

Entangled

Technology and the Transformation
of Performance

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Foreword by Peter Sellars

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Machines/Mechanicals

The world today belongs to machines. We live among machines, they help us do everything, to work and to enjoy ourselves. But what do we know about their moods, their nature?

BRUNO MUNARI, "MANIFESTO OF MACHINISM," 1952¹

In 1960, at the height of the Cold War, Swiss sculptor Jean Tinguely devised a performance event in which a machine, fastidiously assembled from bicycle tires, wire, and electric motors from New Jersey junkyards, would commit an act of suicide, self-destructing in the enclosed garden of the New York Museum of Modern Art (MoMA) before the crème de la crème of New York cultural witnesses. Tinguely's ironically titled *Homage to New York* was one of the earliest and concrete materializations of European modernism's dreams of a machine-only mise-en-scène—a performance enacted solely by the material offspring of industrial society's dreams and nightmares (figure 7.1). But if machine performances such as Tinguely's mixed human embodiment with metallic apparatuses, then where are we to be found in the early and late dreams of modernity, in which electromechanically enhanced automata displace us to be orchestrators, operators, and witnesses to their shifting feelings?

The incessant preoccupation with a total machinic mise-en-scène, performances by and for machines (if not for human spectators) is rooted in a conglomeration of influences criss-crossing the histories of automata, the imagined machine fantasies of industrial modernism, post–World War II military-industrial schemes, the advent of kinetic art, industrial subculture, and finally, our long-standing interest in robots.

The histories of performing machines and robotic art, however, have involved a continual mingling between the *mimetic* (imitative of human behavior in appearance) and the *machinic* (electromechanical behavior that, though animate, is not anthropomorphic) rather than a disambiguation. Curator and art historian Jasia Reichardt, organizer of the

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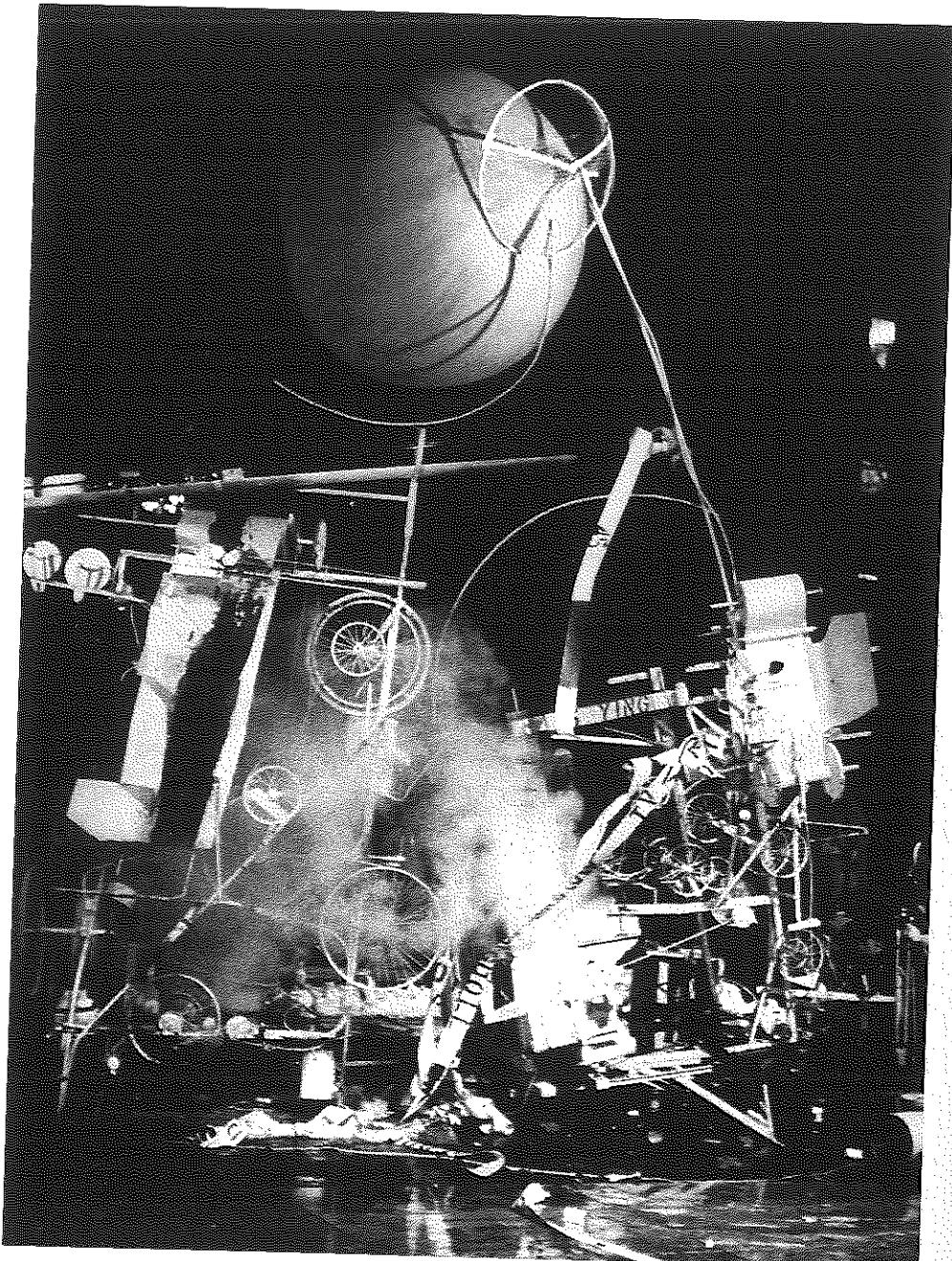


Figure 7.1 Jean Tinguely. *Homage to New York*, 1960. Photo, David Gahr. Courtesy Tinguely Museum, Basel.

1968 ICA-London exhibition *Cybernetic Serendipity*, one of the first machine art-based surveys, wrote that an entity's *behavior* rather than its *appearance* plays a crucial role in whether we ascribe sentience and performativity to something that, for all intents and purposes, is dead to us (Reichardt 1978, 56).

Here, automata not only refer to something that appears on the surface to be mechanical (i.e., kinetic) but also to processes: how a machine might internally behave to understand the environment it is situated in and react accordingly, based on a set of instructions. For Hungarian-born polymath John von Neumann, a key figure in the postwar cybernetic wave to focus science away from its physics-based emphasis on energy and power and toward information, communication, and computation, an automaton was "any system that processes information as part of a self-regulating mechanism" (Asprey 1990, 189).

Interested in the relationship between natural and artificial systems, von Neumann drew upon the models of the nervous system developed by electrical engineers Warren McCulloch and Walter Pitts in which nerves were essentially seen as *switching organs*—input/output devices for neural stimulus and response.² For von Neumann, automata were not machines in the sense that we understand the term, but rather mathematical axioms defining logical processes for such self-regulation and self-replication: the deciding factors for whether something natural or artificial could be considered "living."³

How then can we begin to understand the myriad ways in which machines perform for each other and for us, conveying a sense of animism that appears to be lifelike? How can machines enunciate before spectators and why have they so often been exhibited in an aesthetically artificial performance context based on their ability to perform as "actors" or, as artist Louis-Philippe Demers stated, "agents of expression" (Demers 2004). With few exceptions, from wind-up motors, remote-controlled radios, or computer terminals spitting out ASCII or MIDI information, machinic performances encompass a delicate dance of control between machines and their human counterparts.

"Why do we want our machines to seem alive?" wrote the artist Simon Penny (1995, 216). This is, of course, a salient question when surveying our Eastern and Western pre-modern fantasies of simulating nature through mechanical automata, from the *clipsedra* (water clocks) of Sung-dynasty China and the sophisticated pneumatics of Heron of Alexandria to the mechanical birds of Philon of Byzantium and the "simulacra" of Islamic scientist and engineer Al-Jazari, whose twelfth-century treatise *The Book of Knowledge of Ingenious Mechanical Devices* contained more than a hundred sketches and models for perpetual machines, wine dispensers, clocks, and similar animated matter.⁴

Between the seventeenth and nineteenth centuries, the process of constructing automata accelerated, encompassing everything from French inventor Vaucanson's fabled mechanical duck, musical performing androids, sounding boxes, and chess-playing machines to the Japanese karakuri dolls—mechanical puppets that also had a strong influence on the development of the Japanese puppet theater Bunraku.

