

## IN FORMING SOFTWARE

Software, Structuralism, Dematerialization

Edward A. Shanken

### JACK BURNHAM'S CONCEPT OF "SOFTWARE" AS A METAPHOR FOR ART

The *Software* exhibition, curated by Jack Burnham for the Jewish Museum in 1970, constituted a remarkable convergence of computers, experimental art practice, and structuralist theory. In contrast to the numerous 1960s art and technology exhibitions that focused on the aesthetic applications of technological apparatus, *Software* was predicated on the idea of "software" as a metaphor for art. Under this rubric, Burnham explored his notion of the mythic structure of art by drawing parallels between art and information technology, particularly with respect to the conceptualism and so-called dematerialization of art in the mid- to late 1960s. *Software* joined works of art with works of technology and exhibited them together in an art context, purposely making "no distinction between art and non-art."<sup>1</sup> The exhibition was designed to function, moreover, as a testing ground for public interaction with "information processing systems and their devices."<sup>2</sup> Many of the displays were interactive and based on two-way communication between the viewer and the exhibit, heralding the ethos of interactivity that became pervasive in 1990s art and consumer culture.

Burnham directly interacted with software as a fellow at the Center for Advanced Visual Studies at MIT during the 1968–69 academic year. Having received his MFA from Yale in 1961, he was invited, as an artist, to learn to use the state-of-the-art time-sharing computer system at MIT's Lincoln Laboratories. That experience deeply impacted his thinking about art, software, and information

processing, inspiring many of the ideas manifested in *Software*. In his essay “The Aesthetics of Intelligent Systems,” first presented as a lecture at the Guggenheim Museum in 1969, he reflected on working with computers at MIT. Burnham compared the brain and the computer as information processing systems and drew further analogies between information processing and conceptual art. Concluding that the artistic potential of computers was very limited at the time, 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.”<sup>3</sup> Burnham observed that his interaction with software altered his own state of mind, which in turn altered the program: “A dialogue *evolves* between the participants—the computer program and the human subject—so that both move beyond their original state.”<sup>4</sup> Finally, he drew a parallel between this sort of two-way communication between mind and machine, and the “eventual two-way communication” that he anticipated would evolve in art as a result of computerization:

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.<sup>5</sup>

It is difficult to imagine a more concise and prophetic manifesto for contemporary new media art than this statement, written more than four decades ago.<sup>6</sup>

Burnham conceived of software as analogous 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. The term *post-formalist* may be interpreted as roughly equivalent to the term *post-modern* in both rhetoric and substance. It not only asserts itself as heir to the previously dominant aesthetic ideology, but also identifies formalist orthodoxy as the particular feature that it strategically countermands. *Software* featured what would become an all-star cast of post-formalists associated with process, performance, and various strains of conceptual art, including Vito Acconci, John Baldessari, Robert Barry, Donald Burgy, Agnes Denes, John Giorno, Hans Haacke, Douglas Huebler, Joseph Kosuth, and Les Levine. Technologists, including Nicholas Negroponte and Ted Nelson, exhibited prescient works anticipating

responsive environments and hypertext, respectively. In addition, the catalogue included projects not realized in the exhibition proper by Allan Kaprow, Nam June Paik, and others, adding a further degree of conceptual ephemerality à la Seth Siegelaub's *January Show*.<sup>7</sup>

Burnham organized *Software* while writing *The Structure of Art* (1971) and conceived of the exhibition, in part, as a concrete realization of his structuralist art theories.<sup>8</sup> Drawing on Claude Lévi-Strauss's notion that cultural institutions are mythic structures that emerge differentially from universal principles, Burnham theorized that western art constituted a particular mythic structure. 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 by demystifying it and revealing its internal logic.<sup>9</sup>

Burnham set out these ideas in his essay "Alice's Head." True to the title, he began the essay with a quotation 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!'"<sup>10</sup> Burnham's reference 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. The artistic 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). Deeply influenced by systems theory, Burnham recognized that "hardware and software mutually affect and interact, determining each other's nature for a given problem."<sup>11</sup> He proposed that *Software* "remove the traditional hardware props of art," and he developed an expansive notion of artistic media with "software potential," including radio, telephone, photocopying, teletype, and television, all of which were included in the exhibition.<sup>12</sup> He later described *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."<sup>13</sup>

Burnham's use of the term *aesthetic* offers further insight into his ambitions for *Software*. In the context of his structuralist theory, "aesthetic sensations" and "aesthetic tensions" would constitute individual responses to works of both art and nonart placed within an art context, mediated by socially inscribed rules and expectations. Such rules and expectations can be thought of as a form of programming or social software. In other words, viewers' programmed expectations of and responses to art are brought to bear upon nonart, while their programmed expectations of and responses to nonart are brought to bear upon art. *Software* sought to apply pressure to the disjunctions between the socially programmed modalities of art and nonart in order to create tension between them and thereby reveal their mythic structures.

