Art in the Information Age:
Technology and Conceptual Art

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Introduction

By the mid-1960s, Marshall McLuhan prophesied that electronic media were creating an increasingly interconnected global village. Such pronouncements popularized the idea that the era of machine-age technology was drawing to a close, ushering in a new era of information technology. Sensing this shift, art historian and curator K.G. Pontus Hulten organized a simultaneously nostalgic and futuristic exhibition on art and mechanical technology at the Museum of Modern Art in New York in 1968. The Machine: As Seen at the End of the Mechanical Age included work ranging from Leonardo Da Vinci's 16th-century drawings of flying machines to contemporary artist-engineer collaborations that won a competition organized by Experiments in Art and Technology, Inc. (EAT).[1]

EAT had emerged out of enthusiasm generated by nine evenings: theater and engineering, a festival of technologically enhanced performances that artist Robert Rauschenberg and engineer Billy Klüver organized in New York in October 1966.[2] EAT also lent its expertise to engineering the multimedia extravaganza designed for the Pepsi Pavilion at the Osaka Worlds Fair in 1970.[3] Simultaneously, the American Pavilion at Osaka included an exhibition of collaborative projects between artists and industry, which were produced under the aegis of curator Maurice Tuchman's Art and Technology Program (A&T) at the Los Angeles County Museum of Art between 1967 and 1971.[4]

Ambitious as they were, few of the celebrated artist-engineer collaborations of this period focused on artistic use of the information technologies of computers and telecommuni-cations.[5] Taking an important step in that direction, Cybernetic Serendipity, at the Institute of Contemporary Art in London in 1968, 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.[6]

Art critic Jack Burnham pushed exploration of the relationship between art and information technology to an unprecedented level. In 1970, he curated the exhibition Software, Information Technology: Its New Meaning for Art at the Jewish Museum in New York. This show was the first major US art and technology exhibition that attempted to utilize a computer in a museum context. Software's technological ambitions were matched by Burnham's conceptually sophisticated vision, for the show drew parallels between the ephemeral programs and protocols of computer software and the increasingly "dematerialized" forms of experimental art, which were interpreted, metaphorically, as functioning like information processing systems. Software included works of art by conceptual artists including Les Levine, Hans Haacke, and Joseph Kosuth, which were exhibited beside displays of technology including a hypertext system designed by Ted Nelson and a computer-controlled model of interactive architecture by Nicholas Negroponte and the Architecture Machine Group at MIT.[7]

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Regardless of these points of intersection, and the fact that conceptual art emerged during a moment of intensive artistic experimentation with technology, few scholars have 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. My talk seeks to reexamine the relationship between art and technology in the 1960s, and to challenge the disciplinary boundaries that obscure significant parallels between conceptual art and art and technology. The first part examines Burnham's curatorial premises for the Software exhibition and discusses the technological aspects of contributions to the show 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 historian Charles Harrison's discomfort with art and technology in his writings on conceptual art.[8] 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 have frequently 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 process. It is engaged in theorizing the possibilities of signification in art's multiple contexts (including its history and criticism, exhibitions, and markets.) In interrogating the relationship between ideas and art, conceptual art de-emphasizes the value traditionally accorded to the materiality of art objects. It focuses, rather, on examining the preconditions for how meaning emerges in art, seen as a semiotic system.[9] Frequently, art and technology has focused its inquiry on the materials and/or concepts of technology and science, which it recognizes artists historically have incorporated in their work. Its investigations include:

1. Aesthetic examination of the visual forms of science and technology.
2. Application of science and technology in order to create visual forms.
3. 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 also 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. Further, it examines the social and aesthetic implications of technological media that define, package, and distribute information.

Art as Software: Burnham, Levine, Haacke, Kosuth
The title for the software exhibition was suggested to Burnham by artist Les Levine. Burnham himself had interacted directly with software as a fellow at the Center for Advanced Visual Studies at MIT during the 1968-69 academic year. Burnham reported on that experience in a public lecture at the Guggenheim Museum in 1969, later published as "The Aesthetics of Intelligent Systems." He expressed his interest in how "a dialogue evolves between the participants – the computer program and the human subject - so that both move beyond their original state."[10] He further theorized this bi-directional exchange as a model for the "eventual two-way communication" that he anticipated emerging in art.[11] Karl Katz, director of the Jewish Museum, heard the talk and invited Burnham to curate an exhibition.

