

"Blue" Gene Tyranny
A Short History of Sound Art

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There is an aesthetic tradition, based on our natural attraction to unique sounds in and for themselves, that has been called Sound Art. This love of sounds per se can be found in works for the concert hall, art gallery and open air, as well as in published recordings and computer software. The sounds themselves are discovered in the natural environment or are generated by acoustic and electronic devices, many built by the composer-performers, installation artists, sound designers, sound effects (SFX) mixers, etc., themselves. The main incentive has always been to search for new and interesting sounds and to present them in innovative ways.

At first, new instruments and devices to generate the elements of Sound Art were tied to traditional modes of theatre – for example, sound-effects for thousands of plays and operas – and tied to the re-production of formal music – for example, Jean-Baptiste de la Borde's *Clavecin Electrique* (1759) which employed electricity to trigger small bells; Benjamin Franklin's device for rotating tuned water glasses called the Glass Armonica that enchanted audiences with its ethereal tones (Franklin also hung little bells along his staircases that rang when lightning struck a rod on top of his house and spread a blue electrical stream that frightened his wife Deborah); in 1874, Elisha Gray invented the first completely electronic musical instrument, the Musical Telegraph, just two years before Thomas Edison successfully reproduced sound for the first time on a piece of rotating tinfoil.

Programmatic music transformed

Many sounds that first appeared as imitative effects were later freed from that function and employed in more subtle ways and for their sound alone. For example, the massive (as many notes as possible with the left or both hands) bass tone clusters that the legendary Afro-American pianist "Blind" Tom Bethune used in his pianopiece *The Battle of Manassas* (1866) to imitate the cannon fire between Confederate and Union armies at Bull Run, independently re-appeared 40 years later as non-programmatic dense timbres in many compositions by Charles Ives.

Other examples of this transformation from a symbolic to pure use of sound can be found earlier in the 19th century in the music of Francis "Frank" Johnson's band of 20 "free black" musicians who toured the East Coast during the 1820s and 1830s performing at cotillion balls, churches, in parades, as well as at railroad and canal openings. The band's repertoire included such unusual

music as waltzes in 5/4 time, syncopations of sentimental ballads (a practice that was a precursor of jazz), and programmatic novelty numbers such as the Philadelphia Firemen's Cotillion which featured clanging alarm bells while musicians shouted "Fire!". Similar clanging sounds as well as new wooden-like and metallic timbres would emerge a century later in percussion works of the 1930s and 1940s, like those of William Russell (e.g. *Ogou Badagri*, a ballet based on the voodoo rites of Haiti, 1933; *Three Cuban Pieces*, 1935), Henry Cowell, Johanna Magdalena Beyer (*IV for Percussion*, 1935), and the collaborative piece *Music for 4 Percussionists* (1941) by composers Lou Harrison and John Cage, scored for many unusual instruments including automobile brake drums. Other programmatic effects would surface in the 20th century as "pure sound" in the music of the Futurists, and in electronic music and musique concrète.

Scores for the expanding symphony orchestra also began to concentrate on sound timbre in the mid-19th and early 20th centuries, from the lyrical dream imagery of Berlioz' *Symphonie Fantastique*, through the textures of Wagner, Liszt, Hans Rott, Mahler, the Russian Five, and the transparent lushness of the impressionist soundscapes of Debussy, Ravel, André Caplet, Janacek, Lili Boulanger and others, to the angular expressionist and pointillist timbres of Schoenberg, Webern, and Berg. These new sonorities per se, separated from their traditional melodic and rhythmic functions would find their way into orchestral music of the later 20th-century in scores by Takemitsu, Stockhausen, Messiaen, Grisey, Varèse, Penderecki, Maderna, et al.

Erik Satie diverts the audience's attention

In order to share their experience of focusing on sounds for their own sake, creators invented new methods of presentation. These methods led to radically different concepts of what art could express and describe.

French composer Erik Satie is now well-known for his haunting, simple melodies (e.g. *Trois Gymnopédies*, 1888; *Trois Gnossienne*, 1890), his outrageous sense of humor (the tragi-comical ballet *Parade*, 1917, a collaboration with Picasso and Cocteau, that included a revolver, shrill sirens, typewriter, lottery wheel, and "flaques sonores" or squishy puddles which were cymbals with sponge-head beaters), and his subtle conceptuality.

Two of Satie's compositions offer unique solutions to the problem of encouraging listeners to appreciate sounds per se. In 1920, at the Gallerie Barbazanges, Satie premiered the first of his *Musique d'ameublement* (*Furniture Music*, or *Music for Furnishing*) for piano, three clarinets and a bassoon. This piece is intended to be played in the background of a social gathering. By thus diverting the audience's usual focus, the sounds of the music become "ambiance", and the audience is freed from the almost irresistible psychological imperative to seek the source of a sound.

In Satie's earlier pianowork *Vexations* (No. 11 of the *Pages Mystiques*, 1892-1895), a slowly moving passage of 26 beats is repeated 840 times, requiring a minimum of 18 hours. His chosen harmonies, only augmented and diminished chords, are free of any particular emotive associations. Here, Satie again diverts the listener's concentration, this time by allowing the mind to wander over a greatly extended duration. Listeners and performers have reported altered awareness and even hallucinations while experiencing this composition.

In both of these pieces, the materials of music become sounds through which the listener's attention is modulated. This change in psychological state becomes the primary "theme" of this music, and it is achieved by freeing up both the spatial (in *Furniture Music*) and temporal (in *Vexations*) dimensions. The implications of Satie's insights had to wait another half-century to be recognized.

Liberated Sound: The Futurists and the Dadaists

About this same time in Italy, the Futurist poet and dramatist F.T. Marinetti inserted in composer Francesco Balilla Pratella's *Manifesto tecnico della musica futurista* (*Technical Manifesto of Futurist Music*, Milan, 1911) this passage: "(Music) must represent the spirit of crowds, of great industrial complexes, of trains, of ocean liners, of battle fleets, of automobiles and airplanes. It must add to the great central themes of the musical poem the domain of the machine and the victorious realm of electricity".

The musician who was to fully embrace and realize Marinetti's vision was Luigi Russolo, who had abandoned painting and devoted 20 years to constructing his unique acoustic instruments, some of which imitated natural sounds but most of which created dynamical timbres that had never been heard before, and which are described in his book *L'arte dei rumori* (*The Art of Noises*, 1916). Russolo's compositions, like *Awakening of a City* and *Meeting of Automobiles and Airplanes*, were orchestrated for devices like a "burster" (scoppiatore) which sounded like an early automobile engine, another "burster" that sounded like dishes shattering, a "croaker" like a mass of frogs, a "rustler" which mimicked the gentle susurrus of leaves in the wind or silk brushing against silk, the "howlers" (ululatori) reportedly somewhere between a string instrument and a siren, the low rumbling "roarers" (rombatori), the metallic-sounding "cracklers" (crepitori), "rubbers" (stropicciatori) that scrapped metal-against-metal, the electric dynamo sound of the "hummers" (ronzatore), "gurglers" (gorgolatori) like water running through rain gutters, a "hisser" like the high steamy splatter of heavy rain, the "whistlers" (sibilatore) like howling or whistling wind, the "rumor armonio" or noise harmonium, and the "enharmonic bow", a metal rod with periodic grooves drawn at various speeds over violin or cello strings.

