BACHELOR MACHINES

Marcel Duchamp first made reference to the strange apparatus he called the "machine célibataire," or "bachelor machine," in a 1913 note written in preparation for his piece *The Large Glass* (1915–23). In his notes, Duchamp identifies the machine's component parts, which include: a water paddle, scissors, a chocolate grinder, a sledge, and nine "malic moulds." Represented in a variety of media on the lower pane of *The Large Glass*, the bachelor machine appears as a jumble of mechanical implements and schematic diagrams. Together with the bride machine that hovers wasp-like in the upper pane, Duchamp imagined the bachelor enacting an enigmatic drama of love and marriage, sex and death, suggested by *The Large Glass*'s full title: *The Bride Stripped Bare By Her Bachelors, Even*.

In his 1954 book, *The Bachelor Machines*, Michel Carrouges uses *The Large Glass* as a lens through which he reconsiders early twentieth-century art and literature. Carrouges sees the basic structure of Duchamp's work echoed in other fantastic machines envisioned by writers like Franz Kafka, Raymond Roussel, and Alfred Jarry. While the particulars vary in each case, all bachelor machines share "the sexual origin of the Large Glass' mechanics and their signification of death." Bachelor machines, according to Carrouges, are "unfinished, unfinishable, and incapable of operating in reality." Instead, they are "*mental machines*, the imaginary working of which suffices to produce a real movement of the mind."

Curator Harald Szeemann revisited and expanded Carrouges's argument in a 1975 exhibition also entitled "The Bachelor Machines." Szeemann exhibited a reproduction of Duchamp's *The Large Glass* and fabricated full-scale models of other bachelor machines, including the torture and execution device Kafka described in "In the Penal Colony." Szeemann interpreted the bachelor machine in more optimistic terms than Carrouges, explaining in a later interview, "It had to do with a belief in eternal energy flow as a way to avoid death, as an erotics of life: the bachelor as rebel-model, as antiprocreation."

INFLUENCING MACHINES

At the end of the eighteenth century, as the French Revolution challenged Europe's political order and the Industrial Revolution transformed the world economy, an English merchant and political activist named James Tilly Matthews became convinced that his mind was being controlled by a machine. According to Matthews, a gang of radical French Jacobins had infiltrated England, bringing with them the knowledge and means to construct a mechanism called the Air Loom. By producing invisible gasses and magnetic fields, the machine could manipulate a victim's mind and body from afar. Matthews described the Air Loom's effects and inner workings to anyone who would listen, detailing how it could make him speak like a puppet, or force his brain to accept an idea, all with the simple pull of a lever.

The doctors at Bethlem Royal Hospital, the London insane asylum (more commonly known as "Bedlam") where Matthews was confined in 1797, took detailed notes of his descriptions, which they interpreted as evidence of his madness. Psychologists have since reported that schizophrenics and autistic children often employ mechanistic imagery to articulate basic psychic experiences seemingly outside of their control. In 1919, the pioneering psychoanalyst Viktor Tausk published a study on these imaginary devices, which he called "influencing machines." While influencing machines may be delusions, Tausk found that the effects they produce in the mind seem very real to those who experience them.

Mainstream psychoanalysts in the twentieth century built on Tausk's interpretation of influencing machines as sublimations of sexual pathologies. Some practitioners, however, emphasized the positive, if not liberating, potential of machines for the human psyche. Wilhelm Reich, for instance, invented special chambers designed to concentrate the healing sexual energy he called "Orgone." Although critical of some of the ideological implications of Reich's work, Gilles Deleuze and Félix Guattari also reimagined the potential of human-machine interaction, placing machines at the center of a radically antihumanistic model for understanding desire as a "social-technical phenomenon."

WRITING MACHINES

Mechanical devices that separate the act of writing from the hand of the writer have provoked fascination and dismay since the early days of the Industrial Revolution. Machines that resembled humans and appeared to write on their own delighted the royal courts of Europe in the late eighteenth century. Like music boxes or cuckoo clocks, these automata executed preprogrammed tasks. But they proved to be particularly captivating because the task they performed—handwriting—was thought to be uniquely human. An automata's ability to hold a pen, ink it, and write phrases in cursive demonstrated its inventor's mechanical ingenuity. At the same time, by mutely mimicking a process associated with self-reflection and individuality, automata made for absurd parodies of Enlightenment values.

