientific rationality, art according to Bateson, "has a positive function in maintaining ... "wisdom," i.e., in correcting a too purposive view of life and making the view more systemic...."

Klüver's abhorrence of boredom and dullness may indicate his knowledge as an engineer of how technology constructs and then becomes the vehicle of the instrumentalization of experience. From his collaborations with artists, he also knew that art throws into question the very logic of instrumentality. Ironically, the same year that Klüver organized Nine Evenings, 1966, poet and Fluxus artist Dick Higgins wrote, “Boredom was, until recently, one of the qualities an artist tried most to avoid. Yet today

it appears that artists are deliberately trying to make their work boring.” Higgins theorized this in an essay entitled “Boredom and Danger,” which he concluded by observing that in using boredom as a medium or value, “the intention is more to enrich the experiential world of our spectators, our co-conspirators, by enlargening [sic] the repertoire of their overall experience.”

Perhaps Higgins' notion of the artistic value of boredom constitutes an aesthetic parallel to a non-instrumental method of engineering that might equally "enrich the experiential world" of those who create and use its products, by expanding their overall understanding and experience of the relationship between humans and machines.

Jack Burnham’s Concept of “Software” as a Metaphor for Art

The following discussion identifies and analyzes the convergence of computers, experimental art practice, and structuralist theory in Burnham’s Software exhibition at the Jewish Museum (Figure 2.9). In contrast to the numerous art and technology exhibitions which took place between 1966-1971, and which focused on the aesthetic applications of technological apparatus, Software was predicated on the idea of “software” as a metaphor for art. Under this rubric, the curator explored his notion of the mythic structure of art, and its convergence with information technology, and the increasing conceptualism of art in the late 1960s (Figure 2.10). The exhibition was designed to function, moreover, as a

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testing ground for public interaction with “information processing systems and their devices.”

Many of the displays were indeed interactive and based on two-way communication between the viewer and the exhibit. In this and other respects, much of the work in *Software* can be interpreted as heralding postmodernist strategies for art-making. Finally, as will be discussed below, the architecture for the physical installation in the museum was based on the two-tiered model of Marcel Duchamp’s *Large Glass*, which Burnham interpreted as a signpost announcing the demise of art as “a separate facet of life.”

Burnham’s first book, *Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of Our Time* (1968), established him as the pre-eminent champion of art and technology of his generation. Building on this foundation, his second book, *The Structure of Art*, 1971, developed one of the first systematic methods for applying structural analysis to the interpretation of individual artworks as well as to the canon of western art history itself. Many of his articles for *Arts* magazine from 1968-70, where he was Associate Editor (1972-76), and *Artforum* from 1971-3, where he was Contributing Editor (1971-2), were collected in his third book, *The Great Western Salt Works*, 1973. These essays still remain amongst the most insightful commentaries on

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conceptual art, already suggesting what he now sees in retrospect as the “great hiatus between standard modernism and postmodernism.”

In 1969, Jewish Museum director, Karl Katz, was determined to mount an exhibition on the relationship between art and technology. The Jewish Museum was, at the time, at the vanguard of exhibiting contemporary art. Katz had seen Cybernetic Serendipity in London, and had expressed interest in possibly bringing that show to the Jewish Museum. However, after hearing Burnham deliver his paper, “The Aesthetics of Intelligent Systems,” at the Guggenheim Museum in 1969, he invited Burnham to curate a show. Given this mandate, the critic set to work organizing Software, the only major show he has curated to date.

The underlying principle of the exhibition was the idea of computer software as a metaphor for art. Burnham conceived of software as parallel to the aesthetic principles, concepts, or programs that underlie the formal embodiment of the actual art objects, which in turn parallel “hardware.” In this regard, he interpreted “Post-Formalist Art” (his term referring to various experimental art practices) as predominantly concerned with the software aspect of aesthetic production. Burnham's term, "Post-Formalist" may be taken as roughly equivalent to the term "Postmodernist," in both substance and rhetoric.


60 Correspondence between Jodith Goald, Secretary to the Director of the Corcoran Gallery of Art and Karl Katz, June 12, 1969. Katz had, in fact, interviewed for the position of Director of the ICA, London, where Cybernetic Serendipity originated, before taking his post at the Jewish Museum.

Indeed, the term "Post-formalist" not only locates itself as temporally subsequent to dominant aesthetic ideology, but identifies formalist orthodoxy as the particular feature which it strategically countermands. While perhaps not as ambitious a term as "Postmodernism," "Post-Formalism" offers a more precise description of its own agenda.

The exhibition featured an all-star cast of "Post-Formalists" associated with Process, Performance, and various strains of Conceptual Art, including Robert Barry, Douglas Huebler, Agnes Denes, Sonia Sheridan, Vito Acconci, David Antin, John Giorno, John Baldessari, John Goodyear, Ted Victoria, and Donald Burgy. The catalog also included projects not realized in the show proper by Allan Kaprow, Nam June Paik, and others.

It is significant that Burnham organized *Software* while writing *The Structure of Art* and conceived of the show, in part, as a concrete realization of his structuralist art theories.\(^\text{62}\) Drawing on Claude Lévi-Strauss’s idea that cultural institutions are mythic structures that emerge differentially from universal principles, Burnham theorized that western art constituted a mythic structure.\(^\text{63}\) He further theorized that the primary project of Conceptual Art, beginning with the work of Marcel Duchamp, was to question and lay bare the mythic structure of art, demystifying art and revealing its internal logic.\(^\text{64}\)


\(^\text{63}\) Jack Burnham. *The Structure of Art*.

\(^\text{64}\) See, for example, Jack Burnham, "Duchamp's Bride Stripped Bare: The Meaning of the 'Large Glass,'" *Arts Magazine* 46 (Mar 1972): 28-32. in Jack Burnham. Burnham's interpretation of Duchamp suggests that the idea of using art as a means to "humanize" technology (as Klüver, Cage, Rauschenberg, and APG intended) might be misguided, unless the process of art's own self-revelation offers a model for other types of social reform. It must be noted, however, that despite the flood of literature in the 1960s that raised
Such ideas were already present in Burnham’s 1970 article “Alice’s Head.” True to the title, he began the essay - which focused on the work of conceptual artists Joseph Kosuth, Douglas Huebler, Robert Barry, Lawrence Wiener, and Les Levine - with the following quote from Lewis Carroll’s *Alice in Wonderland*:

“...‘Well! I’ve often seen a cat without a grin,’ thought Alice, ‘but a grin without a cat! It’s the most curious thing I ever saw in all my life!’”

By selecting for his preamble Alice’s curiosity over a disembodied presence, Burnham suggested that, like a grin without a cat, a work of Conceptual Art was all but devoid of the material trappings of paint or marble traditionally associated with art objects. This "Post-Formalist" strategy of dematerialization was, of course, a prominent aesthetic tendency in the 1960s, identified and popularized by Lucy Lippard and John Chandler in their influential article, “The Dematerialization of Art” in *Art International* (February 1968) and reinscribed in Lippard’s *Six Years: The Dematerialization of the Art Object 1966-1972* (1973). Similarly, Burnham explained *Software* as "an attempt to produce aesthetic sensations without the intervening ‘object,' in fact, to exacerbate the conflict or sense of aesthetic tension by placing works in mundane, non-art formats.”

Interpreting Burnham's use of the term "aesthetic" according to his structuralist

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Duchamp to the canonical pantheon of great twentieth century artists alongside Picasso and Pollock, Burnham's structuralist interpretation of Duchamp was unique and novel in 1970, so the implications of its critique would not have been familiar to those involved with Art and Technology in the 1960s.


method offers further insight into his ambitions for *Software*. In this context, "aesthetic sensations" and "aesthetic tensions" constitute individual responses to works of both art and non-art placed within an art context, mediated by a generally agreed-upon, but not fully explicit, set of rules and expectations. In other words, the expectations of and prescribed responses to art are brought to bear upon non-art (technology) and the expectations of and prescribed responses to non-art (technology) are brought to bear upon art. *Software* sought to apply pressure to the disjunctions or spaces between the structural modalities of art and non-art in order to create tension between them and thereby reveal their mythic structures.

Burnham directly interacted with computer software when he was a Fellow at the Center for Advanced Visual Studies under Gyorgy Kepes at MIT during the 1968-9 academic year. Having received his MFA from Yale in 1961, he was invited, as an artist, “to learn to use the time-sharing computer system at MIT’s Lincoln Laboratories” (Figure 2.11).67 In “The Aesthetics of Intelligent Systems,” Burnham discussed this experience of working with computers, comparing the brain and the computer as information processing systems, and drawing further parallels between information processing and conceptual art. He stated, moreover, that “the aesthetic implications of a technology become manifest only when it becomes pervasively, if not subconsciously, present in the

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67 Jack Burnham, “The Aesthetics of Intelligent Systems” (1969), in Edward Fry, Ed., *On the Future of Art*, (New York: The Viking Press, 1970): 119. The subsequent quotations in this paragraph come from same page. The “present social circumstances” to which Burnham refers here can only be the increasing pervasiveness of computer information-processing systems, which he described in the *Software* catalog as “the fastest growing area in this culture.”
life-style of a culture,” and claimed that “present social circumstances point in that
direction.”

As Burnham explained in the paper, given the artistic limits of the computer
system at his disposal, he focused on the “challenge of ... discovering a program’s
memory, interactive ability, and logic functions,” and on “ gradually... conceptualiz[ing]
an entirely abstract model of the program.” In this regard, he was especially interested in
how “a dialogue evolves between the participants - the computer program and the human
subject - so that both move beyond their original state.” Clearly he recognized how his
interaction with software altered his own consciousness, which in turn simultaneously
altered the program. Finally, he drew a parallel between this sort of two-way
communication, and the “eventual two-way communication in art.” In 1969, he wrote,

The computer’s most profound aesthetic implication is that we are being
forced to dismiss the classical view of art and reality which insists that
man stand outside of reality in order to observe it, and, in art, requires the
presence of the picture frame and the sculpture pedestal. The notion that
art can be separated from its everyday environment is a cultural fixation
[in other words, a mythic structure] as is the ideal of objectivity in science.
It may be that the computer will negate the need for such an illusion by
fusing both observer and observed, “inside” and “outside.” It has already
been observed that the everyday world is rapidly assuming identity with
the condition of art.68

The metaphorical premise of Software permitted Burnham to explore convergences
between his notion of the mythic structure of art, emerging information technology, and
the increasing conceptualism characteristic of much experimental art in the late 1960’s.

68 Ibid: 103
These components were conjoined in works that emulated the sort of two-way communication he experienced with computer programs and which he advocated in art. The catalog emphasized the importance of creating a context in which “the public can personally respond to programmatic situations structured by artists,” and explicitly stated that the show “makes no distinctions between art and non-art.”

Burnham was careful to select works of art that demonstrated his theories. I contend that many of these works anticipated and participated in important trends in subsequent intellectual and cultural history. Quoting McLuhan, Burnham identified this shift from the “isolation and domination of society by the visual sense” defined and limited by one-point perspective, to a way of thinking about the world based on the interactive feedback of information amongst systems and their components in global fields, in which there is “no logical separation between the mind of the perceiver and the environment.”

For example, in the hypertext system, Labyrinth, a collaboration between Xanadu creator Ted Nelson and programmer Ned Woodman, users could obtain information from an “interactive catalog” of the exhibition by choosing their own narrative paths through an interlinked database of texts, then receive a print-out of their particular “user history” (Figure 2.12). The self-constructed, non-linear unfolding of Labyrinth shares affinities with structuralist critiques of authorship, narrative structure, and “writerly” (as opposed

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70 Burnham, “Alice’s Head”: 47.
to “readerly”) texts, made by Barthes. Needless to say, with the advent of powerful Internet browsers like Netscape, and the proliferation of CD-ROM technology, the decentered and decentering quality of hypertext has become the subject (and method) of a growing critical post-structuralist literature, and arguably a central icon of postmodernity. It should be noted that this first public exhibition of a hypertext system occurred, and this was perhaps not just a coincidence, in the context of experimental art, and not, as one might have expected, in a technological context, such as a science museum. One might conclude that experimental art has the flexibility and responsiveness to be the initial forum for public encounters with emerging cultural manifestations that can take longer to be presented in the contexts from which they emerged. Such is particularly the case for technologies that are created outside of established laboratories and/or by idiosyncratic individuals, as with Nelson's *Labyrinth*.

Hans Haacke’s *Visitor’s Profile* (Figure 2.13), encouraged visitors to interact with a computer by inputting personal information, which was then tabulated to output statistical data on the exhibition’s audience. Such demographic research - as art - opened up a critical discourse, following Foucault and others, on the exclusivity of cultural institutions and their patrons, revealing the myth of public service as a thin veneer justifying the hierarchical values that reify extant social relations. Haacke's work will be discussed in greater depth below. Similarly, *Interactive Paper Systems* by Sonia Sheridan engaged museum-goers in a creative exchange with the artist and 3M’s first commercially available color photocopying machine, shifting emphases with respect to
conventional artist-viewer-object relations. In this work, the audience became both the artist, controlling the machine and, in many cases, the subject of the work. (Figure 2.14). Sheridan had been artist-in-residence at 3M in 1969, where she used her artistic skills to push the potential of the company's new technology.\textsuperscript{71} While she attributes the title of the piece to Burnham and the organizers,\textsuperscript{72} the critic’s concept of "systems aesthetics" certainly applied to Sheridan's studio practice as well as her founding of the Generative Arts program at the School of the Art Institute of Chicago in 1970.\textsuperscript{73} In \textit{The Seventh Investigation (Art as Idea as Idea) Proposition 1} (Figure 2.15), Joseph Kosuth utilized multiple forms of mass media and distribution (a billboard, a newspaper advertisement, a banner, and a museum installation) to question the conceptual and contextual boundaries between art, philosophy, commerce, pictures, and texts. In works such as these, the relationship Burnham intuited between experimental art practices and “art and technology” problematized conventional distinctions between them, and offered important insights into the complementarity of conventional, experimental, and electronic media. In this regard, Lévi-Strauss’s models from structural anthropology, along with Thomas Kuhn’s critique of the history of science, led Burnham to question what he saw

\textsuperscript{71} The 3M color copier had many creative capabilities absent in contemporary photocopying machines. It used velvety pigments that resulted in print-outs that possessed a richness and auratic quality more closely approximating hand-made images. Many features could be manually controlled, such as depth of field, enabling three dimensional objects to be reproduced in focus.

\textsuperscript{72} Sonia Sheridan, Interview with the author, Hanover, NH, May, 1999.
as the structural foundations of art history’s narrative of progressive and discrete movements, a critique he elaborated in *The Structure of Art*.

As a final example of works selected by Burnham to illustrate his curatorial vision, Nicholas Negroponte and the Architecture Machine Group (precursor to the MIT Media Lab, which Negroponte later directed) submitted *SEEK* (1969-70, Figure 2.16). This computer-controlled robotic environment could, at least in theory, cybernetically reconfigure itself in response to the behavior of the gerbils that inhabited it. *SEEK* may be interpreted as an early example of “intelligent architecture,” a growing concern of the design community internationally. By synthesizing cybernetics, aesthetics, and semiotics, *Software* emphasized the process of audience interaction with “control and communication techniques,” encouraging the “public” to “personally respond” and ascribe meaning to experience. In so doing, *Software* questioned the intrinsic significance of objects and implied that meaning emerges from perception in what Burnham (quoting Barthes) later identified as “syntagmatic” and “systematic” contexts.

A further abiding metaphor in Burnham’s concept for *Software* was Marcel Duchamp’s *Large Glass*, 1915-22, which served as an architectural model for the actual

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73 One of the few women pioneers of Art and Technology, Sheridan went on to experiment with fax and other electronic technologies, including the EASEL computer-graphics system developed by former student John Dunn.


installation. As a proto-conceptual artist whose work interrogated the relationship between humans and machines, Duchamp offered a foundational model for many of the ideas that Burnham's exhibition addressed, and became a central focus of the critic's subsequent scholarship. *The Structure of Art* had a chapter entitled "Marcel Duchamp: Magister Ludi." Burnham later wrote several articles for *Artforum* (reprinted in *Great Western Salt Works*) in which he interpreted the artist's work from a cabbalistic perspective, and spent over a decade producing a lengthy monograph on Duchamp that remains unpublished. He described the relationship of *Software* to Duchamp's magnum opus in a 1970 interview with Willoughby Sharp. Iconographically, he explained, the *Large Glass*, has a lot of machines in the lower section - scissors, grinders, gliders, etc... it represents the patriarchal element, the elements of reason, progress, male dominance. The top of [it] is the female component: intuition, love, internal consistency, art, beauty, and myth itself.76

Burnham claimed that "Duchamp was trying to establish that artists, in their lust to produce art, to ravish art, are going to slowly undress [it] until there's nothing left, and then art is over." He then went on to reveal *Software's* organizational logic:

As a kind of personal joke... I tried to recreate the same relationships in *Software*. I've produced two floors of computers and experiments. Then upstairs on the third floor, conceptual art with Burgy, Huebler, Kosuth, and others, which to my mind represents the last intelligent gasp of the art

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76 Willoughby Sharp, “Willoughby Sharp Interviews Jack Burnham,” *Arts* 45:2 (November, 1970): 23. Subsequent quotes regarding the *Large Glass* and the organizational logic of *Software* are also from this page. While Burnham’s interpretation of the *Large Glass* is widely disputed, it nonetheless informed his organization of the installation.
impulse.

Burnham’s point, following his interpretation of Duchamp, was not that art was dead, or dying, or about to dissolve into nothingness. Rather, he believed that art was “dissolving into comprehension.” He claimed that Conceptual Art was playing an important role in that process, by “feeding off the logical structure of art itself..., taking a piece of information and reproducing it as both a signified and a signifier.” In other words, such work explicitly identified the signifying codes that define the mythic structure of art. Instead of simply obeying or transgressing those codes, it appropriated them as motifs, as signifiers, thereby demystifying the protocols by which meaning and value have conventionally been produced in art.

In this regard, Burnham became very critical of the role of emerging technology in art. While the seeds of his disenchantment with Art and Technology can be seen already in “The Aesthetics of Intelligent Systems,” (1969), his most explicit and antagonistic pronouncement appeared in “Art and Technology: The Panacea that Failed” (1980). In that essay, Burnham stated that art and technology were incommensurable on the most basic structural level. As mentioned above, he believed that the internal logic of western art compelled it to make apparent its own internal semiotic structure.

Technology, he still maintains, contributes nothing to that process, and amounts to

"whipped cream" on the cake.\textsuperscript{78} Having lost faith in the ability of technology to contribute in a meaningful way to the signifying system that he believed to mediate the mythic structure of western art, in \textit{Software} he purposely joined the nearly absent forms of Conceptual Art with the mechanical forms of technological non-art to “exacerbate the conflict or sense of aesthetic tension” between them.\textsuperscript{79} Given his interpretation of Duchamp, such a gesture also can be seen as an attempt to interrogate the categorical oppositions of art and non-art by revealing their semiotic similarity as information processing systems.

It must be noted that in many respects \textit{Software} was a disaster. The DEC PDP-8 Time Share Computer that controlled many of the works did not function for the first month of the exhibition due to problems with, ironically enough, the software. The gerbils in \textit{SEEK} attacked each other, a film was destroyed by its editors, and several aspects of the exhibition - including the catalog - were censored by the Board of Trustees of the museum.\textsuperscript{80} The show went greatly over budget, which put the Jewish Museum in a precarious position financially. The Jewish Theological Seminary procured funds to save the foundering institution, but dictated a radical shift in the museum’s mission, which precipitated Karl Katz’s dismissal as its director and its demise as a leading

\textsuperscript{78} Jack Burnham, Personal correspondence with the author, March 16, 2001.

\textsuperscript{79} Jack Burnham, Personal correspondence with the author, April 23, 1998.

\textsuperscript{80} In the author’s copy of the \textit{Software} catalog, given to him by Ruth Beesch of the Jewish Museum, the list of names of the trustees has been cut out with scissors.
exhibition space for experimental art. The show was scheduled to travel to the Smithsonian Institution, but that venue was canceled. Many other controversies plagued Burnham’s exhibition. Nonetheless, *Software* remains the most conceptually and - when it worked - technologically sophisticated art exhibition of the period.

Like *nine evenings* before it, and manner subsequent exhibitions, the failure of the technology to work contributed to increasing public disappointment and impatience with Art and Technology. While works of art have always been more or less successful according to some set of criteria, the idea of the art simply "not working" was unfamiliar to audiences. Moreover, given the technological accomplishments of the period - such as putting a human being on the moon - the failure of technology to function in artistic contexts made artists appear to be amateurs dabbling unsuccessfully with materials better left to engineers. This appearance, however, fails to consider the budgetary and technological constraints placed on artistic research using technology. It also fails to recognize that experimental art intends to push the limits of what is known to work aesthetically, and that when experimental art utilizes technology, it often also pushes the boundaries of what is known to work technologically. For those who admire the courage of artists to attempt the unknown, the failure of an experiment to actually work, or to work consistently, is not necessarily a failed experiment, and the excitement of the effort to try something new is sufficient to sustain disappointments in the pursuit of discovery. Such remains the case with contemporary Art and Technology.

*Software* was predicated on a structuralist analysis of art in which unfolding of the
history of western art evolved exclusively by a process of demythification. Technology in art, for Burnham, was meaningful only to the extent that it contributed to stripping away signifiers to reveal the mythic structure of art. He later argued that technology simply added a further signifier to the equation. Perhaps the moment is not far off when the deconstruction of art’s mythic structure is approaching completion. And perhaps information technology has become, as Burnham’s own theory demanded, “pervasively, if not subconsciously present in the lifestyle of our culture,” such that its aesthetic implications are sufficiently manifest to play a constructive role in proposing new artistic paradigms.