Following the ideas outlined in "The Aesthetics of Intelligent Systems" and related articles, including "Systems Esthetics" (1968) and "Real Time Systems" (1969), Burnham designed software to function as a testing ground for public interaction with "information systems and their devices."[12] Many of the displays were indeed interactive and based on two-way communication between the viewer and the exhibit. Software was predicated, moreover, on the ideas of "software" and "information technology" as metaphors 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 contemporary experimental art practices, including conceptual art, as predominantly concerned with the software aspect of aesthetic production.[13]

In his 1970 article "Alices Head," Burnham suggested that, like the "grin without the cat" in Lewis Carroll's *Alice in Wonderland*, onceptual art was all but devoid of the conventional materiality associated with art objects. He subsequently explained software in similar terms, as "an attempt to produce aesthetic sensations without the intervening object."[14] Burnham theorized this artistic shift as paralleling larger social transformations based on cybernetics and systems theory. Here, the interactive feedback of information amongst systems, and their components in global fields, eradicated any "separation between the mind of the perceiver and the environment."[15]

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).[16] The original installation at the Phyllis Kind Gallery in Chicago was comprised of 1,000 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 crit-

ics 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."[17]

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

All activities that have no connection with object or material mass are the result of software. Images themselves are hardware. Information about these images is software. 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.[18]

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 offered a critique of the systematic process through which art objects (hardware) become transformed by the media into information about art objects (software). Whereas Levine stated that most art "ends up as information about art," Systems Burn-Off was art as information about information about art, adding a level of complexity and reflexivity onto that cycle of transformations in media culture.[19]

Systems Burn-Off can be related to Levine's interactive video installations, such as Iris (1968) and Contact: A Cybernetic Sculpture (1969). 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 synthesizes man with his technology... the people are the software."[20] 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. In this regard, Levine has provocatively noted that "simulation is more real than reality. Reality is an over-rated hierarchy."[21] For many 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.

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Like Levine, other conceptual artists, such as Hans Haacke, utilized technology and mass media in the production of artworks. Haacke is perhaps best known for his politically charged critiques of power relations among art institutions, industry, the military, and politics. However, his work in the early 1960s evolved from kinetic sculpture. As such, he was included in a number of key *nouvelle tendence* exhibitions[22] and considered himself a "sort of junior partner" of the German-based Zero group.[23] It is perhaps for this reason that the Howard Wise Gallery, the premier commercial venue for presentation of art and technology, gave Haacke solo exhibitions in 1966, 1968, and 1969. At the same time, his early works were predicated on the dynamism of natural systems, an idea that was integral to diverse strains of process and conceptual art, as well as to art and technology.

Haacke, who had been a close friend of Burnham since 1962, contributed two pieces to software: Visitors Profile and News. These works were part of the artist's Real Time Systems series, which was inspired in part by conversations with Burnham, who introduced Haacke to the idea of open biological systems developed by Ludwig Von Bertalanffy, and to Norbert Wiener's theories of cybernetics.[24] Burnhams article, "Real Time Systems," differentiated between "ideal time" and "real time" with respect to art.[25] In ideal time, the aesthetic contemplation of beauty occurs in theoretical isolation from the temporal contingencies of value, while in real time, value accrues on the basis of an immediate, interactive, and necessarily contingent exchange of information.