Moreover, the histories of animate objects such as self-propelling mechanical figures, statues, and robots seem curiously tied up with theatrical performance's similar history of obsession with puppets and performing objects. Already some 120 years after the development of Bunraku, the German romantic writer Heinrich von Kleist's famous manifesto "*Über das Marionettentheater*" ("On the Puppet Theater") described a theater where a dance of marionettes could easily achieve the grace normally accorded to human dancers, because they were not affected by the "inertia of matter" or the affectation of the soul to weigh them down (Kleist 1982, 214). About one hundred years later, director Gordon Craig's essay "*The Actor and the Über-marionette*" reinforced the idea that machines could have the same force as human beings in performative spectacles, a suggestion that, as John Bell writes, could condemn the human performer to a lifeless world of objects—to death itself.⁵

Not surprisingly, the word and concept of "robot" made its first appearance also in the context of artistic performance. Derived from the Czech word *roboř*, meaning "slave worker" or "drudgery," "robot" was brought into widespread usage by the Czech writer Karel Čapek in his 1920 play *R.U.R. (Rossum's Universal Robots)*. It is not a bit ironic that the play's premiere in Berlin had the famous electromechanical machine scenography designed by Frederick Kiesler described in chapter 1, a scenography that presupposed that a mechanical contraption could have equal status with a human performer.

Mechanization Takes Command

The machine-obsessed Futurists were not the only cultural players caught up in the moment of nonhuman dynamism that the rapidly unfolding machine age provoked in the human imagination. In his 1948 treatise *Mechanization Takes Command*, the great Swiss architectural historian Sigfried Giedion described the hailing characteristic of the machine above all else, as the phenomena of movement itself; an extension of the human body and an articulated, performative substitute (Giedion 1969, 46–50). The human hand, which acted as a grasping instrument, was the central assemblage of the body, but the machine was also a kind of articulate aggregation, extending human action and elasticizing it.

In a further animistic move, the kinetic sculptor Bruno Munari's 1936 "Manifesto of Machine Art" suggested that artists were the only ones capable of grasping the machine's personality, intimately understanding its complexities and possibilities. "Artists are the only people who can . . . take an interest in machines. . . . They must get to know the anatomy and the language of machines, they must learn to understand machines and distract them by making them function irregularly, thereby creating works of art with those same machines and with the means they offer" (Hultén 1987, 17). Munari's manifesto demonstrated the general aesthetic interest in the simultaneous uselessness of machines and their aura of superhuman abilities that emerged around the industrial cultures surrounding modernism.

In his encyclopedic 1968 work *Origins and Development of Kinetic Art*, art historian Frank Popper provided yet another crucial piece in the machine performance puzzle, portraying the superhuman ability ascribed to the machine as something akin to the force of magic. "The introduction, suggestion and employment of machine movements in art," wrote Popper, "can be equated with the idea of the identification with the industrial and mechanical universe that is as much within the field of magic as that of aesthetics" (1968, 235). For Popper, machines were only a small subsection of the larger field of kinetic art that began in the early part of the twentieth century—an aesthetic field, like Giedion's claim, based on the dynamics of kinesthetic behavior.

The earliest—and consequently, most well-known—kinetic forms that incorporated what painter Fernand Léger called "machine aesthetics" into a direct translation of movement at the material level such as Naum Gabo's *Kinetic Construction* or László Moholy-Nagy's *Lichtrequisit (Light-Space Modulator)* from 1929, were chiefly driven by a formal exploration into the kinetic behavior of materials. The fact that Moholy-Nagy's *Lichtrequisit* had initially been imagined by the artist to present a new kind of stage environment points out the growing interest that the Constructivist-influenced avant-garde had in the intricate choreography of animated, nonhuman assemblages.

In describing the wide range of kinetic possibilities for artistic practice, Popper created a useful taxonomy of movement that corrected the common assumption that kinetic art was the sole basis for machine art and performance. Among categories such as figurations of movement, representation of movement, and photographic and cinematic procedures, he included the notion of movement expressed by movement itself: simple mechanical as well as electromechanical, electronic, thermal, hydraulic, and magnetic kinesis. "The automata of the 18th century have a direct relationship to . . . simple mechanical movement. But there seems little doubt that the modern manifestation of this technique actually derives a reaction to the machine age, which may take the form of fascination or irony. Picabia and Duchamp, in the first place, followed by such members of the younger generation as Tinguely and Gustav Kramer, have adapted this procedure in order to bring out the simultaneous beauty and monstrosity of the machine in motion" (Popper 1968, 221).

It is the fusion of beauty and monstrosity that helps articulate the strange, late-twentieth-century phenomena of machine performance or what the San Francisco-based machine art collective Survival Research Labs (SRL) described as "a unique set of ritualized interactions between machines, robots, and special effects devices with humans present only as operators or audience" (SRL Machines 2008). Taking place in abandoned urban wastelands and reconstituted former industrial halls, the new man-machine *Gesamtkunstwerk* is that of machines fighting and dying in front of a gathered crowd, their human operators banished behind tables holding the controls that breathe life into these mechanical phantoms. The realization of automata that transcend sculpture, machine performance is a spectacle that is curiously live yet, not living: incessantly counteracting the imagined

utopias of the earlier machine age with the apocalyptic overtones of the postindustrial epoch.

Machine Performance/Mechanical Mise-en-scène

The Futurist vision of machine destruction was most patently actualized in the works of Jean Tinguely. Driven by an interest in the “mechanics of chance” (Hultén 1975, 8), Tinguely’s kinetic forms reflected a postwar world in which the utopian perfection of Futurism was replaced by fragmented and absurd, Duchamp-influenced, ready-made junk. Tinguely’s machines were marked by the same war-scarred characteristics that the artist saw in human agents: ironic fallibility subject to error, disorganization, and breakdown—simultaneously self-driven and self-destructive.

As early as 1953, together with Romanian dancer and object artist Daniel Spoerri, he began conceptual planning for an *Autotheater*, a performance for colored shapes and moving objects without human performers. With the scheme unrealized due to the collapse of his mechanical set, Tinguely soon thereafter began experimenting with what he labeled *meta-mechanical* (“beyond machine”) devices, including a series of automatic drawing machines that consisted of mechanical structures that held pens or markers and could draw on positioned pieces of paper.

Tinguely’s desire to create a spectacle that would “pass like a falling star” and most crucially “be impossible for museums to reabsorb” finally resulted in a landmark series of self-destructing machine performances in the 1960s and 1970s that laid waste to the restrictive white walls of the gallery (Hultén 1987, 350). As described at the beginning of this chapter, the first and most notorious event, *Self-Destroying Construction No. 1—Homage to New York*, was planned for the MoMA sculpture garden. Constructed from electrically welded bicycle wheels, an old upright piano, Addressograph machines, drum parts, a meteorological balloon, mechanically driven paper rolls, go-kart parts, and a plethora of other detritus from suburban salvage dumps, Tinguely’s machine was designed to create acts of seduction and unease in the spectators (Hultén 1987, 2).

Assisted in his scavenging and engineering work by Bell Labs scientist and E.A.T. founder Billy Klüver, Tinguely’s “doomsday machine” undertook its sole thirty-minute performance in the sculpture garden on the cold, wet evening of March 17, 1961; a performance that, for the artist, was nothing less than a playful, almost mischievous act of machine suicide. As the junk apparatus ran, various joints melted and collapsed, while a can of gasoline hidden inside one of the components quickly sped up the mechanical self-immolation process.

“The work had to pass by, make people dream and talk and that would be all,” Tinguely later articulated to curator Karl Pontus Hultén. “It had a certain complex seduction that made it destroy itself—it was a machine that committed suicide. A very beautiful idea!” (Hultén 1987, 350). The *Homage to New York* performance embodied Tinguely’s profound

interest in the anarchic effect of aleatoric, uncontrollable processes. For the gathered crowd who had expected a colossal act of machinic annihilation, however, the machine itself betrayed the expected and instead malfunctioned—much to Tinguely's excitement. Engulfed in a smoky cloud of titanium tetrachloride that Klüver had brought to increase the visual pandemonium quotient, the burning machine reached a premature death not only by its own processes of dissolution but through the New York City fire department attacking it to put out the fire as well.

As the first in his series of machine performances, *Homage to New York* was critical to Tinguely's grasping the importance of the spectator's role in the mechanical mise-en-scène. *Study for an End to the World* or *monster-sculpture-autodestructive dynamique et aggressive* (1961), a second performance given at the Louisiana Museum in Denmark, incorporated dynamite to amplify the violent intensity of the spectacle. Before a gathered audience overlooking the Baltic Sea, a figural machine constructed of scrap metal, plaster, and dynamite performed a long theatrical scenario, eventually exploding in a blaze of fireworks, noise, and smoke.

