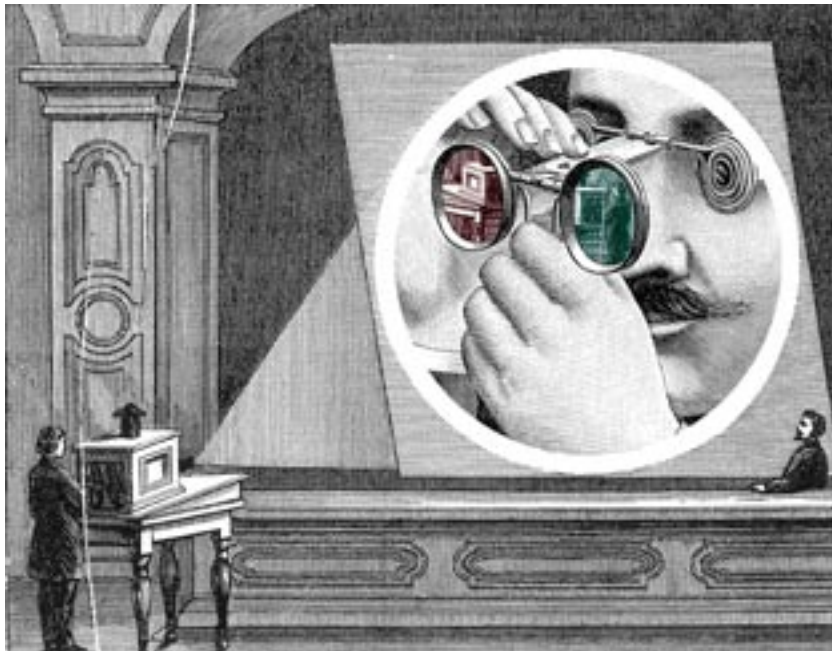


ILLUSTRATED RETROSPECTIVE OF

# MACHINES

AT THE MUSEUM OF NATURAL & ARTIFICIAL EPHEMERATA

MARCH 11 – AUGUST 5, 2006



BY SCOTT WEBEL

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## SPECIAL THANKS

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## THE MACHINES

Everywhere around us *the Machines* clank, whir, and buzz, producing ultra-modern objects alongside archaic effluvia, vast landfills of trash—and vast, trashed landscapes. Inside two centuries, they have infiltrated every social nook and bodily cranny. They service and are serviced. Our skies are aflutter with flying devices, our cities aflow with gas-guzzling engines, our walls aflutter with wires powering menageries of gadgets. Silence defines itself against the omnipresent white noise of *the Machines*, just as night's darkness forms in silhouette around spheres of artificial light. Taken together, the planet's countless individual devices make up a behemoth apparatus, a megamachine chewing away at the earth and churning out a stream of products and pollutants. What is this massive force in natural history? Just what are *the Machines*?

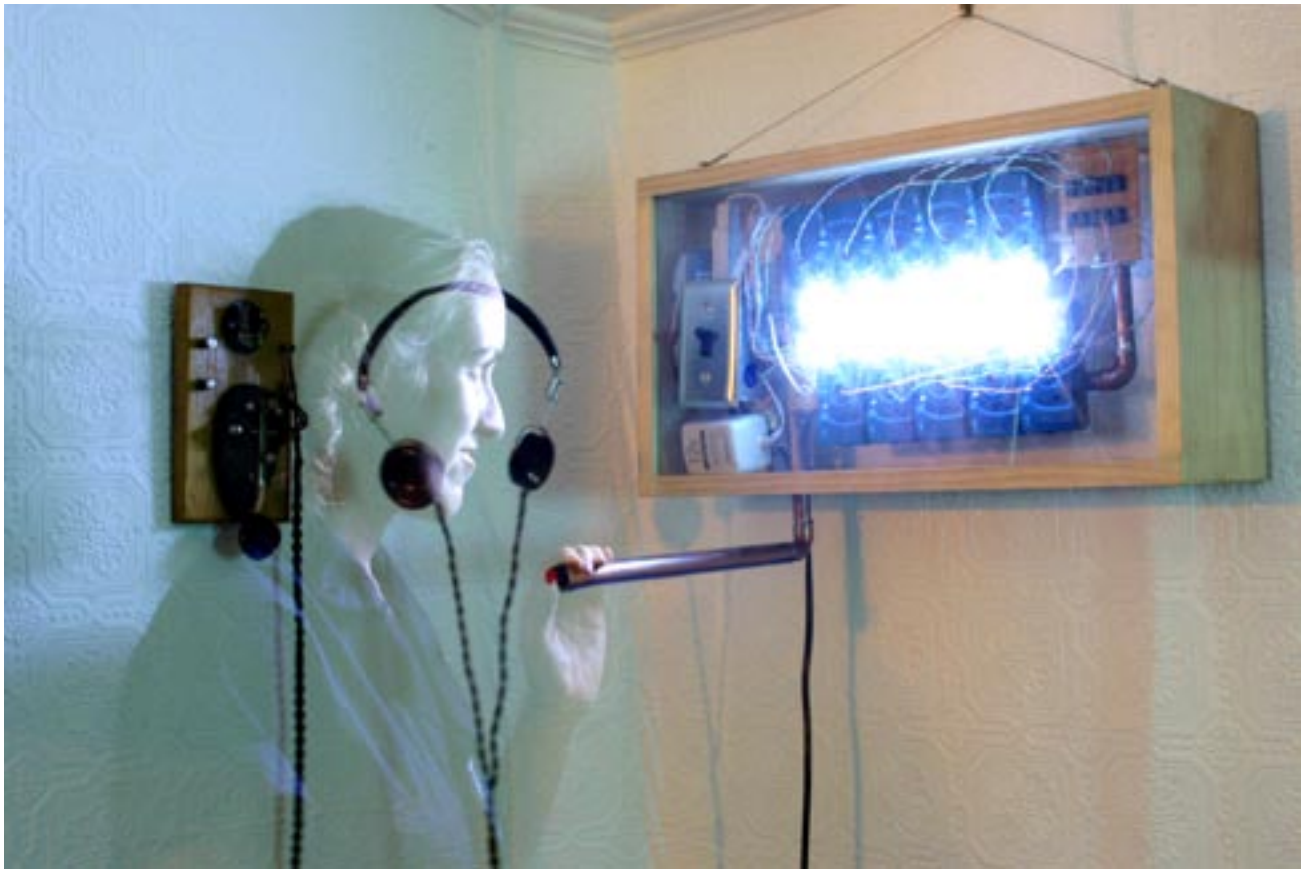
Foremost, a shocking note: they are powered by something outside *the Machines* themselves. They've got to be plugged in somehow, like babies and their umbilical cords. Each instrument owes its existence to some mysterious energy, produced by the Other Machines chugging away in a remote, unreachable backstage. Whole ecologies and economies serve as no more than the power supply to your

little engine. These veiled energy sources take on a phantom-like presence—remote and abstract as the sun at midnight. The crisis of their depletion seems inevitable.