Although the two art groups were often contentious and even hostile toward each other, the Dadaists (opposed to authoritarian power), influenced by the

Futurists (enthusiasts for material energy), began to write “noise poetry” which they performed nightly at the Dada hangout Cabaret Voltaire. The most famous example of this kind of sound poem is the collagist Kurt Schwitters’ four-movement *Ursonate* (*Sonate in Urlauten*, 1922-32) based on Raoul Hausmann’s 1919 sound poem *f m s b w t ä z ä u pggiv – ... ? mü.*

Composers of concert music also began to be affected by Dadaist and Futurist experiments: the chorus of frogs at the end of Maurice Ravel’s opera *L’Enfant et les sortilèges* was suggested by hearing Russolo’s croaker; George Antheil’s *Ballet mécanique* (1923-25) began as a soundtrack for 16 player pianos controlled from a central switchboard but when the synchronization problems became too great the music was re-arranged for eight pianos, one player piano, 2 electric bells, 2 propellers, siren and various percussion; in 1924, Arthur Honegger composed his *Pacific 231*, a symphonic movement which imitates the sound of a gradually accelerating American steam engine locomotive of the Pacific type.

Apart from the European influences of this time, the brilliant American experimentalist Henry Cowell was creating “ultra-modern” acoustic music that explored new timbres. For example, he asked pianists to damp the piano strings with the hand, strum the strings like an autoharp in his famous *Banshee*, and to ring the piano’s artificial harmonics (a method described in his book *New Musical Resources*). Cowell later synthesized a type of world music based on his ethnomusicological researches.

Early electronic instruments, the search for new sounds

From 1900 to 1930, new electronic instruments continued to emerge. Thaddeus Cahill’s Telharmonium, an enormous electronic organ patented in 1896, began touring the country in 1906 housed in more than 12 railroad boxcars. It weighed 200 tons and was controlled by two performers on separate keyboards. In Russia, circa 1920, Leon Theremin invented the seemingly magical electronic instrument that bears his name. This device is played by moving one hand to control the pitch and the other to control the volume, but neither hand ever touches the instrument. Rather the device senses the proximity of the hands to each of two antennas and follows the changing capacitance. The oscillators produce a sound somewhere between an airy string and an insectine buzzing. This simple instrument has had a long life and has been used in pieces by Edgard Varèse, Joseph Schillinger, jazz thereminist Youseff Yancy, and Andrei Pashchenko, and later in movie scores such as Bernard Herrmann’s music for *The Day The Earth Stood Still* and Miklos Rózsa’s music for Hitchcock’s *Spellbound*. Theremin also helped construct Henry Cowell’s Rhythmicon, a device which played complex polyrhythms. A monophonic electronic keyboard producing even more complex waveforms was the Trautonium (1928-1930) built by Dr. Friedrich Trautwein in

Berlin. The composer Oskar Sala became the primary player of this instrument and later constructed his own microtonal Mixturtrautonium (1949-1952).

Maurice Martenot’s instrument the Ondes Martenot introduced in 1928 in Paris originally used a ribbon pulled by a ring to change pitch, with the volume and timbre controlled by switches accessible to the left hand. Later he added a keyboard to replace the pitch ribbon, and a knee-operated lever to facilitate continuous pitch change. This device was used in Edgard Varèse’s *Equatorial*, Dimitri Levidis’ *Symphonic Poem for Solo Ondes Musicales and Orchestra* (1928), and many other concert works and film scores. Other European inventions of the 20s and 30s with techno-exotic names were the Sphärophon (1924) of Jörg Mager, which could play quarter-tones and was used in a Bayreuth production of Wagner’s *Parsifal*, the Hellertion (c.1930) invented by Bruno Helberger and Peter Lertes, and the Mellertion, Dynaphone, Emicon, Melodium, Oscillon, Croix sonore, Magnetton, Photophone, Electrone and Partiturophon. In the late 20s, inventor Laurens Hammond created the famous Hammond organ by modifying the additive-synthesis tonewheels of Cahill’s Telharmonium. His model A was introduced in 1935, and the magnificent, industry standard B-3 in 1936. This popular instrument has subsequently been heard in many thousands of radio and TV dramas and commercials, jazz, rhythm ‘n’ blues, rock music and avantgarde music contexts. As electrical amplification for pianos, guitars and other instruments was being introduced, composers employed the gradually improved recording and amplification mediums in their works: Ottorino Respighi called for a recording of nightingales in the magnificent orchestral piece *Pines of Rome* (1924), Arnold Schönberg called for loudspeaker amplification in his opera *Moses und Aron* (1930-31), and John Cage used recordings of audio-test signals played at various speeds combined with cymbals and piano string sounds for the *Imaginary Landscape No. 1* (1939).

Radio sound art

In the late 1920s and 1930s, radio dramas, mysteries, comedies, westerns, and sci-fi programs produced live began to develop inventive solutions for producing audio illusions or sound effects (in films referred to as “foleying”). Following the evolutionary trend mentioned earlier, imitative effects used in entertainments soon began to take their place in art pieces. A wonderful example of this is the radio play *The City Wears A Slouch Hat* (1942) by John Cage to a text by Kenneth Patchen, broadcast by the CBS “Columbia Workshop” originating from the Chicago station WBBM. The surreal, often touchingly humorous vocal text about the wanderings of a drifter is woven in-between a “sound orchestra” that included tin cans, muted gongs, woodblocks, alarm bells, oxen bells, temple gongs, water gong (a gong slowly emerged in a tub of water producing a serene harmonic effect), tam tam, bass drum, bongos, steel coil, washboard, ratchet, pod

rattle, automobile horn, foghorn, metronome, steel pipes, music stands, buzzer, thundersheet, variable frequency oscillators, as well as recorded baby cries, ocean automobiles, airplanes and rain.

Post WWII

Immediately following WWII, there was a burst of aesthetic and technical activity. Serialist composition procedures based primarily on Anton Webern's music emerged in Europe in works by Stockhausen, Boulez, Maderna and many others. Simultaneously, music composed by chance methods and various indeterminate procedures, and scores in graphic notation were developed in the eastern US in pieces by John Cage, Morton Feldman, Earle Brown, and Christian Wolff, the so-called New York School. Many new techniques for playing traditional instruments were invented, and both new acoustic and electronic instruments appeared.