Exploiting his increasing interest in the destructive powers of dynamite, Tinguely's penultimate machine performance, entitled *Study for the End of the World II* (1962), was to be staged before a NBC camera crew in the barren desert south of Las Vegas, a site not far from the proving grounds where atomic bombs were originally tested. The ultimate tribute to Tinguely's work, however, must have been the obscure *The Tinguely Mystery Machine* or *The Love Suicides at Kaluka*, a 1965 play written by Tinguely's friend Kenneth Koch and performed at the Jewish Museum in New York by a cast of human actors and Tinguely's machines interacting with each other.

In the last two decades of his life, Tinguely shifted his emphasis to large mechanical sculptures installed in public spaces and museums; works that, though sculptural, also displayed the same performative attitudes. *Dissecting Machine* (1965) involved female dress mannequins that functioned by sawing themselves apart in an atavistic act of violence. Tinguely's epic *Mengele Totentanz* (1986), a large-scale assembly of machines, made increasing use of natural and organic elements such as burned wood, animal skeletons, charred metal appliances, and traditional mechanical parts, and revealed the artist's growing apocalyptic world view.

For Tinguely, as a poetic instrument of liberation the machine's essence was its ability to move. "Life is movement . . . everything transforms itself, everything modifies itself ceaselessly" (Tomkins 1962, 150). Subject to their own mechanisms of behavior, Tinguely's machines evolved in a "total atmosphere of anarchy and freedom" (150), their playful, and simultaneously irrational and destructive behavior, expressing the impermanence and entropic dissolution normally attributed solely to human experience. His belief in life's ephemerality captured through the process of movement applied as well to the life of his machines, which at times ended up on the junk piles and in the trash cans of cultural institutions.

This Janus-faced tendency toward playfulness and destruction, and free will and control that was materialized in Tinguely's machines was later resurrected and amplified in what could be called his shadow successors: the California-based machine art group SRL. Founded in San Francisco in 1978 by artist and machinist Mark Pauline as an organization "dedicated to re-directing the techniques, tools and tenets of industry, science and the military away from their typical manifestations in practicality, product or warfare" (SRL Machines 2008), SRL, as it was known, arose in the postpunk, industrial subculture scene of the late 1970s, quickly acquiring an international cult following. As unstable events combining live theater, politics, technology, and engineering, SRL's mechanical performances fused the organic and mechanical, gravitating to the fine line between control and anarchy, the born and the made.

If, for Tinguely, the machine was the ultimate expression of freedom, for Pauline's dramaturgies it embodied a Nietzschean will to power through the violent triumph over both humans as well as its own fellow machine species. Described by critic Mark Dery in his ode to cybersubculture *Escape Velocity* as "a combination of killing field and carnival midway" (Dery 1996, 119), SRL's fiery spectacles created a machine-age theater of cruelty in which "the non-rational and the absurd act as the baseline of all activity" (Pauline 1996, 420).

Initially, SRL's spectacles were staged as word-of-mouth happenings in abandoned parking lots, freeway underpasses, and empty bus terminals, but as their reputation grew, so did the profile of performance venues: stadiums, art museums, and even the Sony corporate park in San Jose, California. The group's partially scripted performances consisted of custom-constructed, tele-operated creatures running amok in Wagnerian-scale pageants of mayhem before a live audience. Unlike German artist Gustav Metzger's 1959 call for an *auto destructive art*, where art made specifically for industrial societies would self-destruct by way of its own formal, natural, and technological mechanisms, SRL's form of performative annihilation was chiefly planned and orchestrated by its human scenographers.⁶

Machine Sex, SRL's first public performance in 1979 was staged at a Chevron gas station and featured the carcasses of dead pigeons sliced to bits by a giant shredding machine.⁷ Other earlier works, such as *Food for Machines*, *Noise*, and *Assured Destructive Capability* (all 1979) were smaller affairs, conducted by Pauline and a small pick-up crew of associates. With the addition of Matt Heckert and Eric Werner in 1980, SRL progressed to more elaborate contraptions that would destroy each other in choreographed rituals of industrial violence accompanied by ear-splitting, machine-generated soundtracks.

With extensive titles such as *An Epidemic of Fear: The Relief of Mass Hysteria Through Expressions of Senseless Jungle Hate and Extremely Cruel Practices: A Series of Events Designed to Instruct Those Interested in Policies that Correct or Punish*, Pauline and company constructed robotic nightmares welded from the plundered remains of Bay Area surplus military and high-tech salvagers in addition to "reanimated" animal carcasses and junked engines (figure 7.2). Radio remote-controlled, SRL performances involved combinations of

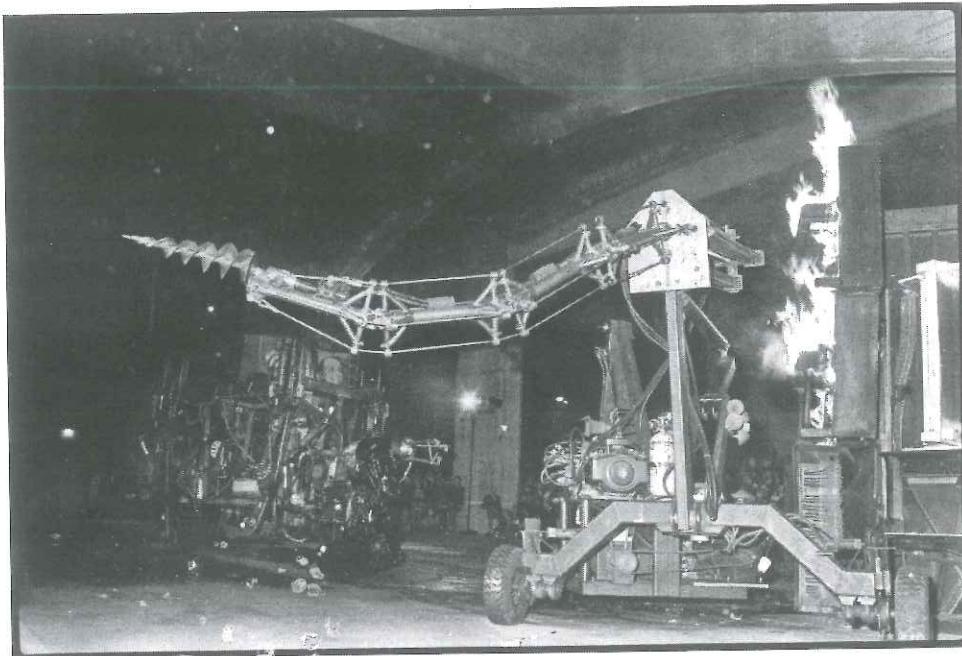


Figure 7.2 Mark Pauline/Survival Research Labs. *Illusions of Shameless Abundance*, San Francisco, 1989.
Photo Steve Heck.

stationary and mobile machines with names like Spike Roller, Chain Thing, and later, V1 (a replica of a World War II Buzz Bomb jet engine), which were pitted against each other in savage battles, spitting flame and shrapnel and eventually consuming themselves in heaps of wreckage.⁸

By the mid 1990s, the group's performances began to incorporate more technically sophisticated tele-robotic systems, including Internet-based remote control systems designed by legions of SRL associates and volunteers whose day jobs involved toiling away in the high-tech research laboratories of the San Francisco Bay Area's military and commercial complexes. In 1997's *Increasing the Latent Period in a System of Remote Destructibility*, a performance/exhibition sponsored by Tokyo's NTT/ICC digital media arts center, SRL associate and UC Berkeley computer scientist Eric Paulos programmed an online *Java Applet* that gave remote audiences indirect control over a machine in San Francisco.

1999's Tokyo follow-up to the 1997 *Remote Destructibility* show was the first recorded event to remotely control a machine during a live performance. In further efforts toward what Pauline described as "converting machines, improving them really, from things which once did 'useful' destruction into things that can now do useless destruction"

(Kelly 1994, 32), more recent performances after 2000 relied on the implementation of even more state-of-the-art sensing, embedded systems, and wireless technologies.

In more than one context, Pauline expressed the desire for his performances to be strictly for the machines rather than the human spectator. "These machines are totally at ease in the world we have built for them... they act completely natural" (Kelly 1994, 33). In the face of increasingly sophisticated war machines driven by telematic technologies and distributed intelligence, the question remained, however, whether SRL's "pyrotechnic insanitarium" (Dery 1999a, 3) of machine war simulacra critiqued or celebrated the performative and cataclysmic potential of such postindustrial systems.