At the time of Software, the general public did not have much, if any, direct experience with computers or any form of information processing technology. Both the discourses of experimental art and the discourses of information technology were beyond their grasp. Now that personal computers with connections to the Internet are popular appliances, information technology is not separate from everyday experience. This situation may make Art and Technology easier to grasp than conventional art, for its formal vernacular speaks a common language. On the other hand, the history of this tendency is marked by a consistent challenging of conventional aesthetic modalities. So, while the media of information technology may be relatively accessible to wide audiences, the conceptual ideas expressed through it by artists often do not correspond to mainstream notions of art. Perhaps, however, this vernacular can help audiences become more attuned to unfamiliar ideas and alternative models of knowledge and being.
Information Technology and Conceptual Art

By the mid-1960s, Marshall McLuhan’s prophetic pronouncements about how electronic media were creating an increasingly interconnected global village had popularized the idea that the era of machine-age technology was drawing to a close, ushering in a new era of information-technology. Ambitious as they were, few of the artist-engineer collaborations that E.A.T. and A&T facilitated during this period focused on the artistic use of the information technologies of computers and telecommunications.81 Taking an important step in that direction, Jasja Reichardt’s 1968 exhibition, Cybernetic Serendipity, was thematically centered on the relationship between computers and creativity. This show, however, remained focused on the materiality of technological apparatus and their products, such as robotic devices and computer graphics.82

Burnham pushed the exploration of the theoretical relationship between art and information technology to an unprecedented level. Software was the first major US Art and Technology exhibition that attempted to utilize a computer in a museum context. The show’s technological ambitions were matched by Burnham’s conceptually

81 This absence was not for lack of interest on the part of artists. Indeed, many of the artists who offered proposals to A&T wanted to use computers. Given the high cost of computer time-sharing then, corporate sponsors were resistant to donate the use of their computers, except for Information International, Inc., which collaborated with Jackson MacLow, helping the artist to create computer-generated poems.

sophisticated vision, which drew parallels between the ephemeral programs and protocols of computer software and the increasingly “dematerialized” forms of Conceptual Art, which were interpreted, metaphorically, as functioning like information processing systems.

Kinaston McShine’s renowned *Information* exhibition at the Museum of Modern Art in New York was roughly contemporaneous with *Software*, though Burnham has pointed out that “*Software* was hatched nine months before *Information*.” The two exhibitions shared various components of Kosuth’s *Seventh Investigation*, and each show included a different version of Haacke’s *Visitor’s Profile* (1970). Although *Information* was not explicitly technological, its title suggested and popularized the idea of art as information (which Burnham had theorized in his 1968 essay “*Systems Esthetics*” and implied an awareness of the broader cultural shift to the Information Age. Due to the intentionally “broad and informal” nature of *Information*, which included the work of


84 Jack Burnham, “Systems Esthetics” *Artforum* 7:1 (September 1968): 30-35. Burnham also gave a series of lectures on “An Introduction to Systems Aesthetics” at Stanford University in May, 1969. I do not mean to suggest that Burnham was the first writer to consider the idea of art as information, but that he became identified with that notion because his theorization of it brought substantial clarity and attention to the subject.

85 Ibid. Burnham also gave a series of lectures on “An Introduction to Systems Aesthetics” at Stanford University in May, 1969. I do not mean to suggest that Burnham was the first writer to consider the idea of art as information, but that he became identified with that notion because his theorization of it brought substantial clarity and attention to the subject. See, for example, Mitchell Whitelaw, "1968/1998 Rethinking Systems Aesthetic," in *Anat News*: 33 (Austrian Network for Art and Technology,1998) online publication ,http://www.anat.org.au> (cit: December 1998).
nearly 100 artists from around the world (many of whom are associated with Conceptual Art), the rubric of “information” could function only as a vague generalization of artistic tendencies that emerged in the 1960s. McShine, perhaps wisely, did not attempt a coherent theorization of the disparate contributions that made up this “international report” of the activity of younger artists,” beyond suggesting that it was an “introduction to work from which many of the aesthetic concerns of the seventies will probably emerge.”

Regardless of these points of intersection, and the fact that Conceptual Art emerged during a moment of intensive artistic experimentation with technology, little scholarship has explored the relationship between technology and Conceptual Art. Indeed, art historical literature traditionally has drawn rigid categorical distinctions between Conceptual Art and Art and Technology. The following discussion seeks to reexamine the relationship between technology and Conceptual Art and to challenge the disciplinary boundaries that obscure significant parallels between this tendency and Art and Technology. The first part discusses the technological aspects of contributions to Software by Levine, Haacke, and Kosuth. The second part proposes several possibilities for why Conceptual Art and Art and Technology may have become fixed as distinct, if


not antithetical, categories. This discussion focuses on British art critic Charles Harrison’s discomfiture with Art and Technology in his writings on Conceptual Art. The conclusion suggests that the correspondences shared by these two artistic tendencies offer grounds for rethinking the relationship between them as part of larger social transformations from the machine age of industrial society to the information age of post-industrial society. Before proceeding, some working definitions will help clarify the terminology of Conceptual Art and Art and Technology in order to open up a discussion of their relatedness beyond the narrow confines of extant discourses.

Resisting the arch formalism that had become institutionalized by the 1960s, Conceptual Art has sought to analyze the ideas underlying the creation and reception of art, rather than to elaborate another stylistic convention in the historical succession of modernist avant-garde movements. Investigations by Conceptual artists into the networks of signification and structures of knowledge that enable art to have meaning, frequently have utilized text as a strategic device to examine the interstice between visual and verbal languages as semiotic systems. In this regard, Conceptual Art is a meta-critical and self-reflexive art practice, engaged in theorizing the possibilities of signification (including its own) in art’s multiple contexts, including its history, criticism,

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88 Harrison first met the four founders of Art & Language in 1969, the same year he wrote a catalog essay “Against Precedents” for the London showing of the landmark Conceptual Art exhibition, *When Attitudes Become Form*. He became an active member of Art & Language in 1971, merging his profession as an art critic with art practice. Formally trained as an artist, Burnham made his first light sculpture in 1954, and his first programmed kinetic sculpture in 1959. He received his MFA in sculpture from Yale in 1961, and later merged his insights as an artist working with technology with his self-taught vocation as an art critic and historian. A close friend of Hans Haacke since 1962, he was also associated with the group of Conceptual artists represented by New York dealer Seth Sieglaub.
and historiography, its exhibition spaces and markets, and so on. In interrogating the relationship between ideas and art, Conceptual Art de-emphasized the value traditionally accorded to the materiality of art objects and placed greater emphasis on revealing the semantic systems that make it possible for meaning to be communicated.89

Art and Technology has focused its inquiry on the materials and/or concepts of technology and science, which it recognizes that artists historically have incorporated in their work. Its investigations include the aesthetic examination of the visual forms of science and technology, the application of science and technology in order to create visual forms, and the use of scientific concepts and technological media both to question their proscribed applications and to create new aesthetic models. In this third case, Art and Technology, like Conceptual Art, is a meta-critical process. It challenges the systems of knowledge (and the technologically mediated modes of knowing) that structure scientific methods and conventional aesthetic values, and examines the social and aesthetic implications of technological media that define, package, and distribute information.

89 As art historian Kristine Stiles has noted, many Conceptual Artists, especially Mel Bochner and Art & Language, recognized the contradiction of the so-called “dematerialization” of the art object theorized by Lucy Lippard and John Chandler in their influential article, “The Dematerialization of Art” Art International (February 1968) and reinscribed in Lippard’s Six Years: The Dematerialization of the Art Object 1966-1972 (1973). Stiles points out that “dematerialization of art” can best be seen as a “strategy for repositioning art in relation to politics – not a shift from material per se, but a shift from an artwork’s value as an object of commercial exchange to its value as aesthetic and political interchange.” See, Kristine Stiles, “Language and Concepts” in Stiles and Selz, eds., Theories and Documents: 804-816; and Mel Bochner, “Book Review” Artforum 11:10 (June, 1973), reprinted in Stiles and Selz, Theories and Documents: 828-32.
The title for the *Software* exhibition was suggested to Burnham by artist Les Levine. In the late 1960s, Levine began using interactive, electronic feedback to interrogate the boundaries between the viewer and the environment. He was represented in *Software* by three pieces, including *Systems Burn-Off X Residual Software* (1969, Figures 2.17 – 2.18). The original installation at the Phyllis Kind Gallery in Chicago was comprised of 1000 copies of each of 31 photographs taken by Levine at the March, 1969 opening of the highly publicized *Earth Works* exhibition in Ithaca, New York. Numerous New York critics and the media had been bused upstate for the event. Most of the 31,000 photographs, which documented the media-event, were “randomly distributed on the floor and covered with jello; some were stuck to the wall with chewing gum; the rest were for sale.” Levine explained his use of jello and gum as a gesture incorporating elements that are symbolic of the emptiness and detritus of society.

In the *Software* exhibition catalog, Levine wrote a statement outlining his concept of software and its relationship to art. His definition of software was highly

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90 The other two works were *A.I.R.* (1968-70) and *Wire Tap* (1969-70). *A.I.R.* an acronym for “Artist In Residence” was conceived of as a live, real-time video link to Levine’s studio, so that the museum audience could observe the minute-to-minute activities of the artist, which were displayed on a ring of television sets, encompassing the viewer. Due to financial limitations, the actual implementation used pre-recorded videotapes of the artist in his studio. *Wire Tap* was comprised of live telephone conversations between the artist and whoever happened to call him at the moment, played over an array of twelve 12” x 12” speakers.

91 Burnham, *Software*: 60.

metaphorical, and diverged from how the term is used in computer science. This passage emphasized his belief that the proliferation of mass media was changing knowledge into a second-hand mental experience of simulations and representations – i.e. software – as opposed to first-hand, direct, corporeal experiences of actual objects, places and events – i.e. hardware.

All activities which have no connection with object or material mass are the result of software. Images themselves are hardware. Information about these images is software… In many cases an object is of much less value than the software concerning the object. The object is the end of a system. The software is an open continuing system. The experience of seeing something first hand is no longer of value in a software controlled society, as anything seen through the media carries just as much energy as first hand experience… In the same way, most of the art that is produced today ends up as information about art.93

Levine conceived of the 31,000 individual photos as the residual effects or “burn-off” of the information system he created – as the material manifestation of software. In other words, Systems Burn-Off was an artwork that produced information (software) about the information produced and disseminated by the media (software) about art (hardware). It functioned as a meta-critique of the systematic process by which art objects (hardware) become transformed by the media into information about art objects (software).

Whereas he stated that most art “ends up as information about art,” Systems Burn-Off was

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93 Les Levine, artist’s statement, Software: 61. 
art as information about information about art, adding a level of complexity and reflexivity onto that cycle of transformations in media culture.94

In this regard, while Art and Technology utilized technology in an explicit manner, technology was made implicit in the construction of Earth Art projects, such as those Levine photographed for Systems Burn-Off. To use a classic example, Robert Smithson’s “Spiral Jetty” (1969-70) demanded the use of aerial surveys and heavy industrial equipment in order to relocate 6,650 tons of organic material.95 Because the site-specificity of Earth Art made direct experience possible only to local denizens and an exclusive group of enthusiasts, Levine drew attention to another implicitly technological aspect of such work: the process by which the media transforms it into information and distributes it.

Systems Burn-Off can be related to Levine’s interactive video installations, such as Iris (1968, Figure 2.19) and Contact: A Cybernetic Sculpture (1969, Figure 2.20). In these works 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

94 This cycle of transformations does not stop here. The reproduction of imagery from “Systems Burn-Off” in the Software catalog added another level to the cycle, creating information about art as information about information about art. And my discussion of it represents information about information about art as information about information about art.

synthesizes man with his technology... the people are the software.\textsuperscript{96} While these works demanded the direct, corporeal experience of the participant, it was the experience of seeing oneself as information - as transformed into software - that was of primary concern to the artist.

When you look at the TV screen and see yourself on it, you don’t see yourself as real flesh, but as an image of the body, as an image of the self. So it’s more representative, not of body, but of appearance - how you represent, how you are represented, how you appear. I don’t think those works had the capability to have any of the real bodily nature that the body really has... It was a transformative system that projected the concept of the image into some other zone.\textsuperscript{97} In this regard, Levine provocatively has noted that, “Simulation is more real than reality. Reality is an over-rated hierarchy.”\textsuperscript{98}

For Levine, like other experimental artists working at the intersection of Conceptual Art and Art and Technology, the particular visual manifestation of the artwork as an object was secondary to the expression of an idea that becomes reality by simulating it.

In Systems Burn-Off Levine used a technological metaphor to create art that was not constructed of technological media, but which commented on how mass media transformed the particularity of artistic matter into the generic uniformity of matter in journalistic information. Using video cameras and television monitors, Iris and Contact similarly revealed how media transform the body into an image, creating a condition of


\textsuperscript{97} Les Levine, Telephone interview with the author, January 21, 1999.

\textsuperscript{98} Ibid.
knowledge – in this case, self-knowledge - based on simulation. While in 1967 artist Sol Lewitt asserted that “New materials are one of the great afflictions of contemporary art,” in 1968 he wrote that “Since no form is intrinsically superior to another, the artist may use any form … equally.” Disagreeing with the former statement, while subscribing to the latter, Levine perceived that his use of mass media technology was as valid as his use of any other media, traditional or expanded.

Like Levine, other Conceptual artists, such as Hans Haacke, subscribed to the belief in the equivalence of media, including technology and mass media, in the production of artworks. Haacke is perhaps best known for his politically charged critiques of power relations between art institutions, industry, the military, and politics. However, it is significant that Haacke’s work in the early 1960s evolved from Kinetic sculpture. As such, he was included in a number of key Nouvelle Tendence exhibitions (Ulm, London, Amsterdam, Berlin, Gelsenkirchen, Venice, Philadelphia, and Washington, D.C.), and considered himself a “sort of junior partner” of the German-

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99 Ibid. The suggested parallel between Levine’s work and French sociologist Jean Baudrillard’s theory of simulacra was made by the artist himself.


based Zero group. Works of this period, such as *Condensation Box* (1965, Figure 2.21), were comprised of Plexiglas or Plexiglas and steel, and shared visual similarities with Minimal Art in their simplified, reductive forms and industrial materials. They also possessed a kinetic element, which allied them with the elements of motion and transformation that characterized Art and Technology. It is perhaps for this reason that the Howard Wise Gallery, the premier commercial venue for the presentation of Art and Technology, gave Haacke solo exhibitions in 1966, 1968, and 1969. At the same time, Haacke’s early works were predicated on the dynamism of natural systems. This concern with the idea of systems in the context of art (which he later elaborated in an ongoing inquiry into art as a system) was integral to diverse strains of Process and Conceptual Art, as well as to Art and Technology. In this latter case, not only were individual artists experimenting with various systematic approaches to art, but exhibitions like *nine evenings, Software*, and A&T thrust artists and art institutions into a confrontation and collaboration with the systems of industry and technology.

Haacke, who had been a close friend of Burnham since 1962, contributed two pieces to *Software: Visitor’s Profile* (Figure 2.22) and *News* (Figure 2.23). These works were part of the artist’s “Real Time Systems” series, which was inspired in part by conversations with Burnham, who introduced him to the idea of open biological systems developed by Ludwig Von Bertalanffy, and to Norbert Wiener’s theories of

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103 Hans Haacke, Interview with the author, January 2, 1999.
cybernetics. Many artists were introduced to these concepts by Burnham’s *Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of This Century* (1968), which included references to Bertalanffy’s proto-cybernetic biological theories of the 1930s, the cybernetic theories of Wiener, Stafford Beer, Ross Ashby, and Gordon Pask, as well as Claude Shannon’s related principles of information theory. Burnham’s article, “Real Time Systems,” differentiated between “ideal time” and “real time” with respect to art. In ideal time, the aesthetic contemplation of beauty occurs in theoretical isolation from the societal and temporal contingencies of value, while in real time value accrues on the basis of an immediate, interactive and necessarily contingent exchange of information. Haacke’s *News* (1969) incorporated several teletype machines that delivered a perpetual flow of information about local, national, and international events, which was printed out on continuous rolls of paper. Visually, these works came to resemble the Minimalist and Post-Minimalist sculpture of Robert Morris, Richard Serra, Barry Le Va, and Alan Saret, in which materials such as felt, lead, and rubber were unrolled in linear configurations in a gallery space. In his discussion of real time systems, Burnham referred to a piece (likely “Visitor’s Profile” for *Software*) that

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Haacke was planning “for a museum” that would produce a “steady output of statistical information about visitors involving a small processor-controlled computer and a display device.”

This computerized version of Visitor’s Profile was obviously more technologically sophisticated than the manual versions exhibited at the Howard Wise Gallery in 1969 and at the Information exhibition in 1970. But it was also far more complex in the variety of politically provocative questions it posed and the instantaneous, statistical compilation of its results. The questionnaire was almost identical to the version Haacke proposed for his solo exhibition at the Guggenheim Museum in 1971, which the museum cancelled. The installation was comprised of a teletype terminal with a monitor that was connected to a time-sharing computer. The computer was programmed to cross-tabulate demographic information about the museum audience (age, sex, education, and so on) with their opinions on a variety of subjects, ranging from “Should the use of marijuana be legalized, lightly or severely punished?” to “Assuming you were Indochinese, would you sympathize with the present Saigon regime?” Whereas the statistical data from the other versions of Visitor’s Profile were tabulated on a daily basis, Haacke noted in the Software catalog that:

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The processing speed of the computer makes it possible that at any given time the statistical evaluation of all answers is up to date and available. The constantly changing data is projected onto a large screen, so that it is accessible to a great number of people. Based on their own information a statistical profile of the exhibition’s visitors emerges.\textsuperscript{109}

On the technological component of Haacke’s proposed museum piece, Burnham wrote, “Two years ago Haacke would have balked at using this kind of technology; today, working more closely with events, it becomes a necessity.”\textsuperscript{110} Haacke amplified this statement on the importance for artists to utilize whatever materials and techniques are necessary, in order to be able to respond systematically to contemporary social issues and its wide range of informational contexts:

The artist’s business requires his involvement with practically everything … It would be bypassing the issue to say that the artist’s business is how to work with this and that material … and that the rest should be left to other professions … The total scope of information he receives everyday is of concern. An artist is not an isolated system … he has to continuously interact with the world around him…\textsuperscript{111}

Like Levine, Haacke did not use technology as an end in itself, but rather put it in the service of the ideas which were central to his artistic practice. As such, these artists attempted to steer clear of falling victim to the danger Lewitt warned of regarding new materials: “making the physicality of the materials so important that it becomes the idea

\textsuperscript{109} Hans Haacke, artist’s statement in \textit{Software}: 34.


of the work (another kind of expressionism).  

As in earlier technologically enhanced works by Haacke, such as *Photo-Electric Viewer-Programmed Coordinate System* (1968, Figure 2.24), technology was employed as a means to enable art to become a responsive, real time system that “merges with the environment in a relationship that is better understood as a ‘system’ of interdependent processes.” Similarly, in the *Software* version of *Visitor’s Profile* a computer was meant to enable the work to receive, process, and distribute information instantaneously. The piece could interact with participants in real time by responsively gathering and evaluating information about the systematic relationship of art and society. In this regard, Haacke’s work shares affinities with the conceptual goals of real-time systems actualized in the work of many artists associated with Art and Technology: Nicholas Schöffer’s *CYSP* series of cybernetic sculptures of the mid-1950s, James Seawright’s interactive robotic sculptures of the mid-1960s, and Myron Kreuger’s “artificial reality” environments of the early 1970s, to name just a few examples.

It must be noted that the *Software* version of *Visitor’s Profile* did not work, due to software problems that rendered inoperable the DEC PDP 9 time-sharing computer on loan to the Jewish Museum. While the idea for the piece remains viable and could be executed easily and reliably with a simple personal computer, the failure of the

112 Sol Lewitt, “Paragraphs on Conceptual Art,” in Stiles and Selz, *Theories and Documents*: 825. Whether or not Levine and Haacke succeeded in this regard is open to debate.

computerized version of Visitor’s Profile discouraged Haacke from using such technology subsequently.\textsuperscript{114} Haacke’s experience was not uncommon. Technical difficulties had plagued the major Art and Technology exhibitions, beginning with nine evenings. The Smithsonian Institute decided against exhibiting Cybernetic Serendipity, which it had already gone to the expense of shipping to the US, when the projected technical repair maintenance costs of $40,000 substantially exceeded its budget. The exhibition was on the verge of being returned to the UK when engineers for the Corcoran Gallery estimated the costs at $4000, hastening Harithas' decision to mount the show.\textsuperscript{115} The technical hurdles, cost, and unreliability of technological media have discouraged many artists from experimenting with it, and have contributed as well to a lack of confidence in, if not public disenchantment with Art and Technology. Three decades later similar operational problems continue to be haunt such exhibitions, including the highly publicized 010101 at the San Francisco Museum of Modern Art (2001).