Developed during his off-hours from employment as a worker on microwave transmission at the Canadian National Research Council in Ottawa during World War II, physicist Hugh Le Caine first recorded his Electronic Sackbut in 1946. This was a precursor to the later voltage-controlled synthesizers introduced during the 1960s. Considerable subtlety was built into Le Caine's instrument, with touch-sensitive keys, sideways pressure producing vibrato, bending of notes up to an octave, and vertical pressure amplitude and articulation changes; breath-like, buzzing and raspy noises were introduced in the waveforms to add variety to the timbre. Le Caine created his first composition *Dripsody* (1955) on his Special Purpose Tape Recorder which could play and manipulate ten stereo tapes independently.

In France, musique concrète, constructed primarily from acoustic and natural sounds recorded and then manipulated on magnetic tape, began with composers Pierre Schaeffer (for example, his *Symphonie pour un homme seul*) and Pierre Henry (*Variations pour une porte et un soupir / Variations for a door and a sigh*), and continued to be developed in following decades by Henri Pousseur, Rune Lindblad, Luc Ferrari, Vladimir Ussachevsky, David Mahler, Jocelyn Pook, and many others. A "Concert de bruits" (Concert of Noises) radio broadcast in 1948 introduced the new music to the public at large. In 1951, the Groupe de Recherches de Musique Concrète was established, and, in 1958, the Group for Musical Research of the Office of French Radio-Television (O.R.T.F.). In the States, James Seawright (later famous for his kinetic sculptures) composed music made of natural sounds modified by electronic means for dances choreographed by Alwin Nikolais at the Henry Street Playhouse in the early 1960s.

American tape music in the 1950s included pieces like Edgard Varèse's dramatic *Poème Electronique* premiered on multiple loudspeakers at the 1958 Brussels World's Fair. The New York-based Project of Music for Magnetic Tape (1951-

1953) produced works like John Cage's *Imaginary Landscape No. 5* (1951-1952) which employed chance procedures to sample sounds from 42 phonograph records.

In 1954, Louis and Bebe Barron, who worked with Cage on his Williams Mix, created the soundtrack for *Forbidden Planet*, the first Hollywood film to use electronic music (the first all-electronic soundtrack was for Anais Nin's film *The Bells of Atlantis* in 1952). The score, credited as "Electronic Tonalities", was built from the emissions of the cybernetic (controlled feedback) circuitry especially designed and built by the Barrons.

New acoustic instruments also emerged during these years. Especially notable were the beautiful 43-tones-to-the-octave sculpture-like devices of the ingenious Harry Partch, built mostly at his home in an unused hatchery in Petaluma, California. His music, based on complex tuning theories, included several operas, ranging in spirit from the light-hearted and gamelan-like to the nocturnal and quiescent. Partch's instruments received affectionately inventive names such as the Zymo-Zyl, Cryochord, Harmonic Canon, Blue Rainbow, Boo, Spoils of War, and so on. "This is my trinity: sound-magic, visual beauty, experience-ritual" (Partch).

Another independent instrument designer and composer was Raymond Scott, an innovative bandleader in radio, who circa 1955 built an electronic music studio in Farmingdale. His many original electronic devices included the Clavivox, Circle Machine (controlled by a circle of photocells), Bass Line Generator, Rhythm Modulator, Karloff, Bandito the Bongo Artist, and the Electronium (1965) that generated algorithms for automatic music composition. With these instruments he created hundreds of television and radio jingles as well as odd recorded productions such as the series *Soothing Sounds for Baby*.

Several independent studios emerged in the late 50s, such as the Cooperative Studio for Electronic Music (1956-1964) in Ann Arbor, Michigan, founded by composers Robert Ashley and Gordon Mumma. The San Francisco Tape Music Center created by Ramon Sender, Terry Riley, and Pauline Oliveros, began in an attic at the San Francisco Conservatory of Music during 1961, and later moved to Mills College in Oakland. In 1971, the Center for Contemporary Music began at Mills as one of the first public access, non-profit studios that made facilities (recording studio, equipment synthesizers etc.) and instruction available inexpensively and open to anyone.

Many of these early private, pre-synthesizer studios gathered equipment from army surplus outlets and the like, bought commercial tape recorders, and built their own transistor-based circuits. For example, the brilliant tape pieces of the 1960s by Richard Maxfield (*Butterflies Encountered on the Ocean, Amazing Grace, Italian Folk Music*) were made using such basic equipment. Simple tape manipulation and splicing continued to be used to create works such as James

Tenney's classic *Collage #1 – Blue Suede* (1961), a hilarious cutup made from the famous Elvis Presley tune.

The synthesizer

The first music synthesizer in our current sense was the Olson-Belar synthesizer introduced in 1955, which Milton Babbitt used at Princeton. In 1957 the Columbia-Princeton Electronic Music Center was established which centered around the RCA Mark II synthesizer, a huge one room device with 750 vacuum tubes. In the early 60s Robert Moog in Trumansberg, NY, Donald Buchla in San Francisco, California, and Paul Ketoff (creator of the "Synket") in Rome, Italy, independently developed the first practicable, modular analog synthesizers for general public use.

The analog synthesizer was an assembly of separate units (modules) that created the new ability to modulate specific aspects of sound in detail, and to either imitate existing acoustic instruments or to provide entirely new sounds beyond the capabilities of traditional instruments. For example, the modules provided exact modulation of articulation (gates, envelope generators), timbre (filters, equalizers), pitch (oscillators, sequencers, ring modulators, white noise generators), and phase (phase shifters, delays). The modules were controlled by keyboards, ribbons, and modules patched by external cords into each other – for example, filtered white noise could control a sequencer to generate quasi-random events. In another arrangement, two oscillators could produce surprising quasi-random effects by "cross-modulation" in which the output of one device would be the input of another and the output of the second oscillator would be attached to the input of the first. Later non-keyboard controllers, like Buchla's Lightning and Thunder and various pitch followers, were invented to enable acoustic instruments and voices to control the synthesizer.

Live electronic music, chance composition, indeterminacy

A significant development in the late 50s was the introduction of "live electronic music" by John Cage and David Tudor. Sounds never heard before were evoked from specially homemade electronic sound boxes, from amplification (by microphones, contact mikes, phonograph cartridges and other transducers) of extramusical objects like Slinkys (Cage's *Cartridge Music*, 1960), from the quasi-random mixing of recordings (Cage's *Variations IV* for the Fiagen/Palmer Gallery, Los Angeles, 1964), etc. Cage had developed the concept of composition by chance (or, aleatoric) methods which included accepting decisions of the ancient Chinese augury called the *I-Ching* or *Book of Changes* after coins were tossed (for the *Concert for Piano and Orchestra*, 1957-58), regarding the imperfections in a sheet of paper as notes, and employing star maps (*Atlas Eclipticalis*, 1961-62; other remarkable compositions from the early 60s based on star maps are

George Cacioppo's *Cassiopeia* and Philip Krumm's *Formations*). The scores that would be realized from these chance procedures were often detailed and complex with certain parameters (sequence, duration, etc.) left open. It was expected that such methods would lessen the effect of habits and the "self" upon the music, hopefully making the live performance more surprising and musical to listeners, players and even the composers themselves. The interactions of musical parameters and of performers were left "indeterminate" or open to coincidence. Any sound could potentially become part of a composition.