If *the Machines* orient one side towards these mystified power outlets, the other turns to visible effects, products, and applications of force. Consider the serial objects of factory production (*i.e.*, patently shaped breakfast cereals) or the absent/present digits of binary code (as involved in nearly every step of this document's coming into being). Though standardized and self-similar, these glorious commodities shimmer with the magic of desire and dream, moments from exchanging novelty for boredom, poised on vanishing and extinction, their dissolution immanent in their very genesis. *The Machines'* purpose—the production of objects, services, and values—seems riddled with a sad impermanence, as if our technology's productivity shared a secret pact with its inbuilt tendency to malfunction.

What we take to be the circuit of *the Machines*—energy in, product out—becomes tragically flawed with the specter of malfunction and waste. At any moment products are darkly mirrored by the trash generated in their production, as well as their own potential to become trash at the temperamental hands of fashion and innovation; hence, *we are living*





within the *Museum of Ephemera*. Rusty landfills attract our objects like vast magnetic complexes of materialist entropy—industrial history’s mass grave. Production’s abjections and unintended effects loom large and inscrutable—a wilderness of arcane consequences. Each device seems haunted by unknown possibilities and hidden catastrophes. And in the end, what is rejected as unintentional, as waste, may be more instrumental in shaping life than intended production itself.

Waste shaping life? As a force of second nature, *the Machines*’ waste folds back into ecology as not-so-raw materials and artificial resources. Wasted spaces in concrete overpasses become nesting grounds; middens of processed food in the dump or backyard serve as microbial metropoli; shipwrecks disappear beneath coral colonies. Of course, enfolded waste includes industrial, agricultural, and light pollution on a grand scale: waste shaping life by slicing out diversity, making even the sky an impressionless slab as stars drown in an urban miasma of incandescence.

Artificial light—our pale mimesis of immense, inexhaustible solar power—seems a fine emblem for *the Machines* in its simultaneous being as energy source, product, and pollution. As in the case of machines like:

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### JAMIE O’SHEA’S WAMCAM

Artificial light sparks natural photonic response in our eyes’ cones and rods. Mr. O’Shea modified the flashbulbs on ten disposable cameras of tasteful blue plastic, forcing their light through the letters of his name. The cameras’ power sources were likewise rewired so the ten flashes trip at the touch of a single red button. They plug into the wall socket by a shared cord. As the light-writing enters our eyes, photo-receptor cells transduce their energy into nerve signals, but with a looped lag as the rods slowly readjust from the burst of excess photons. The artist’s name remains temporarily signed across the media of our eyes for several minutes, the afterimage visible across the surface of things everywhere we look. Energy in, product out: are our eyes numbered among *the Machines*?

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### “LITTLE CURIES”

Human eyes evolved to perceive a rather narrow band of the electromagnetic spectrum—the band of “visible radiation” that comprises the bulk of sunlight’s wavelengths. Just below this optical spectrum, electromagnetic radiation blends into ultraviolet light, then the X-rays, then the gamma rays of nuclear radiation. Wilhelm Conrad Röntgen discov-



ered X-rays (also called Röntgen rays in his honor) in 1895,<sup>1</sup> provoking a frenzy of theoretical research, a generation of irradiated scientists, and an arsenal of medical applications. Among the latter, Marie Curie, discoverer of radium, introduced a “war novelty”<sup>2</sup> by installing X-ray machines inside limousines donated by the French elite so that soldiers’ bullet- and shrapnel-riddled bodies could be treated at the trenches. Over the course of WWI, she equipped twenty of these “Little Curies,” explaining to the cars’ owners, “I shall give you back your motor car after the war ... Truthfully, if it’s not useless by then, I shall give it back to you!”<sup>3</sup> By establishing these mobile units, along with installing X-ray machines in hospitals throughout France, Curie is said to have aided in the treatment of over a million soldiers. Lacking time to develop photographic plates, military doctors often performed surgery directly “under the rays” of *the Machines*.

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### **FLUORESCENT MINERALS: OPAL, WILLEMITE, SODALITE**

Though excavated from the perfect darkness of the earth’s crust, the vibrant colors of fluorescent minerals remain invisible to our eyes without special artificial lighting. Early mines like those of Franklin, New Jersey, and Mt. Saint-Hilaire in Canada worked mules to blindness hauling up UV reactive minerals like sodalite and willemite. Meanwhile, opal mines like Nevada’s Royal Peacock invented ever-larger machines to tear off the “overburden” of visible environment in mountain top removal operations. Given our eyes’ imperception of the UV spectrum, the visibility of these minerals’ fluorescent colors came only after the development of artificial light. Jo-

hann Wilhelm Ritter hypothesized UV radiation in 1801.<sup>4</sup> It wasn’t until the late 1880s that early blacklights like the uvioil lamp—a modified mercury-vapor bulb—extended our vision into the spectral range perceived by the many species of insects, birds, and reptiles that enjoy four-color perception: yellow, red, blue, ultraviolet. Zebra finches and blue titmice, among other avian species, carry ultraviolet designs in their plumage that figure into mating preferences, and bees and butterflies zero in on landing patterns traced in flower petals—all invisible to our eyes. Concerning these UV visions, science writer Jay Withgott comments, “What an animal sees is not an objective and complete recording of the total spectral radiance entering its eyes, but a subjective and selective interpretation of certain wavelengths that depends on species-specific neural machinery.”<sup>5</sup> In the case of *Homo sapiens*, neural machines supplemented by optical and incandescent machines push the product of vision to new scales, new scopic operations on matter—and an atavistic return to a form of vision lost in human evolution.

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### **TESLA FULGURITE (LICHTENBERG FIGURE)**

From the blood vessels in our eyes, to the branches and veined leaves of trees, to rivers seen from outer space, the chaotic pattern of fractal branching echoes across a dizzying multiplicity of natural and artificial scales. When etched in matter through electrical discharge, fractal branching is known as a Lichtenberg Figure in honor of its discoverer, an 18th century German physicist.<sup>6</sup> Stoneridge Engineering produces three dimensional Lichtenberg figures rendered in

1 Dinshar Pestonjee Ghadially, for one, protested the scientific novelty of the Röntgen ray, explaining, “The X ray is a lower manifestation of the astral light on the physical plane, and as such has long been known to Eastern oculists [*sic* occultists?] ... From time immemorial ... India has been the home of spiritual culture and spiritual discovery. Most of the discoveries, so called, of modern Western science, were known in the East ages before. They were laughed at and ridiculed by the scientists of the West, until, forced finally to take note of them, they changed their names and paraded them as their own discoveries.” “Says X rays are not new.” *New York Times*, March 11, 1896.

