HUMANS, ARE THEY REALLY NECESSARY?

SOUND ART, AUTOMATA AND MUSICAL SCULPTURE

BY DAVID TOOP

The men of the Middle Ages were so mechanically minded they could believe that angels were in charge of the mechanisms of the universe: a 14th century Provençal manuscript depicts two winged angels operating the revolving machine of the sky.
Jean Gimpel, *The Medieval Machine*

In 1650, the Jesuit polymath Athanasius Kircher published 1500 copies of a treatise on music and acoustics called *Musurgia Universalis*. Taking over the role of the angels, Kircher had invented an eccentric collection of mechanical devices that generated, amplified and ordered sound. Floating in a late Renaissance netherworld of science and mysticism, Kircher's designs for sound machines included solar powered singing statues, Aeolian harps powered by the wind, a hydraulic organ that seemed to sound through automata representing the gods Pan and Echo, and spiral tubes that projected sound out of the mouths of statues or eavesdropped on conversations in adjacent rooms. He also built an elementary computer, described by Joscelyn Godwin, researcher in esoteric sound, as "a 'musarithmetic ark' or box of sliders on which the patterns are written, that serves as a composing machine".

The ventriloquism of speaking statues and articulated masks, used by the priesthood to conjure spirit voices on demand, was a formative stage in the history of automata. In their turn, automata were the forerunners of robots, replicants and recording. In 18th century Japan, where an optimistic belief in the robotic future of classic sci-fi still survives, Dutchmen were entertained by karakuri performances staged by live musicians and mechanical dolls. An illustration from a guide to Osaka published in 1798 shows the Takeda theatre, where a Kabuki style percussion ensemble accompanied a mechanical cockerel banging a large drum.

These mechanical inventions played an important role in technological evolution. "Just as the European automata of men like Vaucanson anticipated the machines of the Industrial Revolution," wrote Mary Hillier in *Automata And Mechanical Toys*, "the Japanese performance of karakuri was an awakening of automation." According to Hillier, this example of human-machine interfacing led to improvements in the

making of medicines and sugar with the use of treadmill machines.

Similarly, the development of Virtual Reality has been traced to another mechanical musical instrument, the player-piano. In *Virtual Worlds*, Benjamin Woolley's exploration of VR simulation, a genealogy is mapped: notions of computer simulated reality, formulated in the late 1960s by computer graphics pioneer Ivan Sutherland, were inspired by the Link Trainer flight simulator. In turn, the source of inspiration for the Link Trainer was the Pianola. Having been born into a family business of mechanical musical instruments, Edwin Link used the pneumatic mechanism of player-pianos as a basis for his invention of the first flight trainer in 1930.

A technology that allowed music to be perfectly and repeatedly reproduced until the mechanism broke, mechanical music also anticipated the phonograph. Extraordinary creations such as Alexandre Theroude's violin-playing monkey, designed in 1862, became refined and miniaturised for public consumption. A brisk luxury trade in musical boxes, clocks adorned with mechanical singing birds, even musical pictures enhanced by chiming bells, only declined with World War One as other forms of recorded sound became more widely available. This evolutionary obsolescence inevitably becomes a sign of mutated history within the work of composers and performers who create with machines, whether Conlon Nancarrow's or James Tenney's compositions for player-pianos, Stockhausen's *Zodiac* piece for music boxes, or the post-John Cage, post-Grandmaster Flash turntablism of Philip Jeck, Project Dark, Christian Marclay or DJ Disk.

Life sized musical automata of the 19th century were shrouded in an air of exoticism, occultism and horror that matched the contemporary fictional obsessions of Edgar Allan Poe and HP Lovecraft, or the profoundly influential modern creation myth of Mary Shelley's *Frankenstein*. Films as diverse as *Dead Of Night*, *Blade Runner*, *Toy Story* and *Bride Of Chucky* have exploited the ambiguously disturbing yet comic implications of toys coming to life, existing on the threshold of consciousness, taking revenge on their lords and masters.

Rooted in magic, machines that can play music independently of humans also invoke the most modern of fears. Like the HAL computer in *2001: A Space Odyssey*, they ask a chilling question: "Humans, are they

really necessary?" Futurist theorist, poet and activist Filippo Marinetti posed a similar threat in an essay called "Multiplied Man And The Reign Of The Machine". "We look for the creation of a nonhuman type," he wrote, "in whom moral suffering, goodness of heart, affection and love, those sole corrosive poisons of inexhaustible vital energy, sole interruptors of our powerful bodily electricity, will be abolished... This nonhuman and mechanical being, constructed for an omnipresent velocity, will be naturally cruel, omniscient and combative."