Previous to Cage's seminal work, there had been only a few instances of the intentional use of chance in music, for example, in a few short works by the artist Marcel Duchamp (eg., *Erratum Musicale*, 1913) and in W.A. Mozart's use of dice to decide upon passages for some little dance pieces. Many composers began to employ chance techniques and indeterminacy in unique ways – for example, Gordon Mumma's *Medium Size Mograph* (for sound- and non-sound-producing actions) was based on seismographic charts of the earth's activity; Christian Wolff's early game-like compositions for small ensembles involve real-time listening and responding strategies, and Wolff also constructed some early piano works vertically while asking the performer to read the piece in the normal horizontal manner; Robert Ashley's *Complete with Heat* (1962), like his later *String Quartet Describing the Motion of Large Real Bodies* (1972), describes the random and indeterminant Brownian motion of small particles; indeterminacy and randomization was also applied to the spatial aspect of new music at this time in such pieces as Earle Brown's *Octet 1 for 8. Loudspeakers* (1953), which uses random sampling tables to vary the densities of sounds, and Cage's *Variations IV* (1963) which has a score of transparencies with single lines and circles that are distributed by chance over a map of the performance space fixing source-points and movement of sounds. European works such as Karlheinz Stockhausen's *Gruppen* for three orchestras, *Carré (Square)* for 4 orchestras and 4 choirs, and Bruno Maderna's *Quadrivium (Crossroads)* (1969) for 4 percussionists and 4 orchestral groups, applied serial composition techniques to the spatial parameter. Other American works such as Morton Subotnick's four-channel *Touch* (1969) with its flying electronic gestures and Edgard Varèse's previously mentioned *Poème Electronique* did not employ either chance or serialist methods for the spatial distribution of their sounds.

Open space, music theater, artists and engineers

The universal acceptance of multiple discrete sound sources in a neutral and open space is a significant evolution in the history of sound art. More complex interactions were created than had been explored in the call-and-response-type spatial works of previous centuries, such as Giovanni Gabrieli's *Canzoni et Sonati* (1615), W. A. Mozart's *Notturmo for 4 orchestras in D major*, K. 286 (K. 269a)

(1776), or Thomas Tallis's antiphonal motet *Spem in Alium Nunquam Habui* (ca. 1567) for 8 choirs of 5 voices each, its octagonal scoring matching the architecture of the octagonal hall of Arundel Castle where it was premiered.

This opening of space/time which allowed for new freedoms of interaction also influenced the emerging form of multi-media presentations or music theatre (multi-media theatre which is guided by musical principles), as well as "events" and "happenings" (The ONCE Group, Fluxus, Allan Kaprow, Carolee Schneeman, and many others). A notable audio-visual "total" theatre presentation was Milton Cohen's Space Theater, which began in the early 1960s in San Francisco and soon relocated to Ann Arbor, Michigan. A series of large geodesic frames were the surfaces on which an ingenious array of movable prisms and mirrors, film and slide projectors transformed abstract and everyday images, and diffused light in all directions. The unfolding of a performance was guided only by a chart of a general color sequence and by the response of the performers to each other's actions. The multi-channel music was improvised by composers Gordon Mumma and Robert Ashley using electronic boxes (many with Mumma's original "cybersonic" circuits), modified piano sounds, pre-recorded sound effects, French horn and amplified acoustic boxes. A mixed aura of mystery, alternate dimensions, spontaneity, humor and humanism often filled the room. Further activities and speech were added to the performances for the 1964 Venice Biennale. In the fall of 1966, E.A.T. (Experiments in Art and Technology) signaled a new collaboration between artists and engineers with the presentation of *Nine evenings: Theater and Engineering* at New York City's 69th Regiment Armory space. Some of the pieces staged in the large stadium-like space were dancer Alex Hay's *Grass Field* in which the sounds of his body were magnified to accompany his image projected on a huge screen; Lucinda Child's *Vehicle* in which the lights were controlled by radio waves from local station WQXR; David Tudor's *Bandoneon! (a combine)*, made from programmed audio circuits, moving loudspeakers, images and lights. Engineer Billy Klüver who was one of the main founders and promoters of E.A.T. and its collaborative concept, also worked with visual artists to create Jean Tinguely's legendary self-destructing machine entitled *Homage to New York*, Robert Rauschenberg's sound sculpture called *Oracle* that featured five remote-controlled radios, and Andy Warhol's floating silver mylar pillows. Another E.A.T. engineer Per Biorn collaborated with Argentinian artist Marta Minujin to make the interactive *Minophone*, which responded with complex lights and sound to a participant's voice. E.A.T. performances and collaborations with many different engineers, composers and artists (John Dinwiddie, Stanley Lunetta, William Maraldo, Alden Jenks, Martin Bartlett, Warner Jepson, John Viera, Patrick Gleeson, Bernard Krause, Dr. Frank Oppenheimer, Jerry Abrams, and many others) soon spread from New York to San Francisco to the Pepsi-Cola pavilion at Expo 70 in Japan.

Among the many music theatre pieces and short events presented at the legendary ONCE Festival in Ann Arbor, Michigan, and by the ONCE Group on tour, were Mary Ashley's study of narcissism (with the astronaut/masseur, the motorcycle boy, the mirror star etc.) called *The Jelloman*, Mary and Robert Ashley's *The Lecture Series* (1964) at the Joy Road Interchange concerts in New York which included the sandwiching of the teenagers between large vertical plastic frames as if in a huge specimen case while statistical facts about each one was read, Robert Ashley's *Kittyhawk, An Anti-Gravity Piece* (1964), *Combination Wedding and Funeral* (1964) in which a man is wed to a monkey bride whose portable transportation frame becomes horizontal like a casket for the funeral, *That Morning Thing* (1967), *The Trial of Anne Opie Wehrer and Unknown Accomplices for Crimes Against Humanity* (1968), and the ONCE Group's collaboration *Unmarked Interchange* (1965) staged on the upper levels of a car parking structure in the city's center as part of the exchange concerts with the New York-based Judson Dance Company (Steve Paxton, Deborah and Alex Hay, Yvonne Rainer, Robert Rauschenberg, and others). The ONCE Festival itself presented hundreds of new music compositions, dance and street events (eg. TRUCK at the Beach), films and performers from throughout the world.