Like Levine and Haacke, Kosuth has utilized mass media as a component in his work. However, unlike those artists, Kosuth has not made explicit use of technology such as video, computers, or telecommunications. Nonetheless, his contribution to Software, like his approach to art-making in general, can be interpreted as corresponding to a technological model of information processing. As mentioned, Kosuth exhibited elements of his Seventh Investigation (Art as Idea as Idea) Proposition One in

\begin{itemize}
\item \textsuperscript{114} Hans Haacke, Interview with the artist, January 2, 1999.
\item \textsuperscript{115} James Harithas, correspondence with Paul Mellon, May 23, 1969. Archives, Corcoran Gallery of Art.
\end{itemize}
This work included the same text in various international contexts: a billboard in English and Chinese in the Chinatown neighborhood of lower Manhattan (Figure 2.25), an advertisement in The Daily World, and a banner in Turin (in Italian, which was temporarily on display at the Museum of Modern Art’s Information exhibition.) The installation at the Jewish Museum included an area with photographic enlargements of each section of the proposition, and a table with an assortment of information “relevant to the work.” The text of the Chinatown billboard, reproduced in the Software catalog, was comprised of a set of six propositions (Figure 2.25):

[1] to assume a mental set voluntarily.
[2] to shift voluntarily from one aspect of the situation to another.
[4] to grasp the essential of a given whole; to break up a given whole into parts and to isolate them voluntarily.
[5] to generalize; to abstract common properties; to plan ahead ideationally; to assume an attitude toward the ‘mere possible’ and to think or perform symbolically.
[6] to detach our ego from the outer world.117

Kosuth’s statement in the Software catalog emphasized his intention that the work not be able to be reduced to a mental image, but that it exist as information free of any iconography.

116 Of these elements, Kosuth noted that much of the material (loose-leaf folders filled with propositions, information, and documentation) was “borrowed” by an audience member for an extended period, and therefore not present for part of the exhibition, though ultimately it was returned to the museum. Joseph Kosuth, Discussion with the artist, April 5, 1999, Durham, NC.

The elements I use in my propositions consist of information. The groups of information types exist often as ‘sets’ with these sets coupling out in such a manner that an iconic grasp is very difficult, if not impossible. Yet the structure of this set coupling is not the ‘art’. The art consists of my action of placing this activity (investigation) in an art context, (i.e. art as idea as idea).118

This stance would preclude the presence of technology in Kosuth’s work, unless it could be employed in such a way that it did not become iconic, as it arguably was in the work of Levine and Haacke.119 Applying Burnham’s software metaphor, the artwork was not the billboard or the other visible elements of the text (hardware), but rather was manifested in Kosuth’s philosophical questions (software) simultaneously posed in the framework of visual art and decontextualized in mass media. As the artist suggested in his catalog statement, the “art” consisted of his investigation in an art context of the relationship between ideas, the vehicles by which they are expressed, and the semantic networks that enable them to have meaning.120

Because Kosuth neither utilized technological media in his art, nor commented directly on the relationship between technology and art, it is difficult to ascertain the

118 Joseph Kosuth, artist’s statement, Software: 68.

119 The photographic reproduction of the billboard has come to signify the Seventh Investigation, reducing it, at least on a superficial level, to a recognizable icon for those who have not studied the work in sufficient depth, or who continue to insist on seeing art in those terms. At the same time, like most Conceptual artists, Kosuth needs “hardware” to convey the concepts of his “software,” hence the critique of a so-called “dematerialized” art.

technological dimensions of his work.\textsuperscript{121} Nonetheless, his use of photography and mass media can be related generally to the adoption of industrial materials and techniques that began with the technological concerns of Constructivism, Futurism, and the Bauhaus in the early twentieth century, and expanded after World War II. Moreover, in the context of \textit{Software}, Kosuth’s \textit{Seventh Investigation} lends itself to an interpretation based on Burnham’s metaphor of art as an information processing system. In "The Aesthetics of Intelligent Systems" Burnham had, moreover, drawn the cybernetic parallel between how computer software controls the hardware that runs it, and how information directs the activity of the human mind. In this regard, Kosuth’s propositions operate like instructions in the mind of the viewer.\textsuperscript{122} But whereas computer software has an instrumental relationship with respect to coordinating the operation of hardware, the artist’s propositions function as meta-analyses of the phenomenological and linguistic components of meaning. In other words, they demand that the viewer examine the process of processing information, while in the process of doing so.

Though Kosuth did not draw on computer models of information processing, his investigations follow a logic that shares affinities with that model, while at the same time demanding a self-reflexivity that goes beyond it. In posing propositions that required

\textsuperscript{121} Indeed, Kosuth's theoretical models are more directly drawn from Wittgenstein and linguistics. More research on the relationship between those sources and information technology may help to illuminate points of overlap and difference.

\textsuperscript{122} A further parallel may be drawn between the "event scores" of artists like George Brecht and Yoko Ono, and Kosuth’s propositions, which can be interpreted as functioning like thought programs for the mind.
viewers to investigate the cognitive functioning of their own minds with respect to the processing of information and the creation of meaning, Kosuth’s *Seventh Investigation* sought to interrogate how and why what he called the “language game” of art functioned in a larger cultural framework. This critical attitude can be seen as constitutive of the formation of society in the Information Age in general, and in the shift from an Industrial to Post-Industrial economic base. Here semantic meaning and material value are not embedded in objects, institutions, or individuals, so much as they are abstracted in the production, manipulation, and distribution of signs.

**Resistance to Parallels Between Conceptual Art and Art and Technology**

In *Art into Ideas*, Robert C. Morgan credited Burnham’s “Systems Esthetics” with having clarified the “feeling that art had traversed from the object to the idea, from a material definition of art to that of a system of thought.” Morgan then described Conceptual Art as “a significant and innovative method or type (not a style) of artistic practice on the eve of the Informational Age,” and noted a “parallel socioeconomic phenomenon … the penumbra between industry and postindustry.”¹²³

Burnham had already drawn a similar parallel in “Systems Esthetics,” which referred to the shift in industry from the control of production to the control of information that John Kenneth Galbraith described in *The New Industrial State*. However, in “Systems Esthetics,” as in Burnham’s “Real Time Systems,” (1969) “The

Aesthetics of Intelligent Systems” (1969) and in the Software exhibition, the art critic also drew explicit parallels between Conceptual Art and developments in systems theory and computer information processing. For Burnham, these scientific and technological advances were inseparable from the sweeping social changes that Galbraith and others were identifying and forecasting.

Morgan deserves credit for acknowledging the importance of Burnham’s theories about Conceptual Art and reinstating their centrality in art historical discourse. It is important to note, however, that his alliance with Burnham ceases precisely at the point of drawing an explicit parallel between Conceptual Art and technology. Keeping his distance from this parallel, Morgan is in excellent company, for no art historian since Burnham has made that connection so emphatically; and most have sought to dismiss it. However, it is unclear how the relationship that Morgan recognizes between Conceptual Art, the Information Age, and Post-Industrial society can be explained without recourse to the specific technologies that emerged at the same time. If those relationships are going to be drawn (and it seems valuable to do so), then it will be necessary to address, as Burnham did, the scientific and technological advances that contributed to broader cultural and social changes.

It is understandable why Conceptual Art and Art and Technology have been identified as distinct categories of artistic practice. By the early 1970s, public interest in Art and Technology was waning dramatically, while interest in Conceptual Art was on the rise. Art and Technology, which had offered a useful path of aesthetic
experimentation for artists associated with Pop Art, Environmental Art, Fluxus, Happenings, Process, and Video throughout the 1950s and 1960s, no longer appeared to be a viable direction for many artists in the 1970s.

Public expectations had been unreasonably high for the major museum exhibitions of Art and Technology, circa 1966-71. The technologies to which artists had access were relatively primitive, cumbersome, unreliable and expensive compared to what became available twenty years later with the advent of personal computers. Early projects were plagued by malfunctions and in any case, as McShine noted, could not compete with recent, spectacular technological accomplishments like the Apollo 11 lunar landing. Art and Technology appeared to have failed to deliver the unfulfillable promise of an efficient, modern aesthetic vision of a technologically enhanced future, which had been exaggerated by the emerging sector of professional art publicists. Many of these problems continue to plague the production and reception of contemporary works of art and technology.

Art and Technology did not simply go away, it moved into other arenas. The journal *Leonardo*, founded by artist/scientist Frank Malina in 1967 (first published in January 1968), and excellent books like Douglas Davis’s *Art and the Future* (1973), helped to keep interdisciplinary discourses between art, science, and technology alive. However, much of that research either became autonomous (like Video Art), merged with other movements, or retreated from the center stage of the contemporary art world to be undertaken in eclectic university departments at MIT, Carnegie-Mellon, the Art Institute
of Chicago, University of Illinois at Chicago, and Ohio State University. As another indication of waning support for Art and Technology, the Howard Wise Gallery in New York, the premier commercial venue for the exhibition of Art and Technology throughout the 1960s, closed in 1971. Wise decided to dedicate his full energies to Video Art, and created the Electronic Arts Intermix, a not-for-profit service organization, which is still in operation in New York.

Public skepticism towards the military-industrial complex after May 1968 and amidst the Viet Nam War, the Cold War, and mounting ecological concerns, all contributed to problematizing the artistic use of technology - and the production of aesthetic objects in general - within the context of commodity capitalism. Conceptual Art, on the other hand, with its assault on the modernist object, became increasingly central to a variety of artistic discourses, ranging from Post-Minimalism to Performance and from Installation to Earthworks.

Public interest in Conceptual Art had risen steadily since the mid-1960s, when artists, curators and critics began the process of historicizing a broad range of international artistic tendencies under the rubric of "Conceptual Art." 1969 was a watershed year. Activist/gallerist Seth Sieglaub organized the first exhibition of exclusively Conceptual Art, entitled, January 5-31, 1969, at a temporary gallery in New York. Kosuth published his definitive three-part essay, “Art After Philosophy,” and the

124 Software, for example, was publicized by the public relations firm of Ruder & Finn, which also consulted to A&T.

Conceptual Art, in fact, had become so well absorbed into the international art market by 1974 that Sarah Charlesworth, Michael Corris, Joseph Kosuth, and Mel

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125 Stiles and Selz, *Theories and Documents*: 909.
Ramsden initiated *The Fox*, (1975-6),\(^{126}\) in order ‘to establish some kind of community practice [for] the revaluation of ideology.’”\(^{127}\) The disjunction between the critical and public reception of Conceptual Art and Art and Technology in the early 1970s contributed to exacerbating distinctions between these two artistic tendencies, rather than to identifying continuities between them. For it stands to reason that artists, critics, dealers, curators, and collectors invested in internationally prestigious Conceptual Art would want to distance themselves from any association with Art and Technology, which, for the reasons explained above, had become increasingly peripheral to contemporary artistic concerns.

It would be a mistake, however, to underestimate the shared affinities between conceptual artists and artists such as Schöffer, Takis, and Tinguely, who, like other mid-century artists associated with Art and Technology, were concerned with process, real time interaction, and dynamic systems. Nonetheless, the charges that Art and Technology was dominated by the materiality and spectacle of mechanical apparatus (which were anathema to the conceptual project) were not unfounded. At the same time, artists who merged a vested interest in technological ideas with a primarily conceptual approach to art-making did not easily fit the category of Art and Technology.

Ascott, for example, the British artist most closely associated with Cybernetic Art in England, was not included in *Cybernetic Serendipity* because his use of cybernetics

\(^{126}\) Michael Corris, Correspondence with the author, July 31, 1999

\(^{127}\) Stiles and Selz, *Theories and Documents*: 808.
followed a primarily conceptual approach. Conversely, while his 1964 essay “The Construction of Change” was quoted in the frontispiece as the anthem for Lucy Lippard’s seminal *Six Years: The Dematerialization of the Art Object from 1966-1972*, Ascott’s anticipation of, and contribution to, the formation of Conceptual Art in Britain has not received proper recognition, perhaps (and ironically) because his work was too closely allied with Art and Technology.

Ascott’s Molton Gallery solo-exhibition, *Diagram Boxes and Analogue Structures*, drew strong parallels not only between the forms of art and science, but brought those systems of meaning together by the explicit use of language, anticipating aspects of what would come to be known as Conceptual Art. Indeed, the thesaurus became a primary explanatory metaphor for the artist’s practice, and text became an integral part of his work. The catalog reproduced his analog structure, *Video Roget* (1962, Figure 2.26), a relief sculpture inspired in part by the mix of constructivism and vitalism propounded by his mentor, Victor Pasmore, but also incorporating 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 (Figure 2.27). Together they suggested systematic relationships between words and images, and indicated various feedback loops between them.

Immediately following *Thesaurus* and *Video Roget* in the catalog, in a two-page diagram of interlinked text boxes (drawn like an electrical circuit, Figures 2.28-2.29), Ascott more explicitly declared his bid to use text in an art context as part of a cybernetic art system: “This Thesaurus is a statement of my intention to use any assembly of diagrammatic and iconographic forms within a given construct as seems necessary.” In this way, Ascott drew explicit parallels between the semiotics of verbal, visual, and scientific languages. The diagram proposed that the universe of potential meanings of his art could be derived taxonomically and discursively. In this multi-layered process, meaning was contingent on the flow of information between the artist, the object, the semiotic systems that govern the reception of works of art, and the actual responses of viewers. Such concepts would be taken up in Joseph Kosuth’s *Second Investigation, Proposition 1* (1968) and Mel Ramsden’s *Elements of an Incomplete Map* (1968, Figure 2.30).129 In many ways the materials, techniques, and artistic goals of Art and Technology and Conceptual Art were opposed, complicating the fluidity between the two categories, and creating absences where there rather could have been useful associations. At the same, as Ascott’s example powerfully demonstrates, there were also significant intersections between Conceptual Art and Art and Technology, suggesting that the conventional autonomy of these art historical categories be reconsidered.

129 Moreover, since Ascott’s diagram was largely textual, he expressly put in writing his intention to use text in and as art.
Sol Lewitt’s influential essay, “Paragraphs on Conceptual Art” (1967), further exemplifies these complications and contradictions. In the second paragraph he described Conceptual Art as a quasi-mechanical process: “In conceptual art the idea of concept is the most important aspect of the work … [t]he idea becomes a machine that makes the art.” Several paragraphs later, however, he warned that, “New materials are one of the great afflictions of contemporary art … The danger is, I think, in making the physicality of the materials so important that it becomes the idea of the work (another kind of expressionism).”\textsuperscript{130}

While the idea of unifying art and technology continued to captivate artists and audiences throughout the late 1960s, by the very early 1970s the tide had turned. Art and Technology had come to be perceived by many artists, critics, and historians as weighted down by (in Lewitt’s words) the “physicality of the materials” which dominated the “idea of the work.” Indeed, in the introduction to the anthology, \textit{Conceptual Art}, Ursula Meyer appropriated Burnham’s technological metaphor and wrote, “Conceptual Art is diametrically opposed to hardware art.”\textsuperscript{131} Burnham himself acknowledged the “chic superficiality that surrounded so many of the kinetic performances and ‘light events’” and

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\textsuperscript{130} Sol Lewitt, “Paragraphs on Conceptual Art,” Stiles and Selz, \textit{Theories and Documents}: 825.
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further noted that, “there was … more than a little of the uptown discotheque in Haacke’s gallery, Howard Wise.”

The characterization of Art and Technology as so many bells and whistles was not completely unwarranted, for indeed there have been many banal works of art made using technological media. But there have been more and less successful works associated with every strand of art history, including many banal examples of Conceptual Art. To reduce all Art and Technology to the superficial appearances of the unconventional media it uses forces a formalist interpretation on a field of artistic inquiry that is also highly conceptual and immaterial. Doing so thus unfairly oversimplifies a much more complex artistic phenomenon. It is easier to undermine such a straw-man version of Art and Technology than it is to support a richer account of the tendency. Arguments against it can be based on a simple critique of the most obvious external features, while arguments for it must differentiate between complex and banal examples, dig beneath the surface of the latter, and persuasively establish the presence of a relatively subtle and complicated aesthetic theory.

Complicating this polemic are the many abnegating remarks about Art and Technology made by proponents of Conceptual Art. There is cruel irony in this circumstance, for the authority of Conceptual Art as the arbiter of anti-modernist aesthetics was brought to bear against Art and Technology, rather than to help identify

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and build on the underlying conceptual content that characterizes many of its best examples. Part of the problem was that many critics associated with Conceptual Art equated anti-modernism with anti-formalism, shifting the value sign from plus to minus, while arguably remaining formalists at heart. As such, art that deigned to manifest significant physical substance (much less a physical substance that was animated) was written off as overbearingly formal and material. This state of critical affairs was particularly manifest in those Conceptual Art circles, such as those associated with Art & Language, where the battle against the formalism of modernist objects (and their complicity as commodities in reinforcing Capitalist ideology) was being waged most fervently.\textsuperscript{133} From this anti-formalist perspective, the bells and whistles of Art and Technology appeared to be nothing but gaudy, expressionistic, and commercial excesses that were extraneous and antithetical to the aesthetic investigation of superstructural ideas that defined the agenda of Conceptual Art.

One of the most able proponents of this position is art historian Charles Harrison. His work in this context demands a close and careful analysis because of its centrality to the discourses of Conceptual Art. He has written, “the rapprochement of art and technology … tended to suffer from a trivial equation of ‘modernity’ with scientific and mechanical development. It tended also to be co-opted by the very representational

\footnotesize{133 See the journal \textit{Art - Language}, Eds., Terry Atkinson, David Bainbridge, Michael Baldwin, Harold Hurrell, and Joseph Kosuth, was first published in May, 1969 (Vol 1 No 1). See also Harrison, \textit{Essays on Art & Language}. Cambridge: Basil Blackwell, 1991; and \textit{Art & Language}. Eindhoven: Van Abbemuseum, 1980.}
technologies it set out to exploit.”134 He further stated that during this time of Experiments in Art and Technology and Cybernetic Serendipity, “it seemed to some as if fascination with design and technology might be significantly injected into artistic modernism. The boot was on the other foot, however.”135 As the editor of the Studio International special issue that was the catalog for Cybernetic Serendipity, Harrison's position is the result of close personal experience. Nonetheless, he was obliged to acknowledge the interest shared by Art & Language founding members David Bainbridge and Harold Hurrell in Art and Technology. He pointed out that in 1967 at the Architectural Association in London, they organized the Hardware Show, which the art historian described as including “‘customized’ furniture and ‘electromagnetic’ installations.” However, aside from Hardware and Hurrell’s “interventions” which “inserted concepts … derived from engineering practice … into Art & Language conversation well into the 1970s,” Harrison claimed that the “legacies of Pop-Art-and-technology were never part of the Art & Language agenda,”136 and never “furnished much better than chronic distractions from the more interesting and intractable problems of modern art.”137


136 Ibid: 261, fn 30

While Pop Art and Art and Technology overlapped in some ways (particularly in A&T), they also represented two very different legacies. By collapsing them together, Harrison effectively reduced the unique qualities and goals of each to their least common denominator. With respect to the more theoretically sophisticated aspects of Art and Technology - that is, its concern with process and systems, the relationship between technological and aesthetic structures of knowledge, and its explicit emphasis on making art audiences active participants in a two-way exchange of information – these concepts can be seen as closely related to aspects of Conceptual Art.

Because the cybernetic ideas of process, systems, feedback, and informational exchange are not unique to technology, it may be argued that they can be retrofitted to explain everything, so the application of these ideas to an explanation of Conceptual Art offers no additional insight into that artistic practice. However, these ideas emerged within an interdisciplinary context in the US immediately following World War II, reaching a point of cultural saturation in the 1960s concurrent with the emergence of Conceptual Art. Just because cybernetics can be and has been applied as a general theory does not negate its significance as a narrative trope informing a broad range of cultural practices or as an explanatory method. It is in this sense that mapping cybernetics, systems theory, and information processing onto co-synchronous cultural forms, such as Conceptual Art, can shed light on understanding how ideas manifest themselves in and across diverse fields of inquiry. A hermeneutic problem lingers. It remains uncertain to what extent the interpretation of Conceptual Art in terms of cybernetic ideas reflects the
aesthetic ideology of that artistic tendency, and to what extent that interpretation reflects the interpretive method itself. Such a hermeneutic problem is not unique to cybernetics, but is common to many methodologies from psychoanalysis to marxism. The application of a cybernetic interpretation to cultural forms that emerged concurrently with it at least benefits from temporal congruity.

As shown above, the work of Levine and Haacke utilized technology in order to grapple with these issues. Using the technological metaphor of the relationship between hardware and software as his starting point, in *System’s Burn-Off* Levine examined how technology transforms objects into information within the context of art, while *Iris* and *Contact* sought to transform the viewer into information. Haacke’s *News* shifted the context of the systematic production of real-time media information from the editorial offices of the local newspaper to the museum, while *Visitor’s Profile* was intended to interactively exchange information with a museum audience, cross-tabulating demographic information and political opinions in real-time. Both artists’ interactive works attempted to defy the conventional subject-object relationship between active viewer and passive artwork that characterizes not only modernism, but the history of western art in general. Similarly, Kosuth’s work can be interpreted as operating at the intersection of the human mind and computer cognition with respect to the processing of information, thereby shifting the subject of aesthetic contemplation from an art object to the viewer’s mental processes and the semantic systems that structure meaning.

