The Legacy of Constructivism

Constructivism influenced many later groups and movements, all aiming to harmonize art, design, science, technology in one way or another.

The constructivist tradition wanted to believe that engineers and scientists could collaborate with artists for common goals. They could even become artists themselves, or the other way around.

It aimed to bridge the gap between the “two cultures,” the scientific and the humanistic. This issue was discussed by J. P. Shaw in his classic book The Two Cultures and a Second Look (London: Cambridge University Press, 1979, orig. 1959) and widely debated ever since.

The constructivist legacy can be seen in various movements and institutions:

Kinetic art (1950-70s)
Cybernetic art (1960s)
Experiments in Art and Technology (E.A.T., 1967-)
The Center for Advanced Visual Studies, MIT (founded by Moholy-Nagy’s student György Kepes in 1968)
The Art & Technology Project (directed by Maurice Tuchman at LACMA, Los Angeles, 1966-71).

Kinetic Art

Influenced by constructivism, but also by minimalism.

According to Jack Burnham (Beyond Modern Sculpture), kinetic art was based on a simple premise: if so much of 20th century art had represented light and motion (ever since impressionism in painting, etc.), why not create art that is literally based on light and movement?

There were basically two types of kinetic works: some works used perceptual illusions (Bridget Riley, Victor Vasarely, “Op Art”), while others employed actual mechanical, motorized motions.

Began as a movement in the 1950s, although its origins went further back (Marcel Duchamp, László Moholy-Nagy, Naum Gabo...). “Le Mouvement” exhibition in Paris in the Galerie Denis René in 1955 is often seen as the starting point (artists included Duchamp, Jesus Soto, Jean Tinguely, Alexander Calder, Yaacov Agam).

In 1961 the first international exhibition of art and movement was organized - the contradiction between kinetic constructivists and neo-dadaists (Fluxus) became evident.

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Cybernetic Art

Concept coined and theorized by artist, critic and theorist Jack Burnham in his influential book Beyond Modern Sculpture (1968).

Defining features: Shift from object to process, from static art to kinetic art; tradition to anthropomorphic representation replaced by robotic art: the promise of actually creating life, not just representing it.

Cybernetic theory (Norbert Wiener, W. Ross Ashby, W. Grey Walter, etc.) as a model for art-making. Cybernetic art is art that uses feedback mechanisms, self-regulating systems.

Cybernetic artworks are responsive (often responding to light, sound, movement). It is art that has incorporated the principles of modern machine culture, including those of computing and robotics.
From representing Life to Creating it (according to Burnham)

Traditionally arts have been understood as representations of life, rather than as creation of life itself.

“The imitation of life”: for thousands of years there have been stories about cases in which the artist’s creations were so lifelike that they were mistaken by observers as life itself (about the mimetic tradition read Auerbach: Mimesis). For example birds were said to try to land on painted trees, etc. Such stories exist in many different cultural contexts.

The artificial creation of life belonged to the field of the occult, or to the field of engineering demonstrations

Ever since the classical antiquity, there were also automata, or mechanical ‘living’ marvels. They were often disguised as humans or animals that could accomplish simple tasks. Such automata were appreciated, but they fell outside the canon of academic high art (although figures like Leonardo da Vinci did both paintings and created automata).

Automata were sensational attractions, display pieces and demonstrations of human ingenuity. The Romantic imagination ‘animated’ them in the imagination (for example in books by Mary Shelley and E.T.A. Hoffmann). In romantic stories automata were often provided with threatening and frightening features.

According to Burnham, cybernetic art was a continuation of the trajectory of anthropomorphism in Western art. At the same time modernist painting and sculpture had largely become nonrepresentational, abstract.

According to Burnham's opinion, a robot could be an artwork; it was an inheritor of the automata tradition. This idea was controversial and not accepted by everybody.

Cybernetics as an inspiration to "Cybernetic Art"

Jack Burnham's thinking was heavily influenced by the new science of Cybernetics.
The word ‘cybernetics’ was coined in 1948 by U.S. mathematician Norbert Wiener (1894-1964) at MIT. from Greek kubernetes "steersman," perhaps based on 1830s Fr. cybernétique ("the art of governing.").