Burnham's selection of works to demonstrate his theories was nothing short of visionary. Many of them anticipated and participated in important trends in intellectual and cultural history born at that time, including conceptual art, performance, video, new media, networking, hypertext, and interactivity. Quoting McLuhan, Burnham claimed that such work demonstrated a significant 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 among systems and their components in global fields, in which there is "no logical separation between the mind of the perceiver and the environment."<sup>14</sup> The following discussion focuses on the work of three prominent artists whose contributions to *Software* demonstrate the exhibition's conceptual and metaphorical richness.

### ART AS SOFTWARE: LEVINE, HAACKE, KOSUTH

In the late 1960s, Les Levine was at the forefront of experimentation with using the interactive feedback of information systems to interrogate the boundaries among artist, viewer, and environment. He was represented in *Software* by three pieces, including *Systems Burn-Off X Residual Software* (1969).<sup>15</sup> The original installation at the Phyllis Kind Gallery in Chicago was composed of one thousand copies of each of thirty-one 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 thirty-one thousand 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."<sup>16</sup>

In the *Software* exhibition catalogue, Levine wrote a statement outlining his concept of software and its relationship to art; indeed, it was he who suggested the title of the exhibition to Burnham. Levine's statement 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. . . . 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.<sup>17</sup>

Levine conceived of the thirty-one thousand 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 objects (hardware). It functioned as a metacritique 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 *art as information about information about art*, adding a level of complexity and reflexivity onto that cycle of transformations in media culture.<sup>18</sup>

*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.”<sup>19</sup> 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.<sup>20</sup>

In this regard, Levine provocatively has noted that “simulation is more real than reality. Reality is an overrated hierarchy.”<sup>21</sup> 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*.

Like Levine, Hans Haacke utilized technology and mass media in work that is fundamentally conceptual in nature but contributes to the discourses of multiple artistic tendencies. Perhaps best known for his politically charged critiques of power relations among individuals, art institutions, industry, the military, and government, Haacke’s work in the early 1960s evolved from kinetic sculpture. He considered himself a “sort of junior partner” of the German-based Zero group<sup>22</sup> and was included in a number of key *Nouvelle Tendance* exhibitions.<sup>23</sup> The use of



FIGURE 3.1. Hans Haacke, *News*, 1969. © 2010 Hans Haacke / Artists Rights Society (ARS), New York / VG Bild-Kunst, Bonn.

reductive forms and industrial materials in works of this period, such as his *Condensation Boxes*, can be compared with minimal art. But they also possess kinetic elements and constitute dynamic systems that harness and reveal natural phenomena, which allies them with art and technology, process, earth art, and *arte povera*.

Haacke contributed two pieces to *Software: Visitor's Profile* and *News* (figure 3.1). Both works were part of the artist's *Real Time Systems* series, which was inspired in part by conversations with Burnham, a close friend since 1962, who introduced the artist to the idea of open biological systems developed by Ludwig von Bertalanffy, and to Norbert Wiener's theories of cybernetics.<sup>24</sup> Burnham's article, "Real Time Systems," differentiated between "ideal time" and "real time" with respect to art.<sup>25</sup> 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* incorporated several teletype machines that delivered a perpetual flow of real-time information about local, national, and international events, which was printed out on continuous rolls of paper that accumulated on the floor, thus becoming aesthetic objects in ideal

time. Although derived from a very different conceptual framework, this work visually resembles the postminimalist “scatter” pieces of Robert Morris, Richard Serra, Barry Le Va, and others, in which materials such as felt, lead, and rubber were unrolled or scattered in haphazard configurations in a gallery space.