Full up with modern vigour and primitive energy, the Futurist Marinetti encouraged Luigi Russolo to give performances of his intonarumori noise machines in Modena, Milan, Genoa, Paris, Prague and London. "I have the impression of having introduced cows and bulls to their first locomotive," wrote Marinetti, contemptuous of the public derision that this performance of Russolo's Art of Noise faced. Inspired by the noises of the world, natural, industrial and martial, Russolo bubbled with infectious enthusiasm about the possibilities of the new century. "This lyrical and artistic coordination of the chaos of noise in life," he wrote, "constitutes our new acoustical pleasure, capable of truly stirring our nerves, of deeply moving our soul, and of multiplying a hundred-fold the rhythm of our life."

The supposed barbarism of Russolo's machines was overshadowed in 1914 by the barbarity of total war. A tour was cancelled, the noise instruments were lost and Russolo enlisted in the Italian army, "lucky enough", in his words, "to fight in the midst of the marvellous and grand and tragic symphony of modern war". Wounded in battle, he was discharged from the army and resumed his public displays of noise in 1921. By 1928, there were hopes that his Noise Harmonium might go into production as the perfect accompaniment for silent movies. Then the talkies took over and all of Russolo's potential financial backers faded away; for the second time, Russolo was a victim of the progress he celebrated. Now ghosts at the millennial feast, the intonarumori stand mute, an intangible beginning for the 20th century's fascination with noise, industry and the operations of nonhuman mechanical beings.

He liked the happy-looking row of electrical meters and the fact that they ticked off in 3/2 time, claves time, that the multiple row of pipes with their valves whistled, water whirring through them. He liked the crunching noises when faucets were turned on, the conga-drum pounding of the washroom dryer: the thunder of the coal-bin walls.
Oscar Hijuelos, *The Mambo Kings Play Songs Of Love*

Russolo's machines were created in a climate of political upheaval and scientific discovery. "This branch of physics has received renewed attention from research workers during the past decade," wrote EG Richardson in the 1927 preface to *Sound: A Physical Text Book*, "stimulated no doubt in part by the European War and by the development of broadcasting." Musical instruments such as the piano – embodiments of the aesthetic values of European art music – were beginning to be challenged by the electrical world of the radio, the phonograph or the theremin. Erik Satie, equally inspired by the noise of typewriters and the sound of jazz groups, was one of the earliest composers to become alert to these changes and reflect them in music.

EG Richardson's textbook updated the work of late 19th century physicists such as Hermann Helmholtz and John Tyndall and predecessors such as Chladni, scientists whose researches have been echoed in the music of Edgard Varèse, Harry Partch and Alvin Lucier. Tyndall, for example, summarised many experiments in *Sound*, first published in 1898: bowing long monochords; optical illustration of acoustical beat frequencies; the action of fog, hail and snow on sound; echoes from flames; vibrations in metal plates; an analysis of sirens and the "clang of piano wires".

Although they were conducted with scientific rigour, the aetherial nature of sound imbued these experiments with an air of mystery. Smelling faintly of the alchemist's laboratory, they were less bizarre versions of Raymond Roussel's literary creations. Staged for one week at the Parisian Théâtre Fémina in 1911, Roussel's *Impressions D'Afrique* featured among its scenes the trained earthworm whose undulations in a mica trough dripped mercurial water onto the strings of a zither to produce complex melodies. Roussel's fantastic inventions lay in an interzone between vaudeville,

anthropological Surrealism and future audio art. A fictive art that was improbable yet tantalisingly possible, the living sound sculptures of *Impressions D'Afrique* touch sensitive areas of cruelty, dream, perverted science, alien systems and an atavistic social subversion.

Buried in the interstices of science and Surrealism were the elements that demanded new tools for creating sound, new systems for organising it, new spaces in which to hear it. Born in Oakland, California in 1901, Harry Partch began to abandon the traditional scale, instruments and musical forms in 1923 after finding a copy of Hermann Helmholtz's *On The Sensations Of Tone* in a library. Like Antonin Artaud, Partch was driven by a vision of total theatre that would inspire audiences with unheard sounds produced on previously unseen instruments. Unlike Artaud, he set about constructing the machinery to create it. Partch's monumental book *Genesis Of A Music*, completed in 1947, was a manifesto for his Corporeal music. "The impulse to the growth and evolution of music," he wrote, "is generated by the human ear, not by the piano keyboard, without which the harmony classes of this day and age would be inoperative. And the missing element which the human ear wants and needs most is a musical instrument capable of expressing an infinite range of ideas and of infinite mutability, so that ideas can first be tested, then proved or corrected."