The impact of SRL on the international machine performance scene cannot be underestimated. Driven by the liberal political-cultural climate of northern California as well as the widespread impact of SRL itself, satellite artists and collectives who had either worked with, been influenced by, or were in opposition to the group made the San Francisco Bay Area a haven for industrial culture, with SRL alumni artists such as Chip Flynn (the Peoplehater Group), and Christian Ristow and Kal Spelletich/SEEMEN creating their own machines and spin-off groups.⁹

Much of this off-shoot machine performance scene in San Francisco not only took place in the same down-market sites as SRL's but also at the legendary Burning Man festival, an annual late-summer gathering of more than 50,000 people who set up a temporary alternative city (Black Rock City) in the Nevada desert. In a weeklong festival fusing free expression with nonconsumer culture, technopaganism, and drug-induced hallucinogenia, Burning Man became the single largest "in the wild" performance space in the United States. As an ongoing postapocalyptic spectacle attracting legions of artists who built temporary testaments to cyber-machine culture, Burning Man featured such exotic phenomena as self-incinerating robots, roving Tesla coils on flatbed trucks, computer-controlled flamethrowers, dinosaur-like kinetic animals, and other sorts of pyromaniacal, industrial-techno-culture inspired madness in a barren desert.

Another indirect thread from the SRL legacy was the original San Francisco phenomenon of *Robot Wars*. Initially dreamed up by a former Lucas Arts animatronics designer named Marc Thorpe who was trying to develop a radio-based, remote-controlled vacuum cleaner and saw the commercial potential of similar devices engaged in battle, *Robot Wars* arose as a popular competition in which remote-controlled robots built by weekend hobbyists would fight it out in a public spectacle. Reminiscent of Roman gladiatorial matches or *naumachias*, the large-scale mock sea battles that took place in flooded auditoriums and featured condemned criminals fighting to the death on miniature-sized replicas of naval vessels, *Robot Wars* was also partially inspired by Pauline's work and a Denver-based machine spectacle called *Critter Crunch*.¹⁰

Partially based on SRL's European tours, the machine aesthetic also found appeal among European avant-garde art circles in the late 1980s and 1990s, particularly in former Eastern European countries, which found themselves in upheaval after the collapse of

Communism. Both directly and indirectly, the sheer impact of these events set the stage for numerous cultural festivals and organizations to thematize the breakdown of totalizing systems and the implosion of postwar Warsaw Bloc industrial culture.

"Out of Control," the theme of the 1991 Ars Electronica Festival in Linz, Austria—the largest international event for electronic arts—for example, explored what French theorist Jean Baudrillard in his catalogue entry called the "seismic order"—the new energy brought about by natural and technological systems on the edge of collapse (Baudrillard 1991). In continuing the edge-of-chaos theme in artistic projects, curators Gottfried Hattinger and Peter Weibel presented a veritable potpourri of machine makers, including English robotics builder Jim Whiting, Dutch machine artist Eric Hobijn, German roboticist Nicolas Baginsky, and Austrian artist Just Merrit.

Other European media arts organizations, such as the Rotterdam institute V2, EMAF in Osnabrück, Germany, and C3 in Budapest, as well as the squatted derelict East Berlin cultural center Tacheles were also early adopters and presenters of such extreme machine performances. Groups such as the British-founded Mutoid Waste Company, which built roving sculptures from scrap metal, and the infamous Dead Chickens, a collective founded in 1986 that put on machine performances consisting of huge, grotesque mechanical monsters in abandoned buildings, Berlin, in general, and Tacheles, in particular, became attractors for what the Germans called *Schrott Kunst* (scrap metal art): art made from the junked remains of industrial cultures that were disappearing overnight.

The most intriguing European machine performance cum happening, however, took place in the most suitable but unlikely of places: the Voest-Alpine steel factory, one of the world's largest steel mills and former tank factory for Hermann Göring, outside of Linz, Austria. Organized by machine artist Just Merrit, the project Contained was a kind of "nomadic encampment"/arts colony/workshop located directly on the grounds of the behemoth steel mill, whose square area rivaled that of a small town. As a loose "conglomeration of adventurous ideas, carved out with passionate obsession in the heart of a steel works," the local and international members of Contained sought a connection to a dying industrial culture that the Voest embodied, one born from an interest in industrial culture, "a compassion for the steel workers and identification with their access to hardware, as well as a fascination for the immediacy and directness of production machinery" (Merrit 1996).

Operating in stealth mode for two years, Contained's multifarious program of activities, including working television and radio stations, industrial installations, machine performances, sound sculptures, and a bar, was exposed to the public only during the 1996 Ars Electronica festival in a program called "The Rearview Mirror on Reality," which featured more than twenty prominent machine performance artists like Merrit, Chico MacMurtrie's Amorphic Robotic Works, Matt Heckert, Chip Flynn, Nicolas Baginsky, John Duncan, Eric Hobijn, and others.

Machine Orchestras

Taking a cue from the Futurists as well as an interest in the sound production surrounding industrial subculture, a number of artists built machines exclusively for their sound-making potential. One of the most intelligent manifestations of this phenomenon was the Mechanical Sound Orchestra (MSO) of former SRL collaborator/soundtrack designer and artist Matt Heckert. Intrigued by the complex timbral and rhythmic range of sounds that machines could produce, Heckert left SRL in 1990 to create an ensemble of sound-making machines that could be played and conducted by the artist through software-based servo motor and machine control.

Longing to give “sonic voice” to machines, Heckert specifically designed and fabricated a musical ensemble based less on its visual appearance than on its aural abilities. Similar to a conventional orchestra only in terms of the diverse sonic range produced by different groups of instruments, Heckert’s machine-instrument hybrids produced wide ranges of sounds enabled by fine degree changes in motor speeds achieved by computer controlled algorithms that executed a combination of predetermined patterns and random behavior.¹¹

Instruments such as the *Disc-Cable machine*, a rotating, slapping cable threaded with huge metal washers; *Resonators*, large metal cylinders skinned at one end with tympanic membranes that resembled a machine-controlled drum tuned at different frequencies; and *Oscillating Rings*, consisting of four rotating gyroscopic wheels set atop a piezo-amplified metal table created a roaring, pulsing, shaking acoustic environment that brought a more intense experience of immediacy to the spectator (figure 7.3). By removing the stage and spatially placing the audience directly among the machines, Heckert’s MSO shifted the scale of spectator perspective, creating the sensation of being inside a set of industrial procedures or the feeling of “having been shrunk down and fallen inside a watch” (Heckert 2005).

Heckert’s Futurist-inspired sonic universe was echoed by the machine-music performances of Canadian-born, Berlin-based composer Gordon Monahan, also part of the European machine art network. Interested in the relationships between natural phenomena like weather systems and manmade phenomena like industrial devices, Monahan’s most elaborate performance, *Multiple Machine Matrix* (1994–1998), subtitled “Sounds and the Machines that Make Them,” was an installation-like environment filled with computer-controlled and -conducted kinetic devices.

Constructed from industrial and electronic surplus parts and other scrap metal, Monahan’s matrix was played by the composer using similar techniques of MIDI-controlled motors and actuators that, when physically interacting with such material, produced complex percussive and melodic sonorities. Similarly, like Heckert’s work, Monahan’s 2003 performance *New and Used Furniture Music* shifted spectator attention away from the human performer (Monahan sitting behind the computer) to the movement of industrial materials and kinetic elements like motors and metallic strings.



Figure 7.3 Matt Heckert, *Mechanical Sound Orchestra*. Installation at Ultima Oslo Contemporary Music Festival, 1998. Photo Matt Heckert.

The strategy of sounding machines as the performers of a new type of industrially generated music was taken in a different direction by another set of Canadian artists who were not part of the machine art scene, the architect Thomas McIntosh and the composer Emmanuel Madan, collectively known as [The User]. As part of their research of noise by machines, “the by product of our existence” (McIntosh and Madan), the group’s 1998 performance *Symphony #1 for Dot Matrix Printers* consisted of an onstage array of dot matrix printers controlled and conducted through a computer network whose resulting sounds were wholly determined by ASCII text files that shaped their melodic, harmonic, and rhythmic behavior (figure 7.4). Artificially amplifying and processing each printer’s sonic output to create a complex mix of different voices, [The User] also sought to microscopically reveal the mechanical innards of each machine, capturing the movement of its platens, rollers, printer ink cartridges, and disks with miniature video cameras installed inside the printers and projecting these images above the onstage “performers.”