Other 1960s festivals and new music venues included the Fluxus concerts in New York, the Antioch Super-Valu series, the New York Theater Rally, the Red Gallery series in Detroit, San Francisco's Performer's Choice, New Directions in Music in Seattle, the Rose Museum series in Waltham, Mass., the Electric Circus in New York, the Spring Concerts at the McNay Art Institute in San Antonio, Texas, the Buffalo Contemporary Music Festival, and more.

In 1965, the BANG ... BANG ... BANG Festival in Richmond, Virginia, organized by Jon Bowie and Richard Carlyon, presented a total-environment work entitled Synthesis which created a "war theater" that shifted the audience about a space containing a bomber plane, 3 manned aircraft, a thousand projected slides from popular magazines and military manuals, 100 performers in white mess uniforms, winter coats and scarves and shades, 3 bicycles, 900 stuffed laundry bags, 3 Navy resuscitation units, 1 tank, 1 artillery piece, children, 1 cargo parachute, gas masks, ½ ton of recruiting literature, 500 fatigue caps for the audience, army cots, flags, massive amounts of cord/cable/wire, etc. The transmitted sound created an overwhelming sense of mobility and activity.

Installations, walk-through performances, the environment

Apart from festivals and concerts, the new multi-media pieces began to take the form of installations, through which audiences often walked, and environmental works by which listeners experienced sound art in new ways. For example:

- 1 David Tudor's *Sliding Pitches in the Rainforest in the Field: Rainforest (Version IV, Electro-Acoustical Environment)* (1968-1982) was first installed in 1968 at Chocorua, New Hampshire. Inside a large barn, many unique, vibrating resonant objects (bells, resonant beams held between the teeth while the ears are stopped with your fingers, dual metal transducers, parabolic reflectors attached to circular hat-like cages, etc.) were suspended from the ceiling, and the audience moved throughout the space interacting with the ear-level objects and appreciating the gentle sounds emitted by them, like the calls of unnamed/unnameable creatures.
- 2 Max Neuhaus's *Listen* (1966), one of the composer's "sound oriented pieces for situations other than that of the concert hall", was in the form of a field trip for an audience, who were put on a bus, their palms stamped with the one word "listen", and then taken to "existing sound environments" like the Consolidated Edison Power Station, the Hudson Tubes (subway), and the New Jersey Power and Light Power Plant. For his *Drive-In Music* (1967), people drove their cars along a specified path and passed through an array of low-power radio transmitters mounted on poles or trees. On the car radios, passengers heard combinations of sounds emitted from weather-sensitive oscillators.
- 3 Leif Brush began in 1968 to create many sound installations which use his Terrain Instruments. These are electronic and mechanical devices that amplify and convert into sound the actions of natural flora and fauna: the movement of leaves, the wind, snow, rain, grasses (struck or stroked by a participant), pine cones, the movement of rubber-coated rocks over the suspended, epoxy-coated magnesium surface of his *Signal Disc*.
- 4 Originally installed from 1977 to 1992 at the north end of the triangular pedestrian island located at Broadway between 45th and 46th Streets in New York City, Max Neuhaus's installation entitled *Times Square* is a rich, enveloping harmonic sound texture created by oscillators hidden beneath a large metal grid in the street upon which listeners may stand on or nearby. In May of 2002, the project was reinstalled and can now be experienced 24/7.
- 5 George Brecht's legendary *Motor Vehicle Sundown (Event)* (1960) is a verbal instruction piece scored for any number of motor vehicles arranged outdoors. For each vehicle, 22 auditory and visual events and 22 pauses are written onto randomly shuffled instruction cards. Beside "pause", the events include: headlights on and off, parking lights on and off, sound horn, sound siren, sound bell(s), accelerate motor, radio on and off, strike window with knuckles, open or close door (quickly, with moderate speed, slowly), open or close engine hood, operate special equipment (carousels, ladders, fire hoses with

truck-contained pumps and water supply), operate special lights (truck-body, safety, signal, warning, signs, displays).

- 6 Ralph Lundsten and Leo Nilson's *Fågel Blå* (Blue Bird, 1969), commissioned by the Foundations for Nationwide Concerts as inauguration music for the Expo-Norr festival in 1969 at Östersund, was a two-channel electronic composition broadcast from giant balloons that floated over the city. A strange effect was that the sounds did not dissipate when passing over a listener, so that the height of the balloons made no difference.
- 7 In realizations of "Blue" Gene Tyranny's procedural score *How to Discover Music in the Sounds of Your Daily Life* (1967), any number of persons, following certain strategies based on attraction rather than logic, move about and record (or transmit in real-time) sounds of their immediate daily environments. These sounds electronically trigger and generate rhythmic, melodic, and harmonic "transforms" that are played back into the same environment and are used to compose electro-acoustic works. This procedure serves as a kind of immediate reality check comparing "inside" feeling and thought with "outside" circumstantial events, a mixture of environmental sound with "shadowing" electronics that gives the impression of a hidden life (e.g. the presence of the subconscious) going on simultaneously to one's daily life.

Later environmental pieces took performers and listeners into further real and virtual spaces:

- 1 David Dunn's *Skydrift* (1977) is scored for an electro-acoustic ensemble moving in an outdoors environment. One recorded performance involved 10 voices, 16 instrumentalists, and 4 channels of electronic sound generated from materials gathered at the performance site in a Southwestern desert. The instrumentalists moved outward from a central circle while their playing responded to environmental sounds – the circle became enlarged up to a half-mile from its original formation.
- 2 The pieces in Stuart Dempster's CD *Underground Overlays from the Cistern Chapel* explore sound movement and resonance within a 186-foot diameter cistern at Fort Worden, about 70 miles northwest of Seattle. Dempster plays on conch shell, didjeridu, and trombone, and in ensemble with nine other trombonists, two conch players and one on Tibetan cymbals. The reverberation length inside the cistern is so long (approximately 45 seconds) that the composer experienced the feeling that "this is where you have been forever and will always be forever".
- 3 Annea Lockwood's spectacular virtual environment tape piece *World Rhythms* (1975/1997) is composed of an array of natural sounds, the

rhythms of which are sometimes on a time scale “too great or the effects too subtle for human perception. The sounds employed include volcanic eruptions from Hawaii, earthquakes from a geological laboratory, radio waves from a pulsar in the Vela supernova, geysers and mud pools recorded in Yellowstone National Park, various rivers, peepers (tree frogs) near the Mississippi River, a bonfire with crows from England, waves on Flathead Lake, Montana, human breathing and a gong marking muscular action and nerve responses. An amazing illusion is created by having all sounds at nearly similar amplitudes, the pulsar is the same “size” in loudness, as it were, as the crow.