Typewriters are not, strictly speaking, writing machines in the same way as automata. As the philosopher Martin Heidegger observed, typewriters are "something in between a tool and a machine." They facilitate human expression even as they shape it in subtle but fundamental ways. In his cultural history of the typewriter, Barry Sanders describes how the introduction of these devices on a mass-produced scale in the mid-nineteenth century altered the experience of both reading and writing. Typing replaced the distinctive character of written language with a string of mechanically produced data points. And, as Friedrich Kittler argues, this "irruption of the mechanism in the realm of the word," constitutes a pivotal moment in the history of modernity when "writing and soul fall apart."

INDEPENDENT GROUP

Amongst the photographs included in Richard Hamilton's 1955 exhibition "Man, Machine and Motion," was an image of a skydiver strapped to a set of flimsy canvas "wings" preparing to jump from an airplane. Hamilton, a painter, conceived the exhibition of archival photographs as a "survey of appliances invented by men to overcome the limits imposed on them by the physical attributes provided by nature." The photographs of diving equipment, spacesuits, airplanes, and flight suits that Hamilton installed on steel lattices for the show illustrated a mastery of technology. But the historical images he chose also emphasized how quickly machines become obsolete—and, like the skydiver's wings, how prone they can be to catastrophic failure.

Hamilton was a central figure of the Independent Group (IG), a collective of British artists, architects, and critics who met at the Institute of Contemporary Art in London in the early 1950s. The Independent Group staged a series of groundbreaking exhibitions that explored the relationship between art, technology, science fiction, and popular culture. Unlike the Futurists and other modernist avant-garde groups that celebrated machines and envisioned mechanized utopias, the IG emphasized the irrationality lurking beneath the shiny veneer of postwar industrial society.

Eduardo Paolozzi, another IG member, was one of the first artists to include images from movies and glossy magazines in his work. But he did not consider himself a Pop artist, characterizing his practice instead as an "extension of radical surrealism." Paolozzi imagined the dystopian side of consumer culture. "I don't want to make prints that will help people to escape from the terrible world," he said in an interview, "I want to remind them."

During the 1960s, Paolozzi contributed illustrations to *Ambit*, an avant-garde journal that also frequently published J.G. Ballard's writing. Ballard used science-fiction tropes to explore the "inner space" of popular culture, especially the psychosexual tensions activated by the most seductive mechanical "appliance" of all, the automobile. In 1970, Ballard staged an exhibition that could be regarded as an explicitly dystopian response to Hamilton's "Man, Machine and Motion." Ballard's "Atrocity Exhibition" included three automobiles that had been violently mangled in real accidents, prompting horrified reactions in the viewers: "It was not so much an exhibition of sculpture as… of experimental psychology," Ballard said while recalling the exhibition's infamously raucous opening night, "…people were unnerved, you see. There was enormous hostility."

CYBERNETICS

In the years following World War II, cybernetics emerged as an interdisciplinary field at the intersection of computer science, statistics, and information theory. Although modern cybernetics is associated with high technology, the term derives from Plato's ancient studies of political self-governance. The mathematician Norbert Wiener appropriated Plato's concept in the late 1940s and applied it to the study of how both mechanical and biological systems process information by accepting inputs and producing outputs. Wiener was interested in how complex systems—everything from the human nervous system to self-guided missiles—self-regulate through feedback mechanisms. Unlike automata, which simply execute preprogrammed tasks, cybernetic systems respond in novel ways to new input without human intervention. In 1950, the British mathematician Alan Turing theorized that sophisticated versions of cybernetic systems—in effect, powerful digital computers—could one day program themselves and eventually mimic human intelligence.

The technological optimism underlying cybernetics spread to other fields as well, especially the social sciences and philosophy. Self-regulation and feedback provided the basic tools for explaining how complex phenomena can emerge from simple but interconnected behaviors. Cyberneticists proposed technocratic solutions for a host of political, social, and economic problems. Abraham A. Moles was at the forefront of a movement that understood art and aesthetics as cybernetic systems, explicable as social behaviors in rational, quantitative terms.

By the 1960s, a diverse group of artists began applying the lessons of cybernetics to their work. For some, this meant using high-tech materials and electronic media to create artworks that could respond to human interaction or their environment. On the other hand, cybernetics provided the basis of understanding art as a kind of information, inspiring many artists to reject traditional artistic media in order to present language and images as flows of data to be processed by the art world and other social systems.