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 in real time. The computerized version of Visitors Profile was more technologically sophisticated than the manual installation at the information exhibition in 1970. The computer was programmed to instantaneously cross-tabulate demographic information about the museum audience (age, sex, education, and so on) with its opinions on a variety of provocative 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?"[26] Whereas the statistical data from the other versions of Visitors Profile were tabulated on a daily basis, the software version was designed to perform these calculations in real time. As Haacke noted in his artists statement:

> 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 exhibitions visitors emerges.[27]

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 in earlier technologically enhanced works by Haacke, such as Photo-Electric Viewer-Programmed Coordinate System (1966-68), technology was employed as a means to enable art to become a responsive, real-time system that, according to the

artist, "merges with the environment in a relationship that is better understood as a system of interdependent processes."[28] Similarly, in the software version of Visitors 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: Nicolas Schöffer's CYSP series of cybernetic sculptures of the mid-1950s, James Seawright's interactive robotic sculptures of the mid-1960s, and Myron Krueger's "artificial reality" environments of the early 1970s, to name just a few examples.

Like Levine and Haacke, Joseph 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, the technological metaphor of information processing offers an insightful model for interpreting his work. His contribution to software, the Seventh Investigation (Art as Idea as Idea) Proposition One (1970), included the same printed text in various international contexts: a billboard in English and Chinese in the Chinatown neighborhood of lower Manhattan, an advertisement in The Daily World, and a banner in Turin.[29] The text was comprised of a set of six propositions:

1. To voluntarily assume a mental set.
2. To voluntarily shift from one aspect of the situation to another.
3. To simultaneously keep in mind various aspects.
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.[30]

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: "The art consists of my action of placing this activity (investigation) in an art context, (i.e. art as idea as idea)."[31]

This stance would preclude the presence of technological apparatus in Kosuth's work, unless it could be employed in such a way that it did not become iconic, as anti-formalist critics might argue was the case in the work of Levine and Haacke.[32] Applying Burnham's software metaphor, the artwork was not the billboard or the other structural elements (hardware), but rather was manifested in Kosuth's philosophical questions (software), simultaneously contextualized within the framework of visual art and decontextualized in various public media. In this way, his work investigated the relationship between art and non-art ideas, the vehicles by which they are expressed, and the semiotic networks that enable them to have meaning.[33]

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 technological quality of his work. Nonetheless, in the context of software, Kosuth's Seventh Investigation lends itself to an interpretation based on Burnham's notion of art as an information-processing system. As mentioned above, Burnham had already drawn a parallel between how computer software controls the hardware that runs it and how information directs the activity of the human mind.[34] In this regard, Kosuth's propositions operate like instructions in the mind of the viewer.[35] 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 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 reflects the Information Age in general and the shift from an industrial to post-industrial economic base. Here, meaning and value are not embedded in objects, institutions, or individuals so much as they are abstracted in the production, manipulation, and distribution of signs and information.

Resistance to Parallels Between Conceptual Art and Art and Technology

In *Art into Ideas*, Robert C. Morgan credited Burnham's "Systems Esthetics" as 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 onceptual 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 socio-economic phenomenon ... the penumbra between industry and post-industry."[36]

Burnham had already drawn a similar parallel in Systems Esthetics, which referred to the shift in industry from control of production to control of information that John Kenneth Galbraith described in *The New Industrial State*. However, in "Systems Esthetics," he 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 economic and social changes that Galbraith and others were identifying and forecasting.

Morgan's alliance with Burnham ceases precisely at the point of drawing an explicit parallel between conceptual art and technology. Indeed, no art historian since Burnham has made that connection so emphatically, and nearly all have sought to dismiss it.

However, it is unclear how the relationship that Morgan recognizes among 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.

Nonetheless, 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 throughout the 1950s and 1960s, no longer appeared to be a viable direction for many artists in the 1970s.[37] Public skepticism toward the military-industrial complex after May 1968 and amidst the Vietnam 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.[38] Conceptual art, on the other hand, with its assault on the modernist object, became increasingly central to a variety of artistic and critical discourses, ranging from post-minimalism to performance and from installation to earthworks.[39]

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, appeared peripheral to contemporary artistic concerns, if not simply passé.