Cybernetics is the science of control systems, a theory of self-regulating organisms. It provided explanations for command and control systems. “Feedback” was its central concept. It was closely related to Information Theory (Shannon, Weaver) that was developing at the same time.

Potentially cybernetics was seen as an umbrella science that could be applied to understanding communication in both machines, organic creatures and even social systems.

Neuroscientist W. Grey Walter created robot tortoises in the early 1950s, claiming they were able to avoid obstacles on their own and even to reason to an extent. Walter was a great scientist, who wrote the seminal book The Living Brain (1953). however, he also loved publicity and the claims he made about the capabilities of his robots were exaggerated. For an early newsreel about Walter's robots, see http://www.youtube.com/watch?v=ILULRlmXkKo .

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Cybernetic Art

Technology based: motors, light, sound. Often (but not always) responsive: reacted in various ways to external stimuli (wind, light, sound; to natural elements or the visitors’ presence).

Predecessors: “Bachelor machines”, absurd often sexualized machines imagined by writers and artists (Duchamp, Raymond Roussel, Franz Kafka...Jean Tinguely continued this tradition). Duchamp's “Precision Optics” project (different kinds of optical discs in motion), Moholy-Nagy's Light-space Modulator or “Licht-requisit”, Naum Gabo's Permanent Wave, Len Lye's later work, Alexander Calder’s “Mobiles.”

Kinetic Art (1950s-) can be seeb as a transitory stage toward cybernetic art (required active perception and played with perception and optical illusions; did not necessarily use technology, but often did).
Leading cybernetic artists: Nicolas Schöffer, Wen Ying Tsai, Takis, Frank Malina, Edward Ihnatowitz, James Seawright.

Nicolas Schöffer (1912-92)

Born in Hungary, but active in France most of his life. Cybernetic artist and theoretician

All-embracing vision about harmonizing the arts and the modern society in the tradition of Moholy-Nagy.

Created cybernetic works as manifestations of modern society; the works took many forms, sizes, roles. Among other things, created "spatiodynamic towers." These could respond to various impulses from the outside (wind, sound, light) and responded, creating a cybernetic feedback loop.

Schöffer's work bridged art, design, architecture and urban design. Schöfer's utopian vision meant to transform modern life. In this way he followed the visions of modernist architects and urban theorists like Le Corbusier.

Le Lumino, Le Minieffet and Varetra were self-functioning lightart boxes meant for the home. The were manufactured by the Philips Corporation. Similar idea has already been explored by Thomas Wilfred in his Clavilux Junior machines, 1930s.

Dancers like Maurice Béjart and Carolyn Carlson performed on stage with Schöffer's cybernetic artworks such as Spatiodynamique and Kyldex 1 (1973).

Edward Ihnatowicz (1926-1988)


Senster was a giant (15 feet long) hydraulic robot commissioned by Philips to their permanent showroom named Evoluon in Eindhoven, Holland. Removed in 1974, thought to have been destroyed, but re-
discovered (with electronic control system) as a sculpture in front of the building of the company that constructed it.

Cybernetic Serendipity (Institute of Contemporary Art, London 1968) was a major exhibition event bridging art and technology, curated by Jasia Reichardt. Ihnatowicz's "SAM," responsive sculpture was one of the exhibits.

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Issues Raised by Cybernetic Art

Should an artwork be a self-regulating system? What is the role of the audience/spectator? Can art be a system that incorporates both the work and the spectator/participant? Are hybrid cybernetic/organic systems possible? How do “responsive sculptures” differ from “interactive installations”?

Responsive sculptures create one-to-one responsiveness; they initiate a relationship, but usually are not really user controllable; create rather simple forms of action-response between the work and an observer.

How do work that respond to environmental stimuli (like Alexander Calder’s mobiles) differ from those than respond to human presence and actions (like Ihnatowitz’s Senster)?

In what sense can cybernetic artworks be considered as really ‘living’ entities?

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E.A.T. (Experiments in Art and Technology)

Initiators Billy Klüver (Swedish-born engineer working at Bell Labs) and artist Robert Rauschenberg in 1967. Main inspiration: John Cage.