NOUVELLE TENDANCE

In the early 1960s, a network of international artists adopted the name "Nouvelle Tendance, recherché continuelle" ("new tendency, continuous research") to describe their rational, even scientific, approach to aesthetics. Reacting against the romantic rhetoric of earlier Abstract Expressionist painting, Nouvelle Tendance artists defined their work as "research" and sought to re-establish abstract art as an impersonal, collective endeavor. Rejecting self-expression, they aimed to transform the viewer's perceptual experience through experiments with geometric forms, high-tech materials, and kinetic objects.

A series of European exhibitions, beginning with "Nove Tendencije" in Zagreb, in former Yugoslavia, in 1961, galvanized the movement by revealing the common ground between avant-garde groups that had previously operated independently. These included Gruppo T and Gruppo N in Italy, Equipo 57 in Spain, GRAV (Groupe de Recherche d'Art Visuel) in France, Nul in the Netherlands, and Zero in Germany. In part because so many different artists were involved, the exact parameters of the "tendency" remained open-ended. Often written in the measured tone of a scientific paper, manifestos issued under the name of Nouvelle Tendance stressed experimentation, depersonalization, and the mechanics of perception.

Although most Nouvelle Tendance artists eventually went their separate ways, the movement anticipated critical debates central to later 1960s art. Their embrace of technology allowed them to create new aesthetic forms. But more importantly, perhaps, Nouvelle Tendance artists envisioned a radically democratic role for artists in society. Rather than creating unique objects to satisfy elite tastes, Nouvelle Tendance artists sought to integrate art and everyday life by exploiting advanced production techniques and utilizing mass distribution systems.

OP ART

The pervasive influence of science and technology on 1960s art can be seen in the proliferation of new media like video, kinetic sculpture, and computer animation. But some artists—or at least their critics—also looked to science as a basis for reinventing the traditional medium of painting. First popularized in a 1964 *Time* magazine article, the term Op art refers to abstract paintings that can generate optical illusions of motion and depth through precisely rendered—though entirely flat and static—geometric compositions. If abstract painting had previously been associated with personal expression and irrationality in the 1940s and 1950s, art historian Pamela M. Lee argues that "Op was invariably described as an art of high science and technology, linked to theories of perception and historical studies of optics." Rather than appealing to emotions and romantic feelings, Op paintings were thought to operate directly on the viewer's perceptual faculties, simultaneously engaging the mechanics of the eye and revealing its fallibility.

William C. Seitz, as a curator at the Museum of Modern Art, promoted this link between art and science in his influential 1965 exhibition "The Responsive Eye." Seitz positioned work by artists like Bridget Riley, Julian Stanczak, Richard Anuskiewicz, and Victor Vasarely in relation to scientific investigations of vision, and established a pedigree for Op art stretching back to nineteenth-century Impressionism and Pointillism. However, as much as it gained institutional acceptance, Op art was equally a mass cultural phenomenon (in fact, one of the most comprehensive theoretical statements about the movement is an article Seitz published in *Vogue* magazine). Beyond the museum, the bold Op aesthetic informed commercial graphic design, nightclub architecture, and especially fashion, often to the dismay of the artists whose work was transformed into decorative patterns.

EXPANDED CINEMA

In the 1960s, an increasing number of visual artists began exploring the aesthetics of cinema, an art form that had long been associated with Hollywood's commercial ambitions. "Expanded cinema," a term popularized by the critic Gene Youngblood in 1970, refers to a diverse range of experimental practices that employ film, television, video, and other electronic media. For some artists, like Paul Sharits, expanding cinema meant rejecting the illusionism of photographic images. Sharits's "flicker films," such as *T,O,U,C,H,I,N,G* (1968), are composed almost entirely of monochromatic frames that produce intense pulsations when projected, drawing the viewer's attention to the basic structure of the film strip, the mechanics of the projector, the physical effects of light, and the real space of the cinema. Other artists at the time integrated film projections with live performances, or created elaborate installations with multiple projectors running simultaneously. Stan VanDerBeek conceived the *Movie-Drome* in 1963 as an architectural environment saturated with moving images. Viewers entered the domed structure and lay beneath a concave screen on which dozens of films and slides could be projected all at once. Although VanDerBeek only constructed one movie-drome, he envisioned a global network of similar structures functioning together as "culture-intercoms." Anticipating internet culture, VanDerBeek envisioned cinema as part of a media landscape where people around the world could exchange images and information.