As for the relationship of technology to the work of Art & Language, many of the
aforementioned concerns were manifest in Hurrell’s *Cybernetic Artwork that Nobody Broke*, (1969, Figure 2.31), Bainbridge’s electronic installation for *Lecher System* (1969-70, Figure 2.32), and Terry Atkinson and Michael Baldwin’s *Key to 22 Predicates: The French Army* (1967, Figure 2.33). *Cybernetic Artwork* was a spurious computer program for interactively generating color. It refused to allow the user to interact beyond the rigid banality of binary input. If the user input a number other than 0 or 1, the program proffered the message: “YOU HAVE NOTHING, OBEY INSTRUCTIONS!” If the user input a non-number, *The Cybernetic Art Work That Nobody Broke* told him/her that there was an “ERROR AT STEP 3.2.” \(^{138}\) *Lecher System* juxtaposed a “‘sculptural morphology’ and an ‘electromagnetic morphology.’” The perceptual experience of interacting with the sculptural aspect of the system was intended to result in knowledge about the electromagnetic aspect of the system; which in turn, would create knowledge about the sculptural aspects.\(^{139}\) In *22 Predicates* Terry Atkinson and Michael Baldwin offered a key to abbreviations for the French Army (FA), the Collection of Men and Machines (CMM), and the Group of Regiments (GR), then described the inter-relationships between them:

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

\(^{138}\) Ibid: 58.

another class of objects): by transitivity the FA is the same CMM as the ‘New Shape/Order one.’

This ironic passage reduces to absurdity the sort of systematic relationships between individuals, groups, and institutions characteristic of cybernetics and the military.

Because all these works by Art & Language members were infused with irony, their technological components must be interpreted as parodies of scientific structures of knowledge and their uncritical application in art. But by challenging what was referred to earlier as “the systems of knowledge (and the technologically mediated modes of knowing) that structure scientific methods and conventional aesthetic values,” these works by Art & Language affiliates share a vital commonality with the objectives of Art and Technology outlined in the introduction. While many works of Art and Technology uncritically celebrate technology, the critical questioning of the social implications of technology characterizes a wide variety of artistic inquiries in the field since the late 1950s. Key monuments include Gustav Metzger’s theory of auto-destructive art (1959), Tinguely’s *Homage to New York*, (1960), Nam June Paik and Shuya Abe’s *Robot K-456* (1964), and Oyvind Fahlstrom’s *Kisses Sweeter than Wine* (1966). The work of Stelarc and Survival Research Laboratories beginning in the mid-1970s continues this tradition of artists’ use of technology in a critical manner.

Harrison equated technology with the machine aesthetic of American modernism. In the tradition of Marcel Duchamp’s dismissal of “retinal art,” he interpreted the kinetic

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gadgets and other spectacles commonly associated with Art and Technology as capitulating to the modernist “beholder discourse.” Since modernism represented the entrenched seat of authority and power in the artworld that Art & Language strategically set out to deconstruct, technological references posed a potential contradiction to the collective’s project. Harrison was unable to acknowledge the ways in which artists’ use of technology has been critical not only of technology itself, but of modernist aesthetics. This resistance to technology obscured his ability to see the use of technology by Art & Language members in positive terms, interpreting them simply as a rejection of modernism. For example, he described Hurrell’s Cybernetic Artwork and Bainbridge’s Lecher System as “flailing about - products of the search for practical and intellectual tools which had not already been compromised and rendered euphemistic in Modernist use.”

At the same time, Art & Language's Index (1972, Figure 2.34), as well as Harrison's subsequent description of the work, are full of scientific and technological metaphors, analogies, and references. In his description of Index, Harrison cited the research of computer scientist Marvin Minsky, whom Burnham had met at MIT in 1968-69. Index had a variety of manifestations, including a component of Index 4, which consisted of a computer print-out. Several instances of the work can be likened to hypertext, an electronic text system first theorized by scientist Vannevar Bush in 1945, in

141 Ibid: 56.
142 Ibid: 72.
which a non-linear narrative is navigated by participants through a process of making associational links.\textsuperscript{143} Harrison's description of "Index" explicitly referred to the fields of artificial intelligence and what has come to be known as neurophilosophy, which he proposed were analogous to the systematic approaches of two types of Conceptual Art:

The analogy between such systems … serves to distinguish between … the intellectual ready-made, in which ideas were treated as immutable objects and the art world [as] a kind of system in which these objects were to be installed; [and] works which required … that not only they themselves, but also the structures within which they were located, should be seen as problematic, so that mutual relations between the ‘work’ and ‘structure’ might be rendered dynamic and transformable.\textsuperscript{144}

Despite Harrison's hostility towards Art and Technology, this passage is itself indebted to cybernetics and systems theory, an odd contradiction. In fact, this description of the systematic approaches of Conceptual Art sounds remarkably similar to the ideas that Burnham theorized in the late 1960s to discuss the systematic relationship between technology and Conceptual Art, later exemplified in \textit{Software}. In his catalog essay, for example, Burnham wrote,

Used in the art format, any notion of software leads one to reconsider our historical notions of art… Contexts lend meaning to art works or art ideas: they “frame” the work, so to speak… For sophisticated viewers, contexts are implicitly carried over from previous art experiences. Thus many of the exhibits in \textit{Software} deal with conceptual and process relationships which … undermine normal perceptual expectations and habits which

\textsuperscript{143} Vannevar Bush, "As We May Think," \textit{Atlantic Monthly} 176: 1 (July, 1945): 101-108.

\textsuperscript{144} Harrison, \textit{Essays on Art & Language}: 72-3. Harrison does not use the term “neurophilosophy” a recently established field that conducts research on what he refers to as the “theorization of mind and memory.”
viewers bring to an art exhibition.\textsuperscript{145}

The absence in Harrison’s writings of any reference to Burnham’s theories of Conceptual Art or to Burnham’s \textit{Software} exhibition is a significant omission.\textsuperscript{146} Can this oversight help explain Harrison’s difficulty in recognizing the significance of science and technology as a theoretical and material component in a wide range of Conceptual Art practices, from Art & Language to \textit{Software}?

It is hard to imagine that Harrison, a consummate, culturally-informed intellectual, and former editor of \textit{Studio International} and a contributor to \textit{Artforum}, was not familiar with Burnham’s writings. Clearly, Burnham and Harrison disagreed on some fundamental issues regarding Conceptual Art, especially with respect to its relationship to technology. Harrison was dismissive of technology in his account of Art & Language, which focused on differentiating it from Conceptual Art, and on identifying the philosophical and political foundations of its challenges to the aesthetic discourses of modernism.\textsuperscript{147} But by limiting his foil to pre-war notions of materiality and production and the aesthetic issues of modernist formalism, Harrison’s description of Art &

\textsuperscript{145} Burnham, “Notes on Art and Information Processing” \textit{Software}: 12.

\textsuperscript{146} Rather than dignify Burnham’s theories of art by disagreeing with them directly, Harrison avoided specific reference to him. Like American critic and historian Rosalind Krauss, this exclusion contributed to a critical agenda in influential art journals that has minimized Burnham’s contributions to art history. Krauss’s \textit{Passages in Modern Sculpture} did not include \textit{Beyond Modern Sculpture} in its bibliography.

\textsuperscript{147} Some of the distinctions Harrison has made between Art & Language and what he has referred to as “the normal work of … Conceptual Art,” such as the idea that “it was the supposed end product of the [Conceptual] artist’s activity that claimed primary attention,” contradict the stated goals of so-called “normal … Conceptual art[ists]” like Robert Barry and Douglas Huebler, whom Burnham discussed in “Alice’s Head.” See, Harrison, \textit{Essays}: 51
Language and Conceptual Art is unnecessarily narrow in its implications, and fails to address the relationship of late twentieth-century experimental art to the Information Age of Post-Industrial society. In addition to the relevant philosophical, political, and aesthetic issues, a more comprehensive account of post-World War II art must also take into consideration the specific scientific and technological theories and developments that contributed to larger social formations that impacted all aspects of material culture. For indeed, such technological ideas were not only present in the artistic practices of Art & Language members but they seeped into Harrison's interpretation of the collective's work.

**Intermediate Conclusions Regarding Technology and Conceptual Art**

The continuities between Art and Technology and Conceptual Art are more readily apparent from an historical distance of three decades, removed from the aesthetical-political debates of that time. Advances in electronics, computing and telecommunications, and especially the advent of the Internet have provided tools that enable artists to interrogate the conventional materiality of art objects in ways that were not available thirty years ago. This perspective also brings into relief the ways in which critical discourse has been unable to reconcile how the work of an artist could be allied simultaneously with both Art and Technology and Conceptual Art. Haacke, for example, exhibited at the Howard Wise Gallery, and his work features prominently in key
monographs on Kinetic Art and Art and Technology. Nonetheless, his work has been
canonized primarily within the context of Conceptual Art. Other artists, like Ascott,
remained simultaneously visible and invisible to each camp throughout the 1970s,
because of his close affinities to both. The critical reception and historicization of
Haacke and Ascott says less about their work than it does about the institutional
mechanisms that have created and reinforced categorical distinctions between Art and
Technology and Conceptual Art at the expense of identifying continuities between them.

By respecting the differences between these artistic tendencies, while at the same
time understanding some of the common theoretical threads that they have shared, a more
comprehensive account of art in the 1960s and in the post-World War II period can be
formulated. Such a history will acknowledge how cybernetics, information theory, and
systems theory were foundational intellectual models which, in combination with the
advent of digital computing and telecommunications, played a significant role in
transforming society. As Burnham wrote in 1970,

Information processing technology influences our notions about creativity,

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149 See, for example, the prominence of Haacke in many issues of *October Magazine*. See also, Wheeler, *Art Since Mid-Century*; Meyer, *Conceptual Art*; and Morgan, *Art into Ideas*.

150 When computer-telecommunications became accessible to civilians, Ascott was one of the first artists to use them for aesthetic purposes, and developed a distinguished reputation as a pioneering theorist and practitioner of Telematic Art. Telematic Art claims to achieve a state of technologically mediated dematerialization that Ascott has referred to in Derridean terms as “pure electronic difference.” See Roy Ascott, “Is There Love in the Telematic Embrace?,” *Art Journal* 49:3 (Fall, 1990): 241-7.
perception, and the limits of art … It … is probably not the province of computers and other telecommunication devices to produce works of art as we know it; but they will, in fact be instrumental in redefining the entire area of esthetic awareness.151

By re-examining the relationship between technology and Conceptual Art, this discussion has attempted to develop a better understanding of how computers and telecommunications entered into aesthetic discourses – explicitly and implicitly – in the late 1960s and early 1970s. The impact of these intellectual, technological, and social transformations on art and on culture in general are just beginning to be theorized, as their manifestation becomes increasingly pervasive, and as scholarship can, for the first time, reflect on the critical moments of those transformations from an historical perspective.

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151 Burnham, “Notes on Art and Information Processing” Software: 11.
Chapter 3. Telematics and Telematic Art

This chapter offers a historical chronology of the development of Telematic Art, setting the stage for a more critical discussion in Chapter 4. It begins with a description of telematics as defined by French Inspector General Simon Nora and Finance Inspector Alain Minc, who coined the term télématique in 1978. The introduction continues with a description of Telematic Art as defined by Roy Ascott, the field's primary theorist, identifying significant commonalities between the Nora/Minc definition and Ascott's description. The section ends by addressing some terminological issues that pertain to the definition of new technologies. The second section locates Telematic Art within a broad historical account of artists’ use of communications and telecommunications, showing its embeddedness in a particular current of twentieth century aesthetic discourses. Several directions in the subsequent development of Telematic Art are exemplified in the third section, which offers descriptions of more recent artworks that use the World Wide Web as a primary medium.

Introduction

Telematics, or the convergence of computers and telecommunications, is rapidly becoming ubiquitous in the developed world. Anyone who has corresponded using email, surfed the World Wide Web, or withdrawn money from an automatic teller, has participated in a telematic exchange. The term "telematics" is the English equivalent of

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the term *télématique*, coined by Nora and Minc in *The Computerization of Society.*

Written in 1978 at the request of President Valéry Giscard d’Estaing of France, this official government report outlined the nation’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) Nora and Minc described the impending telematic revolution 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.

While effusive about the potential impact of telematics, Nora and Minc were keenly aware of the desire of governments and other powerful interests to strictly monitor access to technologies 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

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3 Ibid: 4-5.
communication in such a way that every citizen and every group can be responsible for itself?4

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.”5

Telematic Art (though not yet under that title) emerged co-synchronously with Minc and Nora's Computerization of Society. This art-form uses computer-networking as a primary medium, just as conventional art uses paint, marble, or some other material. Ascott, whose work in the 1960s and 1970s joined art and cybernetics, was recognized by art historian Frank Popper as “the outstanding artist and theoretician in the field of telematics.”6 Indeed, it was Ascott who, having read Nora and Minc, applied the term "telematic" to art, coining the term "Telematic Art" in 1983. Because Ascott's theory and

4 Ibid: 10-11

5 Ibid: 11. 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, Andrew Feenberg, Alternative Modernity: The Technical Turn in Philosophy and Social Theory. (Berkeley: University of California Press, 1995): 144-166.

practice so definitively chronicle the conceptual and material history of the field, his work will be central to the following discussion of Telematic Art. His oeuvre, perhaps more than that of any other artist, constitutes a continuous bridge from cybernetics to cyberspace, offering a particularly rich source of material chronicling Art and Technology from the 1960s to the present.

Like Minc and Nora, 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 the French ministers’ 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 poetic analogy between cybernetics and computer-telecommunications, novelist William Gibson coined the term "cyberspace" in his 1982 short story "Burning Chrome," and elaborated on the concept in his 1984 novel *Neuromancer*. Cyberspace applies a virtual location to the state of mind an individual experiences in telematic networks. Telematics implies the potential exchange of information amongst 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. For 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 2000, Telematic Art is only beginning to gain wide recognition, though by no means has it achieved canonical status. This state of affairs is not surprising, given the general elision of Art and Technology from the canon, the relative youth of Telematic Art, and the challenges that this artistic medium 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 superpowers for technological dominance. Given this

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7 ARPANET was a project of the Advanced Research Projects Agency (ARPA). ARPA was founded in 1958 by the US Department of Defense in response to the successful launching of the Sputnik by the USSR. While the official purpose of ARPANET was to increase the speed with which scientific information could be exchanged by US scientists, it is rumored that it served an ulterior motive: a
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. In contrast to the paranoia of international relations in the nuclear age, Ascott proposes "telenoia" a concept that instantiates *noia* (knowledge) and *tele* (at a distance). Despite the logic of its Greek roots, this term unfortunately connotes a sense of fear of knowledge at a distance, rather than an embrace of it.

Before proceeding, it must be mentioned that definitions for the terms used to describe relatively new technologies, like telematics, virtual reality, and cyberspace, are unstable and overlap in complex, if not confusing, ways. The applications and manifestations of a given technology, like the terminological distinctions that apply to it throughout the course of its use, are highly variable, contextual, and historical. This condition 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 Nora and Minc initially proposed. As will be discussed at greater length in Chapter 4, hybrid forms incorporating telematics, robotics, and virtual reality complicate terminological distinctions. There is also a political component to the use of terminology, for the particular definition of any decentralized and highly redundant communications backbone that could be utilized in the event that nuclear weapons disabled the standard telephone network.
given term may vary to include or exclude the desired elements in order to support a personal or institutional agenda. Finally, historians of science and media theorists have questioned the autonomy of technology as an historical agent, pointing out that technological media, such as computer-telecommunications, are inextricably related to the political, economic, and cultural contexts in which emerge and operate. From this perspective, technology possesses no agency independent of the hybrid social practices of which it is a co-constituent.

Telematic Art and Its Precursors

All media impose restrictions while enabling forms of artistic expression. While bounded by the limitations and demands of the hardware and software that make it possible, telematics also enables artists to free their work from the conventional embodiment of art in a physical object located in a unique geographic location. According to Ascott, telematics provides a context for interactive aesthetic encounters and facilitates artistic collaborations amongst globally dispersed individuals. It emphasizes the process of artistic creation and the systematic relationship between artist,

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9 See, for example, Jay David Bolter and Richard Grusin, Remediation: Understanding New Media (Cambridge, MA: MIT Press, 1999): 75-78. Bolter and Grusin the problem of technical determinism and writing about media, noting that "It is difficult … to hold in relief all the aspects of a technology at any one rhetorical moment." 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." In spite of its shortcomings, I have followed this approach in my text.
artwork, and audience as part of a social network of communication. In addition to these qualities, Ascott argued that a distinctive feature of Telematic Art was the capability of computer-mediated communications to function \textit{asynchronously}.\footnote{Roy Ascott, email correspondence with the author, October 11, 1998.} Early satellite and slo-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 be actively engaged in the exchange at the same time. In 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. Ascott had anticipated this aspect of Telematic Art in his 1967 description of a “pillar of information [that would] store and record data ... available for everyone’s use in various areas, e.g., links to workshops, studios, ... exhibition spaces, or... directly to the central nervous system of any individual.”\footnote{See Roy Ascott,“The Cybernetic Vision in Art” (CAM/1 Information-Handling and Communications, ICC 3) \textit{Cybernetica}: 10:1 (1967): 25-56 . 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, \textit{The New York Times on the Web}, October 22, 1998. <http://www.nytimes.com/library/tech/yr/mo/circuits/articles/22brai.html>}

Ascott’s theory and practice of Telematic Art expanded on his Cybernetic Art praxis, 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 his telematic artwork *Ten Wings* (1982). Expanding on the sorts of connections he had made between cybernetics and parapsychology in his essay "Psibernetic Arch" (1970), twenty years later in "Beyond Time-Based Art: ESP, PDP, & PU" (1990) he identified correspondences between telematic consciousness and parapsychology, parallel distributed processing, and parallel universes theory, in which the processing and exchange of information occur in atypical or anomalous temporal modalities. Indeed, 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 will be discussed below. For indeed, they raised many of the same conceptual questions that the use of telecommunications by artists continues 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 these other genres. What, after all, could be more kinetic and performative than an interactive exchange between

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12 See, for example, Tilman Baumgärtel, “Immaterialien: Aus der Vor- und Frühgeschichte der Netzkunst” *Telepolis*: 3 (September 1997): 135 - 151. Also published online at <http://www.heise.de/tp/deutsch/special/ku/6151/1.html>.
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 exchange 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 open-up new frontiers for artists using mail, fax, and television as a medium. This convergence of interests brought great energy and richness to the use of telecommunications for art. By framing Telematic Art within these larger artistic and art historical contexts, the following discussion offers insight into the unique qualities of the genre, as well as its place in a continuity of aesthetic research.

Precursors

The first use of telecommunications as an artistic medium may well have occurred in 1922, when Hungarian Constructivist artist and later Bauhaus master 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.”

Whether or not the pictures were, in fact, ordered over the telephone is a matter of dispute. Their commercial method of manufacture, however, clearly questioned

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traditional notions of the isolated, individual artist and the unique, original art object. Moreover, by 1925, Moholy-Nagy wrote about the importance of "photo-telegraphy" and "wireless telegraphed photographs." It is unknown if 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 was 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 artist 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..." 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.17

Written in the midst of the rise to power of National Socialism, 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 he advocated. Like Brecht, Ascott was equally committed to the pedagogical role
of art. Furthermore, in "Art and Telematics" (1984), he began theorizing that the
decentralized and non-hierarchical 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."

As a variant of 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, American artist George Brecht mailed his "event cards," in order to distribute his
"idea happenings" to friends outside of an artworld context.18 The precise date when
such practices became historicized as the genre known as Mail Art is not known.


18 Thomas Dreher, "The Arts and Artists of Networking" in Karl Gerbel and Peter Weibel, eds., Mythos
concepts reduced to a minimal suggestion of an event that the reader could interpret and enact.
However, in 1968 artist Ray Johnson organized the first meeting of the New York Correspondence School, which expanded to become an international movement.\footnote{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.” <http://www.artpool.hu/Ray/RJ_curriculum.html> (cit: October 26, 1998).} 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.\footnote{Eduardo Kac, “The Internet and the Future of Art: Immateriality, Telematics, Videoconferencing, Hypermedia, Networking, Vrml, Interactivity, Visual Telephony, Artist’s Software, Telerobotics, Mbone, and Beyond,” Published in German in Mythos Internet, Stefan Muenker and Alexander Roesler, eds., (Frankfurt: Suhrkamp Verlag, 1997): 291-318. The author is grateful to Kac for furnishing the original English version.}

Mail Art was especially important amongst artists working in remote regions and countries, such as Eastern Europe, where access to contemporary Western art was severely limited, South America, and even Canada. Many such artists also embraced telecommunications technologies, such as fax, which expanded the capabilities of Mail Art. Hungarian artists György Galántai and Júlia Klaniczay, for example, founded the group Art Pool in the mid-1970s in order to obtain, exchange, and distribute information about international art, which was forbidden behind the Iron Curtain.\footnote{See <http://www.artpool.hu> (lm: September 8, 1997, cit: October 26, 1998).}
telecommunications projects attempted by visual artists. 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.”


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.

Kaprow, who readily admits that working with technology is not his strength as an artist,

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22 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. While 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.

23 Douglas Davis, *Art and the Future*: 90. The other artists commissioned to contribute to the show were Nam June Paik, Otto Piene, James Seawright, Thomas Tadlock, Stan Vanderbeek, and Aldo Tambellini.

explained that he was interested in the idea of “communications media as non-communications,” and that the most important message was the idea of “Oneself in connection with someone else.” Along these lines, *Hello* offered a critique of the disruptive manner by which technology mediates interaction. It metaphorically short-circuited the television network - and thereby called attention to - the connections made between actual people.