2 “Motor operating theatre is latest war novelty.” *New York Times*, March 7, 1915. For another X-ray related “war novelty,” see “Bullet, in 42 years, goes through body” (*New York Times*, July 15, 1905), relating the story of one William Eckert, Civil War veteran. Struck in his right shoulder by a Confederate bullet at Gettysburg in 1863, Eckert developed a pain in his left ankle over forty years later that, upon X-ray analysis, proved to be caused by the migratory bullet. Dr. Wyman, who removed the bullet, proclaimed, “how it traveled around [from the right shoulder] to the left [ankle] is a mystery that no medical man or surgeon probably will ever be able to account for.” For another example of mobile radiographic machines, see “Army flashlights used as X-rays” (*New York Times*, March 29, 1915), briefly describing how “the inexpensive flashlights with which all soldiers are equipped [proved], in conjunction with empty cigar boxes, excellent and effective X-ray machines for the detection of fractures and iron splinters in the hands and feet.”

3 Eve Curie. *Madame Curie: A biography*. Trans. Vincent Sheean. Garden City, NY: Garden City Publishing Co., Inc., 1943: 295.

4 Various known as actinic-, chemical-, and dark-rays, UV-rays incited fantastical conjectures with their ability to pass through solid objects like human skin: “Opacity is a phenomenon that exists only for an eye like ours, which, were it a little differently constructed, might be able to see through a wall.” G. Le Bon. *Scientific American Supplement* XLI(1054), March 14, 1896: 16852.

5 Jay Withgott. “Taking a bird’s-eye view...in the UV: Recent studies reveal a surprising new picture of how birds see the world.” *BioScience* 50 (October 2000): 854-859.

6 While lightning flickers Lichtenberg figures across the sky, manicured grass fields and human skin struck by lightning bolts can fleetingly





acrylic cubes called Tesla Fulgurites for their resemblance to the branched voltage generated by Tesla coils. Acrylic Lichtenberg figures permanently freeze the path of highly charged electrons through matter, thus qualifying them as fulgurites (along with amorphous tubes of lightning-fused dunes and desert sand turned to green glass by atomic bomb blasts).

## MOONLIGHT TOWERS

Columns of architectural fulgurite, Austin's seventeen Moonlight Towers freeze the 111-year-old history of the City's electrification into crystallized form. On May 6, 1895, the thirty-one original Towers first illuminated Austin's rolling residential hills, drawing power from the brand new Granite Dam hydroelectric station.<sup>7</sup> From these magical beginnings

capture those figures in organic media.

<sup>7</sup> Today they draw power from a mix of coal (35%), nuclear (28%), natural gas (26%), and green energy (6%). Asher Price. "Natural gas





that turned flowing water into light, the Moonlight Towers continue to conduct electricity to the tune of an enchanting urbanism. Early on, the uncanny, omnipresent artificial moonlight prompted back yard farmers to worry that “their corn and beans [would] grow 24 hours a day and [that] it would be necessary to use saws to cut down the stalks.”<sup>8</sup> “A few might have thought of reviling the ever present illumination, at times inconvenient, but, like the weather, there wasn’t anything they could do about it.”<sup>9</sup> The Towers’ bright crowns hover above us like benevolent ball lightning in holding patterns; like UFOs inspecting the state of our ecology; like miniature moons locked in orbit around the Capitol. Carbon arc lamps—the Towers’ first mode of illumination—were developed not for street lighting, but “for purposes of projec-

tion” in magic lanterns,<sup>10</sup> making Austin into a sort of vast cinematic screen. These lamps were replaced by standard incandescent bulbs in 1923, but the City switched back to more theatrical modes of lighting in 1936 with the installation of the mercury-vapor lamps still in use today.<sup>11</sup> As “the longest ultraviolet spectra are found in electric illuminants, of which the mercury vapor lamp ... and arc lamps are found to come foremost,”<sup>12</sup> the Moonlight Towers cast a ghostly, blue-ish phosphorescent glow, perhaps subtly drawing out the UV reactive designs in the City’s flower petals and so subtly enlarging our ocular perception.

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### PLANET WIRELESS NEON

*On loan from Classic Glass Neon, Austin, TX*

prices generate shift: More electricity in Austin, state coming from cheaper, dirtier fuel.” *Austin American-Statesman*, April 21, 2006.

8 “City back yard farmers feared tower lights effect on crops.” *Austin American-Statesman*, March 26, 1939.

9 “How tower lights came here told: Old records show history of installation.” *Austin American-Statesman*, January, 1933, in clippings of the Center for American History, The University of Texas at Austin.

10 “The illuminating power of arc lamps.” *Scientific American*, LVII (24), December 10, 1887: 368.

11 If the carbon-arc lamp made Austin into a screen, the mercury-vapor bulbs made it a film set. Early applications of these stage lights to the urban scene include a New York subway train mounted with seventy-two mercury-vapor bulbs and a mutoscope camera. “The time of exposure was seven minutes, so that the film included 6,300 pictures. At the Grand Central Station a stop of several minutes was made, the mercury lamps illuminating the station perfectly, the crowds of passengers being taken in every detail as they were alighting from the trains” (“Photographing the New York subway.” *New York Times*, July 1, 1905: 12).

12 “The harmful effects of ultra-violet rays on the human eye.” *Scientific American*, XCIX (17), October 24, 1908: 278.





Among Nikola Tesla's stunning array of inventions, his unbuilt World Telegraphy System promised a global electromagnetic transformation—the dream of a wireless planet. Tesla proposed a series of mushroom-shaped towers on every coast, capable of transmitting not only telegraph messages and disembodied human voices but wireless electricity through earth's upper atmosphere: bands of voltage across the oceans' skies, siphoning energy from the clouds, lighting shipping lanes at night. After captains of industry like J.P. Morgan realized that wireless currents could not be metered, investors laughed off the proposal.<sup>13</sup> Tesla weathered a drought of funding, but continued to experiment with wireless electricity, powering neon tubes from across large rooms with his coils. Fractal branches of voltage strike the tubes' electrodes, exciting the gases within to produce artificial light. Nikola sees the vacuum bulbs flicker in response to electromagnetic frequencies and muses that their machinic reactions are “based on the principles inherent in the

construction of the human eye.”<sup>14</sup> Mercury vapor diffused in the vacuum emits ultraviolet rays; phosphor dusts coating the tubes' inner surfaces react to the rays with phosphorescence, making their UV coloration visible to human eyes. Mines excavate mercury and rare earth phosphors to be hermetically sealed within the tubes. Forests transform into power poles, denuded of their green branches and strung with wires delivering electric currents. The wired planet arcs through the vacuum of space, glimmering at the poles with electromagnetic aurora. In the late 1900s, the global image—our planet grasped by the eye—becomes the emblem of the Planet Wireless cell phone company, as the tarred power poles lining American streets bend funny with age.