It would be a mistake, however, to underestimate the commonalities among 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. For example, Roy Ascott, the British artist most closely associated with cybernetic art in England, was not

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included in cybernetic serendipity because his use of cybernetics followed a primarily conceptual approach.[40] Conversely, though his 1964 essay "The Construction of Change" was quoted on the dedication page of 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. In this regard, Ascott's use of the Thesaurus in 1963 drew an explicit parallel between the taxonomic qualities of verbal and visual languages, a concept that would be taken up in Kosuth's Second Investigation, Proposition 1 (1968) and Mel Ramsden's Elements of an Incomplete Map (1968).[41] In these ways, the inheritances of art and technology and conceptual art were somewhat opposed, complicating the fluidity between the two categories, and creating absences where useful associations could have been made. Ascott's example, however, powerfully demonstrates the significant intersections between conceptual art and art and technology, exploding the conventional autonomy of these art historical categories.

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).[42] Whatever once was relevant about unifying art and technology, it was increasingly 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 *Conceptual Art*, Ursula Meyer appropriated a technological metaphor and wrote: "Conceptual Art is diametrically opposed to hardware art."[43]

Burnham himself acknowledged the "chic superficiality that surrounded so many of the kinetic performances and light events" and further noted that "there was ... more than a little of the uptown discotheque in Haacke's gallery, Howard Wise."[44] However, this sentiment was held perhaps more strongly in those conceptual art circles, and especially art and language, where the battle against the formalism of modernist objects (and their complicity as commodities in reinforcing capitalist ideology) was being waged most fervently. From this anti-formalist perspective, the bells and whistles of art and technology appeared to be gaudy, expressionistic, and commercial excesses that were extraneous and antithetical to the aesthetic investigation of signifying systems that defined the agenda of conceptual art.

One of the most able proponents of this position is art critic 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 that, "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 technologies it set out to exploit."[45] He further stated that during this time of experiments in art and yechnology 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."[46] Nonetheless, Harrison was obliged to acknowledge the interest in technology shared by art and language founding members David Bainbridge and Harold Hurrell. Harrison claimed, however, that the "legacies of Pop-Art-and-technology were never part of the Art & Language agenda"[47] and never "furnished much better than chronic distractions from the more interesting and intractable problems of modern art."[48]

While pop art and art and technology overlapped in some ways, 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 (its concern with process and systems; the relationship between technological and aesthetic structures of knowledge; and an interactive, two-way exchange of information) these concepts can be seen as closely related to aspects of conceptual art.

Indeed, many of the concerns of art and technology were manifest in Hurrell's Cybernetic Artwork that Nobody Broke, (1969),[49] Bainbridge's electronic installation for Lecher System (1969-70),[50] and Terry Atkinson and Michael Baldwin's key to 22 Predicates: The French Army (1967).[51] Because all these works by art and 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 the systems of knowledge (and the technologically mediated modes of knowing) that structure scientific methods and conventional aesthetic values, these works have much in common with the objectives of art and technology. Indeed, the critical questioning of the social implications of technology characterizes a wide variety of artistic inquiries in the domain of art and technology since the 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 continued this tradition of artists' use of technology in a critical manner.

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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 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 art world that art and language strategically set out to deconstruct, technological references posed a potential contradiction to the collectives project. Harrison was unable to acknowledge the ways in which artists' use of technology has been critical not only of technology itself, but also of modernist aesthetics. This resistance to technology obscured his ability to see the use of technology by art and 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."[52]

Oddly enough, Harrison's discussion of Index (1972),[53] an art and language group collaboration, explicitly referred to the fields of artificial intelligence and what has come to be known as neurophilosophy, with strong overtones of cybernetics and systems theory. In fact, his 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 software. Index, moreover, can be thought of as a kind of manual hypertext system that allows for interactive association and linking of ideas. Ironically, the first public display of a hypertext system took place in Burnham's software exhibition!

It is hard to imagine that Harrison, a consummate, culturally informed intellectual, the former editor of *Studio International,* and a contributor to Artforum, was not familiar with Burnham's *Beyond Modern Sculpture*, his prominent writings in *Arts* and *Artforum*, or the highly publicized software exhibition. 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 and 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.[54] But by limiting his foil to pre-war notions of materiality and production, and the aesthetic issues of modernist formalism, Harrison's history of art and language and conceptual art is unnecessarily narrow in its implications and fails to address the relationship of late 20th-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, an awareness of such developments is not only present in the art and language works discussed above, but also seeped into Harrison's interpretation of the collective's work, as the example of his description of "Index" shows.