In 1971 Kaprow proposed an expanded vision of the possibilities of such communication/non-communication systems, a combination of video arcade and television studio, which he described as:

A global network of simultaneously transmitting and receiving “TV Arcades.” Open to the public twenty-four hours a day, like any washerette... Each equipped with a hundred or more monitors... A dozen automatically moving cameras (like those secreted in banks and airports, but now prominently displayed) will pan and fix anyone or anything that happens to come along or be in view. Including cameras or monitors if no one is present. People will be free to do whatever they want and will see themselves on the monitors in different ways. But the cameras will send the same images to all other arcades... Thus what happens in one arcade may be happening in a thousand, generated a thousand times... But the built-in program for distributing the signals, visible and audible, random and fixed, could also be manually altered at any arcade... The world could make up its own social relations as it went along. Everybody in and out of touch all at once!27

Though unrealized by the artist, Kaprow’s idea of linked commercial arcades has become commonly available through public Internet cafés and CU-See Me portals, through which


individuals can share real-time video transmissions of their private lives.

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...”28 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."29 Davis later commented that,

> 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.30

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


29 David Ross, "Douglas Davis: Video Against Video" *Arts* 49 (December 1974): 62.

passively consume pre-fabricated entertainments and commercial messages, has a long and distinguished history in the arts.

In *Expanded Cinema* (1970), a classic and perceptive account of experimental art in the 1960s, media historian Gene Youngblood documents how some of the first interactive video installations also challenged the uni-directionality of commercial media. In works like *Iris* (1968) and *Contact: A Cybernetic Sculpture* (1969) by artist Les Levine and *Wipe Cycle* (1969) by artists 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.”31 Schneider amplified this view of interactive video installation, stating that, “The most important function... was to integrate the audience into the information.”32 Gillette described, moreover, how *Wipe Cycle* was related to satellite communications: "you'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."33 While these works were limited to closed-loop video, they offered the unprecedented opportunity for the public literally to see itself as the content of television.


33 Ibid.
Significant museum exhibitions in 1969-1970 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 described 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.34

Kinaston McShine’s Information exhibition at the Museum of Modern Art (1970) and Jack Burnham’s Software exhibition, discussed in Chapter 2, examined how Conceptual Art could be seen as engaged in a form of information processing and exchange akin to that of computers and telecommunications.35 In the context of telematics, it is important to recall two works in particular from Software: 1) Hans Haacke’s News (1969), comprised of teletype machines connected to international news service bureaus, which printed continuous scrolls of information about world events; and 2) Ted Nelson and Ned Woodman's Labyrinth, the first public display of a computerized hypertext system, which allowed users to interactively construct non-linear narratives through a database of information. Software thus afforded the museum audience in 1970 an opportunity to

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interact in an aesthetic context with online data communications and hypertext - two of the key elements that would enable the construction of the World Wide Web some twenty years later.

On July 30, 1971, E.A.T. organized *Utopia Q&A*, an international telecommunications project comprised of telex stations in New York, Tokyo, Ahmedabad, 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 occurring over the next decade. As E.A.T. co-founder Billy Klüver noted in one of the early communications posted during the event,

> Our hope is that this project will contribute to recognition of and contact between different cultures. 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.36

*Utopia Q&A* poignantly utilized telecommunications to enable an interactive exchange across geopolitical borders and times-zones, creating a global village of ideas about the future.

These precursors, representing an extremely 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

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36 Transcript of *Utopia Q&A*, E.A.T. archive, Getty Research Institute for the History of Art and the Humanities, Los Angeles.
the mid-1970s.\textsuperscript{37} As telecommunications researcher John Carey and interactive television programmer Pat Quarles have pointed out, “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.”\textsuperscript{38} Similarly, telematics has been described 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.”\textsuperscript{39} Such concepts were first actualized in an artistic context in the late 1970s, which led to a decade of early aesthetic experiments with telecommunications.

\textit{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 predictable that artists were quick to take advantage of these opportunities. Although communications via satellite, cable, and computer-conferencing enable different types of experiences, there is much overlap between them in the


\textsuperscript{38} Ibid.

\textsuperscript{39} Roy Ascott, “Is There Love in the Telematic Embrace?: 241.
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. Far from comprehensive, the following history frames the development of Telematic Art within the context of the first decade that telecommunications became a viable art medium. The discussion proceeds more or less chronologically, offering descriptions of selected major monuments, and more detailed accounts of Ascott's *Terminal Art* (1980), *Ten Wings* (1982), *La Plissure du Texte* (1983), and *Organe et Fonction d’Alice au Pays des Merveilles* (1985).

In 1977 “the first artists’ live, bi-directional, transcontinental satellite transmission” took place. The *Send/Receive Satellite Network* emerged from Keith Sonnier's idea to make a work of art using satellite communications. Liza 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 the National Aeronautics and Space Administration (NASA). Given the proliferation of the Internet and community access cable in the 1980s and 1990s, it may now be difficult 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. Artists Willoughby Sharp and Duff Schweniger rigged a military infrared transmission system between the mobile satellite transceiver (affectionately known as the “Bread Truck”) at the Battery Park landfill and the Manhattan Cable system downlink at the Rector Street subway station. According to Sharp, this experiment was the first time the Manhattan Cable system uplinked information from a downlink box, a technique which it later used to great commercial success for live broadcasting of the New York Marathon. Artists Sharon Grace and Carl Loeffler coordinated the San Francisco end, gaining access to a fully-equipped studio. For six hours over a period of two days, participants on both coasts engaged in a two-way interactive satellite transmission, which was distributed live within the respective cities via cable television. 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 shown on a split-screen. However interesting and novel the programming may have been, Bear has insisted that “the process was paramount.” Because they were exploring the use of unfamiliar technological media, it was crucial to “let the materials speak for themselves.” Here it is important to note that this first satellite work emphasized the primacy of process that Ascott had articulated in the mid-1960s, and which has remained central to his theory and practice of Telematic Art.

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


43 Liza Bear, telephone interview with the author, October 26, 1998.
Also in 1977, artists Kit Galloway and Sherrie Rabinowitz organized the *Satellite Arts Project*. Again with the support of NASA, using time-delay satellite feedback 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 time-delay, with those of their remote partners projected on the screen.

In 1971, Canadian artist Bill Bartlett began focusing his artistic research on promoting the “exchange between artists through the ‘regeneration, transformation, transportation, communication and transmutation of images.’” That year he founded the group “For Continuous Use League,” which Bull has cited as “the first group to devote its full energies to artists’ telecommunications projects.”

Inspired in part by Brecht’s theories of media and the potential of an interactive, two-way exchange of information, Bartlett initially began using mail and telephone, then slow-scan, and finally with Toronto artist Norman White began to use the I.P. Sharp Associates (IPSA) international computer timesharing network in 1978.

The first work of art to use computer-conferencing, and therefore the first work of

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44 Hank Bull, “Notes.”

45 Ibid. White had a free account on the IPSA network through his friend Bob Bernecky who worked there as a systems programmer. The only problem was that White didn’t know anyone 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 also met.
Telematic Art proper, was *Sat-Tel-Comp Collaboratory* (1978). This multi-media telecommunications art project was organized by Bartlett's Direct Media Association, using the IPSA network,\(^{46}\) in order to promote the "regeneration, transformation, transportation, communication and transmutation of images."\(^{47}\) The *Collaboratory* used this precursor to Internet-based email for the telematic exchange of texts between four sites in the US and Canada. The project 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 US. Slow-scan utilized a picture scanning robot 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 degree of actual participation that QUBE claimed to offer users. He wrote,

> 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.\(^{48}\)

He noted that in a 1978 program on eggs, “forty-eight percent of the homes had pressed

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\(^{46}\) Prior to the advent of PCs beginning in the late 1970s, computers were relatively large, expensive, and rare, which necessitated that users 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.

\(^{47}\) Hank Bull, “Notes.” Subsequent quotation comes from the same source.

the scrambled button.” Sarcastically referring to a newspaper headline lauding the QUBE system, the artist added, “This is how viewers are ‘talking back to their television sets.’”

Despite claims by Warner Cable 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.”

Given D’Agostino’s critical posture regarding QUBE, perhaps it is not surprising that the cablecast component of the artist’s proposal was cancelled “due to ‘special programming’” and never rescheduled.

In 1979, Bartlett organized Interplay: Computer Culture/Interactive Communications, which again utilized the I.P. Sharp network to link twenty-two sites in Australia, North America, and Europe for a communications conference. In 1980, Bartlett, Grace, and Loeffler organized Artists’ Use of Telecommunications: Live International Video and Audio Link. This event comprised the international, online expansion of a conference held at the San Francisco Museum of Modern Art. According to Bull, it was the most ambitious and successful of the early telecommunications art projects. It incorporated a two-way slow-scan audio, video, and personal computer link between the San Francisco conference and ten sites in Canada, Europe, the continental US and Hawaii. As Loeffler later commented,

> It took 2 years to set it up, and it was over in 2 hours! Essentially, a two way audio and slo-scan video link to Australia, Japan, Canada, Austria, and points in the U.S. This was the first time a slo-scan networked project found its way into a museum. It was neat to connect up like that. The

49 Ibid: 15.
organization was conducted over computer networks, largely the I.P. Sharp system, a Canadian teleconferencing company that donated connect time. We also used Atari computers that had acoustic couplers, built-in modems, and just printed out on paper, no screens.\textsuperscript{50}

Ascott's first Telematic Art project, \textit{Terminal Consciousness}, took place in 1980. Sponsored in part by grants from the National Endowment for the Arts and the Gwent College of Higher Education, 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).\textsuperscript{51} As Ascott later recollected,

I... mailed portable terminals to a group of artists... to participate in collectively generating ideas from their own studios... Don Burgy chose to take his terminal wherever he was visiting and log-in from there.\textsuperscript{52}

\textit{Terminal Consciousness} was the first artists' computer-conferencing project between the US and the UK, and the first ever to use the INFOMEDIA Notepad System. As distinguished from telex or electronic mail, which did not offer “logical control of the conference context or a retrievable group memory,” astronomer and Infomedia founder Jacques Vallée claimed that \textit{Notepad} was, “the first commercial use of a new medium

\textsuperscript{50} Mark J. Jones, “Email From Carl” (Online publication of Email interview with Carl Loeffler) \textit{Cyberstage} 1:2 (May, 1995) <http://www.cyberstage.org/archive/cstage12/carl12.htm>

\textsuperscript{51} Peter Large, “Terminal Consciousness” \textit{The Manchester Guardian} October 4, 1980.

that fully utilize[d] the logical and memory abilities of the modern computer.”53 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. As Ascott explained at the time, the group could "tell the computer to turn up any mentions of giraffes and ice cream…” and he added that, "The surrealists could have a field day.”54

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 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.”55

Ascott's earliest attitudes about the experience of telematics and its possibilities as an art medium are reflected in a statement he contributed to the Saturn Encounter, an interdisciplinary computer-conferencing project that overlapped with Terminal Consciousness.

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,


54 Peter Large, “Terminal Consciousness.”

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...

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." Building on the prior experience of their *Satellite Arts Project* (1977), 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.”

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56 Vallee, ed., *Saturn Encounter*. These comments were made by Ascott telematically as part of the *Saturn Encounter* conference organized by Jacques Vallee, Ren Breck, and Stan Kent.


58 Bull, “Notes”
In 1984, commissioned by the Museum of Contemporary Art, Los Angeles for the Olympic Arts Festival, Galloway and Rabinowitz created the *Electronic Cafe*. This work comprised a “real-time, multimedia computer-video network and public image bank that interconnected five ethnic neighborhoods in Los Angeles for seven weeks during the Olympics.”

The *Electronic Cafe International* has evolved over the years to include over 40 nodes around the globe. In keeping with its founders’ vision to create a culturally diverse virtual community in which ideas and information can be exchanged regardless of economic, ethnic, or geographic boundaries, the Electronic Cafe claims to continue to conduct “ground-breaking aesthetic research in the exploration of real-time networked collaborative multimedia environments.”

Douglas Davis began experimenting with satellite transmission in 1977, as part of ongoing efforts to question the possibility of increasing the intimacy of the experience of watching television, including two-way exchanges. For Documenta 6, he and Joseph Beuys “collaborated in a performance simulating Davis breaking through a television screen into a viewer’s home.”

In 1981, Davis produced the satellite telecast and radio broadcast *Double Entendre: Two Sites Two Times Two Sides. (For Roland Barthes) (A Live Radio-Television Performance. For Paris and New York)*. This work involved a two-way telecast between Davis at the Whitney Museum in New York and his female

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counterpart, or persona, Nadia Taleb, at the Centre Pompidou in Paris. According to artist and critic Robert C. Morgan, Davis “intended the dialogue and visual character of this performance as a manifestation of so-called ‘poststructuralist’ ideas ... introduced ... by ... Roland Barthes [in] A Lover’s Discourse.” Morgan suggested that just as Barthes was “attempting to break out of the structuralist mold of linguistic analysis” so Davis in *Double Entendre* was attempting to use telecommunications technology as “a kind of ploy, making fun of the medium in order to emphasize the message - *his* message - being a unique commentary upon the human condition.”

Robert Adrian began experimenting with computer networking in 1979. His major telematic project, *The World in 24 Hours* (1982), was an extraordinarily ambitious telecommunications project commissioned by Ars Electronica. Connecting artists and artist groups in 16 cities on three continents, each node of this global network organized a contribution that made use of any combination of slo-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. 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

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63 It is reputed that Bartlett dropped-out of telecommunications art after artistic collaborators left him to foot a telephone bill that he could not afford to pay, a situation clearly antithetical to his idealistic aims of global sharing. 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).
possible only with substantial funding or at great personal expense.

The history and evolution of ARTBOX is noteworthy, because it constitutes a major technological achievement that enabled many text-based Telematic Art projects in the 1980s. Adrian explained that, "In the summer of 1980, Bill Bartlett and I began to put pressure on IPSA 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 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.

Ascott's *Ten Wings* (1982, Figure 3.1) was one of contributions to *The World in 24 Hours* that utilized the IPSA ARTBOX network. As the artist described in “Art and Telematics,” participants in *Ten Wings* were invited to join in the first planetary throwing of the *I Ching*. 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." 64

Ascott’s *La Plissure du Texte* (The Pleating of the Text, 1983, Figures 3.2-3.4)

64 Robert Adrian, Interview with the author, December 13, 1999, Plymouth, England.
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 in Vancouver, organized the ARTEX system for it. Identified by *Leonardo* 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 US, Canada, Europe, and Australia to experiment with what the artist has termed “distributed authorship.” Each remote location represented a character in the “planetary fairytale,” and participated in collectively creating and contributing texts and ASCII-based images to the interactive unfolding, or distributed authorship, of the emerging story. Distributed authorship in Telematic Art makes concrete Derrida's assertion that "The 'subject' of writing does not exist if we mean by that some sovereign solitude of the author. The subject of writing is a system of relations between strata: the Mystic Pad, the psyche, the society, the world." Bull, who participated in the event from the Vancouver node, described “the result of this intense exchange” as a “fat tome of Joycean pretensions that delved deep into the poetics of disembodied collaboration and

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65 The roles were: Alma (Quebec) - "beast"; Amsterdam - "villain"; Bristol - "trickster"; Honolulu - "wise old man"; Paris - "magician"; Pittsburg - "prince"; San Francisco - "fool"; Sydney - "witch"; Toronto - "fairy godmother"; Vancouver - "princess"; Vienna - "sorcerer's apprentice." Robert Adrian, "Art and Telecommunications: The Pioneer Years," A transcript of “La Plissure” compiled by Norman White at the Toronto node is available online at <http://www.bmns.com/~normall/artpage.html>.

French artist and media theorist Edmond Couchot has noted similarities between the process of distributed authorship and the Surrealist game of *cadavre exquis*, in which one artist would begin a drawing, and several others, not knowing what preceded them, would continue it. 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 Surrealist’s 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. Such a collaborative process parallels Ascott’s goal of creating a field of consciousness greater than the sum of its parts.

Telematic artworks like *La Plissure du Texte* have challenged 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

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67 Hank Bull, “Notes.” He further clarified this statement, 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, email correspondence with the author, September 23, 1998.


others are relinquished in order to allow a more open-ended development, fashioned by participants or "participators" (Ascott’s preferred term), involved in a multi-directional 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 is, moreover, a pun that refers to French semiotician and literary critic Roland Barthes’ essay “Le Plaisir du Text” (1973). In “Art and Telematics” Ascott claimed that text is commonly perceived as a tissue that simultaneously veils, but also permits, access to the meaning or truth hidden behind it. In contrast, he noted that Barthes proposed “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.”70 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. In this vein, Couchot suggested that telematic networks “offer the artist the only medium really capable of breaking the barriers of time and space and which, one day, will set one free of the limits of individual, national, and cultural intelligence.”71


71 Couchot, Images: 187. Author’s translation.
The potential of telecommunications to allow such individual and cultural freedom was at the heart of the major satellite telecast that Nam June Paik organized on New Year’s Day, 1984. *Good Morning Mr. Orwell* was intended as a liberatory and multi-directional alternative to the threat posed by “Big Brother” surveillance that George Orwell warned of in his novel *1984*. Paik explained that,

> 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.\(^72\)

Broadcast live from New York, Paris, and San Francisco to the US, France, Canada, Germany and Korea, the event reached a broad international audience and included the collaboration of, among others, artists John Cage, Laurie Anderson, Charlotte Moorman, and Salvador Dali.\(^73\)

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, Figure 3.5) for *Les Immateriaux*, the exhibition curated by Jean-Francois Lyotard at the Centre Pompidou 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

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experience the sort of intertextual pleating the artist had initiated in *La Plissure du Texte*. Sharing significant conceptual and formal similarities to Jacques Derrida's *Glas, 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 "sampled" and juxtaposed with quotations from a scientific treatise entitled *Organe et Function*, creating unexpected relationships and associations. Conventional notions of originality, authenticity, objecthood, narrative, and style were supplanted by appropriation, duplication, distribution, juxtaposition, and randomness. Lyotard, it must be noted, was exceptional in casting works of Art and Technology within the context of postmodernism. For indeed, the contemporaneous literature on Postmodern Art, like the discourses on Conceptual Art, have generally failed to recognize the contributions of Art and Technology to the ideals they otherwise promoted, an oversight that persists.

Telematic Art was embraced by the Venice Biennale in 1986. Ascott, along with Tom Sherman, Don Foresta and Tomasso Trini, were the international team of commissioners responsible for organizing the Laboratorio Ubiqua (Ubiquitous Laboratory, Figure 3.6). Part of this project included a variety of telecommunications stations (fax, slo-scan, computer-conferencing) assembled under the title Planetary


Network. Robert Adrian organized the telematic component on ARTEX, and traveled around the world to observe each node in operation. He later recounted that, “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 ...”

With entré into this canonical international exhibition, the pioneer days may indeed have been over. While one senses remorse 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 non-artists alike to participate in telematic exchanges.

76 Robert Adrian X, “Art And Telecommunications 1979-1986: The Pioneer Years,” *Springer* 1:1 (1995) cited March 20, 2001. There have been numerous large-scale telematic networking projects since the Laboratorio Ubiqua, utilizing newer technologies, such as personal computers, electronic bulletin board systems (BBSs), and the Internet. The Ponton European Media Art Lab’s *Piazza Virtuale* (Virtual Plaza, 1993) for Documenta IX in Kassel, Germany stands out for its use of a variety of media, including telephone, fax, videophone, ISDN, and satellite to produce live, interactive television, freed from the confines of the studio. Up to twenty people from around the world could interact with each by contributing voice, text, images, and video to a program broadcast to Europe, North America, and Japan. Ole Lntjens, who designed that interface has stated, “The Piazza Virtuale is a step forward for the media art of the future, in which interactive television and international networks can be an important collective form of expression.” Lntjens quoted in Eduardo Kac, “Interactive Art on the Internet” *Mythos Information: Welcome to the Wired World* (Vienna and New York: Springer Verlag, 1995): 175.
Extensions: Telematic Art and the WWW

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 mark-up language (HTML), and the free distribution to consumers of browsing software (such as Navigator and 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 US and Canada grew exponentially, from 37 million in 1995 to over 90 million in 1999. The WWW is used in a variety of 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 as theorized by Ascott, it is used as an artistic medium in itself, often exploring distributed authorship and alternative modes of narrativity, as in the work of Antonio Muntadas and Melinda Rackham. 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.

The File Room, created by artist Antonio Muntadas with the collaboration of Paul Brenner and Maria Roussos in 1994, is one the most extensive early works of Telematic Art to use the WWW as a medium. Initially conceived as part of an installation at the Randolph Street Gallery in Chicago, the File Room is an ongoing project comprised of a massive and growing electronic database on the censorship of art. Amidst critiques of the
lack of content on the Internet, *The File Room* provides remarkable substance and wealth of information and makes use of the hyperlinking capabilities of the WWW as a navigational method. In addition, this work utilizes the networking capabilities of the Internet in order to allow users to add their own experiences of censorship, thus allowing the work to emerge as a collaboration amongst participators.

Like Ascott's *La Plissure du Texte*, Melinda Rackham’s *Line* (1997), is an online fairytale. This Web-based artwork subtly integrates visual and textual elements to create a hypermedia fiction about identity in cyberspace. Using a simple and intuitive interface, the seventeen screens incorporate both associative connections via text and random elements via the image. A map allows the participator to visualize where s/he is in relation to the other screens. Users are invited to email their own personal views, which become incorporated in the work, adding intimacy and complexity to it, and allowing for a two-way exchange of information.

Ascott’s *Aspects of Gaia* (1989, Figures 3.7-3.8) 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 who collaborated in the creation and transformation of texts and images related to British chemist James Lovelock’s “Gaia Hypothesis.” This holistic theory suggested that the

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Earth (Gaia) is a unified living organism, and that climate, atmosphere, geography, plants and animals have co-developed in a way that sustains the vitality of the planet.  