### ==== CARBIDE MINING LANTERN

Carbide lanterns join Argand lamps, neon tubes, and quantum dots in a galaxy of artificial light. Mixing chunks of car-

<sup>13</sup> Tesla partially built only one piece of the World Telegraphy System—the Wardenclyffe Tower on Long Island. Considering the tower's fantastical shape, one farmer commented that Long Island residents were “tired... [of] trying to figure out why he put it here instead of at Coney Island” (“Cloudborn electric wavelets to encircle the globe.” *New York Times*, March 27, 1904).

<sup>14</sup> Tesla observed that insulated vacuum bulbs—related to both neon and radio tubes—“not only reacted to magnetic influences but also to the approach of a person and to the torque of the earth, just as the eye also reacts to faint impulses near or far” (Marc J. Seifer, *Wizard: The life and times of Nikola Tesla*. Secaucus, NJ: Carol Publishing Group, 1999: 102).

bide with water in complex chambers to produce flammable acetylene gas, the lantern “throws a brilliant white light for a distance of 50 feet.”<sup>15</sup> The chemical reaction leaves lime as waste, with its peculiar odor reminiscent of the smell of mines. The lanterns offered an early form of mobile artificial light by clipping onto bikes, carriages, and automobiles.

## METRONOME

*On loan from Vince Hannemann*

Mechanical predecessor to analog and digital drum machines, metronomes were invented by Dietrich Nikolaus Winkel in 1812. Four years later, John Mälzel adapted the design into the quintessential portable version, familiar from Man Ray’s 1923 photograph of an eye paper-clipped to the swinging arm of a metronome. Mälzel is most remembered for his adventures with Wolfgang von Kempelen’s automaton chess player, a gaff robot hiding a human who challenged players from within. Von Kempelen’s device was essentially a mechanical illusion, and Mälzel, its showman in Europe and America. After touring the states and being defrauded in an 1836 article penned by Edgar Allen Poe, the well-worn chess player melted in an 1854 Philadelphia fire. Controversy still surrounds its true capacities as an automaton.

## FURBY

If given a Furby as a child, the toy’s inventor, David Hampton, would have “[taken] the fur off,” then “[opened] up the case, the shell ... [to] look at everything as it’s working” before “disassembling the circuit board.”<sup>16</sup> Furby first marched in history’s parade of automata in the holiday shopping season of 1998,<sup>17</sup> generating a frenzy of competitive consumption that made the doll’s \$30 retail price soar to as much as ten times that value in a spontaneous Furby scalping economy. On top of its cuddly fledgling owl/kitten form, the doll’s appeal lies in its speech ability. Furby rattles off babytalk in English and its native tongue, Furbish—an amalgam of Mandarin, Hebrew, and other languages. Given rumors about the doll’s capacity to record human voices, Furby was banned from National Security Agency offices in 1999.

## REPLICA OF THE PROBABLE STATE OF BANVARD’S MOVING PANORAMA

John Banvard’s moving panorama of the Mississippi River—a “three mile long” canvas painted with scenes sketched by the artist on a solitary 400 day voyage—scrolled past audiences on a taut line stretched between two massive rollers. Premiering in the late 1840s, this proto-cinematic novelty mimicked a steamboat trip down America’s frontier river just as tourism became feasible with railroads. Banvard showed his painting while narrating a tale of the travels that it captured in scrolling landscapes: “a tall tale of pirates, colorful frontier eccentrics, hairbreadth escapes, and wondrous vistas.”<sup>18</sup> The search for new audiences drove Banvard to Britain, where he unfurled his imaginary America. “Most of the English people think that our Western country is nothing but a wild-man-of-the-woods region, and no doubt but many places on the Mississippi are wild enough, but Banvard’s panorama presents many scenes where the poet might indulge his fancy and the lover of the picturesque sigh to behold in reality.”<sup>19</sup> For all its fame in the 1850s, the battered panorama disappeared, perhaps dismembered into smaller theater backdrops, perhaps shredded to insulate houses.<sup>20</sup> Like his painting, Banvard was forgotten, buried penniless in a Dakota grave.

## BOTTLECAP SNAKES

On February 2, 1892, William Painter, Baltimore mechanic, patented his Crown Cork bottle capping system—essentially the same design found on most glass bottles today. Painter’s caps were molded steel, undersides coated in Japanese lacquer or hidden with a small cork disc. Because the caps’ sides were fluted to grip a modified glass lip, he had to sell bottle makers not only his cap design, but also his specially adapted bottles. Painter thus inaugurated a one-two punch approach to industrial design, pairing a delivery system (bottle) with a disposable product to be inexhaustibly purchased and *thrown away* (cap). As an abundant unnatural resource, bottle caps return to life as folk art, becoming analog pixels in giant mosaic images or taking on sculptural form as coiled snakes, decorative frames, porous baskets, and linked chains.

15 “The Baldwin acetylene bicycle-lamp.” *Scientific American*, LXXXII(25), June 23, 1900: 294.

16 Jacques Steinberg. “Far from the pleading crowd: Furby’s dad.” *New York Times*, December 10, 1998.

17 Fellow marchers in the parade include Toyota’s Asimo robot (2000; <http://world.honda.com/ASIMO>) and Jacques de Vaucanson’s defecating duck (1739).

18 Paul Collins. *Banvard’s Folly: Thirteen tales of renowned obscurity, famous anonymity, and rotten luck*. New York: Picador USA, 2001: 9.

19 “Banvard’s Panorama.” *Scientific American*, IV(13), December 16, 1848: 100.

20 Paul Collins, pp. 23-24.





### STEREOGRAPH VIEWER

In 1838, experimental tinkerer Charles Wheatstone explained the optical mechanics behind binocular vision in *Homo sapiens* to the Royal Society.<sup>21</sup> His lecture was accompanied by a special viewer capable of reproducing the phenomena with photographs. David Brewster popularized a refined version of the viewer in 1849, marketing a parlor pastime whose demand for novelty produced a dispersed time capsule of historic landscape photography, portraits of villages, monuments and artworks since lost to war, and snapshots of unique moments above and below the earth's surface—3-D replicas of visions past. Stereographs perfected realism in photography, even superseding the eye's optical horizons: "Ranges of distant mountains generally appear to the naked eye like perpendicular walls attached to the firmament. In the stereoscope, it is possible to combine

two perspective views of a landscape taken from two different points sufficiently distant so as to give the observer a correct idea of the real or true forms embraced in the views. A stereoscopic picture, therefore, conveys a more perfect representation of a landscape than an observation made with the naked eye."<sup>22</sup> In a startling act of prestidigitation, *the Machines* made human vision an inferior copy of their own optical capacities.