Partch's instruments – remarkable constructions such as Chromelodeons, Kitharas and Cloud-Chamber Bowls, designed to play a 43 tone scale and dominate the staging of his integrated theatre works – are as striking in their look and their materials as any sculpture or furniture design of the mid-20th century. Partch also questioned the formality of concert venues, suggesting that a bar might be a better place to enjoy music. Sound sculptures and audio installations challenged many of the precepts of 20th century concertgoing by working towards a deconstruction of the triangulated relationship of composer, performer and audience.

The sculptures of François and Bernard Baschet from France were artefacts of the space age, all silvered surfaces, steel flowers and translucent manta ray wing forms, yet they signalled a reaction against the omniscient control wielded by composers of electronic music. Like many sound sculptures, the Baschet brothers' constructions were

acoustic, and they could be sounded by visitors to their exhibitions. What was implied (later to be demanded in the anti-elitist spirit of the late 1960s and early 1970s, a period of stage invasions, jam sessions and free festivals) was a democratisation of music making. Ironically, this easy accessibility has consigned the Baschet instruments to near-oblivion; their eerie, resonant tones suggested a kind of freedom, yet suffered from the same intractability that Varèse had criticised in Russolo's intonarumori.

The paradox of freedom created by machines was explored in isolation by Percy Grainger, one of the least classifiable, confoundingly contradictory composers of the 20th century. In 1924, a year in which his arrangement of "Country Gardens" had sold 27,000 copies in the US and Canada alone, Grainger gave a series of lecture-recitals in Australia that broached the subject of machines that could play 'beatless music'. "It seems to me absurd," he wrote in a 1938 essay called "Free Music", "to live in an age of flying and yet not be able to execute tonal glides and curves... Machines (if properly constructed and properly written for) are capable of niceties of emotional expression impossible to a human performer."

Ten years later, Grainger built his first Free Music Machine. He had been producing piano rolls since 1915 and the machines he constructed in later life were Heath Robinson extensions of the player-piano, mixing milk bottles, bamboo, ping-pong balls, children's toy records, brown paper and string with harmonium reeds, oscillators and a vacuum cleaner. Given names such as The Cross-Grainger Double-decker Kangaroo-pouch Flying Disc Paper Graph Model for Synchronising and Playing 8 Oscillators, the machines were recorded during the mid-50s by Grainger's collaborator, Burnett Cross. "Had Grainger lived longer," wrote biographer John Bird in 1976, "and been able to continue his experiments with more sophisticated equipment he would not be very far removed today from some of the electronic extravaganzas of such groups as Pink Floyd."

A gasoline-driven generator in the entrance hall was soon pounding away, its power plugged into the mains. Even this small step immediately brought the building alive... However, in the tape-recorders, stereo systems and telephone answering machines, Halloway at last found the noise he needed to break the silence of the city.
JG Ballard, *The Ultimate City*

"What interests me is sound moving from its source out into space," Alvin Lucier told Michael Parsons in *Resonance* magazine, "in other words what the three-dimensional quality is. Because sound waves, once they're actually produced, they have to go somewhere, and what they do as they're going interests me a lot." The articulation of space through sound has been a potent agent for decomposition in 20th century music making, either by dissolving the frame, dispersing the sound-source or absenting the composer/performer. In his 1974 book *Experimental Music*, Michael Nyman listed Ives, Debussy, Russolo, Varèse, Schaeffer and Cage as composers who have "pioneered the use of 'music' to make us conscious of the life and sounds outside the accepted musical-social environment".

But Cage's *4'33"*, despite its huge importance, had limitations. "Cage's piece is 'hindered' by being set in a concert hall," wrote Nyman, "by containing no specific directive for the audience, and by leaving what is heard completely to chance. [Max] Neuhaus 'remedies' this. An audience expecting a conventional concert or lecture is put on a bus, their palms are stamped with the word listen and they are taken to and around an underground railway system." Other Neuhaus pieces of the late 1960s used the telephone system, radio transmitters, swimming pools, power stations and subway entrances to create what are now called site-specific installations and events.

As art forms have merged, many individual works have tended to be categorised according to their prime element. Alvin Lucier's score for *Music On A Long Thin Wire*, a piece for audio oscillator and electronic monochord, concludes with the instruction: "Light the wire so that the modes of vibration are visible to viewers." In a sense, this locates Lucier's piece as kinetic audio-visual art, rather than music, though the sound is available on CD.