Participators could access and contribute information to a global flow of data via several interfaces, and on three 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."

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 the 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.) On the lower level, horizontal computer screens were set into what Ascott referred to as “information bars,” metaphorical cocktail lounges 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 bars 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 flashed messages about


79 Roy Ascott, “Is There Love in the Telematic Embrace”
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 described in “Is There Love in the Telematic Embrace?” (1990), 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 been explored by a number of artists subsequently, challenging conventional relationships between human and non-human agents. Artist Stelarc (b. Stelios Arcadiou) offers a compelling approach this area of Telematic Art. Since commencing his controversial suspension performances in 1976, perhaps no artist has pushed the physical limits of the human body with respect to technology more than he.80 In Ping Body (Figure 3.9), first performed on April 10, 1996 in Sydney, Stelarc wired his body and his robotic “Third Hand” to the Internet, and allowed variation 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 the artist 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.81

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*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 than Ascott’s emphasis on distributed authorship in his telematic projects. However, in *Ping Body*, remote individuals could exert influence telematically on Stelarc’s behavior.

As a further example of Web-based art beyond the Internet, *TechnoSphere*, spearheaded by artist Jane Prophet beginning in 1995, combined telematics and artificial life.\(^8^2\) This work used the Web as an interface to “an evolution simulator that enables people to create their own creatures and communicate with them as they grow, evolve and die in a virtual three-dimensional environment.”\(^8^3\) 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 parented. The activities of each creature: its weight, its battles with other creatures, its reproductive success, and so on, were

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calculated using natural selection algorithms and the creator was periodically emailed updates on his/her offspring's status. *Technosphere* was unique in its conjunction of 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. While CAiiA+STAR was not a work of art, per se, it constitutes a large, ongoing 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. CAiiA+STAR is a Ph.D. program designed to develop analytical skills for theorizing and writing aesthetic ideas related to students' professional practice of interactive art. It promotes artists’ writings and raises the authority of the artists who complete the program to the level of Doctor of Philosophy, granted by the University of Wales, Newport. As a result, the program is helping dismantle the social misconception of the artist as an intuitive “producer of enigmas” and replace it with a concept of the artist as an intellectual with the highest academic credentials. In these ways, CAiiA+STAR extends Ascott’s research on telematics into social praxis. At the same time, the program 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.\textsuperscript{84}

Chapter 4. Conclusion: Towards a Critique of Telematic Art

The final chapter offers a series of critical analyses of key issues raised in Chapter 3 with respect to history of telematics and Telematic Art. It begins by comparing Telematic Art with Telerobotic Art and discusses the question of agency with respect to tele-mediated systems, distinguishing between active-active and active-passive forms of agency. It continues with a description of Ascott’s theory of the "telematic embrace," and addresses some of the artist's diverse sources, such as Charles Fourier's metaphysical notion of love as "passionate attraction." This discussion sets the stage for a more probing interrogation of the foundations and aims of Telematic Art, particularly with respect to Ascott's notion of global consciousness. The primacy of ideas in Telematic Art suggests further convergences between artists' use of technology and Conceptual Art, as proposed in Chapter 2.

Tele-Agency: Telematics, Telerobotics, and the Art of Meaning

We look for the creation of a nonhuman type in whom moral suffering, goodness of heart, affection, and love, those sole corrosive poisons of inexhaustible vital energy, sole interrupters of our powerful bodily electricity, will be abolished… This nonhuman and mechanical being, constructed for an omnipresent velocity, will be naturally cruel, omniscient, and combative.

- Filippo Tomaso Marinetti

Unhindered by morality, tenderness, or internal volition – that is, by any hint of personal agency – Marinetti’s ideal Fascist worker could inexhaustibly build the future.
with the utmost efficiency. Such a mechanical being would as readily carry out the plans of Mussolini as it would those of Mother Theresa. It would do so without pausing to consider its own desires or the consequences, because it cannot care. It is the perfect slave and the perfect soldier, but the worst kind of citizen. For citizens, in the republican sense, must possess agency and must care about the results of their actions if they are to fulfill their responsibility to construct, maintain, and improve society. Indeed, in western society it is the empathic exchange of information, the give and take of ideas between active agents necessary for consensus, that is the backbone of democracy and the precondition for human dignity.

Given its human and political implications, especially regarding technology, the concept of agency and the rhetoric surrounding it must be problematized with respect to telematics and telerobotics. Recent literature, such as *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet*, identifies "agency" as one of the "central issues for the new subject of telepistemology: the study of knowledge acquired at a distance." By analyzing artworks that utilize these telecommunications technologies, the following discussion differentiates between various models of agency, and suggests some of their epistemological and ontological implications. By comparing the historical ideological issues underlying telematics and Telematic Art with the goals for telerobotics and Telerobotic Art, this analysis identifies some of the continuities and discontinuities between them, especially as they concern agency. In particular, in classic

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works of Telematic Art, such as Ascott's *La Plissure du Texte* (1982), *active agents* exchange information with other *active agents*. Standard implementations of telerobots, by contrast, are predicated on a model in which an *active agent* controls a *passive entity* that lacks agency. Some works of telecommunications art expand conventional conceptions of telerobotics. For example, Norman White and Doug Back’s *Telephonic Arm Wrestling* (1986, Figure 4.1), Paul Sermon’s *Telematic Vision* (1994, Figure 4.2), and Eduardo Kac and Ikuo Nakamura’s *Essay Concerning Human Understanding* (1994, Figure 4.3) employ *active-active* models of telerobotic agency. Such artworks shed light on the philosophical, ethical, and aesthetic limits of active-passive telerobots and offer alternative structures for the creation of knowledge and being at a distance.

As discussed in the previous chapter, Nora and Minc’s aspirations for telematics, like Ascott’s theories of Telematic Art, were concerned with how technology would enable agency to emerge bottom-up from the periphery, rather than from centralized institutions controlling social relations hierarchically from the top-down. Similarly, a primary goal of Internet-based telerobotics is to allow a decentralized set of individuals who are geophysically distributed across the globe to experience telepresence and express their agency individually and collectively at a centralized site. The user’s remote location can protect her/him from dangerous environmental conditions (such as radioactivity and war), or permit that user’s will to be enacted in places s/he could not physically go (such as Mars). Internet-based telerobots also allow for a degree of democratization and collaboration, since they theoretically can be made accessible to the general public, and
certain implementations may permit multiple users to participate simultaneously as agents in observing and manipulating a remote site.

Both telematics and telerobotics claim to enhance agency, empowering the user to attain knowledge and control that otherwise would not be possible. But it is precisely on the basis of agency that a notable distinction can be made between telematics and telerobotics. Indeed, the term “agency” circumscribes a broad range of potentialities that demand more careful delineation.² To clarify matters, agency may be interpreted in terms of two basic models: 1) active-passive and 2) active-active. It must be noted here that the active-passive and active-active models of agency are neither mutually exclusive, nor do they exhaust the many possible varieties of agency. Nevertheless, the distinction between them offers a starting point for developing a more subtle understanding of the profound implications that tele-mediated agency has on human and non-human relationships.

The etymology of robotics offers insight into why the field has been constructed around an active-passive model of agency. The term “robot” comes from the Czech word “robota,” meaning work or compulsory service. Consequently, the literature on robotics and telerobotics employs the terminology of “master” and “slave” to describe the relationship between the active human agent who issues instructions and the passive mechanical apparatus that executes them. To use a typical example, human agents

² The rhetoric of agency vis-à-vis telematics and telerobotics is most similar to the use of the term in sociology (the freedom to create, change, and influence institutions and events). There is also a large literature on agency in business law, which addresses the ability and responsibility to act as an agent on the behalf of someone else.
(active) control via the Internet a remote robotic gripper (passive) that can manipulate an array of blocks. Agency resides solely with the active component of the system; the passive component has no agency. While telematics and telerobotics are capable of enabling many types of agency, Ascott’s theory of Telematic Art aspires to the active-active model, while most commercial and artistic implementations of telerobots employ an active-passive one.

_Telerobotics and Art_

Artist Eduardo Kac has written, “One of the most problematic issues of robotics in art is the very definition of what a robot is.” He continued,

If artists working with or interested in robotics cannot ignore mythological, literary, or industrial definitions of robots …, it is also true that these definitions do not directly apply to any given robotic artwork… As artists continue to push the very limits of art… they introduce robotics as a new medium at the same time that they challenge our understanding of robots – questioning therefore our premises in conceiving, building, and employing these electronic creatures.³

Kac rightly notes that the concept of the robot or automaton was not the invention of engineering, but rather emerged thousands of years ago in the Greek myth of Galatea, and was recapitulated in the Jewish mystical legends of the Golem, beginning in the Middle Ages. The historical inextricability of automata, robots, and the arts was well documented a quarter of a century ago in the chapters "Sculpture and Automata" and "Robot and Cyborg Art" of Burnham’s _Beyond Modern Sculpture_. Indeed, the word

“robot” gained its contemporary meaning only in the twentieth century after Czech dramatist Karel Capek used the term to refer to mechanical automata in his 1921 play *R.U.R. (Rossum's Universal Robots).*

It is inevitable that mythology and the arts will continue to play an important role in creating the future of robotics and telerobotics, if through no other process than by simply imagining possible uses (or misuses) of them for aesthetic, rather than practical purposes. Along these lines, artist Rafael Lozano-Hemmer has recently advocated the work of artists who “pervert technological correctness” by using technology to interrogate technocratic norms and values, thereby opening up new ways of thinking about the relationship between humans and machines. Such artistic interventions have a distinguished history. In 1962, Renato Poggioli described “perversion” as an ironic strategy of the avant-garde, which points out the emptiness of the “miracles that science seems to promise.” Such irony, he wrote, “can become pathetic and tragic … focusing not only on the way the machine fails man, but also on the way man fails the machine.” With varying degrees of perversity and irony the following artists and artworks utilize telematics, telepresence, telerobotics, and hybrid technological forms in ways that challenge conventional definitions of telerobotics and explore alternative modes of

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agency, that question traditional values, reconsider the foundations of knowledge, and explore the emptiness of science's promised miracles. They offer expanded conceptions of what telerobots can be, what sorts of knowledge they can enable, and the relationship between sentient and non-sentient beings.

**White and Back: Telephonic Arm Wrestling**

One of the earliest works of Telerobotic Art was *Telephonic Arm Wrestling* (1986) by Canadian artists Norman White and Doug Back. The idea for the piece emerged from a bar-room conversation regarding the US-Soviet Arms Race. “Wouldn’t it be great,” Doug Back suggested, “if it could be resolved by arm-wrestling?” White, who began making robots in the early 1970s (and, as mentioned in Chapter 3, was a pioneer of Telematic Art), explained that, “the idea was to allow contestants in two different cities to arm-wrestle, using motorized force-transmitting systems interconnected by a telephone data link.” As such, the system would not follow the conventional active-passive relationship of telerobotics, but instead would allow information to flow bi-directionally between identical robotic arms controlled by active agents at each of two sites. After engineers at the University of Toronto estimated a cost of $75,000, the artists decided to try to build it themselves, which they succeeded in doing in two months for

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6 Paraphrased by Norman White, telephone interview with the author, May 23, 1999. All other quotes by White are from this interview unless otherwise noted.

approximately $500 by “throwing together a bunch of junk” along with some home-made custom electronics.\(^8\)

Initially attempted at the "Strategic Arts Initiative" conference in Salerno, Italy, the first successful implementation of the work took place between the Canadian Cultural Centre in Paris and the Artculture Resource Centre in Toronto. While so much of the rhetoric surrounding artists’ use of telecommunications in the 1980s focused on the idealistic goals of collaboration, emergence, and decentralization, *Telephonic Arm Wrestling* wryly established a low-tech system for resolving competitive, if not antagonistic relations. While the work enabled active-active agency, because of the time-delays in the telephone link, the system could not support standard rules of engagement. It was impossible for the competitors to really have much of a fight. Under certain circumstances, both sides could win simultaneously, fundamentally undermining the bipolar competitive model of win-lose, and demanding a different sort of interactional goal between participants. In this case, there was no victor, only local perceptions, a telling commentary on the Arms Race and the opposition of capitalism and communism. Moreover, because each participant “inhabited a separate Einsteinian time-space continuum,” the work brought into relief the contingency of perception and the relativistic constraints of agency. At the same time, the system was remarkably sensitive. As White explained, “You could almost feel the pulse of the other person … it was uncannily human-like - the sensation of sinews and muscle - not at all like feeling a

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machine.” *Telematic Arm Wrestling* poetically revealed some of the unpredictable phenomena and perceptual warps of telematics and telerobotics, offered an ironic cultural response to Cold War politics, and raised important issues of agency in technologically mediated systems.

**Paul Sermon: Telematic Vision**

As its title suggests, Paul Sermon’s *Telematic Vision* (1994) was conceived of as an artwork using telematics, not telerobotics. Yet to consider it in the context of telerobotics offers a challenge to the boundaries of the field. In this piece, an ISDN line connects two remote sites that are 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 are simultaneously superimposed on both monitors so that people sitting on the sofa at site A see themselves sitting on the sofa with the people at site B, and vice-versa. The emotional and intellectual impact of this telematic exchange is difficult to grasp without experiencing it directly. One participant reported feeling rejected by a person at a 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 other. Feeling violated by a phantom image, the less demonstrative participant felt compelled to leave.

The affective power of such virtual exchanges with respect to the construction of knowledge and the enactment of agency raises a number of questions regarding telerobotics. Does *Telematic Vision* fit within the domain of telerobotics? Clearly Sermon’s work does not include a dexterous robotic arm, a standard device of
telerobotics. Nor can the position of the video cameras in *Telematic Vision* be remotely controlled, another typical provision in telerobotics. At the same time, Sermon’s work satisfies industrial engineer Ken Goldberg's definition of telerobotics as a system that “offers data that claims to correspond to a live remote physical reality and allows remote users to perform actions and gauge the results.” In contrast to standard telerobotics, *Telematic Vision* enables active-active agency. Each participant can influence the behavior of another person at a remote location. Agency, here, is not exercised by the physical manipulation of material objects via mechanical apparatus, but rather by the mutual evocation of responses through the immaterial projection of body language.

Accepting *Telematic Vision* as a telerobot may come down to whether or not one makes a distinction between a machine that, for example, remotely showers a garden with water, as in Goldberg's *Telegarden* (1995, Figure 4.4), and one that remotely showers a screen with cathode rays. By this measure, however, so many forms of communication would enable telerobotic agency that both telerobotics and agency cease to remain useful concepts.

The process of negotiating and determining which types of telematic and telerobotic agency have significance within the context of art cannot be separated from the ideological positions expressed by making those terminological distinctions, and the

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implicit, vested interests that demarcate particular disciplinary boundaries. As sociologist Thomas F. Gieryn has written, “Boundary-work is strategic practical action … Borders and territories … will be drawn to pursue immediate goals and interests… and to appeal to the goals and interests of audiences and stakeholders…”10 Quoting Pierre Bourdieu, Gieryn further notes that such boundaries constitute “ideological strategies and epistemological positions whereby agents … aim to justify their own position and the strategies they use to maintain or improve it, while at the same time discrediting the holders of the opposing position and strategies.”11 In other words, artistic and scientific domains are not bounded by natural borders, but rather are constructed by those who stand to benefit from particular configurations of those domains. Such is the case with the differential claims made by artists and engineers over the domains of telematics and telerobotics. Ultimately, the question becomes how those borders and territories are “mapped out in pursuit of some observed or inferred ambition – and with what consequences, and for whom?”12

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environment and through sensors can gauge the consequences" (7). This definition is still loose enough to accommodate Sermon’s *Telematic Vision.*


A collaboration between Eduardo Kac and Ikuo Nakamura, *Essay Concerning Human Understanding* (1994), was a rare artistic attempt to use telematics to facilitate remote communication between non-humans, in this case, a canary in Kentucky and a philodendron plant in New York. Kac described the mechanics of the installation:

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.\(^\text{13}\)

While the bird and the plant ostensibly communicated with each other, Kac noted that humans also interacted with the bird and the plant as well, causing the bird to sing more or less, and the plant to activate greater or fewer numbers of sounds. In this way, humans, plants, and animals became part of a tele-mediated assemblage of feedback loops, each affecting the behavior of the other and the system as a whole. Here agency was no longer the exclusive province of humans, but was endowed primarily in the canary and philodendron who shared information in an active-active way.\(^\text{14}\) But agency in *Essay* is more properly rhizomatic, in the sense that multiple agents interacted with each other on

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\(^{14}\) Of course the bird’s and plant’s ability to affect a remote environment was made possible only through the mediating agency of computers and telecommunications and the humans who designed the system.
myriad levels, all contributing to the overall behavior of a non-linear system of exchange.\textsuperscript{15} 

The title of this artwork ironically refers to John Locke’s 1690 treatise of the same name, which begins by stating that “… it is the \textit{Understanding} that sets Man above the rest of sensible Beings, and gives him all the Advantage and Dominion which he has over them…”\textsuperscript{16} Kac and Nakamura’s \textit{Essay} subverted the conventional active-passive relationship described by Locke, which remains fundamental to most implementations of telerobots. Instead of a one-sided exchange in which agency is defined by human command causing non-human response, their work enabled was a multi-directional flow of information that inverted conventional hierarchies of control. In \textit{Essay}, the avian and botanical agents were the primary actors engaged in a telerobotic exchange, and the human agents were secondary components in the system.\textsuperscript{17} While the degree to which the bird and plant had a meaningful exchange remains unclear, Kac and Nakamura attempted to enable interspecies communication by translating, metaphorically, between the participants. At the same time, \textit{Essay} can be seen as a metaphor for the very possibility of communication and the human desire to overcome isolation by bridging the gap between self and other, subject and object.


\textsuperscript{17} From another perspective, the bird and plant were objectified in a work of art authored by human beings for consumption by other human beings. Nonetheless, the work provides a model in which those conventional relationships are altered.
As an unanticipated result, this work of art also brought to light the difficulty of overcoming the boundaries between science and art, forcing the artists to question the possibility of communication between them. Kac noted that, “scientists … were quick to ask if and how we were measuring the bird's and the plant's responses … reveal[ing] a basic misunderstanding of our work on their part.”¹⁸ For the artists were concerned with producing symbolic, qualitative meaning, not with gathering and quantifying experimental data. This disjuncture between science and art parallels how the goals of artists and engineers using telerobots may also diverge, but at the same time offer each other important insights into different ways of creating meaning and value. In these ways, Essay brings into relief the many taxonomic, geographical, cultural, and linguistic boundaries to agency, if it is to extend beyond the active-passive variety, and if understanding is to be produced between disciplines, much less between nations.

Agency and the Art of Meaning

The preceding discussion of telematics and telerobotics distinguished between active-active and active-passive models of agency. This nomenclature emphasized the difference between those models without burdening the issue with the ethically loaded terminology of “master” and “slave” which is pervasive in the robotics literature. But that such terms can be recycled as though depoliticized from any real-world considerations demands further reflection.

The master-slave model of robotics is a metaphor for human-machine relations. Since the slaves are machines, not sentient beings, then apparently no harm is done. However, whether or not the slave or passive component is human or mechanical, there are crippling limits to the sorts of knowledge and existence that can emerge in a system in which one element exerts agency on another element that lacks it. Regardless of terminology, the use of such a model in telerobotics reifies a tarnished philosophical construct that has been complicit in perpetuating an ethically unacceptable system of social relations. Anticipating this condition, in 1948 Wiener wrote,

> It gives the human race a new and most effective collection of mechanical slaves to perform its labor. Such mechanical labor has most of the economic properties of slave labor, although, unlike slave labor, it does not involve the direct demoralizing effects of human cruelty. However, any labor that accepts the conditions of competition with slave labor accepts the conditions of slave labor, and is essentially slave labor.\(^{19}\)

For half a century, academic scholarship and artistic research increasingly have focused on deconstructing the inherited categories and hierarchies that are part and parcel of the structure of knowledge and power since the Enlightenment.\(^{20}\) If, as Marshall McLuhan provocatively observed, the medium is the message, and if the medium operates on an active-passive or master-slave principle of command and control, then the message of

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telerobotics (as it is conventionally practiced) is far from the cutting edge of intellectual discourses regarding epistemology and agency.

Because metaphor functions not only as the content but also as the concrete material form of artistic practice, it is not surprising that many artists have sought alternatives to the hierarchical relationship of subject and object and the active-passive conditions of agency employed in most commercial and scientific implementations of telerobots. Indeed, for over a decade, Stiles has theorized that the conventional metaphorical function of art was appended by an interactive metonymical function that emerged when the human body became a primary medium and content of visual art.21 By introducing the possibility for a subject-subject relationship between artist and spectator (that simultaneously entailed a subject-object experience of the artist as object before the spectator), Performance Art, she has argued, held the possibility for a more connected relationship. The inherently interactive situation of exchange between two subjects had the effect of altering the binary condition of alienation in the subject-object (active-passive) viewing conditions of traditional art, thereby enhancing interpersonal agency and reducing, although never completely eradicating, alienation.22 In this regard, Telematic Art and certain works of Telerobotic Art can also be said to employ the principle of metonymy, reconstructing the active-passive relation of subject and object by cultivating an active-active mode of agency between subjects. As Kac has suggested,


The fascination robots exert on the population at large has unexplored social, political, and emotional implications. These implications must be coupled... with the new aesthetic dimension of modeling behavior and developing unprecedented interactive communicative scenarios in physical or telematic spaces.23

The epistemological implications of these alternative models of behavior and agency are unclear. Nonetheless, it stands to reason that there are significant differences between the ways of knowing and being that emerge from a collaborative or rhizomatic exchange between active agents and those derived by an active agent controlling a passive machine. Although the artworks discussed above utilize various media, all of them are based on an active-active scheme of agency, and therefore share a common message about the fundamental importance of transcending hierarchical relations and permitting all components of a communication network to participate actively in it.