### FOOT-POWERED NEW HOME SEWING MACHINE

French tailors rioted against Barthelemy Thimonnier's 1830 design of a mechanical sewing machine. Rather than causing unemployment, *the Machines* spawned new industry in their manufacture and use. Whole department stores of modern garb flew through the production lines of clothing

21 On top of being the first researcher to (incorrectly) measure electricity's velocity, Wheatstone made substantial innovations in the field of telegraphy. Son of a London musician, young Wheatstone independently translated a book by Volta from French, then went about building a battery. Volta's recipe called for copper plates, and when Charles' copper pennies couldn't buy them, he used the coins themselves as conductors.

22 "The tele-stereoscope." *Scientific American*, XIII(19), January 16, 1858: 149. By the same principle, the eye's incapacity to render 3-D horizons gave wraparound panoramas a dizzyingly realistic spatial quality.



factory floors, stitched into being by nimble-fingered ex-hairdressers out of a job after the Revolution. The 1850s found American inventors ensnarled in patent wars as their foot-powered sewing machines entered mass production. Now the japanned flowers decorating *the Machines* have faded and blackened from the touch of working hands, the innovative pressure-embossed wood worn down by flowing fabric.

## EDISON BULB & CYLINDER RECORD

Thomas Edison's 1879 invention of the incandescent light bulb presupposed that he install an urban electricity grid to power his product. America's first electric company supplied energy to a handful of New York blocks in 1882, prompting newspapers to churn out jingle-like articles that acted as ads for Edison's industry: "As soon as it is dark enough to need artificial light, you turn the thumbscrew and the light is there, with no nauseous smell, no flicker and no glare."<sup>23</sup> "Looking for a suitable fibre" to provide the filaments in his bulbs, "Edison carbonized almost 6,000 vegetable substances. He started with everyday materials such as paper, yarn, cork, celluloid, linen, wood, and human and animal hair, and discovered that bamboo fibre was particularly well suited to his purpose."<sup>24</sup> While the bulbs reproduced daylight—a homely effect given seventy years of gas light in the parlor—listeners experienced the 1877 cylinder record's uncanny mimicry of sound as the "magic release of music" from an object.<sup>25</sup> The first reporter to hear Edison's cylinder record responded, with objective restraint, "no matter how familiar a person may be with modern machinery and its wonderful performances, or how clear in his mind the principle underlying this strange device may be, it is impossible to listen to the mechanical speech without his experiencing the idea that his senses are deceiving him."<sup>26</sup> Fifty years later, the magic release had sunk into the everyday as the phonograph became regarded as "first a novelty, then a luxury, then a commonplace."<sup>27</sup> The gadget's worldwide familiarity, however, still excited the imagination with a veritable stereoscopic catalog of people all over the globe listening to sounds artificially stuck in time.

Edison's sonic invention "brought the great arias of opera into the tenements, Caruso's voice soared for flat-faced Tibetans in the hill villages near Darjeeling. Traders saw to it that the spear-carrying natives of Central Africa had a chance to hear crack orchestras from Broadway and Picadilly grind out jazz, with a faintly reminiscent note. And, fifty years from now, the voice of Caruso and all his contemporaries will be heard by those not yet born."<sup>28</sup> And so, fifty years hence, the globe is encircled with radio waves, territorialized with WIFI networks, delivering songs and voices without wires, playing the digitized ghosts of Edison's cylinders.

## ANALOG DRUM MACHINES

*On loan from Erich Ragsdale and Chad A.*

Electronic robot rhythms premiered with Léon Theremin's 1930s Rhythmicon,<sup>29</sup> gaining popularity with programmable drum machines in the late 70s and early 80s. While new digital machines crunch binary code to program sounds, analog models race electrons through circuits to bend waveforms into percussive patterns. Tireless and precise breaks, fills, flows, bleeps, and bloops of analog drum machines pulsate air to rattle our tympanic membranes. Playing one of *the Machines* is good, but five is better, each polyrhythm a unique and ephemeral sonic snowflake.

## THEREMIN

*On loan from Adam Rice*

Léon Theremin's 1919 invention of his eponymous electronic musical instrument emerged out of Russian research on remote sensing. Much like dreamachines are art objects seen with eyes closed, Theremins are played without touching *the Machines* themselves. Two metal antennae generate electromagnetic fields by overlapping radio waves vibrating at frequencies far above X-rays, visible radiation, and UV light. Our hands' electrical capacity alters the fields and their sonic waveforms, one antenna modulating pitch, and the other, volume. Léon personally demonstrated the device to

23 "Edison's electric light: 'The Times' building illuminated by electricity," *New York Times*, September 5, 1882, p.8. The first light fixtures copied gas lamps by turning on and off with a screw; switches were an afterthought.

24 Wolfgang Schivelbusch. *Disenchanted night: The industrialization of light in the nineteenth century*. Trans. Angela Davies. New York: Berg Publishers, 1988: 63. The filament list recalls Ukichiro Nakaya's 1950s search for a suitable substrate upon which to grow artificial snowflakes.

25 "World made over by Edison's magic: he did more than any one man to put luxuries into the lives of the masses." *New York Times*, October 18, 1931: 34.

26 "The talking phonograph." *Scientific American*, XXXVII(25), December 22, 1877: 384.

27 "World made over by Edison's magic," p.34.

28 Ibid.

29 Italian Futurist Luigi Russolo's *Intronumori*—"noise machines" that raucously copied the sound of percussive instruments—anticipated Theremin's device by 20 years, but lacked electronic elements.





an enthusiastic Lenin, who bankrolled a global marketing campaign to sell Theremins as hallmarks of Soviet ingenuity. Though virtuosos like Clara Rockmore approached the instruments as expansions of the classical repertoire, their sounds became most familiar through Hollywood science-fiction movies like the archetypal UFO film *The Day the Earth Stood Still*.