Conclusion

The continuities between art and technology and conceptual art are more readily apparent from an historical distance of three decades, removed from the aesthetic-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 30 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.[55] Nonetheless, his work has been canonized primarily within the context of conceptual art.[56] Other artists, like Ascott, remained simultaneously visible and invisible to each camp throughout the 1960s and 1970s.[57] The critical reception and historicization of Haacke and Ascott say less about their work than they do 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 that, in combination with the advent of digital computing and telecommunications, played a significant role in shaping culture. As Burnham wrote in 1970, "information-processing technology influences our notions about creativity, 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."[58]

By re-examining the relationship between technology and conceptual art, this essay 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 shifts 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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Notes

1. Because of the extraordinary response to the MOMA competition, the numerous other proposals resulted in a spin-off exhibition, Some More Beginnings, that EAT organized at the Brooklyn Art Museum concurrently with The Machine. See K.G. Pontus Hulten, The Machine: As Seen at the End of the Mechanical Age. New York: Museum of Modern Art, 1968. See also, Experiments in Art and Technology, Some More Beginnings, New York: Experiments in Art and Technology, 1968.

2. nine evenings was the culmination of collaborations between artists and dancers, like Rauschenberg, who were associated with the Judson Dance Theater, and engineers, like Klüver, from Bell Laboratories. If any single event could be identified as the spark that ignited American interest in the idea of joining art and technology in the 1960s, this was it.

3. See Klüver, B., Martin, J., and Rose, B., eds., *Pavilion*. New York: Dutton, 1972.

4. See Tuchman, M., "A Report on the Art and technology Program of the Los Angeles County Museum of Art," 1967-1971.

5. Many of the artists who offered proposals to A&T wanted to use computers, but 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. See Tuchman, "A Report: 19," 201-23. With regard to telecommunications projects, on July, 1971, EAT organized Utopia Q&A, an international telex project that involved participants in New York, Tokyo, Ahmedabad, and Stockholm exchanging information about changes they anticipated in culture and society in 10 years. EAT archives: 67:1, Getty Research Institute, Los Angeles.

6. Reichardt, J., ed., *Cybernetic Serendipity: The Computer and the Arts*. London: Studio International, 1968.

7. See Judith Benjamin Burnham, ed., Software, Information Technology: Its New Meaning for Art. New York: The Jewish Museum, 1971. The exhibition featured a stellar cast of experimental artists, including Robert Barry, Douglas Huebler, Agnes Denes, Sonia Sheridan, Alan Kaprow, Vito Acconci, David Antin, John Giorno, John Baldessari, John Goodyear, Ted Victoria, and Donald Burgy.

8. Like Burnham, Harrison was extremely close to the pulse of conceptual art, and his writings, like those of his American counterpart, warrant respect and response. Harrison first met the four founders of art and 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 Became Form. He became an active member of Art & Language in 1971, merging his professional training as an art historian 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.

9. 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 Lippards 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 artworks value as an object of commercial exchange to its value as aesthetic and political interchange." See Kristine Stiles, "Language and Concepts" in Kristine Stiles and Peter Selz, eds., Theories and Documents of Contemporary Art: A Sourcebook of Artists Writings, (Berkeley: University of California Press, 1996): 804-816; and Mel Bochner, "Book Review," Artforum 11:10 (June, 1973), reprinted in Stiles and Selz, Theories and Documents: 828-32.

10. Burnham, J., "The Aesthetics of Intelligent Systems" in Edward Fry, Intro., *On the Future of Art,* (New York: Viking, 1970): 119.