In his discussion of real-time systems, Burnham referred to a piece (likely *Visitor's Profile for Software*) that 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.”<sup>26</sup> 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 canceled solo exhibition at the Guggenheim Museum in 1971.<sup>27</sup> The installation was composed 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 questions, 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* catalogue that “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.”<sup>28</sup>

On the technological component of the artist'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.”<sup>29</sup> Haacke amplified this statement, stressing the importance of using whatever means are necessary to respond systematically to social exigencies and an expanding informational field: “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 every day is of concern. An artist is not an isolated system . . . he has to continuously interact with the world around him.”<sup>30</sup>

It must be noted that, like several other works in the exhibition, the *Software* version of *Visitor's Profile* initially did not work. Ironically, this failure appears to

be due to software problems that rendered inoperable the DEC PDP 9 time-sharing computer on loan to the Jewish Museum. Although Burnham blamed the programmer, rumors circulated ranging from sabotage to a custodian accidentally causing the computer to malfunction. Technical difficulties had beset many major art and technology exhibitions. The Smithsonian Institute decided against exhibiting *Cybernetic Serendipity*, which already had been shipped to Washington, DC, when the projected technical maintenance costs for the show substantially exceeded its budget. The Smithsonian had planned to exhibit *Software* as well but later declined.

Like Levine's *Systems Burn-Off*, Joseph Kosuth's "unplugged" contribution to *Software* can be interpreted as corresponding to a technological model of information processing. His *Seventh Investigation (Art as Idea as Idea) Proposition One* (1970) included the same 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 (in Italian, which was simultaneously on display at the Museum of Modern Art's *Information* exhibition). The English billboard text was composed of a set of six propositions:

- [1] to assume a mental set voluntarily.
- [2] to shift voluntarily from one aspect of the situation to another.
- [3] to keep in mind simultaneously 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.<sup>31</sup>

Kosuth's statement in the *Software* catalogue emphasized his intention that the work could not be reduced to a mental image, but that it existed as information free of any iconography. "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*)."<sup>32</sup>

In the context of *Software*, Kosuth's *Seventh Investigation* lends itself to an interpretation based on the exhibition's underlying metaphor of art as an information-processing system and the parallel Burnham drew between how computer software controls the hardware that runs it and how information directs the activity of the human mind.<sup>33</sup> In this regard, Kosuth's propositions operate like instructions in the mind of the viewer.<sup>34</sup> 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 those models, while at the same time demanding a self-reflexivity that goes beyond them. Kosuth's propositions required viewers to investigate the cognitive functioning of their own minds with respect to the processing of information, the creation of meaning, and the experience of consciousness. Taking a Wittgensteinian approach, *Seventh Investigation* interrogated how 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 a postindustrial economic base. Here semantic meaning and material value are not embedded in objects, institutions, or individuals as much as they are abstracted in the production, manipulation, and distribution of signs.

## CONCLUSION

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 installation. Burnham 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."<sup>35</sup> 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 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 conventionally have been produced in art.

In this regard, Burnham became very critical of the role of emerging technology in art.<sup>36</sup> Having lost faith in its ability to contribute in a meaningful way to the signifying system that he believed mediated the mythic structure of western art, in *Software* he purposely joined the nearly absent forms of conceptual art with the mechanical forms of technological nonart to “exacerbate the conflict or sense of aesthetic tension” between them.<sup>37</sup> Given his interpretation of Duchamp, such a gesture also can be seen as an attempt to interrogate the categorical oppositions of art and nonart by revealing their semiotic similarity as information-processing systems.

*Software* was founded 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, ultimately was meaningful only to the extent that it contributed to stripping away signifiers to reveal the mythic structure of art. Perhaps the point is nearing where the deconstruction of art’s mythic structure, if indeed it has one, 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,”<sup>38</sup> to such an extent that its aesthetic implications are sufficiently manifest to play a constructive role in proposing new artistic paradigms, if not new technological paradigms. The problem now confronting artists and curators involved with technology is not as much getting the machines and software to work as it is living up to the conceptual richness of *Software*.

## NOTES

Portions of this essay were previously published in “The House That Jack Built: Jack Burnham’s Concept of Software as a Metaphor for Art,” in Roy Ascott, ed., *Reframing Consciousness: Art and Consciousness in the Post-Biological Era* (Exeter: Intellect, 1999): 156–60; in “Art in the Information Age: Technology and Conceptual Art,” in *SIGGRAPH 2001 Electronic Art and Animation Catalog* (New York: ACM SIGGRAPH, 2001), 8–15; and in “Art in the Information Age: Cybernetics, Software, Telematics, and the Conceptual Contributions of Art and Technology to Art History and Aesthetic Theory,” Ph.D. diss., Duke University, 2001. It is dedicated to my loving parents, who provided me with the hardware and software that make my work possible.

1. Jack Burnham, “Notes on Art and Information Processing,” in *Software—Information Technology: Its New Meaning for Art*, ed. Judith Root Burnham (New York: Jewish Museum, 1970), 10.

2. Ibid.

3. Jack Burnham, “The Aesthetics of Intelligent Systems,” in *On the Future of Art*, ed. Edward Fry (New York: Viking Press, 1970), 119.