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**DREAMACHINE**

*On loan from Erich Ragsdale*

Spinning out hypnagogia-inducing patterns of light, Brion Gysin and Ian Sommerville's dreamachines paint moving colors and dream-images across our optic nerves with eyes closed. By flickering photons upon our inner eye at 8 to 12 pulses a second—roughly equivalent to the human brain's alpha wave frequencies—the *Machines* offer a method to “travel into the areas of one's own unconscious dream state. The dreamachine plans are quite literally a passport to this domain, and for once there are no customs posts to pass, no police barriers or laws to break down or transgress. It's quite



simply a voyage of exploration without restriction.”<sup>30</sup> Make a do-it-yourself dreamachine out of poster board, color gels, and a 78 RPM record player. What starts as Moiré patterns ripple and distort into a passing river bank, reflected in water ... a Mississippi flood with a tiny UFO rocking on its surface like a floating bottlecap ... a circus train throttling through midnight wilderness, its menagerie of transgenic owl-kittens reflecting moonlight from glassy eyes ... UV towers perpetually assembled by a pack of hammers, wrenches, and pliers, topped by elk skulls with incandescent bulbs fused into their horn tips ... Neon tubes flickering in what looks like a cavern or mine, subterranean alleys carved beneath a mushroom-shaped tower topped by the glass dome of a bubblegum machine, aglow with vast arcs of voltage ... Could the rainbow balls assemble into molecular polymers, proteins adapted to sense light?

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### WOLFTRACK

Austin artist Grant King’s Wolftrack digitally registers a po-

tential dreamachine vision, blurring fractal color with soccer ball black/white hexagons and prints of wolf paws in snow. How many wolves laid these tracks? “You can’t be one wolf, you’re always eight or nine, six or seven. Not six or seven wolves all by yourself all at once, but one wolf among others, with five or six others.”<sup>31</sup> As with wolves, so with *the Machines*...

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### ORGONE ACCUMULATOR

*Gift of Grant King*

Jewish-Ukrainian psychoanalyst and compulsive inventor Wilhelm Reich studied with Freud before developing his own theories on the forces behind orgasm and life in general: orgone radiation. Reich theorized orgone as an all-pervasive form of physical energy—a sort of electricity for organic machines—with a “negatively entropic” pulsion that draws living matter together into higher forms of cellular order. After publishing *The Mass Psychology of Fascism* in 1933, Reich escaped Nazi Germany to Denmark where he

30 10111.org Collective Studio. “Brion Gysin’s dreamachine.” <http://www.10111.org/dreamachine> (accessed March 15, 2006).

31 Gilles Deleuze and Felix Guattari. *Capitalism and schizophrenia*. Vol. 2, *A thousand plateaus*. Trans. Brian Massumi. Minneapolis: University of Minneapolis Press, 1987: 29.

conducted his first experiments with orgone energy. Among those experiments, he proposed testing the visual phenomena of seeing bluish dots of light behind closed eyes. Could these luminous specks be motes of orgone, or are they simply subjective feedback from the organism itself? Reasoning that we “cannot feel or phantasy anything which does not actually exist in one form or another,” Reich wondered “whether such definite phenomena as the light impressions one can have with one’s eyes closed do not reflect a reality after all.” This line of research led him to invent an orgonoscope, capable of more clearly rendering another unexplained phenomena, “the flickering in the sky.”<sup>32</sup> From Denmark, Reich settled in America in 1939 and continued building orgone machines (while developing psychoanalytic practices like character analysis and vegetotherapy, both of which combined “the talking cure” with touch and breathing exercises). Reich’s cloudbuster produced rain by orchestrating atmospheric streams of orgone, and his accumulator offered an orgone-saturated haven to rejuvenate the body. But after the accumulator was shipped to a cancer patient across state lines, the therapeutic device channeled the Food and Drug Administration’s wrath, landing Reich in jail. In addition to a two-year sentence, the FDA ordered all of Reich’s orgone research, publications, and machines destroyed. Reich died (mysteriously) a day before his parole in 1959; a year later, a New York incinerator made ashes of what remained of six tons of his papers and research burned by the FDA.

### UFO REPLICA

While experimenting with his cloudbuster to make rain in Arizona, Wilhelm Reich reportedly observed a UFO hovering over the mountains. He proposed that *the Machines*, like our bodies and certain weather patterns, were fueled by orgone energy. Controversial inventor Nikola Tesla was equally fascinated with speculating on alien technology. Claiming to have detected “feeble electrical disturbances” emanating from Mars in 1899, he concluded that an extraterrestrial intelligence had attempted to contact earth and set about building a device capable of returning the interplanetary signal—a celestial telegraph.<sup>33</sup> Physicist Bob Lazar allegedly worked on a downed UFO at a lab related to Area 51, then consulted Testors for their plastic model design. As the instructions attest, “it is possible this kit is the world’s first

authentic plastic scale model of a flying craft designed and built on a planet of a star system outside our own Solar system.”<sup>34</sup>

### BUBBLEGUM MACHINE

Chewing gum enjoys a venerable role in histories of human mastication: Mayans chewed chicle; ancient Greeks munched mastiche between philosophical enunciations; natives of North America chomped spruce sap, passing the habit on to European settlers, who commercialized it in the 1850s; vending machines debuted in the 1880s as effective, unmanned delivery methods for chewing gum at train stations.<sup>35</sup> However, the wonders of gum that can be *blown into bubbles* is truly modern, dating to its invention by Frank Fleeer in 1906. Fleeer’s design—called Blibber Blubber—proved unmarketable, as the wet bubbles spattered upon bursting. In 1928, Fleeer’s accountant, Walter Diemer, created a suitably elastic, marketable bubble gum by adding latex to the formula—latex derived from sap originating in the Mayan lands of rubber trees... now cemented to sidewalks, shoe soles, and the undersides of seats.

### MABEL STARK’S WHIP; “HOLD THAT TIGER” MUSIC BOX

At a time when male circus stars shoved chair legs down snarling tigers’ and lions’ throats, Mabel Stark trained large cats with love. She entered her ring with a stick, her trusty whip, and a gun with blanks—a last resort—but sought to teach through trust and mutual respect. Thus, her whip, though over eighty years old, looks brand new. Stark became the best known female tiger trainer during the 1920s, the glory days of the circus. She began her career after a nervous breakdown caused by nursing in a hospital. Stark did time as a hootchie-kootchie dancer before working her way up to training tigers, eventually touring as a main attraction with the Barnum & Bailey Circus where she famously pioneered a 15 cat act. Her act was pure novelty: rather than forcing a single cat through a trick at a time while the others waited on pedestals, she kept the giant felines in fluid, choreographed movement. Out of the ring, Stark led a wild life befitting a circus star, strolling Venice Beach with her pet tiger Rajah during the circus’ wintering months. Her autobiography, *Hold That Tiger*, is full of such adventures. She had

32 Wilhelm Reich. *The discovery of the orgone*. Vol. 2, *The cancer biopathy*. Trans. Theodore P. Wolfe. New York: Orgone Institute Press, 1948: 84-89.