11. Ibid.

12. Burnham, J., "Notes on Art and Information Processing," *Software: 10*

13. See my "The House That Jack Built: Jack Burnhams Concept of Software as a Metaphor for Art," Leonardo Electronic Almanac 6:10 (Nov 1998) online publication: mitpress.mit.edu/e-journals/LEA/ARTICLES/jack.html

14. Burnham, J., Personal correspondence with the author, April 23, 1998.

15. Burnham, J., "Alices Head," *Artforum 1970, reprinted in Jack Burnham*, Great Western Salt Works, (New York: George Braziller): 47.

16. The other two works were A.I.R. (1968-70) and Wire Tap (1969-70). A.I.R. (Artist In Residence) was conceived as a live, real-time video link to Levines 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 12 12-inch x 12-inch speakers.

17. Burnham, *Software: 60*.

18. Levine, L., artists statement, *Software: 61*.

19. 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.

20. Levine quoted in Gene Youngblood, *Expanded Cinema*. (New York: E.P. Dutton and Co., Inc, 1970): 340.

21. Ibid.

22. Burnham, J., Haacke, H. "Wind and Water Sculpture," *Tri-Quarterly, 3* Evanston: Northwestern University Press, 1967.

23. Haacke, H., Interview with the author, January 2, 1999.

24. Ibid. Bertalanffy's ideas were compiled in *General Systems Theory: Foundations, Development, Application*, New York: George Braziller, 1968. See also, Wiener's *Cybernetics: or, Control and Communication in the Animal and the Machine*, Cambridge: MIT Press, 1948. 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,* New York: George Braziller, 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; and Claude Shannon's related principles of information theory. For more on Burnham's influence on artists, see Simon Penny, "Systems Aesthetics + Cyborg Art: The Legacy of Jack Burnham," *Sculpture Magazine, 18* (1), January-Febuary 1999. Published online at www.sculpture.org/documents/scmag99/burnham/sm-burnh.htm

25. Burnham, J., "Real Time Systems," *Artforum* (Sept 1969): 49-55, reprinted in *Great Western Salt Works*: 27-38.

26. The questionnaire was almost identical to the version Haacke proposed for his solo exhibition at the Guggenheim Museum in 1971, which the museum cancelled. See Brian Wallis, ed., *Hans Haacke: Unfinished Business*, Cambridge: MIT Press, 1986: 82-7; and also in this volume, Rosalyn Deutsche, "Property Values: Hans Haacke, Real Estate, and the Museum": 20-38.

27. Haacke, H., artists statement in *Software: 34*.

28. Haacke, H., artists statement in "Hans Haacke," exhibition catalog, New York: Howard Wise Gallery, 1968, quoted in Jack Burnham, *Systems Esthetics, 35*.

29. Kosuth recalls that much of the material for the software installation (loose-leaf folders filled with propositions, information, and documentation) was "borrowed" by an audience member for an extended period, though ultimately it was returned to the museum. Joseph Kosuth, interview with the author, April 5, 1999.

30. See Kosuth, J., "Seventh Investigation (Art as Idea as Idea) Proposition One" illustrated in *Software, 69*.

31. Kosuth, J., artists statement, *Software, 68*.

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32. 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 iconic 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.

33. For more on Kosuth's theorization of conceptual art, see Joseph Kosuth, *Art After Philosophy and After: Collected Writings, 1966-90,* Gabriele Guercio, ed. Cambridge: MIT Press, 1991.

34. Burnham, "The Aesthetics of Intelligent Systems."

35. 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 event scores for the mind.

36. Morgan, R. C., *Art into Ideas*, New York: Cambridge University Press, 1996: 2-3.

37. The journal *Leonardo*, founded by artist/scientist Frank Malina in 1967, and excellent books like Jonathan Benthall's *Science and Technology in Art Today* (1972) and especially Douglas Davis's *Art and the Future* (1973), helped to keep interdisciplinary discourses among 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, the University of Illinois at Chicago, and The Ohio State University. Howard Wise closed his gallery in 1971 in order to create the Electronic Arts Intermix, a not-for-profit organization serving video artists, which is still in operation in New York.