- 4 *McCall.DEM* (1989), a collaborative work by Scot Gresham-Lancaster and Bill Thibault, derives melodic, timbral, visual and rhythmic materials from a computer representation of terrain based on composer Rich Gold’s program Terrain Reader. The waveforms produced are considered cross-sections of the terrain, cut along a Traveler’s path (data files of land types, water, roads, etc.) The Traveler’s behaviors include the “dry drunk”: who stumbles about randomly, yet avoids falling into a lake; “drunken Jesus” who moves over land and water; “drunken sailor” who passes out at the helm of his speed boat, then travels in a straight line until hitting the shore, which wakes him up to shove off in a random direction only to pass out again.

Pattern Music, the drone, music of extended duration

Besides chance and serial composition, the development of “free jazz”, the uniting of art music and rock styles (which continues to this day in the music of Glenn Branca, Rhys Chatham, Peter Gordon, the outrageous and detailed “Plunderphonics” cultural collages of John Oswald, the record scratching of Christian Marclay, and others), and the overnight adoption of electronic sound by popular culture, the 1960s also saw the birth of another new music, sometimes referred to by the awkward name of “minimal music” but more correctly termed drone, pattern or extended duration music.

In general, this music is meditative and slowly unfolding, describing a resonant eternal universe that is still or has internally pulsing cyclic motion, and which creates an altered and expanded time sense. Indirectly influenced by the sounds of gamelan music, the drones of classical Indian ragas, the canons of Moondog, and the repetition of short melodic gestures (modules) found in the style of film composer Bernard Herrmann, this hypnotic style still seemed to come from nowhere, the music of a new generation.

Terry Riley and Terry Jennings were among the founders of this style and respectively employed the repetitive (e.g. Riley’s famous *In C* and his keyboard improvisations with tape delay) and the sustained (Jennings’ *String Quartet*

September 1960, and his piano music) modes. Riley’s style soon influenced composers Steve Reich, Philip Glass, John Adams, Robert Moran, Gavin Bryars, Michael Nyman, Joseph Byrd, Lois V. Vierk (*Simoom, River Beneath the River*), Michael Byron (*Music of Nights Without Moon or Pearl*), David Borden (*The Continuing Story of Counterpoint*), and others.

LaMonte Young expressed the sustained or extended duration mode in his drone room installations that employed oscillators which slowly drifted in pitch over many days and weeks. Young’s verbal instruction pieces, such as *Composition 1960 #10 “Draw a straight line and follow it”* and his *Composition 1960 #7* which consisted of the notes B and F sharp “to be held for a long time”, were also sustained works. Young later employed the repetitive mode of drone music with *The Well-Tuned Piano* and *The Second Dream of the High-Tension Line Stepdown Transformer*. Young’s music in alternative tunings has influenced many composers such as Michael Harrison, Kyle Gann, and others. Also well-known for his compelling works in modal style with alternative tunings is Ben Johnston (*Amazing Grace – String Quartet No. 4, 1973*), and other composers such as Ivan Wyschnegradsky, Alois Hába, Charles Ives, and Harry Partch have used new tunings in their respective styles.

A serene, sustained mode also individuated the works of Morton Feldman from the *Durations* (1960-61) to his late string quartets of more than 6 hours duration. Sophisticated cyclic patterning can be found in his highly dramatic opera *Neither* (1977) and many other pieces. The sustained, slowly unfolding style also characterizes compositions by Phill Niblock (*Five More String Quartets, Early Winter*), Mary Jane Leach (*Ariadne’s Lament*), Ellen Fullman (inventor of The Long String Instrument), Alvin Lucier (*Music on a Long Thin Wire, 1977*), Eliane Radigue (*The Milarepa Songs*), Pauline Oliveros’s “Deep Listening” group and her inspired solo improvisations, “Blue” Gene Tyranny (*The Interior Distance, 1959*), and others.

New Narrative Opera

The cyclic pattern style in modal keys is also fundamental to the sound of what has been termed “new narrative” opera, a richly inflected rhythmic speech style with a post-modern attitude toward language and often humorous, touching, and imbued with personal experience, humanitarian and ultimately spiritual concerns. This new style, invented by composer Robert Ashley (*That Morning Thing, Perfect Lives, Atalanta (Acts of God), Improvement [Don Leaves Linda], The Immortality Songs, Dust, Celestial Encounters*) is the first fundamentally new direction for opera in several decades. Other creators influenced by or making work similar to this form are Kenneth Atchley (*Edison’s Last Projection, Marconi – The Last Seven Words*), Ben Neill (*ITSOFOMO – In the Shadow of Forward Motion*), Mikel Rouse (*Failing Kansas, Dennis Cleveland*), Lars Gunnar Bodin

(*For Jon – Fragments of a Time To Come*, 1977), *The Residents (God in Three Persons)*, Gregory Whitehead (the “radiophonic” works), and others.

Noted for their original contributions to extended vocal techniques in new music are singers Joan La Barbara, Shelley Hirsch, Meredith Monk, Jackie Humbert, David Hykes, Raphael Mostel, and others.

At this point in this study of Sound Art, it will be helpful to discuss some of the more subtle psychic effects of contemporary music, as was done previously in the earlier paragraphs discussing Erik Satie’s work.

Stillness, feeling-thought, internal motion, silence

Pattern and extended duration music generally creates a feeling that is simultaneously modern and ancient, hypnotic yet clear. Attention to the forward motion of linear time begins to disappear, and the world of the conceptual, what Buckminster Fuller called “feeling-thought”, predominates. When this music transports the listener to such a state, either by the unceasing movement of repeated small gestures (in the manner of Riley) or by serenely sustained tonalities (in the manner of Radigue), the sensation of a closed resonant universe is perfectly maintained.

Conversely, when music consists of discrete events (aggregates, icti, moments) as in John Cage’s music, this same sustained world can be entered through an awareness of silence – a sensation of unchanging presence per se. Here, our attention is turned toward an omni-present stillness that exists at the same time as the sound events. The elegant score for John Cage’s (in-) famous meditation piece entitled *4’33” tacet* (1952) consists only of the simple indications I. Tacet, II. Tacet, III. Tacet. Those seem to assign the performer(s) the task of indicating three moments in time while making the presence of an undisturbed silence felt – not a negative act but an essential affirmation of awareness. The first performance was by David Tudor who closed, opened, then closed the keyboard cover of a piano to indicate the three movements. His performance lasted 4 minutes and 33 seconds but the piece can have any duration.