An industrial music of used office machinery was also prevalent in the work of yet another Canadian artist, Hungarian-born Istvan Kantor (also known as Monty Cantsin). Founder of the notorious Neoist antiart movement, known for the splashing of his blood onto famous artwork in international museums, Kantor developed mechanical performances whose featured actants included junked file cabinets, office chairs, desks, and the like. After a series of low-tech machine works including *File Cabinet Slammers I–III*



Figure 7.4 [The User], *Symphony #2 for Dot Matrix Printers*, 2001. Avanto Festival, Kiasma Theater, Helsinki, Finland. Courtesy of [The User], © Thomas McIntosh.

(1993–1996), *Universal Folk Cymbal*, *Schlager Kloppen* (1994), and *Telepathic Transmission Mobile* (1995), Kantor created his signature *Executive Machinery: Intercourse: The File Cabinet Project*—a performance constructed from the sounds of pneumatically controlled file cabinet drawers, which Kantor called “a socio-sonic noise machine and interactive sub-monument” (Kantor 1997).

The machines in the performances of Heckert, Monahan, Kantor, or [The User] somewhat approximated human scale, but other European-based artists like Eric Hobijn, Bastiaan Maris, and Nicolas Baginsky created much larger mechanical sound apparatuses that easily dwarfed the human spectator in their size and the intensity of acoustic output. Curating The Absolute Threshold, one of the earliest European machine art festivals in

Amsterdam in 1993, Dutch artist Hobijn built his colossal *Dante Orgel* (*Dante Organ*), a musical instrument assembled from computer-controlled flamethrowers, which paid tribute to another critical element in industrial mythology: the Promethean power of fire.

Conceived for an SRL European tour opening in Amsterdam, Hobijn's organ was a pyrotechnic machine spectacle extraordinaire: a sculpture consisting of from five to twelve computer-actuated and synchronized MIDI-orchestrated flamethrowers whose inner chambers were amplified by microphones and distributed over a multichannel sound environment. Creating tornado-like columns of flame spiraling upwards in excess of 40 meters high and producing the howling frequencies of the various fires together with the internal sounds of the opening and closing movement of pneumatic valves and escaping air, Hobijn's spectacular fire drama united both industrial fossil fuel and information-age technologies in what he called "an audio visual environment, based on military knowledge, dealing with the sounds and aesthetics of domesticated violence" (Hobijn 1988).¹²

Machine sound instruments consisting of steel, fire, chemical substances, electricity, and water subject to computer control also surfaced in the work of the German artist Nicolas Anatol Baginsky. In *I-Beam Music* (1995), a collaborative performance with American industrial artist Barry Schwartz, Baginsky created a colossal computer-actuated string instrument consisting of a 4-meter-long I-beam, strung with stretched piano wire and plucked by solenoid actuators. Traveling the length of the vast, former industrial hall of the Kampnagel theater in Hamburg and "played" by an environment of dry ice "fingers" (chemicals such as liquid nitrogen, water, electric current, and machine parts) as well as by acoustic information gathered and analyzed from the environment and transduced back to the instrument, Baginsky's *I-Beam* suggested a giant industrial car wash concert—a performance for an autonomous instrument that both played and was played by the environment.¹³

Baginsky's interest in the potential autonomy of the machine, in its ability to "learn" and adapt to its environment was already articulated in his *Humunculus* (1987) project, a self-performing machine controlled by audio signals, with joint movement based on a double pendulum that could exhibit chaotic, nonlinear behavior. A far more involved set of procedures marked the artist's long-term *The Three Sirens*, an ensemble of "self-learning" music-performing robots composed of three machines: Aglaopheme (slide guitar), Peisinoe (bass), and Thelxiepeia (drum). Baginsky's high-tech band, which used sonic *spectral analysis* as input for computer-modeled *artificial neural networks* (ANN), learned what sounds were being made based on the strength of the various input signals and then used such learned data to control actuators on the individual machines to produce new sound—what amounted to a rough and strange blend of rock music without any human presence or control.

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Performing Machines: Mimetic or Machinic

Baginsky's work pointed to the shift from human-based operation and control toward machine autonomy: self-organizing, unpredictable, and "lifelike" physical behavior based on environmental input. Thus, although machines—and particularly robots—were associated with mechanical behavior, the powerful influence of information, feedback, and *control theory* strongly suggested that technological advances in sensing, microelectronics, and computationally enabled "intelligent" systems could further problematize the fragile lines between natural and artificial behavior.

In the mid 1960s, prominent art historian Jack Burnham was already analyzing the shift from the fixed, material art object to the *unobject* arising from experimentation into areas such as kinetic environments, intermedia events, and happenings. Although Burnham's discourse focused chiefly on sculpture and not performance in its traditional connotation, his articulation of the emergence of cybernetically influenced systems aesthetics paved the way for machinic performances in which the human would attempt "to concede a soul or indwelling vitality to inanimate objects" (Burnham 1968a, 16).

His pioneering 1968 book *Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of this Century*, now widely acknowledged as one of the key texts in the diffuse history of the "cybernetic arts," set out to describe the influence of both electro-mechanical systems in order to make objects seem "alive" as well as the application of biological models of feedback and control to artificial, manmade systems.¹⁴

As a particular case in point of Burnham's paradigm, sculptor and architect Nicolas Schöffer [Screen/Scene, chapter 3] had already begun work on the development of autonomous, cybernetic sculpture-machines and accompanying dramatic spectacles in which such hybrids could publicly perform. Generally acknowledged as providing one of the earliest links between kinetic sculpture, architecture, and the more technologically complex arena of robotics, Schöffer was trained in the abstract formalism of the Bauhaus style but then became deeply influenced by mathematician Norbert Wiener's theories of cybernetics. Schöffer proposed a new approach to sculptural practice, which he termed *spatio-lumino-chronodynamism*, in which space, light, and time would be combined to generate an unprecedented machinic-sculptural form.

Working with the concepts of spatiodynamism, in which the proportions of a sculptural form would, in effect, shape and modify the space that surrounded it, as well as the luminosity of surfaces (luminodynamism), Schöffer's early machines of sharp geometric forms and vertical structures somehow conveyed a rhythmic, multidimensional, and almost immaterial quality, one of "energy and not material" upon being set into movement (Schöffer 1996, 398).

With technical and financial support from the French branch of the Philips corporation, Schöffer began incorporating ideas from cybernetics such as feedback control and the use of environmental data gathered from sensors in his first kinetic machine, which was named

CYSP 1 (cybernetic + spatiodynamism): a two-and-a-half-meter-high construction made from aluminum and electronics that had its debut stage performance in Paris at the famous “Nuit de la Poesie” (Sarah Bernhard Theater) in 1956. Ambulatory in all directions at two different speeds, with both axial and eccentric rotation, *CYSP 1* was described as constituting “a living counterpoint, a new and harmonious contrast with the articulated movements of the undulating bodies of humans by its evolutions and its transparent, orthogonal and metallic structure” (Schöffer n.d.).

Further outfitted with photoelectric sensors and a microphone that enabled it to be set into unpredictable motion by external events, *CYSP 1* also performed shortly after its Paris debut on the rooftop terrace of Le Corbusier’s Cité Radieuse apartment complex in Marseille for the great Belgian ballet choreographer Maurice Béjart. Béjart incorporated the sculptor’s “artificial being” (Schöffer n.d.) into a dance performance for the Festival d’Art d’Avant-Garde because the choreographer was intrigued not only by the sculpture’s unique movement but also by its interaction with dancers around it.¹⁵

Aspiring to further exploit his idea of luminodynamism, Schöffer also constructed two-dimensional machines that could accept, transform, and reflect light sources.¹⁶ His *Spectacle Spatiodynamique Expérimental*, a “luminodynamic” performance involving music and light projections, took place at Grand Central Station in New York in 1957. Even after 1960, as the sculptor’s interest in urban space quickly led him to conceive of cybernetic machines at architectural scale (*Tour Lumière Cybérétique*), Schöffer continued to integrate machines into stage-based spectacles. In 1968, in collaboration with the American experimental choreographer Alwin Nikolais in Hamburg, he deployed his cybernetic creatures as a key scenographic element in composer Gian Carlo Menotti’s opera-ballet *Les Globolinks*. Schöffer and Nikolais—along with the French acousmatic composer Pierre Henry—followed up *Les Globolinks* with their 1973 production of *Kyldex I*, a “cybernetic experiment” for the Hamburg Staatsoper in which the main performers were five of Schöffer’s autonomous mechanae interacting with Nikolais’s dancers in a pageant of shifting light and color on the opera stage.¹⁷

Schöffer’s interest in the feedback loops of man-machine control was offset by Nam June Paik’s more anthropomorphic experiments with his and engineer Shuya Abe’s robot, K-456 (named after a Mozart piano concerto), which aspired to demonstrate technology’s fallibility and stupidity in its supposedly animate relationship to human observers. K-456, a twenty-radio-channel, remote-controlled machine built in Japan with wire, foam, and other scrap parts, bore quick resemblances to its human counterparts through the execution of simple actions such as moving its arms and legs, making noises, and excreting beans. First appearing in private, the robot had its first public performance in Paik’s own *Robot Opera* with Paik and Charlotte Moorman at the Judson Church in the New York Avant-Garde Festival organized by Moorman in 1964. After performing indoors, Paik led the robot out into the streets, where it expelled beans and played speeches of John F. Kennedy from speakers built into its mouth.