33 Nikola Tesla. “How to signal to Mars: Wireless the only way now.” *New York Times*, May 23, 1909.

34 John Andrews. “Area S4 UFO instructions.” Testors kit no. 576, 1994.

35 Gumballs.com. “History of chewing gum and the vending machine.” <http://www.gumballs.com/history.html> (accessed July 12, 2006).





at least three husbands, one of whom was mortally mauled by Rajah during a fierce viral outbreak caused by a circus train's tainted water supply. Stark was using her skills as a former nurse to tend the nauseous carries when the love of her life wandered into her train car. Rajah languished inside, feverish with the sickness, and lashed out. In her seventies, Stark was still lying about her age to work with cats at Jungle Land in California. She was fired for curious reasons relating to insurance coverage, and committed suicide after surviving over a dozen sever maulings at the claws and teeth of her beloved felines.

### ===== **HUMAN BLOCKHEAD'S NAIL**

The hidden mechanics of human nasal passages offer in-built tricks for human blockhead side-show performers. Legend has it that Melvin Burkhart introduced the routine after having his nose broken in the boxing ring. "When doctors operated on his nose they removed a heap of bone fragments. He watched them as they went in and out of his nose with scalpels and long pincher-like things. And that's when the lightbulb went off. He could put things through his nose, too. He quit boxing as the doctors had advised" and started





performing as the Anatomical Wonder.<sup>36</sup>

### ===== PLASTIC EGG-LAYING CHICKEN

Just as letters form words that string together into sentences, atoms bond into molecules called monomers that link into repetitious polymer chains to form plastic. Natural polymers like wax and the sap of rubber and spruce trees show polymeric structures similar to synthetic plastic. Artificial products like gasoline, pesticides, and fertilizers share a secret bond with plastic toys, clothes, housewares, and credit cards: they are all derived from crude petroleum. Plastic toys like egg-laying chickens, robots, and dinosaurs, are literally made of prehistoric ocean life, fueled by ancient sunlight a quarter of a billion years ago.

### ===== SCAT OF EASTERN IDAHO

While mapping wildlife trails through an Earthwatch edu-

cator fellowship, Museum of Ephemera curator Jen Hirt collected six scat samples from Eastern Idaho's Bitterroot Range along Louis and Clark's original trail. The Earthwatch expedition correlated large mammals' migratory paths with food availability, with the ultimate goal of determining effective wildlife corridors between state and national parks.<sup>37</sup> As the byproduct of energy production in biological life, scat embodies both an animal's diet and the season of its passage through the landscape. Ms. Hirt's collection includes spring and fall elk scat (demonstrating an obvious difference in texture and color due to seasonal vegetation), mountain lion scat (containing bits of bone and fur), bear scat (smelling sweet due to clover ingested), porcupine scat (resembling female pinecones), and deer scat (those familiar, dainty marbles of digested arrowroot, bluegrass, and cheatgrass). Ms. Hirt paired each scat vial with a turn-of-the-century etching of the animal in question. Scott Salas—host of the televised program "What's That Scat?" in Denver, CO—helped to procure and identify the collection.

36 Marc Hartzman. "The original human blockhead: 94 and still banging away." *Backwash Zine*, 2001. <http://www.backwashzine.com/melvin.html> (accessed July 7, 2006).

37 Ms. Hirt's expedition took place in July 2005. For a comparable expedition, see "Wildlife Trails of the American West." Earthwatch. [http://www.earthwatch.org/site/pp2.asp?c=dsJSK6PFJnH&b=1147589#research\\_mission](http://www.earthwatch.org/site/pp2.asp?c=dsJSK6PFJnH&b=1147589#research_mission) (accessed July 11, 2006).



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## PACHINKO MACHINE

By the end of the US occupation of Japan in 1952, pachinko's chance-driven enchantment had mesmerized the nation with the hypnotic sound of little metal balls hitting pins: *pachi-pachi*, *pachi-pachi*.<sup>38</sup> Players launch balls into a vertical

field of obstacles, perhaps landing them in one of five to eight basket- and flower-shaped holes to trigger the release of more balls. Pachinko parlors, filled with hundreds of *the Machines*, exchange the balls for prizes like sugar and tobacco that were in scarce supply in a post-war economy. The game's massive popularity bolstered the Japanese

<sup>38</sup> Pachinko's name derives from the Japanese onomatopoeic word *pachi-pachi* which imitates the sound of small metal objects knocking against one another. Pachinko "parlors actually broadcast a tape of balls clanging through machines, so that even when a parlor is empty, it sounds like it's full of players" (David Plotz. "Pachinko Nation." [http://www.japansociety.org/web\\_docs/plotz\\_pachinko.pdf](http://www.japansociety.org/web_docs/plotz_pachinko.pdf) [accessed May 24, 2006]).



economy (and continues to, now outgrossing the automobile industry),<sup>39</sup> but had dangers: “Doctors report cases of sprained thumbs resulting from an over-indulgence. This affliction has become known as pachinkosis.”<sup>40</sup> Gambling is illegal in Japan, but players can trade boring prizes like lighter flints for cash at unaffiliated booths in nearby alleys.

### ===== **BUTT JIGGLER & BUTT ROLLER** *On loan from Carl McQueary*

Austin art historian and collector Carl McQueary fondly calls his 1950s turquoise workout machines the “Butt Jiggler and the Butt Roller.” The latter device rolls wooden rods resem-

39 According to Wired Magazine writer Yukihiro Hatano, “Government figures show [the pachinko] industry racking up gargantuan receipts [of] 30.4 trillion yen (US\$286 billion) in 1994 ... Pachinko leaves ... the 14 trillion yen (US\$132 billion) Japanese auto industry in the dust” (“Pachinko über alles.” Wired Japan. <http://www.wired.com/wired/archive/4.06/pachinko.html> [accessed June 20, 2006]).