The “tacet” piece was written at a time when artists and musicians were taken with Robert Rauschenberg’s all-white paintings, Zen Buddhism, and the concept of the “surface” (e.g. a “blank wall” on which the mind involuntarily projects itself). Cage’s other version of the tacet piece seemed to go to the opposite extreme but is in fact the other side of the same coin: *o’oo” / Solo to be performed in any way by anyone*, written for Yoko Ono and Toshi Ichiyanagi in Tokyo, October 24, 1962, indicates timeless (holotropic, eternal) stillness held in infinite universal compression: “In a situation provided with maximum amplification (no feedback), perform a disciplined action. With any interruptions. Fulfilling in whole or part an obligation to others ... No attention to be given the situation (electronic, musical, theatrical)”.

Feedback

Cage’s phrase “(no feedback)” in the instruction above again contrasts his world of discrete sounds with that of the resonant universe. The creative use of positive feedback, normally an unwanted artifact like line hum in an amplification system, can be found in compositions such as Robert Ashley’s famous *The Wolfman* (1964) in which the amplification system is tuned to just blow the threshold of feedback and then gradually stimulated into overwhelming waves of sound by the vocalist’s cool delivery of phonemes, and in David Behrman’s *Wave Train* (1966).

Eternity

Cage’s late “number pieces” also create a profound sense of the eternal and consist of aggregations of notes held for a long time; the progression from note to note is usually changed by the performer’s internal time sense.

Recently, the city of Halberstadt in Germany decided to install one of these later works, entitled *Organ 2 / ASLSP (as slow as possible)*, in the medieval church of St. Burchardi. The piece will take 639 years to perform, each of its 9 movements lasting 71 years, covering the years from Sept. 5, 2001 to 2640, with an intermission in 2319. Since the piece begins with a rest, the organ was silent for the first 17 months; it currently resonates with two unchanging tones. The duration was chosen by subtracting the birth year (1361 CE) of the city from 2000. The organ itself is being slowly assembled with funds from people who may sponsor a year of the piece. Gerd Zacher, the German organist to whom the work was dedicated, disagrees with this extreme interpretation because Cage originally indicated that the composition “should be played slowly but also like a soft morning and then should be gone”.

The awareness of silence in Cage’s music and the expression of a resonant universe in pattern music generate a sense of potentiality (e.g. “there’s something in the air tonight”). This has become a property of contemporary sound art. These contrasting directions in contemporary music may perhaps also be viewed as manifestations of the predominant modes of the left (sustained, drone) and right (single events) sides of the brain. In music, certain feelings can only be expressed or suggested at certain tempos (i.e. psychic states). Thus, if a person is aware, for example, of a feeling of stillness, it will affect the kind of music he or she makes, or as a listener the kind of music he or she will take to heart.

The personal computer

In the 1970s the instruments, methods and feeling-thoughts from the previous two decades continued to be explored and spontaneously generate new insights. The introduction of the personal computer created radically new possibilities in electronic music and of course world society in general. Composers began to build their own homemade computers from integrated-circuit chips and modified

commercial kits, such as the KIM-1, to their own uses. Previously, synthesizers had made available new sounds and new control of pitch, amplitude, speed and sound modification way beyond the ability of acoustic instruments and their players. Personal computers now made available a new world of

- 1 automaticity and
- 2 sophisticated programming;
- 3 interactiveness (especially in the pioneering and exquisitely beautiful work of composer David Behrman who has worked with many acoustic musicians that trigger the electronics with their playing; The Bifurcators recent composition *Like A Bird in the Wilderness* is one of many interactive pieces since the 70s; an earlier, non-computer based but interactive work was Robert Ashley's electronic theater piece *Public Opinion Descends Upon The Demonstrators* (1961) in which performers reacted to the movements of an audience which could potentially be 28,278,466 people);
- 4 fine control of sound parameters (in the 90s with MAX),
- 5 sound sampling and digital sound processing of acoustic inputs (DSP, especially as developed "live" by composer Joel Ryan),
- 6 precise mapping of the characteristics of one sound on another (in vocoding, morphing, ring modulation, etc.),
- 7 fine synthesis (in the 90s through programs such as Super-Collider, granular synthesis, Reaktor, etc.),
- 8 precise rhythm and sequence coordination (e.g. Digital Performer),
- 9 synchronous control of multi-media through MIDI triggers and sensing devices (for example, the primeval grass hut built by composer Jerry Hunt for New Music America in Dallas which contained subtle devices which sensed the movement proximities of a participant and activated strange ritualistic imagery, gently lifted a covered figure on a bed, and so on; Hunt also created brilliant and often densely textured mechanical and electronic music like *Haramand Plane* (1993), *Fluud for dual Synclaviers* (1988)), etc.

Computer music

The first computer-generated music was a brief 17-second composition scored in 1957 by Newman Guttman created using the Music I program written by Max Mathews at the Bell Telephone Laboratories in Murray Hill, New Jersey. Other computer-music centers were soon established at Stanford University, Columbia University, and at IRCAM in Paris. Composer James Tenney at Bell Labs wrote

programs involving new mathematical forms such as stochastic processes and has continued to produce acoustic and electronic works of unique originality and beauty. John Chowning developed frequency-modulation (FM) methods for generating computer sound, produced many subtle audio illusions of sounds moving in space, and has used classic proportions such as the Golden Section to create unusual sound spectra.

Live computer music

Parallel to the introduction of "live electronic music", the creation of the first "live computer music" group took place in the mid-1970s in the San Francisco Bay Area. The League of Automatic Music Composers, the first microcomputer network band, was the brainchild of composers John Bischoff, Jim Horton and Tim Perkis. Seeking a way to "open up the process" and bring other musicians into the network situation the League soon became The Hub. Unlike earlier computer music practice, this group sought "more surprise through the lively and unpredictable response of these systems, and hope to encourage an active response in the playing" (Perkis). The Hub eventually grew to include composers Mark Traylor, Phil Stone, Tom Erbe, Scot Gresham-Lancaster, and Chris Brown. They have also performed with many guest artists such as the Rova Saxophone Quartet and composer Alvin Curran. Several of the group's pieces (composed by the individual composers or by group improvisation) interconnect their mini-computers so that, for example, the indeterminant influence of 4 or so software programs is simultaneously at play. Humor, mystery, quirkiness, and spectacular massed textures can all be heard in The Hub's real-time creations. The members have been known to even incorporate normally unwanted, "malfunctioning" but musically interesting artifacts of the electronics in their pieces.

There are many other composers who have made live computer music their primary style, including Frankie Mann and Warren Burt. And there are by now countless other composers who employ personal computers in their art music including Joel Chadabe, Larry Polansky, David Rosenboom, Tom Hamilton, Yuji Takahashi, David Wessel, Joe Reinsel, Sam Ashley, Ben Azarm, Laurie Spiegel (whose realization of Kepler's *Music of the Spheres* was sent into space by NASA), John Driscoll (*Stall* with Phil Edelstein and Peter Labiak's rotating loudspeaker system), Brenda Hutchison (*The Voices of Reason*), Ron Kuivila (*Parodicals*), Paul De Marinis, Madelyn Byrne (*Winter*, 1997), Neil B. Rolnick. Computerized digital recording and editing are now the standard.