Subsequently, in what Paik described as the “first nonhuman performance artist,” K-456 performed in the *Robot Opera* in Berlin in 1965, where it walked up and down the *Strasse des 17. Juni*, toward the Berlin Wall-surrounded Brandenburg Gate. With two tiny propellers for eyes and a clattering baking sheet for a hat, the robot became a cult object in Germany, perhaps suggesting in its downtrodden appearance an all-too-human pathos—a machine stranded in the midst of an isolated Berlin stricken by the military-technological tension of the Cold War. Described by Paik as a street performer, the robot could meet people on the street and “give them a split-second surprise. Like a sudden shower” (Paik 1965). Performing for the last time during Paik’s 1982 retrospective at the Whitney Museum in New York, the robot rambled down Madison Avenue, where it met its not-unplanned end in the path of a moving car.¹⁸

Far more electronically sophisticated anthropomorphic-technological entities were created by Polish sculptor/engineer Edward Ihnatowicz. A Polish refugee who fled to England during World War II, Ihnatowicz was an autodidact in matters of science and engineering but quickly became fascinated by the potential of electronics to create unpredictable behavior in kinetic systems. Shown at Reichardt’s *Cybernetic Serendipity* exhibition in 1968, Ihnatowicz’s first cybernetic influenced work, *SAM (Sound Activated Mobile)* was an electronically controlled, hydraulic, biomorphic-like sculpture in the shape of overgrown vertebrae with a petal-shaped head containing a miniature microphone array. Based on the direction of sound picked up by the microphones, the sculpture could be set into lateral or sideways motion.¹⁹

Between 1968 and 1971, Ihnatowicz developed his most revered creation: a large, claw-like mobile machine with six hinged joints enabling multiple degrees of freedom. Named *The Senster*, the machine was specifically commissioned for the Philips Electronics hands-on science museum Evolon at their corporate headquarters in the Dutch city of Eindhoven. As one of the first mainframe computer-controlled sculptures, the 5-meter-long *Senster* incorporated electrohydraulics, sophisticated microphone arrays, and Doppler radar tracking technologies in order to generate spectator-perceivable, physical-mechanical interaction. Through relatively simple, low-level environmental input such as spectator motion and sound location and intensity, the *Senster*, as Ihnatowicz described, could exhibit a sophisticated set of physical behaviors, moving toward quiet and sustained sound sources or rebounding from sudden bursts of movement, noise or violent gestures.²⁰ Unlike the vertebrae-outfitted appearance of Ihnatowicz’s earlier *SAM*, the *Senster* eschewed biomorphic tendencies in its visual manifestation and looked like an industrial metal framework with exposed electronics, motors, and wires.

Ihnatowicz’s desire to correlate sensorimotor functions in a machine was a strategy that would be echoed some thirty years later in the performance projects of several machine-robotic artists who also sought through more refined hardware/software systems to create what Reichardt (in describing the *Senster*) had announced as “reactions that one might expect when someone is trying to communicate with another human being or an

animal . . . the sort of robot which we could imagine must have feelings because it behaves like creatures that have them" (Reichardt 1978, 56).

The performances of machine artist Chico MacMurtrie's Amorphic Robot Works, for example, relied on machines with more direct anthropomorphic behavior, yet also amorphous geometries. Also a staple on the European machine art scene, MacMurtrie's spindly, rust-eroded human-, animal-, and plant-like forms were a combination of garage aesthetics and higher-end technology, driven by computer-controlled servo motors and actuators that gave complex kinetic possibilities to the individual parts of the machines. In direct opposition to SRL's threatening assemblages, Amorphic's machines such as "Super Dog Monkey," "Sub Human," "Tabla," and "Skele" were constructed from plastic, bronze, aluminum, and steel in order to achieve more realistic and graceful movement that could mimic human or animal behaviors.

MacMurtrie's "amorphic epistemology" cast his machines into dreamlike, almost organic landscapes, where they would perform with one another, spinning out multiple dramatic scenarios as well as interacting with observers via body-based sensing technologies. In *Trigram: A Robotic Opera* (1992), thirty-five of MacMurtrie's scrap metal, pneumatic-controlled creatures engaged with human performers in a macabre battle in which movement and sound echoed, as MacMurtrie described, "the anguish we feel in a world where we are deprived of the pure by our dependence upon machines that we once controlled" (MacMurtrie 1992).

The *Cave of the Subconscious* (1997) was a performative environment that sought to fulfill the artist's ongoing obsessions with "the primacy of movement and sound" and consisted of twenty-four machines embedded into the walls of a subterranean, cave-like structure that exhibited different nuances of movement based on visitor proximity. The epic *The Amorphic Landscape* (2000) was even more daedal, creating a moving, breathing landscape for the members of the artists' "society" to interact within, where movement could be exchanged between the machines and the hydraulic-sculptural contours of the kinetic landscape.²¹

The complex behavior of a society of machines based on autonomous computer-augmented control also surfaced in the performance work of Québec robotic artists Bill Vorn and Louis-Phillipe Demers. In earlier collaborative works such as *Espace Vectorial* (1993), *At the Edge of Chaos* (1994), *The Frenchman Lake* (1995), and *La Cour des Miracles* (1997), Vorn and Demers developed autonomous and complex machine societies: pneumatic-driven, reactive mechanical systems that diffused sound and light within sensor-augmented installations.

One of their most complex works, *La Cour des Miracles* populated a space with six different computer-controlled mechanical apparatuses that were assigned human-like behavioral qualities of crawling, limping, begging, convulsing, harassing, and acting heretically. "Neither animals nor humans, the aim of the work is to induce empathy of the viewer towards these 'characters' which are solely articulated metal structures . . . an attempt to

express the profound human nature of the machinic realm and the profound machinic nature of humankind" (Vorn and Demers 1998).²²

Applying concepts from the computing discipline of *Artificial Life* (or A-Life) where the execution of simple rules yields unpredictable, systemwide behavior, Vorn's and Demers's machine ecologies were simultaneously zoo and theater, placing the spectator into the dual position of interloper and activator of the machines' behaviors, which ranged from pathetic to manic. For *Le Procès—The Trial* (1999), a robotic performance staged for Robert Lepage's techno cabaret *Zulu Time*, an array of machines with realistic movement were suspended, caged, hung, and anchored around the environment of a motorized catwalk. Accompanied by polyrhythmic, pulsing metallic beats as well as a live soundtrack created by their banging into the metallic scaffolding of the scenery, the machines in *Le Procès* engaged in a mock tribunal reminiscent of Franz Kafka's *The Trial*, accusing, menacing, and judging each other.

In what artificial intelligence researcher Herbert Simon famously termed "the sciences of the artificial" (Simon 1996), Vorn's and Demers' solo and collectively created machines were driven by locally "implanted" simple and low-level rules that, when combined, yielded unpredictable, global "emergent" behaviors: group reactions "engendered by the sum of all the individual reactions" (Vorn and Demers 1995, 6). Moving from the purely digital, computational models of Artificial Life into directly constructed "robotic organisms," the artists' "primitive mechanical animats" sought to embody the four characteristics of Simon's notion of artificiality: (1) artifacts synthesized by human beings, (2) imitating the appearance (or behavior) of natural things, (3) characterized in terms of functions, goals, and adaptation, and (4) articulated in terms of imperatives and descriptives.