40 Ray Falk. “Pinball panic over Japan: ‘Pachinko’ is a zany game; its havoc is nation-wide.” *New York Times*, October 12, 1952.

bling stairway banisters across rumps, flanks, and feet, self-polishing all the while. Dating from the 1920s, butt jiggling belt massagers like the Savage Health Motor provided work-free workouts to men and women alike. *The Machines* facilitated potentially whiplash-inducing exercises like “the Scalp Invigorator” and “the Facial” as well as digestion workouts like “the Regulator” or “the Big 3 Stimulator”: “Aids the functioning of the three important vital organs of digestion and elimination: the liver (right side), stomach (left side), and the kidneys (right and left sides). Also beneficial for the intestines.”<sup>41</sup> Eighty years after their invention, *the Machines* still promise sweatless weight loss: “Imagine if you could lose weight, tone your muscles [and] relieve stress all at the same time. Well now you can with our Exercise Belt Massager ... The machine does all the work for you.”<sup>42</sup>

## WORK-RELATED STEREOGRAPHS

Stereography, and photography more generally, visually catalogued the world’s marvels in chemicals, paper, and natural and artificial light. “The heavenly bodies floating in space, have by [this] art been made to draw their own likeness; ... catacombs, grottoes, and caverns deep in the bowels of the earth have been illuminated by the electric light, and their hidden wonders fixed on the sensitive plate; but all these achievements fall short of one which has recently come under our notice—obtaining photographs of the interior of a living human body.”<sup>43</sup> Popular alongside the rise of tourism in the 1850s, nothing was too strange to appear on stereographs in home parlors; the more exotic the better. Even the mundane toils of Sears and Roebucks laborers, building watches in a factory or counting money at the day’s end, were worthy of three-dimensional photographic representation.

## GMO FOODSTUFFS

In his 1986 book *Engines of Creation*, nanotechnology guru K. Eric Drexler encouraged an approach to industrial manufacture modeled on ribosomes, the organelles responsible for assembling proteins. Although most genetic engineers talk about ribosomes in linguistic terms—as “translators” of a transcribed genetic code—Drexler professed a mechanistic metaphor, referring to them as “molecular machines.” “Ribosomes are proof that nanomachines built of protein and RNA can be programmed to build complex molecules.”<sup>44</sup> Indeed, at the time of Drexler’s proposition, genetic engineers capable of modifying bacteria into designer protein factories (*i.e.*, *E. coli* bacteria transformed into machines that produce human insulin) were far ahead of nanotechnology scientists in the new industry of molecular manufacturing.<sup>45</sup> While nanotechnology products only recently came to market, biotechnology foodstuffs have been commercially available since 1996. Only seven years later, “25 percent [of all crops] or 167.2 million acres” of the earth’s surface “—an area greater than twice the size of the United Kingdom—consisted of [genetically modified] crops in 2003.”<sup>46</sup> Several companies manufacture petroleum-based herbicides like Monsanto’s Roundup alongside seeds genetically modified to survive those products. The new trend in invention finds these companies patenting genetic sequences and raising experimental “biopharming” crops in open fields next to other harvests. When a “test plot with seed corn genetically modified to produce proteins containing powerful drugs for treatment of diarrhea in pigs” infiltrated a crop of soybeans, *the Machines’* specter of unintended effects took form in the public eye as *genetic pollution*.<sup>47</sup>

41 “How to set up and use your Savage Health Motor.” Savage Products Distributing Corporation pamphlet, circa 1928. Private collection of Carl McQueary.

42 “Exercise Belt Massager.” Gadget Universe. [http://www.gadgetuniverse.com/product\\_detail.asp?SKU=TH+453](http://www.gadgetuniverse.com/product_detail.asp?SKU=TH+453) (accessed July 7, 2006).

43 “Stereoscopic photographs of the organs of voice in action.” *Scientific American*, VII(12), September 20, 1862: 179.

44 K. Eric Drexler. *Engines of creation: The coming era of nanotechnology*. New York: Anchor Press, 1986: 5-8.

45 By the late 1980s, “genetic engineering [had] mainly been used to produce substances that already existed in nature,” albeit by inventing transgenic species like *E. coli* bacteria with human genes (Andrew Pollack. “Genetic engineers prepare to create brand new proteins: Scientists hope to tailor-make proteins for specific tasks.” *New York Times*, March 15, 1988). Taiwanese scientists recently added a glow-in-the-dark pig with jellyfish genes to the freak show of new species (Chris Hogg. “Taiwan breeds green-glowing pigs.” *BBC News*, January 12, 2006. <http://news.bbc.co.uk/1/hi/world/asia-pacific/4605202.stm> [accessed on July 2, 2006]).

46 “Genetically modified crops in the United States.” Pew Initiative on Food and Biotechnology, August 2004. <http://pewagbiotech.org/resources/factsheets/display.php3?FactsheetID=1> (accessed February 9, 2006).

47 John Nichols. “The Three Mile Island of Biotech?” *The Nation*, December 12, 2002. <http://www.thenation.com/doc/20021230/nichols> (accessed February 14, 2006).





## THE PLANTS & ANIMALS

*The Machines* demand perpetual energy. Though nothing else matters to them, their productions and wastes matter in the profound sense that they *reproduce the world* in copies and varieties of nature that become originals—second natures brimming with artificial resources, toxic habitats, and vast ruins. As biotechnology makes machines of the very food we eat, and as nanotechnology increasingly mimics the workings of molecular biology, it seems that *everything* is a machine. The secret source of *the Machines'* energy—*the Other Machines*—comes down to mystified solar power, reflected and recycled through a global ecology of plant, animal, and technical machines, all plugged into the sun.

While *the Plants & Animals* turn out to be nothing but assemblages of molecular machines, they have one great advantage over *the Machines* of humankind: they routinely eat their own waste. In the circus of reproduction, our machines are “like the juggler who takes a set of bowling pins, tosses them in the air once, then throws them out, reaching for a new set. Life, on the other hand, juggles one set of pins and cycles them continually. A leaf falls to the forest floor only to be recycled in the bodies of microbes and returned to the soil water, where it is reabsorbed by the tree to make new leaves. Nothing is wasted.”<sup>48</sup>

Why is it that our machines transform the very groundwork

of life—genomes and photons—into genetic and light pollution? Could ours be *Cancer Machines*, churning out nothing but clotting wastes and copies of themselves at the cost of diversity? Like money begets money, *the Machines* flatten out values into a single form, a bottom line: self-replication.

Paradoxically, *the Machines* unleash differences as novel (and potentially hazardous) as transgenic species and remote viewing by satellite. For example, the expansion of human optical capacities in the 19th century through innovations like stereographs, X-ray machines, and varieties of artificial illumination taught us to see things differently by making our eyes into wolves in a pack of optical devices: one vision among others, eight or nine cameras, six or seven telescopes. *The Machines* offer us the Animals' visual worlds of minute scale and UV color, or the celestial vision of stars.

After we've made bacteria into molecular machines, the once obvious distinction between *the Machines*, *the Plants*, and *the Animals* no longer holds. Only life and death remain distinct. Perhaps *the Machines* were new species of plants and animals all along, fresh biospheric actors and viral agents uniquely capable of generating final deaths like species extinction and nuclear waste as byproducts of their self-replication. Capable, too, of bioengineering the very principles of life into an autopoietic mega-animal, a solar creature suckling its own tail.

48 Janine M. Benys. *Biomimicry: Innovation inspired by nature*. New York: William Morrow and Company, Inc., 1997: 242.