Artists such as Len Lye, Tsai Wen-Ying, Jean Dupuy, Takis, Pol Bury, Jean Tinguely and Harry Bertoia incorporated sound into their kinetic sculpture, either as the activating element of a cybernetic system or as the by-product of motion. "Sound interested me enormously," Tinguely told Calvin Tomkins, author of *Ahead Of The Game: Four Versions Of Avant-Garde*, "it is another kind of material to me." Tinguely's *Homage To New York*, gigantic, fallible and typically anarchic, was staged in the garden of MoMA, New York in 1960, self-destructing in front of an audience that feared for its safety. The spectacle included a radio that turned itself on yet nobody could hear it, an Addressograph machine that clattered into life and then fell over and stopped after one minute, an erratically mobile klaxon, and a piano that had been doused in petrol, then set alight. "All the unforeseen accidents and failures delighted Tinguely," wrote Tomkins. "The fact that only three notes of the piano worked moved him deeply."

As resonant or amplified solids move and interact, activated by unpredictable systems, the patterns of sound they create take on the drama of natural emergent phenomena. The effect can be compared with the optical illusions of Op Art, yet the experience of seeing and hearing sounding sculpture could be immersive, more prolonged and emotionally deeper. For the late Harry Bertoia, successful as a sculptor from the 1950s to the mid-1970s, sound extended sculpture's articulation of space to fill the air and permeate walls. "It all started in the 1970s," wrote Chris Rice in *Halana* magazine, "when Harry purchased a bunch of Navy surplus beryllium-copper wires for use in his sculpting. In the process of working with these rods, a few happened to knock against one another, producing a remarkably resonant and long lasting sound." Many of the sound sculptures that Bertoia made were kept in his studio, a renovated barn in Barto, Pennsylvania. Instead of selling them, Bertoia made recordings of the sounds, activated by himself and his brother Oreste, then sold the records in a series he called Sonambient.

The sound of Bertoia's sculpture was architectural – an articulation of a specific space – yet also oceanic – the articulation of infinite space. Like many other forms of music of the period, sound sculpture challenged conventional notions of performance: no composer, no performer, no beginning, no end, no narrative, no critical language of

evaluation, some might say no point. Sound sculpture simply was and is: existing as a process that described space and shaped time.

John Cage's writings had implanted (at least) two important ideas: music grows out of silence and paradoxically, there is no silence, since the sounds of the world are invasive.

The UK artist Max Eastley began making sound sculptures in 1971, inspired by the wind and water-powered instruments of Athanasius Kircher and Robert Fludd, by Oriental whistling arrows and wind bells, by the military tactic of a Chinese general who in AD 34 placed bronze kettledrums under a waterfall to scare enemy forces with their noise, and closer to home and the present, by kinetic art, Marcel Duchamp, John Cage and the American minimalists. Stringed instruments were sounded by wind or water, flutes were voiced by wind, water dripped into boxes, and metal plates and strings were struck by hammers driven by electric motors.

As Eastley's work became more focused during the 1970s, his interest in complex natural rhythms, microscopic sounds and long durations deepened. La Monte Young and AMM had described their music as a continuum, a stream of sound that flowed without pause, only becoming audible and evident to the public when it was performed with listeners present other than the musicians. The metaphor was influential, though Eastley's work implied that metaphor might become actual, his instruments sounding for as long as the wind blew or the motors (and the electrical power that drove them) survived. The music of sound sculptures could become landscapes or oceans of sound: continuous, diffuse, immersive, a conglomerate of inner rhythms that was endlessly engaging, an enactment of a process that seemed to hover on the threshold of nature and culture.

Although they are not a performance in the strict sense of the word, the best sound sculptures are theatrical. Argentinian composer Mauricio Kagel used adapted, unusual, specially constructed and ethnic instruments in a number of his pieces, either to heighten theatricality or to challenge received notions of virtuosity and compositional form. *Staatstheater*, premiered in 1971 at the Hamburg State Opera, was a music theatre work of consecutive actions, many of them featuring strange 'instruments': mouth drumming using a plastic disc and wooden

beater; a steel spiral whirled above the operator's head, then lowered to strangle him or her; a board of nails stroked with two double bass bows; a 'drum man' covered in tambourines; amplified wire netting; a perspex water drum that dripped onto suspended cymbals.