These themes of artificiality were taken further in Vorn's and Demers's solo work. In Demers's robotic theater cycle entitled *The Mechanized Eccentric Series*, an updating of Lissitzky and Moholy-Nagy's electromechanical peep show, machines were elevated to the role of "actors of expression" who could perform in their own mechanical theater and consequently, subsume the human body into a "mechanical rendering and abstract play of stage action and movement" (Demers 2004). *Armageddon* (2004), an operetta with robots done in collaboration with the French rock-pop orchestra Art Zoyd and featuring twenty-one musical instrument-playing robots with loudspeaker mouths alongside human musicians, was an enactment of the mythic event of Armageddon, leaving a society populated only by machines.

Demers's *L'Assemblée/The Assembly* (2001) took this theme to an extreme, in the creation of a fictitious future where human spectators crowded into a vast, scaffolding-erected arena became the last witnesses to a machine takeover. Surrounded on all sides by forty-eight computer-controlled and -choreographed robots hanging from an architectural scaffolding membrane with speakers for mouths and theatrical spotlights for eyes, human spectators in the crowd were surveilled by the robotic lights and individually picked out by mounted

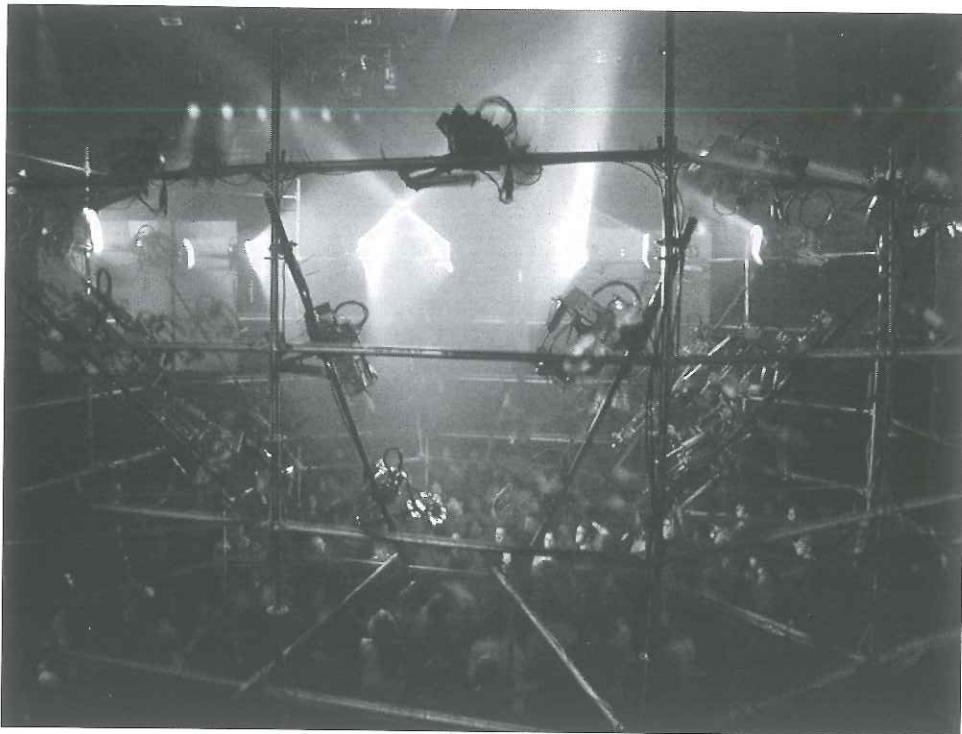


Figure 7.5 Louis-Philippe Demers. *L'Assemblée*. Elektra—Usine C, 2001. Photo © Peter Dimakos.

cameras sensing movement (figure 7.5). *L'Assemblée* invoked a nightmarish machine spectacle: a court and assembly where the nonhuman judged the human.²³

Machines for Themselves

The exploration of human-machine co-presence explicitly enabled through sensing and computation was also taken up by a number of artists not working in performance contexts *per se* but in new media, who nevertheless developed articulate, expressive machine systems. Indeed, the autonomy of machines became one of the central themes in the arena of the new media arts during the 1990s. Dozens of festivals presented hybrid performance-installations in which machines would enact self-driven and autonomous behaviors as a result of mechanical and/or computational processes, from artists such as Norman White, Ted Krueger, Simon Penny, Ken Rinaldo, Max Dean, Adrienne Wortzel, Susan Collins, Arthur Ganson, Eduardo Kac, and others.²⁴

The kinetic environments of artist Ken Rinaldo, for example, exploited emergent phenomena and the co-productive possibilities between natural and artificial systems. In

projects such as *The Flock* (1994) and *Autopoiesis* (2000), Rinaldo experimented with machines that through a minimum amount of sensing technology could be programmed to exhibit complex movement behavior through their interaction with a spectator moving in proximity to them. The works of Australian artist and educator Simon Penny, such as *Petit Mal* (1993) and *Pride of Our Young Nation* (1990), critiqued the zoomorphic and anthropomorphic tendencies of much robotic art, instead focusing on the “kinesthetic intelligences” (Penny n.d.) expressed through physically enacted and artificially constructed electromechanical bodies rather than A-Life-esque computer simulations.

Others, like Canadian artists Norman White and Max Dean, built more playful robotic constructions that demonstrated the joint fragility of machines and human beings. White’s *The Helpless Robot* (1996) featured a quasi robot kinetic sculpture that only responded to the presence of visitors by voice synthesis. Asking its observers to reposition it, the machine grew more demanding in time based on the level of interaction. In a more auto-kinetic direction, Max Dean’s “Robotic Chair” (1994–2006) was a six- to twelve-minute performance consisting of a mechanically controlled chair that would fall apart and then put itself back together again in order “to elicit empathy, compassion, and hope” (Dean n.d.).

Even works that were sited in the decidedly nonperformance context of museums and galleries explored the tensions generated by machine co-presence. One of the more bizarre hybrids was invoked in the *Cloaca* series of performance-installation machines by Belgian conceptual artist Wim Delvoye—byzantine contraptions dedicated to enacting the human gastrointestinal system. A nonanthropomorphic, biochemical system, Delvoye’s numerous *Cloaca* variations from 2002–2007 were formed from an assembly line of lab glassware, vials, hoses, housings (later, a trio of washing machines), and computer-monitored elements enhanced with more than four hundred types of human digestive enzymes, acids, and human bacteria. In what Delvoye referred to as *Cloaca*’s “performance,” attendants fed the system’s garbage-disposal mouth opening with food, which was then gradually broken down over a twenty-seven-hour period, with visible excrement finally produced as the result (Delvoye 2008).

In an entirely different context, the mechanomorphic objects of Rebecca Horn [Non-invasive Extension, chapter 6] provided a strong contrast to machine art’s predominantly industrial-age male flavor. Horn’s mysterious performing apparatuses simultaneously conjured up feelings of menace, wonderment, and pathos in a spectator who became inscribed into their performances based on simple presence. Self-propelled, precision-designed, and elegantly controlled by small motors, for Horn, such automata suggested no less than the cycle of an organism’s birth, life, and death: proxies for bodies that as “melancholic actors performing in solitude” would “shake, tremble, faint, almost fall apart and then come back to life again” (Celant 1994, 18).

Fabricating a world of things that, as curator Nancy Spector explained, “mischiefously revealed the hidden, amorous impulses of the human psyche” (Spector 1994, 56), Horn’s

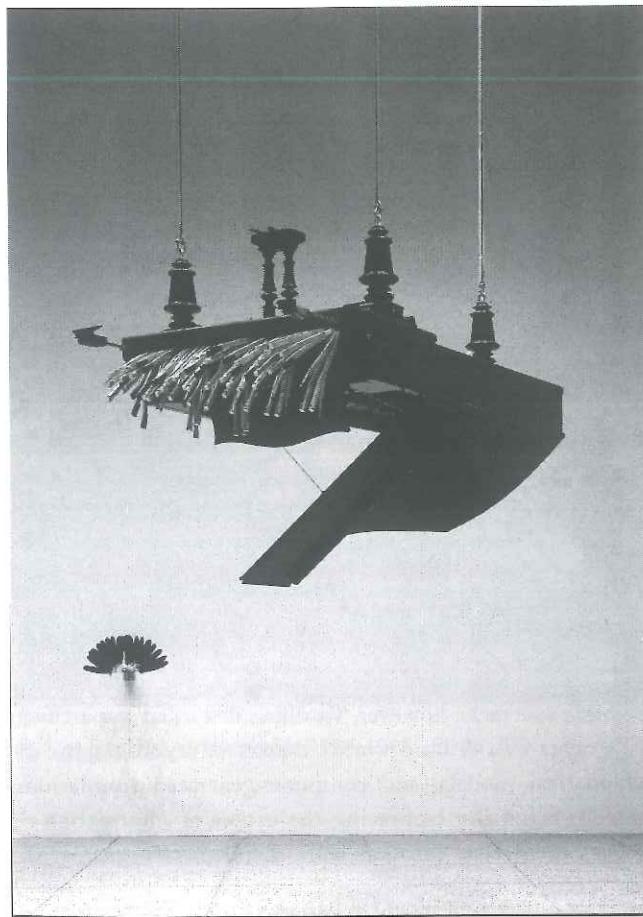


Figure 7.6 Rebecca Horn. *Concert for Anarchy*, 1990. Courtesy of Rebecca Horn.

strange creations of miniature metal hammers, mechanical unfolding peacock feathers, rotating binoculars, mercury-filled funnels, and self-playing musical instruments danced, kissed, slept, fought, and kept watch over each other in performing installations that elevated ordinary objects to the surreal and the fantastic.