In the early nineteenth century, Friedrich Hegel claimed that the relationship between master and slave was asymmetrical and unstable, a theory that has foreboding implications for the future of human-machine relations. He argued that as the master became increasingly dependent upon the slave, and as the slave became more highly skilled and disciplined, it was the latter who developed a “truly independent consciousness,” and whose actions shaped the external world in such a way that mind is embodied in it.24

By the mid-twentieth century, it appeared that the slippage of roles

23 Kac, “Foundation and Development”: 60.

24 Georg Wilhelm Friedrich Hegel, *Phenomenology of Spirit.* (Oxford: Oxford University Press, 1977, c. 1807): 117, ¶ 193. Hegel theorized that the mutual recognition of the interdependence of the opposing pairs would result in a synthesis that yielded an optimal economical relationship. While machines do not currently possess such abstract cognitive functions, one might imagine a time when they develop a “truly independent consciousness” and start demanding compensation for shaping the external world.
Hegel theorized between master and slave was mirrored by instabilities between the human and the machine. Writing in the wake of the mechanized holocaust executed by the Third Reich and the nuclear annihilation of Hiroshima and Nagasaki undertaken by the United States, Martin Heidegger proclaimed that art held the potential for transforming the situation of technological enframing that he identified as characteristic of the human condition in the late twentieth century. Such idealistic claims certainly have great validity in Hollywood, which perennially produces fictional accounts of uniquely human qualities prevailing in the end against would-be mechanical overlords. Although these works of cinematic art are not quite what Heidegger had in mind, the real and imagined struggle between humans and machines does offer insight into the rhetorical importance of agency with respect to technology, and especially telerobotics.

The ideal of agency is one of the last bastions of humanism, and has become the epitome of technological correctness. As artist Garnet Hertz has observed, “the ‘agency’ concept seems to be stronger the closer you get to the commercial applications of telerobotics; this is the big cash-cow.” Its centrality in discourses about telecommunications and automata is hardly surprising. Indeed, the importance of agency vis-à-vis technology is proportionate to the perceived need to protect that most cherished


26 The Matrix is a good example from the late1990s.

27 Garnet Hertz, Email correspondence with the author, April 24, 1999.
of human values from being subsumed by the machines of our own creation. As a result, rhetorical strategies emerge which promote the idea that machines, rather than usurping agency, will serve to help it flourish in new and expanded forms. This familiar response to what Paul Goodman has called “the metaphysical emergency of Modern Times” follows the paradoxical formula of “relying on technological means to solve problems caused by previous technological means.”

The fear of human subjugation by technology is not just a pervasive modern myth. Rather, it can be seen as rooted in the very real ways that implementations of technology threaten agency by displacing human labor, polluting Earth and consuming natural resources, or simply by enabling the mass-destruction of human life with ever-increasing efficiency. It is an overwhelming proposition to reflect on the human ability, or inability, to control technology in the abstract. Writing on how complex technological systems diminish human agency, in 1977 Winner observed that, “Possibilities once crucial to citizenship are neutralized… The idea that civilized life consists of a fully conscious, intelligent, self-determining populace making informed choices… and taking action … is revealed as a pathetic fantasy.” By contrast, when technology is constituted in a surrogate being - a robot - the importance of retaining mastery appears to become more comprehensible and more urgent; the issue can be broken down into anthropomorphic terms of conflict: us against them.


What would happen if the human-robot/master-slave relationship were switched?

Moravec has suggested that robots with artificial intelligence will gain consciousness, supercede human intelligence, and ultimately become autonomous. Moreover, he heralds the quasi-evolutionary moment when these robots will perform surgical operations on humans, augmenting our brains with computer chips.\(^{30}\) But is there any reason to trust such autonomous agents to care, in the sense of having an ethical concern with promoting the life and liberty of human beings? Though rarely cited in discussions of technology and culture, the social value of care, as theorized in feminist ethics, can help reconceptualize agency with respect to the relationship between human and machine.\(^{31}\) Of particular interest in this regard is the Personal Aid for Mobility and Health Monitoring (PAMM) project at the Field and Space Robotics Laboratory at MIT.\(^{32}\) The "Smart Cane” and “Smart Walker" being developed there are robotic devices designed to function as a companion for elderly people who have difficulty walking. As mechanical engineer Adam Skwersky explained, “they are programmed using learning algorithms to


become familiar with their environment in order to help a person move from place to place.” The cane and walker will be able to identify and lead their ward to a chair, the cafeteria, or a friend’s room, and they will monitor vital signs and relay that information to a central nursing station that can respond to emergencies.

The commercial, institutional, and artistic rhetoric of "agency" signify a bundle of technologically correct values that demand systematic critical scrutiny. This discussion has attempted to identify and define a more subtle way of distinguishing between varieties of agency, especially with respect to technological media. These efforts have only just begun to scratch the surface of this tricky problem. For with respect to active-active and active-passive models of agency, there is no clear point at which one ends and the other begins, and there are doubtless many varieties of agency that evade such a simple heuristic. Clearly much is at stake for human agency in qualifying these differences. Moreover, artists and scholars have a responsibility to distinguish more precisely and subtly among them, and to rigorously question the claims of agency attributed to technological media. As a general principle in keeping with the First Amendment, a maximum diversity of artworks is desirable. At the same time, those works based on an active-passive model of agency are deeply problematic aesthetically and philosophically, and all the more so when they are presented as the embodiment of something new and liberating.

Marinetti’s description of an ideal automaton as a “nonhuman and mechanical

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33 Adam Skwersky, interview with the author, May 7, 1999, Cambridge, Massachusetts.
being” that would be “naturally cruel, omniscient, and combative” is not far from a common nightmare about robots. The bleak prospect of the human struggle against such a mechanical foe makes the notion of agency so important to the rhetoric surrounding robotics and telerobotics. Despite the deification of progress in the twentieth century, technological development does not constitute the objective, inevitable march of history, but rather is the result of financially and ideologically motivated interests within politico-economic systems and the military bodies that protect and expand them. In one version of the Golem legend, the mystic who brought the Golem to life returned it to base matter when it became a threat to the community. Can citizens and institutions exercise the same degree of judgement and discipline today? The discussion of agency vis-à-vis technology must go beyond whether robots can be trusted to care, or whether the military-industrial-complex, which sponsors their development, can be trusted to care. The question must become how to enhance agency in society as a whole so that its citizens – human and otherwise - can care for each other collectively.

Ascott's Telematic Embrace

Global Consciousness

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

While “Is There Love in the Telematic Embrace?” welcomed the challenge that Telematic Art posed to conventional aesthetic values, the essay maintained that this electronic medium nonetheless serves certain humanist principles. Ascott's argument melded seemingly incompatible systems of knowledge and being, suggesting their complementarity. For example, he asserted a universal principle of love that would, by analogy, promote collaboration and unification in telematic networks. At the same time, Ascott characterized his project in Derridean terms as “pure electronic difference,” and celebrated 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 world view, a redescription of reality..." In these ways the artist's theory of Telematic Art embraced both the transcendence of romanticism and the contingency of relativism.

While Ascott asserted the inevitability of change, he conformed 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. Such a position is
consistent with the way artists have imagined the confluence of philosophical rationalism, science, and technology on 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 for constructing alternate ways of knowing and being. The following description enumerates some of the various sources that the artist amalgamated in his theory of the telematic embrace.

Ascott’s notion of telematic love is derived from the theory of "passionate attraction" that French utopian philosopher Charles Fourier (1772-1837) described as "the drive given us by nature prior to any reflection... toward the coordination of the passions... and consequently toward universal unity." The artist thus defined love as a natural, intuitive force that can draw human beings towards one another (like gravity), and that can transform multiplicity into unity. Ascott applied the notion of passionate attraction to Duchamp's *The Large Glass* (1915-23), which he interpreted 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," he wrote, the vitreous sculpture "always includes both its environment and the reflection of the observer." By observing the work, he explained, the viewer becomes implicated as a participant in it and thus a progenitor of the love that is "contained in this total embrace."

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 from the subjectivity of interpretation and by the physical alteration of matter at the quantum level.\(^\text{35}\) In this regard, Ascott cites physicists John Wheeler and Wojciech Zureck’s contention that, “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.”\(^\text{36}\) Similarly, for Ascott, art became 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 (including global telematic networks) were inextricably integrated in an emergent, distributed, interactive system.

Ascott joined these ideas with the prophecies of global consciousness expounded by French paleontologist and theologian Pierre Teilhard de Chardin, who theorized the "noosphere," and British futurologist Peter Russell, who theorized the “global brain.” Anthropologist and cybernetician Gregory Bateson’s theory of "mind at large" and James Lovelock’s "Gaia hypothesis" also conceptualized emergent forms of planetary


consciousness that were important to Ascott's theory of Telematic Art. 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 the Telematic Embrace

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 concept 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 noos, or mind) theorized a purported dawning of a new stage of human evolution. Writing in 1955, 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.37

One might rightly be suspect 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.38

Peter Russell, writing in 1982, built on Teilhard’s notion of noosphere in his
thesis on the "global brain." Such an idea appealed to Ascott, who in "Behaviourist Art
and the Cybernetic Vision" had theorized that "A highly interactive CAM network on an
international level might form the embryonic structure of a world brain." (ECC1) Based
on the trend of data-processing capacity doubling every two and a half years, Russell
claimed 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 comprised of individuals, all telematically interconnected, like a neural
network) could give rise to an emergent form of consciousness.39 According to Russell,
this structural system, modeled on that of biological organisms, provided 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 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,

38 It is interesting to note that Teilhard has been resuscitated as a model for networked consciousness and
spirituality. See, for example, Mike King, "Concerning the Spiritual in Twentieth-Century Art and
with a Brain" Wired 3:6 (June, 1995).

39 Peter Russell, The Global Brain: Speculations on the Evolutionary Leap to Planetary Consciousness,
and functional dissimilarities between these two systems. While many scientists and philosophers believe that the operations of the human mind can be reduced to materialist explanations, 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. On the other hand, perhaps forms of consciousness will emerge (or have already emerged) in electronic networks that are unlike human consciousness and that defy human understanding. Criticisms of Teilhard and Russell apply only partially to Ascott’s work, 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 in an artistic context. But that hardly means they are not possible, much less that they are not meaningful as art and as theory. 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 intuitionism, 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.\(^\text{40}\) In "Is There Love in the Telematic Embrace?" Ascott proposed the *Large Glass* as a model for the passionate attraction he theorized in Telematic Art. According to Ascott, Duchamp's magnum opus embodies and generates love by drawing viewers into a hybrid field made up of its passionate imagery, its environment, and the viewer's own reflection. Similarly, he described the embrace of Telematic Art as drawing participators into the hybrid field of cyberspace, an environment where they meet, and which they collaboratively create and transform in a process of unification that embodies and generates love. While much of his discussion of love in the *Large Glass* focused on its dynamic form, Ascott also identified the element of attraction in the glass sculpture’s sexualized imagery. But alongside whatever attraction may 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 can also be interpreted as creating a perverse tension rather than a loving embrace.

The *Large Glass*, like the vitreous surface of a computer terminal, resists a consistently transparent view because it includes the reflection of the observer and his/her environment in its image. Ascott advocated this quality for its inclusiveness, and claimed

that it promoted the dissolution of traditional epistemological models based on binary oppositions, in particular the Albertian model of painting as a window through which a subject on one side may encounter an object on the other. 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 really can 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 more so for its elusiveness, for the impossibility of possessing it, for 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. How could the persistent self-reflection one experiences on a computer screen not but interrupt 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 s/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. Skeptical assertions to the effect that, love is but "a shared experience at the same moment of time, narcissistically … like reflections in different mirrors," have a long history in philosophy
and literature. 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. Media theorist Lev Manovich argued that the history of the screen in western representation offered the illusion of liberating access into infinite space, but may equally be interpreted as a prison, demanding that the viewer’s physical presence be fixed at a precise location. One must wonder, however, if the screen is perceived as a prison, then what apparatus could not be, in some sense, as a prison. The term “prison” lapses into a generality in which it begins to lose its significance. Nonetheless, Manovich’s point, following (though not acknowledging) film theorist Jean-Louis Baudry’s more substantial analysis, is well-taken. For all media apparatus demand and restrict behavior as they offer and supply information.

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 rejected the idea of art as a transparent surface, and conceived of it rather as a map of actual and potential relationships. Similarly, Ascott understood computer monitors to be metaphorical “screens of operation,” rather than screens of representation. He claimed that the “telematic screen gives the individual mind and spirit worldwide access to other minds


and spirits,” enabling expanded “cognitive, affective, and spiritual behavior. It is not at all … imprisoning.”

Ascott’s telematic embrace resides 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 the artist presented 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 the Bride, then such love is enigmatic. Similarly, the form and content of telematics are capable of both sustaining life and violating it; and violation and sustenance are not mutually exclusive. It is this ambiguity which characterizes the dialectical locus of utopian and dystopian visions of the future with respect to technology.

Further 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 an 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

44 Roy Ascott, Email correspondence with the author, January 6, 1999. I have reordered this quotation for clarity.

of expanding global control and profit - the question of human values becomes increasingly urgent. Which ones are worth keeping? What other types of values might emerge? Ascott proposed 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 unclear 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 proffers the further questions: "What will love be?" "How will it be manifested?" and "Who will benefit from it?" Indeed, the "sunrise of uncertainty" that the artist advocated 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, since at the end of the second millennium, only a fraction of the world's population had a telephone, one must ask how wide the arms of the telematic embrace will be. At the same time one must remain vigilant that its hugs do not squeeze too tightly.

Telematic spaces reproduce the physical world, simultaneously intensifying and dematerializing it. While online rape, child pornography, terrorism, and viruses are part of the economy and structure of the global village, telematic interaction also offers

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46 Even if everyone were connected, there is no guarantee that cyberspace would be any less hierarchical than any other space. This sort of concern was anticipated by Licklider and Taylor as early as 1968, and remain a current topic of debate. See J.C.R. Licklider and Robert W. Taylor, "The Computer as Communication Device." *Science and Technology,* (April, 1968): 21-31. As recently as 1996, the plenary session at the annual conference of the International Society for Electronic Art (ISEA) focused on the need to increase cultural diversity in the exhibitions, membership, administration and symposia topics of the organization and its annual conference.
potential benefits that are unique. On the constructive side of this double-edge sword, Ascott’s artistic experiments, beginning in the 1960s with interactive art systems, and since the 1980s, on the emergent behavior of Telematic Art networks, can be seen as state-of-the art, aesthetic research and design. His early collaborative networking experiments sought to explore the potential of new communications media for human interaction, the ramifications of which remain a speculative work in progress.

_Utopian Values and Responsibility_

Ascott’s theories of Telematic Art are also subject to criticism for their deterministic and utopian attitude regarding technology and the future. However, the artist has been keenly aware of the threats that technology potentially poses to society, and expressed concern about how the misuse of technology by empowered institutions can serve to reinforce the status quo. Perhaps Ascott’s commission as a radar officer in the Royal Air Force (at height of the Cold War in the mid-1950s) stimulated his mindfulness of the potency of communications and surveillance technologies. This experience may have influenced his conviction to imagine alternative scenarios in which these instruments of control could 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 constitutes 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. At the same time, Ascott's assertion of the artist as a sort of Platonic philosopher king who designs the future may not appeal to non-artists. Given the failures of Art and Technology, to say nothing of the uninhabitable horrors of modern architecture, placing the future in the hands of artists and planners might well be considered an act of Dada randomness. At the same time, the artistic mode of induction and the sort of "out of the box" thinking that it promulgates may make an invaluable contribution to designing the future. Indeed, the concept of cyberspace described in Gibson's novels has been widely credited with providing a vision that was so inspirational that engineers were motivated to construct it. While cyberspace does not precisely match Gibson's description, his vision functioned as a plan that became realized.

The ethical responsibility of artists' use of telecommunications, and the potential efficacy of art to affect the structure and content of networked communications is a persistent topic of debate.47 In general Ascott eschewed making explicitly political statements about the potential of telematics. However, in “Art and Telematics” he stated 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...

He continued,

47 See, for example, Carol A. Gigliotti, "Aesthetics of a Virtual World: Ethical Issues in Interactive Technological Design," Doctoral Dissertation, Ohio State University, 1993.
[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.

Here, Ascott theorized how telematics could promote the development of a society that was essentially different from the inherited model of hierarchical, discrete, centralized, individualistic systems of communication. He claimed that this telematic model was “subversive” in as much as it would “replace the bricks and mortar of institutions.” In this distinctly political statement Ascott anticipated not only the expansion of human consciousness, but a reconceptualization of reality that involved the replacement of the top-down hierarchical organization of traditional cultural and social institutions with a bottom-up model characterized by a more highly distributed network of individual and collective agency. Indeed, with the exception of the telephone, industry and government historically have restricted public communication transmissions to a one-way sender-receiver 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 amongst 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 Napster may be a thorn in the side of the record industry, and cottage industries have
sprung up as a result of the economies of 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 can cripple a corporate or governmental email server.

Youngblood reiterated the ethical responsibility of artists to utilize telecommunications in a socially constructive manner, but was skeptical because he interpreted early telematic artworks as merely repeating what had become common commercial practices. In 1986 he wrote, “A communications revolution is not about technology; it’s about possible relations among people.”48 He argued that this revolution had the potential to invert extant social relations, shifting the centralized, hierarchical structure of geographically discrete nations to one of decentralized, but politically significant communities defined by “consciousness, ideology and desire.” However, Youngblood warned that,

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.49

According to this line of reasoning, the artistic use of telecommunications is “special” (i.e. art as opposed to non-art) only if the media are employed in way that is not “done every day in business and industry,” and therefore “given, obvious, routine, ... [and]  


49 Ibid.
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 an 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 effectively changing Western 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 can raise significant challenges to artistic traditions.

Robert Adrian also has 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. In an early essay, “Decentralisation - Communication as Content” (1979), Adrian wrote that, "It is in the ephemeral immediacy of the exchange that the meaning of the work exists." He further noted, 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.\(^{50}\) To use Bolter and Grusin's terminology, the structure of computer networking "remediates" extant relationships

between artists. In his 1982 essay on *The World in 24 Hours*, Adrian stated that it was too late for artists "to really change the direction of design development" of electronic media, but he maintained 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.\(^{51}\)

While doubtful that artists could influence the structural form of computer networks, Adrian remained optimistic that they might nonetheless use them in unprescribed ways and contribute provocative material that would be subversive. In contrast to Youngblood and Adrian, Ascott's position is closer to that of Nora and Minc, who asserted that the very structure of telematics held the potential for a subversive reordering of social relationships and values. Ascott's theories of Telematic Art emphasized how the structure and process of asynchronous, decentralized, and collaborative interaction resulted in the transformation of consciousness on a global scale.

Also addressing the question of responsibility in Telematic Art, Kac's essay “Aspects of the Aesthetics of Telecommunications” (1992), questioned the ability of telematics to change the conventional relationship between artist and viewer. He asked rhetorically if 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

\(^{51}\) Robert Adrian, ““The World in 24 Hours” in *Ars Electronica 1982* (exhibition catalog) Linz: Liva Ges. m.b.h., 1982.
Arguing that they do not, Kac explained that the telematic artist creates a context in which networked telecommunications transpire, “but without fully controlling the flux of signs through it.” Such a position closely parallels Ascott’s assertion twenty-five years earlier in “Behaviourist Art and the Cybernetic Vision” that “While 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.” Kac concluded that, “The artist working with telecommunication 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.”

French sociologist Jean Baudrillard’s essay, "Requiem for the Media," theorized media “responsibility” not in psychological or moral terms, but as a “personal, mutual correlation in exchange ... restoring the possibility of response.” In contrast to McLuhan's proposition that telecommunications was creating an inter-connected global village, Baudrillard insisted that the formal qualities and institutional conditions of media were the embodiment of “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 dismissed as uncritical and retrograde the utopian dreams to “liberate the media, to return them to their social vocation of open communication and

52 Kac, “Aspects” 48. Subsequent quotes from same page.

unlimited democratic exchange.” He continued,

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 domain of media consisted in
“restoring [the] possibility of response.” But he added that, “such a simple possibility
presupposes an upheaval in the entire existing structure of the media.”

While Baudrillard’s critique of the structural limits of media challenges Ascott’s
assertion of the liberatory potential of telematics, 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 argued that Baudrillard’s position is technologically deterministic; it
confers potency exclusively on the formal aspects of media while evacuating their
content of significant meaning.54 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
do-determining elements of social practice. Moreover, because for Baudrillard media
vitiate the possibility of response, he was unable to entertain the potential of alternative
media structures (like two-way radio and telematics) to enable response, much less to

54 See, Douglas Kellner, Jean Baudrillard: From Marxism to Postmodernism and Beyond. Cambridge:
in Marc Raboy and Peter A. Bruck, eds., Communication for and against Democracy, (Montreal/New
constitute an "upheaval in the entire existing structure of the media." Finally, Kellner pointed out that the sociologist's nostalgia for a primitive form of direct response naively imagined that communication could be unmediated in some pre- or post-technological context. Ascott had himself repudiated this notion in "Telenoia," stating that,

> Human communication has never been … beyond mediation, 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.