38. For more on the ideological context for art and technology in the 1960s, see Edward A. Shanken, "Gemini Rising, Moon in Apollo: Attitudes Towards Art and Technology in the US, 1966-1971" in ISEA97 *(Proceedings of International Society for Electronic Art),* Chicago: ISEA97, 1998; reprinted online in Leonardo Electronic Almanac 6:12 (January, 1999): mitpress.mit.edu/e-journals/LEA/ARTI-CLES/gemini.html

39. Public interest in conceptual art had steadily increased 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." Nineteen sixty-nine was a watershed year, marked by an extraordinary number of international exhibitions. Its increasing reputation led to the publication in 1972 of Ursula Meyers' *Conceptual Art*, a compilation of statements, essays, artworks, and interviews by conceptual artists; and in 1973, Gregory Battcock's *Idea Art: A Critical Anthology*.

40. Jasia Reichardt, interview with the author, July 30, 1998, London.

41. Moreover, since Ascott's diagram entitled "Thesaurus" was largely textual, he expressly put in writing his intention to use text in and as art.

42. Sol Lewitt, "Paragraphs on Conceptual Art," Stiles and Selz, Theories and Documents: 825.

43. Ursula Meyer, *Conceptual Art*, New York: Dutton, 1972, xvi.

44. Jack Burnham, "Steps in the Formulation of Real-Time Political Art" in Kaspar Koenig, ed., *Hans Haacke: Framing and Being Framed, 7 Works* 1970-75, (Halifax: The Press of the Nova Scotia College of Art and Design, 1975): 128-9.

45. Charles Harrison, "A Kind of Context," in *Essays on Art & Language* (London: Basil Blackwell, 1991): 17.

46. Ibid: 260, fn 25.

47. Ibid: 261, fn 30

48. Harrison, C., "The Late Sixties in London and Elsewhere" Hillary Gresty, ed., 1965-1972, When Attitudes Became Form, (Cambridge: Kettles Yard Gallery, 1984): 10-11.

49. This spurious computer program for interactively generating color refused to allow the user to interact beyond the rigid banality of binary input. If the user entered a number other than 0 or 1, the program proffered the message: "YOU HAVE NOTHING, OBEY INSTRUCTIONS!" If the user entered a non-number, The Cybernetic Art Work That Nobody Broke responded that there was an "ERROR AT STEP 3.2." Ibid: 58.

50. This work 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. See, Terry Atkinson, David Bainbridge, Michael Baldwin, and Harold Hurrell, "Lecher System" Studio International 180:924 (July/Aug 1970), reprinted in Ursula Meyer, *Conceptual Art*: 22-25.

51. In this work, Terry Atkinson and Michael Baldwin offered a key to abbreviations for the French Army (FAA), the Collection of Men and Machines (CMM), and the Group of Regiments (GR), then described the inter-relationships among them: The FA is regarded as the same CMM as the GR, and the GR is the same CMM as (for example) a new order FA (for example, morphologically a member of 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 systematic relationships among individuals, groups, and institutions characteristic of cybernetics and the military. See, Harrison, *Essays on Art & Language*: 52 Ibid: 56.

53. Index had a variety of manifestions, including a component of Index 4, which consisted of a computer printout. Several instances of the work can be likened to hypertext, an electronic text system in which a non-linear narrative is navigated by participants through a process of making associational links. Ibid: 72.

54. Some of the distinctions Harrison has made between art and language and "the normal work of ... Conceptual Art," such as the idea that "it was the supposed end product of the [Conceptual] artists 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 "Alices Head." See, Harrison, Essays: 51

55. See for example, Popper, F., *Origins and Development of Kinetic Art*. Trans. Stephen Bann. Greenwich, CT: New York Graphic Society, 1969; Jack Burnham, *Beyond Modern Sculpture*; Douglas Davis, *Art and the Future: A History/Prophecy of the Collaboration between Science, Technology and Art*. New York: Praeger, 1973.

56. 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*.

57. 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 practicioner of telematic art, which achieves 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. While deeply ensconced in theoretical concerns regarding process, systems, and linguistic structures of communication, Ascott's work is in the process of being canonized in the domain of media art, the apparent successor to art and technology.

58. Burnham, "Notes on Art and Information Processing" *Software: 11* (16).

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