Inspired by “9 Evenings: Theatre and Engineering”, a large scale performance event at New York Armory 1966. Participating artists included Rauschenberg, John Cage, Lucinda Childs, David Tudor, Yvonne Rainer, Steve Paxton, etc.
The idea was to organize a society where artists, designers and engineers could get to know each other and innovate with new kinds of creative projects.

John Cage: “It’s ...about artists and engineers...it’s about hands on, working together.”

The most important collective project: The Pepsi Pavilion for Osaka Expo, 1970 (”ambitious failure”). The pavilion was essentially empty, its major feature was a huge mirror dome. The audience was supposed to create the content spontaneously (it did not work as planned). Other works: Robert Breer's Floats, motorized slowly moving sculptures outside the pavilion, Fujiko Nakaya's for sculture that surrounded it, David Tudor's electronic music.

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Artificial Intelligence and Art

Basic questions:

Can a computer system learn, transcend pre-programmed constraints (take a “leap”?)

Is it possible to program a computer to be an autonomous artist?

Is it possible to create a smart conversational program that could fool a human user to take it as another human?

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Michael L. Noll: ”The Mondrian Experiment” (circa 1965)

Michael L. Noll created a variant of the Turing Test (”The Mondrian Experiment”) by juxtaposing a black and white copy of Piet Mondrian’s abstract Composition with Lines (1917) and a variant created by a computer with a pseudo random number generator.

Noll showed the test audience two pictures, one by Piet Mondrian and the other something similar but created by the computer program. Two questions were asked:

- Which one was made by Mondrian?
- Which one do you prefer?
According to Noll, 59% of the subjects preferred the computer generated picture, and only 28% correctly identified the work by Mondrian.

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Joseph Weizenbaum: ELIZA, 1966

A computer program that pretended to be a human person, a rogerian therapist. The user had “conversations” with it by typing on the teletype terminal and receiving responses through the same channel.

Raised a question: is it an intelligent computer program or a hidden human respondent?

The work was sceptical statement on natural language processing, although some people took it as a demonstration of the possibility of true artificial intelligence.

ELIZA has inspired many artists, including Sara Roberts and Ken Feingold, who have created parodies of artificial intelligence in the tradition on ELIZA (artifial personalities).

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Nicholas Negroponte and the Architecture Machine Group, MIT: SEEK

- Created the installation and system named SEEK, which was shown at the Software Exhibition, Jewish Museum, New York, 1970. Living gerbils were placed in a miniature world with many building blocks. These were arranged by a robot arm operating according to a predefined program. The gerbils were a "randomizing factor" causing chaos (piled of building blocks fells, etc.). The work asked the question: could the computer program learn to correct the situation, take a leap into an intelligent reasoning system?

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Harold Cohen: AARON

A project that has been continuously under development since the early 1970s. Probably the longest computer programming effort in history.
Cohen was a British visual artist, who moved to University of California San Diego around 1970. Became obsessed by computers, and started wondering if he could "teach" a computer to paint as he himself might have painted. Gave up painting himself, although had been vary successful.

AARON was influenced by Cohen’s encounter with artificial intelligence research at Edward Feigenbaum’s laboratory at Stanford University.

AARON is an expert system that creates paintings and drawings “relatively autonomously” (Cohen).

For 30 years, the code has been constantly re-written and expanded by Cohen. Series of different output devices have been used: a drawing “turtle” moving on paper, painting machines (designed by Cohen himself), more recently a software application that automatically creates pictures on the desktop.

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Artificial Intelligence and Artificial Life

In the 1960s and 70s artificial intelligence (AI) represented one of the frontiers of digital culture.

From the late 1980s onward Artificial Life or A-Life became a buzzword, also among media artists. One of the originating centers for A-Life research was the Santa Fe Institute, with researchers as Christopher Langdon, Tom Ray. Larry Yaeger at Apple created Polyworld, an artificial life ecological simulator. Cellular automata.

Where is the difference between AI and A-Life? AI was about simulating human reasoning and intellect with a computer program: interest in learning systems, natural language processing. A-Life simulates biological life-processes within the computer: creates ‘theoretical, hypothetical, alternate’ biosystems. Uses genetic algorithms.

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Artists who have used Artificial Life

Karl Sims
Troy Innocent
Yoichiro Kawaguchi
Christa Sommerer and Laurent Mignonneau
Ken Rinaldo (Autopoiesis, 2000)