4. Ibid.

5. Ibid., 103.

6. Equally prophetic statements can be found in the theoretical writings of artist Roy Ascott. See Roy Ascott, *Telematic Embrace: Visionary Theories of Art, Technology, and Consciousness*, ed. Edward A. Shanken (Berkeley: University of California Press, 2003).
7. Art dealer Siegelau gained notoriety for mounting exhibitions, beginning in 1968, in which the exhibition catalogue was the primary, if not sole, object on display. The *January Show* (January 5–31, 1969) included work by Barry, Heubler, Kosuth, and Lawrence Weiner.
8. Willoughby Sharp, “Willoughby Sharp Interviews Jack Burnham,” *Arts* 45, no. 2 (November 1970): 23.
9. See, for example, Jack Burnham, “Duchamp’s Bride Stripped Bare: The Meaning of the ‘Large Glass,’” *Arts Magazine* 46 (March 1972): 28–32.
10. Jack Burnham, “Alice’s Head” (1970), in Burnham, *Great Western Salt Works: Essays on the Meaning of Post-Formalist Art* (New York: George Braziller, 1974), 47.
11. Jack Burnham, unpublished notes, March 13, 1969, Jewish Museum archives.
12. *Ibid.*, June 10, 1969, Jewish Museum archives.
13. Jack Burnham, personal correspondence with the author, April 23, 1998.
14. Burnham, “Alice’s Head,” 47.
15. 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 prerecorded videotapes of the artist in his studio. *Wire Tap* was composed of live telephone conversations between the artist and whoever happened to call him at the moment, played over an array of twelve 12-by-12-inch speakers.
16. Les Levine, artist’s statement, in *Software*, 60.
17. *Ibid.*, 61.
18. This cycle of transformations does not stop here. The reproduction of imagery from *Systems Burn-Off* in the *Software* catalogue 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 . . .
19. Les Levine quoted in Gene Youngblood, *Expanded Cinema* (New York: E. P. Dutton, 1970), 340.
20. Les Levine, telephone interview with the author, January 21, 1999.
21. *Ibid.*
22. Hans Haacke, interview with the author, January 2, 1999.
23. Jack Burnham, “Hans Haacke: Wind and Water Sculpture,” in *Tri-Quarterly* (Evanston, IL: Northwestern University Press, 1967), 3.
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, MA: 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 and the cybernetic theories of Wiener, Stafford Beer, Ross Ashby, and Gordon Pask, as well as 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, no. 1 (January–February 1999), <http://ace.uci.edu/penny/texts/systemaesthetics.html> (accessed October 10, 2007).
25. Jack Burnham, “Real Time Systems,” *Artforum* (September 1969): 49–55, reprinted in Burnham, *Great Western Salt Works*, 27–38.

26. *Ibid.*, 30.
27. Hans Haacke, interview with the author, January 2, 1999.
28. Hans Haacke, artist's statement, in *Software*, 34.
29. Burnham, "Real Time Systems," in Burnham, *Great Western Salt Works*, 30.
30. Hans Haacke, from a talk delivered at the Annual Meeting of the Intersocietal Color Council, April 1968, quoted in Burnham, "Real Time Systems," in Burnham, *Great Western Salt Works*, 30–31.
31. See Joseph Kosuth, *Seventh Investigation (Art as Idea as Idea) Proposition One*, illustrated in *Software*, 69.
32. Joseph Kosuth, artist's statement, in *Software*, 68.
33. Burnham, "The Aesthetics of Intelligent Systems."
34. A further parallel may be drawn between the event scores of artists such as George Brecht and Yoko Ono and Kosuth's propositions, which can be interpreted as functioning like event scores for the mind.
35. Sharp, "Willoughby Sharp Interviews Jack Burnham," 23. Subsequent quotes regarding the *Large Glass* and the organizational logic of *Software* are also from this page.
36. While Burnham's loss of faith in art and technology can already be seen in his 1969 article "The Aesthetics of Intelligent Systems," *op. cit.*, his most explicit and antagonistic pronouncement against is in Jack Burnham, "Art and Technology: The Panacea That Failed," in *Myths of Information: Technology and Postindustrial Culture*, ed. Kathleen Woodward (Madison, WI: Coda Press, 1980), reprinted in *Video Culture*, ed. John Hanhardt (New York: Visual Studies Workshop Press, 1986), 232–48.
37. Jack Burnham, personal correspondence with the author, April 23, 1998.
38. Burnham, "The Aesthetics of Intelligent Systems," 119.