In *Les Amants* (1991), a menacing aluminum paint gun continually sprayed a white wall with dark black ink, totally oblivious to the observer's presence. 1990's *Concert for Anarchy* comprised an enormous upside-down grand piano suspended in the air, which, in spasmodic bursts, would suddenly begin to play itself, expelling its keys in full force until its lid fell open with a loud bang (figure 7.6). Similarly, *Ballet of the Woodpeckers* (1986) featured a gallery of mirrors upon which tiny hammers beguiled by their reflection

gently hammered away at the glass, continuously recoiling from their images like a frightened Narcissus.

Although not computationally advanced, Horn's imperfect machines also exhibited similar physically animistic characteristics as their more technologically sophisticated, computer-controlled emergent cousins: repetition, dynamic motion, reaction, and unfolding patterns of both periodic and nonperiodic behavior. Arresting in their visual elegance and puzzling in their behavior, her automata confronted viewers with deep-seated philosophical questions concerning their position in a world of seemingly useless yet animistic systems. If machines were no longer designed to assist and augment human abilities, but instead to act on their own volition based on special internal laws, then what role did they play in a human-centered *Weltanschauung*? What could eventually be unleashed in performances for and by machines? What role did such performing automata give their human counterparts other than to simply trigger them into action or to act as fleshy voyeurs in an electro-mechanical-computational peep show?

Perhaps the most provocative answer to these questions came from artist Woody Vasulka's epic *Theater of Hybrid Automata* and *Brotherhood* series of media constructions that explored mankind's "never ceasing attempt to reorganize nature itself" (Vasulka 1998b). Co-opting instruments of warfare to redefine perceptions of space, Vasulka's media instrumentaria were culled from military-industrial salvage from surplus dealers and scrap yards near Los Alamos, New Mexico. Unlike SRL's direct use of military hardware to produce violent spectacle, however, Vasulka's discarded war artifacts mainly served as scenographic elements in a "closed world" theater of cryptographic devices, feedback algorithms, mathematical models, and computer-generated simulations. With artists, curators, and theorists originally embracing the utopia of information-driven, military-influenced Cold War cybernetics, Vasulka's work revealed the nightmarish, dystopian side of C3I (Command, Control, Communication).²⁵

His earliest "space exploring machine," entitled the *Theater of Hybrid Automata*, (1990) invoked the blur between real and computer-generated space so prevalent in the "infowar" military simulations used to train fighter pilots for advanced aerial combat. Consisting of a RPT (rotate, pan, and tilt) robotic head armed with a video camera and equipped with infrared sensors, Vasulka's "automated theater" was surrounded by a series of screens upon which computer-generated images of virtual spaces triggered by the sensors were displayed and in which the moving RPT head could "travel" through, providing an articulate example of computer-augmented "machine vision."

These early machines by and large showed little interest in the spectator's presence, a topic that Vasulka addressed on a much larger scale with *The Brotherhood*. Commissioned by the NTT/ICC media arts center in Tokyo in 1998, *The Brotherhood* comprised six interactive media assemblages whose names immediately triggered military associations ("Translocations," "Automata," "Friendly Fire," "Stealth," "Scribe," and the "Maiden";

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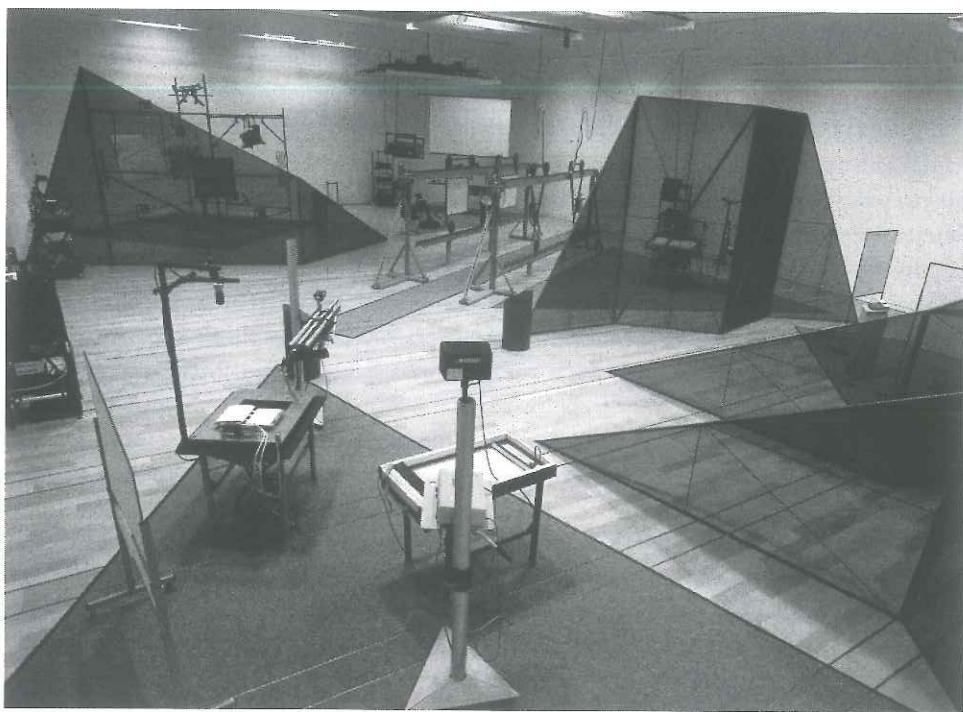


Figure 7.7 Woody Vasulka. *The Brotherhood*, 1990–1998. Photo Bruce Hamilton. Courtesy of the Vasulkas.

figure 7.7). Described as “a series of tables representing the core with its instrumentation able to produce, compose and display varied acoustic and visual structures, surrounded by an exoskeletal support, carrying media (projectors, speakers, screens, lights and sensors),” *The Brotherhood* referred to a society of devices that artificially prolonged a male sexual drive displaced onto information age control systems; what Vasulka and David Dunn called “the male idea of the machine’s destructive potential” (Dunn and Vasulka 1998b). Made up of three components including “actors” (software), “authors” (spectators), and “drivers” (hardware), each assemblage provided the possibility of spectator and environmental interaction by which a machine could be influenced not only by human onlookers but also by its own mechanisms.²⁶

For Vasulka’s theater of automata, actors not only denoted the pneumatic pistons and printed circuit boards of the material hardware but also the “acoustic evocations, logic processes and finally, necessary machine rituals, machine states, resets and calibrations” (Vasulka 1998a, 33) caused by endogenous software processes and exogenous

perturbations from the human environment. The contraptions of *The Brotherhood* thus occupied the same precarious space that so many other machine performances previously had: between control and freedom, structure and anarchy, order and disorder.

At first glance, the use of machines involving the military paraphernalia of industrial capitalism seemed like a strange approach for artists interested in a form, however much abstracted, of political critique. Yet, as Vasulka eloquently pointed out, the potential of interactive systems and scenarios was not only to enable observers and participants to communicate with the machine through its own intrinsic languages of binary code but also to generate an act of potential resistance, an "interference pattern" in the autonomous behavior of a system such that unscripted behaviors and patterns might emerge between the machine's life and our own. Such computationally embedded interaction processes would go far beyond the idea of choice among a finite set of alternatives and instead "provide the user/perceiver with a sense of exploring an environment of new [elastic] sensory relationships rather than a mere description of such a world" (Dunn and Vasulka 1998a).

The spectator's power to perturb the animism of the machine through interactive processes could ultimately contribute to a co-productive understanding of what machine autonomy actually signified: the potential of interaction between machines and us to create a new "environment in a state of awareness" (Vasulka 1988a, 15).