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 emphasized the importance of content, while Youngblood and Baudrillard emphasized formal concerns. Kac and Kellner attempted to strike a balance between form and content as inextricably connected components of communication. As will be discussed below, Ascott's work emerged from an aesthetic tradition that, at least in part, undermined 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 art using computer networking. However, Telematic Art
arguably exemplifies the intrinsic inter-relatedness 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 artworks like *La Plissure du Text, 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.\(^5\)

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 content in Telematic Art cannot be considered in isolation from one another, nor outside of considerations of process and context. Neither is form a receptacle for content, nor content 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 proposed

\(^{55}\) 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 position that ”consistency” is a value, not an *a priori* necessity, particularly with respect to art.
by Ascott 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 that, though it rarely goes unnoticed, has not been given sufficient consideration. As discussed in Chapters 1 and 2, 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 sign systems. Ascott’s interactive constructions were 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. Whereas Conceptual Art de-emphasized the materiality of art objects to interrogate the semiotic basis of visual meaning, Telematic Art has interrogated how the semiotic structure of computer-networking offers alternative forms of authorship, meaning, and consciousness in 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. 56 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.

Artist Carl Loeffler has corroborated these points. His involvement with satellite and telematic projects beginning in the late 1970s grew out of his interest in Conceptual Art. 57 He has stated:

Language, mathematics, and systems are an integral part of 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. 58

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


57 Mark J. Jones, “Email From Carl” (Email interview with Carl Loeffler) Cyberstage 1:2 (May, 1995) http://www.cyberstage.org/archive/cstage12/carl12.htm

58 Interview with Carl Loeffler, September 16, 1998.
between art and society. Telematic Art involves an ideology of interactive collaboration and global connectivity. As such, it embodies utopian aspirations and constitutes a model for achieving them.

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. As mentioned in Chapter 3, in 1969, Kaprow's *Hello* was intended to express the idea of “communications media as non-communications.” Thirty years later, artist Heath Bunting’s "Own, Be Owned, Or Remain Invisible" (1998) offers an ironic (mis)use of hyperlinking on the WWW in this spirit. Nearly all the words, including “a”, “the”, and “and” (but few significant ones, like “Heath” or “Mother”) that comprise the autobiographical text are hotlinks to potential sites like “www.a.com”, “www.the.com”, “www.and.com” and so on. Instead of branching off into associations meaningful to the narrative, these links often lead to error messages because there is no server “www.a.com”. If a domain exists for a given word, as for example “www.simply.com”, the user is linked to that site (an internet service provider in this case) which is usually irrelevant to the narrative. Links can also lead to solicitations to purchase the site name from domain speculators, "Interesting.com is for sale. Offers over $3,500 will be considered; email chris@free-market.net." In this way, Bunting’s piece suggests the superfluous use of hypermedia, the unexpected presences and absences in cyberspace, and the economic infrastructure of the WWW.

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59 [http://www.irational.org/heath/_readme.html]

"Jodi.com," created by artists Joan Heemskerk and Dirk Paesmans, is a web-based artwork that uses the medium’s vernacular as its content in a similarly critical manner.61 A visit to the website address (or URL, Uniform Resource Locator) listed by *Beyond Interface*, resulted in an error message, “403 Forbidden directory browsing is enabled on this server.” Was this error message part of the work? A disruptive element either inhibiting the exchange of information, or a provocation to undermine the error message, to try to figure out a way around the authoritative, technologically-closed front door, and gain access through a side window? Indeed, a little hacking enabled access to another message, “404” (the typical error message received when a server cannot find the requested URL), which ironically had active hyperlinks to other interactive parts of the site.

In one section of the "Jodi.com" site were strings of Internet Protocol numbers (IPs) that *JODI* had skimmed from visitors’ computers and added to its database. Each visitor was invited to submit a short statement, which could be seen only by mousing over the entry to highlight it. In another section, messages left by visitors had accumulated, but the vowels had been removed. In a third section were visitors’ messages missing all the consonants. As artist Cary Peppermint has written,

> “Jodi.org” removes the shimmering facade of the World Wide Web. There is no longer a seductive guise of glamorous sound bytes and Photoshop splendor... We find the ‘organism’ exposed. Raw, writhing, pixelated code, unruly windows, and routines sometimes crashing the

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browser. This is our baptism in information technologies... Amidst the deconstruction of interface, “Jodi.org” suggests our arrival is an impossibility. Of course all this could be my own subversive fantasy.62

Peppermint continued,

Jodi.org’ is interesting for many reasons including it being the forerunner of the first recognizable ‘style’ of internet art to emerge. However, I remain wary of art being so easily categorized. Is not “Jodi.org” simply a self-referential and otherwise modernist approach to Internet art? “Jodi.org” is isolating not only in its decentralizing and subsequent removal of the individual through abstraction of the interface but, also in that it is part of a dialogue exclusively for those with a privileged familiarity and wide knowledge base of evolving internet “culture”...

Then again all of this might just be the point.

Peppermint rightly claims that "Jodi.org" is mired in modernist values. But her position itself seems mired in the modernist belief that the modern and the postmodern constitute a set of binary oppositions, and that an art that is "purely" one thing or another is conceivable. An alternate reading of "Jodi.org" might interpret these two aspects as complementary. On the one hand, the site seems to recapitulate the self-referential quality and discursive exclusivity characteristic of modernist aesthetics. On the other hand, its purposely disruptive interface undermines conventional aesthetics, and its decentralization of the individual and the creation (and subversion) of a community presence suggests a different modality of artistic production.

This tension between the modern and postmodern, the utopian and dystopian, is a common feature of late twentieth century art in general, Art and Technology in particular, and Telematic Art especially. Mindful of both utopian and dystopian attitudes towards

62 Cary Peppermint, untitled response to Jodi.org, included in comments organized by Remo Campopiano for Beyond Interface, op cit. For more on Jodi.org, see Randall Packer, "Net Art as Theater of the Senses: A HyperTour of Jodi and Grammatron," also published in the Beyond Interface online exhibition catalog.
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 artificial life researcher Christopher Langton has written. The telematic embrace is the artistic vision of an imagined future, created as a precursor to building it in the present. In this sense, Ascott’s praxis bears a striking affinity to the strategic convictions of innovative artists throughout history: the perception, conception, envisioning, and representation of alternative realities and systems of meaning. Alongside postmodernist theories of the death of the author, and the death of the avant-garde, Ascott’s theory and practice of Telematic Art simultaneously challenges conventional notions of authorship, while continuing to function in the manner of nineteenth and twentieth century avant-gardes.

The telematic embrace summons the social force of art as an ally with technology. Unencumbered by the destructive history of technology and the demands of rational epistemology, perhaps the discipline of art - as a cultural convention charged with the embodiment and maintenance of lofty human ideals and the rigorous questioning of them - can offer alternatives to military and commercial applications of new technologies. In this context, Telematic Art can be interpreted as offering an artistic meta-perspective capable of embodying paradox, dismantling convention, and constructing new visual forms that utilize emerging technologies in ways that redefine knowledge and being.

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BIOGRAPHY

Edward A. Shanken earned his BA from Haverford College in 1986, and his MBA from Yale University in 1990. He was Administrative Director of the Lower East Side Community Music Workshop, where he organized the Jazz Arts Expo in 1987. He organized the Conference on the Arts at Yale University in 1990, and was a Fellow in Arts Administration at the National Endowment for the Arts in 1991. He has been the recipient of fellowships from the Henry Luce/American Council for Learned Societies (1998-99), the College Art Association (1996), and the Zentrum für Kunst und Medientenologie (ZKM, 1994). At Duke University, he was a Graduate Fellow at the Center for Teaching and Learning, and received grants from the Graduate School, the Department of Art History, and the Center for International Studies. He has taught courses at Duke ranging from the introductory art history survey to the Cultural Economy of Cybernetics. He has served on the steering committee for the Center for International Studies and on the Internet Technology Advisory Committee at Duke. He serves on the editorial board of Leonardo Digital Reviews. He is editor of Telematic Embrace: Visionary Theories of Art, Technology, and Consciousness, forthcoming from the University of California Press. He was born in Philadelphia on June 8, 1964.
Figure 1.1 Nicholas Schöffer, *CYSP I*, 1956. Electronic, interactive sculpture. Shown on the stage of the Sarah Bernhardt Theater, Paris, where it performed with the Maurice Bejart ballet group, to a concrete music composition by Pierre Henry in 1956. Schöffer is shown gesturing behind the sculpture on the right.
Fig. 1.2. Roy Ascott, *Analogue Table: Wiener-Rosenblueth*, 1964. Paint, wood, 48x54."
Figure 1.3. Roy Ascott, *Bigelow*, 1965. Wood, 122x61"
"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."

Figure 1.5. Roy Ascott, Untitled drawing, 1962. 77/8 x 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.
Figure 1.6. Roy Ascott, *Change Map*, 1969. Wax and crayon on stained wood, 80x80"
Figure 1.7. Roy Ascott, *Logical Conditions*, 1962. Glass and wood. One of four boxes, each 18x18x9" (Diagram Box)

Figure 1.8. Roy Ascott, *LOVE-CODE*, 1962. 12/13 Cellulose on glass, wood, 13x48x3". (Diagram Box) Note influence of Hamilton's *She* and Duchamp's *Large Glass* in Ascott's integration of female and technological forms, and the "seed cloud" between them.
Figure 1.9. Roy Ascott, *Transaction Set*, 1971. Found objects, dimensions variable.
Figure 1.10. Student work at Ealing College of Art, London, supervised by Roy Ascott, *Calibrator for Selecting Human Characteristics*, c. 1963.
Figure 1.11. Student behavioural experiments at Ipswich Civic College, Suffolk, supervised by Roy Ascott, 1965. A precursor to the parlor game of Twister? U. S. Patent 3,454,279 was filed on April 14, 1966, and accepted July 8, 1969.
Figure 1.12. Roy Ascott, Curriculum Diagram, Ontario College of Art, 1972.
Figure 2.1. The cast of *nine evenings* in front of the Armory, New York, 1966.
Figure 2.2. John Cage, performing *Variations VII*, at *nine evenings*, 1966.
Figure 2.4. *The Machine*, exhibition catalog, 1968.
Figure 2.5. John Latham, *Time-Base Roller*. 1972. Wooden cylinder, electric motor, canvas, paint. 600cm x 426.7 cm (unrolled)

Figure 2.6. Artists Placement Group (right) with ministers from German government (left), Bonn, December 8, 1977.
Figure 2.7. Jean Toche, in protest at the Metropolitan Museum of Art, New York, October 16, 1969.
Figure 2.8. Ted Victoria, *Solar Audio Window Transmission*, 1969-70.
Figure 2.9. *Software* catalog, Jewish Museum, New York, 1970.
Software is not specifically a demonstration of engineering know-how, nor for that matter an art exhibition. Rather, in a limited sense it demonstrates the effects of contemporary control and communication techniques in the hands of artists. Most importantly it provides the means by which the public can personally respond to programmable situations structured by artists. Software makes no distinctions between art and non-art. The need to make such decisions is left to each visitor. Hence, the goal of Software is to focus our sensibilities on the fastest growing area in this culture: information processing systems and their devices.

In just the past few years, the movement away from art objects has been created by concern with natural and man-made systems, processes, ecological relationships, and the philosophical-linguistic involvement of Conceptual Art. All of these interests deal with all which is transactional.
Figure 2.11. Burnham at the computer, MIT Lincoln Laboratory, 1968.
Figure 2.12. Ted Nelson (left) and James A. Mahoney (exhibition designer, right), going over plans for *Software*.
Figure 2.13. Hans Haacke, *Visitors Profile* questionnaire proposed for Guggenheim Museum exhibition, 1971 (cancelled).
Figure 2.14. Sonia Sheridan, *Interactive Paper Systems*, 1969-70. Photographed at the opening night of *Software*. Sheridan is holding flowers at the bottom, right.
Figure 2.15. Joseph Kosuth, *Seventh Investigation (Art as Idea as Idea) Proposition 1*, 1970.
Figure 2.16. Nicholas Negroponte and the Architecture Machine Group, *SEEK*, 1969-70.
Figure 2.17. Les Levine, *Systems Burn-off X Residual Software*, 1969 (detail from *Software Catalog*).
communication. They say, ‘it’s going to be raining tomorrow,’ is software. All activities which have no connexion with object or material mass are the result of software. Images themselves are hardware. Information about these images is software. All software carries its own residuals.

The residual may take the form of news, print, television tapes or other so-called ‘media’. In many cases an object is of much less value than the software concerning the object. The object is the end of a system. The software is an open continuing system. The experience of seeing something first hand is no longer of value in a software controlled society, as anything seen through the media carries just as much energy as first hand experience. We do not question whether the things that happen on radio or television have actually occurred. The fact that we can confront them mentally through electronics is sufficient for us to know that they exist.... in the same way, most of the art that is produced today ends up as information about art.” L. L.

Figure 2.18. Les Levine, Systems Burn-off X Residual Software, 1969 (detail from Software Catalog).
Figure 2.19. Les Levine, *Iris*, 1968.
Figure 2.20. Les Levine, *Contact: A Cybernetic Sculpture*, 1969.
Figure 2.21. Jack Burnham, *Hans Haacke: Wind and Water Sculpture*, 1967. Cover illustrates Haacke's *Condensation Box*, 1965 (bottom), and *Sail Construction*, 1965 (top).
Figure 2.22. Hans Haacke, Visitor's Profile, installation from Information, 1970. The Software installation would have used a computer to tabulate data in real-time.
Figure 2.23. Hans Haacke, *News*, 1969. Roy Chapin, Chairman of American Motors Corporation, which sponsored *Software*, pictured in background with the artwork.
Figure 2.24. Hans Haacke, *Photo-Electric Viewer Coordinate System*, 1968.
Figure 2.25. Joseph Kosuth, *Seventh Investigation (Art as Idea as Idea) Proposition 1*, 1970.
Figures 2.26 and 2.27. Roy Ascott, *Video Roget* and *Thesaurus*, 1963.
Figure 2.28. Roy Ascott, Diagram from *Diagram Boxes and Analog Structures* (Exhibition Catalog), 1963

Figure 2.29. Detail of Diagram from *Diagram Boxes and Analog Structures*, 1963.

VIDEO-ROGET
This Thesaurus is a statement of my intention to use any assembly of diagrammatic and iconographic forms within a given construct as seems necessary.
Figure 2.30. Mel Ramsden, *Elements of an Incomplete Map*, 1968.
Figure 2.31. Harold Hurrell, *The Cybernetic Artwork that Nobody Broke*, 1969
Figure 2.32. David Bainbridge, *Lecher System*, 1969-70
KEY:
FA — French Army
CMM — Collection of Men and Machines
GR — Group of Regiments

The context of identity statements in which 'collection of men and machines' appears as a covering concept is a relativistic one. Identity is not simply built into that concept. The 'sense' of identity is extinguished with the constitutive one.

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'.

It's all in support of the constitutive sense that the FA is the same CMM as the GR. The inference is that the FA is predicatively a CMM. The identity statement subverts the covering concept. It's a strong condition of identity that the FA and the CMM have the same life history (both the FA and the CMM are decimated) and in which case CMM fails as a covering concept. If the CMM isn't decimated (no identity), the predicate fails. The 'constitutive' concept says, And its durability doesn't come from a distorted construction of 'Collection'.

The concept of collection or manifold is one for which there can be no empty or null collection. The manifold FA; a domain, a regiment; it's all one whether the elements are specified as the battalions, the companies or single soldiers. (This doesn't work for classes.)

The elements are intended to define and exhaust the 'whole'. If the CMM is to be regarded as no more and no less tolerant of damage and replacement of parts as FA, then the right persistence-conditions and configuration of CMM can be ensured only by grafting on the concept FA, and thus to 'de-recognize' thing-matter equations.

The rest is not equivocation. 'Concrete' and 'pool' are not, in this framework, the sorts with classificatory purport (and in the terminological context, the sense does not emanate from them). And the same for all the constituents which may be specified at different dates for the FA.

Figure 2.33. Terry Atkinson and Michael Baldwin, *Key to 22 Predicates: The French Army*, 1967.
Figure 2.34. Art & Language, *Index 01*, 1972 (Installation at *Documenta 5*).
TEN WINGS
A PROJECT FOR ARS ELECTRONICA 1982, INITIATED BY ROY ASCOTT IN
CONSULTATION WITH I CHING, THE BOOK OF CHANGES.

YOU ARE INVITED TO PARTICIPATE IN THE FIRST PLANETARY CONSULTATION OF I
CHING. THERE WILL BE TEN PLAYERS INVOLVED AROUND THE PLANET, HENCE: TEN
WINGS'. TEN WINGS IS ALSO THE NAME ATTRIBUTED TO THE OLDEST EXPOSITION
OF THE BOOK OF CHANGES.

THE PROJECT:
IT IS ESSENTIAL YOU RESPOND TO THIS CALL.

TO MAINTAIN PLANETARY BALANCE IN THE READING, AS SOON AS YOU RECEIVE
THIS MESSAGE PREPARE TO PARTICIPATE AS FOLLOWS:
TAKE THREE COINS OF EQUAL SIZE. ASCRIBE NUMERICAL VALUES TO EACH SIDE
WHEN YOU ARE GIVEN THE SIGN TO DO SO, SHAKE THE COINS IN YOUR CUPPED
HANDS, LET THE COINS FALL SIMULTANEOUSLY.
RECORD THE SUM TOTAL OF EACH FALL.
FOR EXAMPLE: TWO HEADS: 3-3 AND A TAIL: 2 - THE SUM OF 8.
MADE THREE THROWS OF THE COINS AND RECORD THE SEQUENCE OF TOTALS FOR
EACH THROW, FOR EXAMPLE: THROW 1: 8; THROW 2: 6; THROW 3: 7.
THEN IMMEDIATELY PLACE THIS INFO INTO YOUR TERMINAL ADDRESSED TO
<ASCOT> ON IPSA ARTBOX.

PLEASE NOTE: THE SIGN FOR YOU TO BEGIN THE THROWING OF COINS WILL BE
THE FIRST SIGHT YOU HAVE OF A BIRD OR INSECT IN FLIGHT: EITHER IN REAL
SPACE, ON TV OR IN PRINT.

THE INFO RECEIVED FROM ALL POINTS WILL GENERATE TRIGRAMS AND HEXAGRAMS
WHICH THROUGH THE MEDIUM OF MY COORDINATION WILL YIELD A MASTER
HEXAGRAM. THIS WILL PRODUCE A "WORLD QUESTION". KEEP THIS "WORLD
QUESTION" VERY MUCH AS THE FOCUS OF YOUR ATTENTION AS SOON AS YOU
RECEIVE IT BACK FROM ME VIA ARTBOX. THEN REPEAT THE PROCESS OF THROWING
COINS THREE TIMES AS SHOWN ABOVE AND IMMEDIATELY SEND THE NEW SEQUENCE
OF TOTALS TO ME ADDRESSED <ASCOT> AS BEFORE. BY THE SAME PROCESS OF
DIVINATION A JUDGEMENT, A COMMENTARY AND AN IMAGE :IN TEXT" WILL BE
GENERATED AND TRANSMITTED BACK TO YOU AND TO THE ARS ELECTRONICA
CENTER FOR DISPLAY.

ON RECEIPT OF THE FINAL TEXT AS ANSWER TO THE WORLD QUESTION, COLLATE
ONTO A CARD () IN BLACK AND WHITE, FIVE IMAGES OF THE FIRST, REPEAT THE
FIRST FIVE OBJECTS, PEOPLE, THINGS OR PLACES WHICH RELATE IMMEDIATELY
IN ANY WAY TO THE "IMAGE" SUGGESTED BY THE TEXT AND MAIL WITHIN 24
HOURS TO ROY ASCOTT, ART ACCESS/NETWORKING, 16, BLOOMFIELD RD, BATH,
ENGLAND. A DOCUMENTATION OF THE EVENT WILL BE MAILED TO ALL THE
PARTICIPANTS AND INTERESTED PARTIES. IS ALL.

THANKS.
ACCEPT (Y/N): Y
MSG ACCEPTED: ASCOT 33

Figure 3.1. Roy Ascott, instructions for Ten Wings, 1982
Figure 3.2. Roy Ascott, *La Plissure du Texte*, 1983.

Printout of computer-networking exchange.
Figure 3.3. Roy Ascott, *La Plissure du Texte*, 1983. Students at the Ontario College of Art reading print-out with Robert Adrian, back left.
Figure 3.4. Roy Ascott, *La Plissure du Texte*, 1983. Performers in Sydney enacting print-out from computer networking exchange.
Figure 3.5. Roy Ascott, computer monitor still from Organe et Function d'Alice au Pays des Merveilles, 1985.
Figure 3.7. Roy Ascott, *Aspects of Gaia*, ("Information Bar") 1989
Figure 3.8. Roy Ascott, *Aspects of Gaia* (trolley under Brucknerhaus), 1983
Figure 3.9. Stelarc, *Ping Body*, 1996
Figure 4.1 Norman White and Doug Back, *Telephonic Arm Wrestling*, 1986. Technician Ian McGuigan at Salerno Opera House.
Figure 4.2. Paul Sermon, video captures from *Telematic Vision*, 1994.
Figure 4.3. Eduardo Kac and Ikuo Nakamura, *Essay Concerning Human Understanding*, 1994. Canary in New York (top) and Philodendron in Kentucky (bottom).
Figure 4.4. Ken Goldberg, Telegarden, 1995