Kagel's *Acustica*, produced in Cologne in 1969, used many strange soundmakers – bullroarers, balloons, a gas blowlamp, a cross-blower to modulate the timbre of a book's pages, clapper sandals, a miniature window used for radio plays, a gramophone record played by a knife attached to a large paper cone, photocells and an audio generator. In Kagel's words, a "self-evident supplement to currently existent sound-makers", these arcane instrumental sounds were lined up as a cabinet of curiosities, their dry scrapings and whirrings, disembodied bangs, gurgles and tortured squeaks, recalling Raymond Roussel, the physics of Chladni and Tyndall, the monstrous vacuum and pressure system music boxes of Stephan Von Huene or the self-made instruments used in improvisation by Evan Parker, Paul Lytton, Hugh Davies, Jamie Muir and Paul Burwell.

Conceptual art, land art, ecology and the aftermath of Fluxus performance were pervasive influences on sound works during the 1970s, many of which seemed to be spiritual heirs of both Athanasius Kircher and Yoko Ono. Annea Lockwood's *Piano Transplant – Pacific Ocean Number 5*, composed in 1972, gave the following instructions: "Materials: a concert grand piano, a heavy ship's anchor chain. Bolt the chain to the piano's back leg with strong bolts. Set the piano in the surf at the low tide line at Sunset Beach near Santa Cruz, California. Chain the anchor to the piano leg. Open the piano lid. Leave the piano there until it vanishes."

Frustrated with the confines of the concert hall and the educated expectations of New Music's small audience, sound art aspired to a closer engagement with the environment and the listener. Either directly or tangentially, the results were a critique of musical behaviour that was tired, even within the so-called avant garde. So Laurie Anderson performed on her Viophonograph, a turntable mounted on a violin and played by a needle in a bow, or played violin while standing on a melting block of ice; Bill Fontana proposed a project that amplified the singing tones produced by traffic crossing the Brooklyn Bridge, then sent a mixed

version via satellite to other parts of the world; and Alan Lamb recorded the Aeolian humming of telegraph wires in Australia.

From 1974, when she gave up flute playing for installations, Berlin based artist Christina Kubisch has used sound art to explore relationships of natural to technological, visible to invisible, and visual to acoustic, articulating symbolic space in specific sites with intangible sculptures of sound and light. Her *Clocktower Project*, for example, reactivated the bells of a clocktower at Massachusetts Museum of Contemporary Art. Kubisch encircled the tower windows with a band of black reflective solar panels. These registered the intensity and position of the sun, transmitting this information to a computer that assembled and played mini-compositions of bell sounds, sampled from the original 19th century clocktower bells.

Many of the original parameters of sound art are still being explored, given a new spin by the post-Techno installations and actions of younger artists such as Pan Sonic, Ryoji Ikeda, Disinformation and Scanner, or by the determinedly non-musical sound processes of Minoru Sato and Atsushi Tominaga in Japan, documenting the peripheral bug noise and fugitive crackle of loudspeakers saturated by steam or disconnecting electrodes planted in vibrating window frames. "When we reflect on the condition that most sound works have been requisitioned by music," Minoru Sato wrote in his catalogue essay for the 1996 Sonic Perception exhibition in Kawasaki City Museum, "we are forced to think that the perception/consciousness of the aspect of sound as a phenomenon has not been valued."

A new generation of artists has also turned to sound as a major component in installation work. They range from Angela Bulloch's *Sound Clash Benches*, featuring a film by Jimi Tenor, and her *Superstructure With Satellites* beanbags transmitting low frequency theremin sounds; to Heri Dono's speaking and buzzing satires on power in Indonesia; and Mariko Mori's video installations, particularly her *Miko No Inori* performance in Osaka's Kansai airport, Mori playing a cyborg shamaness performing crystal magic in one of the trance 'n' transit spaces of our disengaged present.

Appropriately for the age of Manga, robotsushi waiters, *Star Wars* droids and global positioning satellites, robotics has reappeared in sound

sculpture, including Felix Hess's sound-pressure sensitive robots, the automata of Pierre Bastien and Maxime De La Rochefoucauld, and Chico MacMurtrie's distressed, chaotic and skeletal androids, playing drums like entertainers at a post-nuclear blast party. Perhaps they symbolise the post-human, post-musical condition. The club aesthetic, the laptop computer and downloadable plug-ins are the most recent strands in a 20th century musical trajectory that throws conventional performance routines into question. If there are answers to the question of how music will be performed, enacted or experienced in the 21st century, then some of them will be discovered in the past and future of sound art.