Robots

Recently the personal computer has come to be actively used in the control of sound-producing robotic sculptures. A gallery exhibition (2003) in New York City introduced a large roaming crowd to

- 1 the randomly tapping shoes known as *Happy Feet* by Stephen Turbek;
- 2 a scratch performance on automatic turntables, controlled by MAX software, entitled *Scratchrobot* by Stijn Slabbinck;
- 3 huge baby bottles with sampled baby sounds which changed as the bottle is slowly tilted – *Babybot* by Stefan Prosky;
- 4 four guitar strings played with shifting plectra and vertically sliding pressure pads which replace fingers accompanied by an automated shaker tree, everything guided by MAX software – *Guitarbot* by Eric Singer, Kevin Larke and David Biancardi of the collaboration LEMUR;
- 5 a theremin played by automated shifting wands to replace hand movements;
- 6 the *Shivabot* – a huge statue of blue Shiva playing cymbals, drum, with four hands by LEMUR. Robots, yes, but robotics with a sense of humor.

Fire organs, flower pots, etc.

From the 70s through the 90s, many original acoustic instruments appeared: Michel Moglia's Fire Organ (Orgue à feu), Maggi Payne's work broadcast through omni-directional flame loudspeakers, Richard Waters' Waterphone, Wendy Mae Chambers' Car Horn Organ, Reed Ghazala's elegant and otherworldly voice synthesizer called The Trigon Incantor which is triggered by small steel balls on a pressure-sensitive plate. There have been many variations on guitars and harps stretched across various organic sculptural forms, as well as ensembles of glass instruments by Jean-Claude Chapuis, Annea Lockwood and others, electronically amplified natural substances like cactus needles (Cage), wood slabs, leaves, etc., ensembles of tuned flower pots (Barry Hall's Flowerpotophone) and other ceramics (Ward Hartenstein, Brian Ransom, and others), as well as fanciful musical sculptures by Arthur Frick, Tom Nunn, Fred "Spaceman" Long, and others.

Electronics and the natural world

The 1970s also saw the birth of an interest in the interaction of electronic music and natural organic phenomena, including the human body.

- 1 Tom Zahuranec's *Plant Music* (1972) made use of the Backster Effect in which a plant's apparent response to emotional, even telepathic, stimuli were amplified by electronic transducers attached to the leaves and controlling a synthesizer.
- 2 Alvin Lucier's compositions have employed "enormously amplified brain waves" which trigger percussive sounds (*Music for Solo Performer*, 1965;

composer David Rosenboom also issued his *Brainwave Music* based on similar phenomena in 1972), an analog of a bat's echolocation abilities (*Vespers*, 1969), the resonance of natural environments (*Chambers*, 1968; *I Am Sitting in a Room*, 1969), the creation of standing waves to move dancers about (*Still and Moving Lines of Silence in Families of Hyperbolas*, 1973-74), massive collections of ambient sounds (*Gentle Fire*, 1971), the response of a gas flame to sound (*Tyndall Orchestrations*, 1976), and Chladni figures created live and amplified by video (*The Queen of the South*, 1972). Lucier's *Sferics* (the shortened term for "atmospherics"), is built from the natural radio frequency emissions (often delicate whistling sounds) in the ionosphere caused by electromagnetic energy radiated from nearby or distant lightning.

- 3 Various attempts at interspecies communication via sound have included pieces by David Dunn (*Mimus Polyglottos for electronic sounds and mockingbird*, 1976), Pauline Oliveros, Alvin Lucier (*Bird and Person Dyrning*, 1975), and others.
- 4 Among compositions dealing with psychoacoustic illusions are the striking performance situations ("music rooms") which have been set up by Maryanne Amacher since the 70s; in her *Third Ear Music*, for example, audiences experience tones and melodies which seem to emerge from the center of their heads, a product of patterns which originate within their ears and neuroanatomy. One of Robert Ashley's *Illusion Models hypothetical computer tasks* (1970) creates the illusion of an infinitely receding tone in a room installation that, because of an irresistible urge to find the source of a sound, compels visitors to want to follow it.

In the 1980s and 90s, this exploration of the natural world would continue in such pieces as:

- 1 David Tudor's *Neural Synthesis* (1989) which was performed on a home-made synthesizer constructed from 64 non-linear amplifiers with 10,240 programmable interconnections that emulate neuron cell patterns in the brain.
- 2 Maggi Payne's *Solar Wave* (1983) includes a source tape from a plasma wave instrument for detecting the shock wave interactions of Saturn and Venus with the solar wind. Data from this instrument triggered a 16-voice synthesizer.

The Internet

In the late 1980s, the advent of the telephonic cyberspace called the Internet made new musical performance arrangements possible. Although the Internet serves a more ordinary function as an immense repository of information of all sorts, one of its greatest promises lies in its live aspects such as instant messages,

chat rooms, broadcasts, instant and unbridled access, the free exchange and interchange of thoughts.

There are of course mp3 music downloads and virtual on-line recording studios, like resrocket.com, where musicians far removed from each other may gradually build up multi-track pieces or leave basic tracks for anyone to add to or change. But creative composers have begun using the Internet as a giant instrument.

One of the first interactive works of music and art created specifically for the World Wide Web was William Duckworth and Nora Farrell's *Cathedral*. On line since June 10, 1997, at www.monroestreet/cathedral, the *Cathedral* website includes both acoustic and computer music, live webcasts with improvising ensembles from all over the world, and new virtual instruments called Chaos, the Sound Pool, and the PitchWeb that can be played by anyone and allow the web audience to interact with the site. *Cathedral* deviates from the traditional concert model – where audiences attend a scheduled performance at a fixed place and time – in that the venue, time and location of performance, and even the performers themselves (both live and virtual) are variables. Time, for example, is no longer a factor in a piece of music that is always available; that has no beginning, middle, or end; and that no two people listen to in the same order, or for the same length of time. For listeners on the web, the effect is individual, and more like exploring an art gallery than attending an opera” (Duckworth).

Chris Brown & John Bischoff's Internet work entitled *Eternal Network Music* (2003) consists of two real-time sound pieces for quartets of networked players and is posted at www.sfmoma.org/crossfade, or www.crossfade.walkerart.org.

Helen Thorington's spectacular *Adrift* (2001) is an evolving multi-location Internet performance event that combines movement through 3D space, multiple narratives and richly textured sound streaming between virtual and real geographies. Making use of 3 vrml cameras, images are received by three computers and projected onto a semicircular screen. The work focuses on “multiple journeys through a harbor and through virtual space”.

Jason Freeman's software program N.A.G. (Network Auralization for Gnutella, 2003), which can be downloaded for free, is a tool that roams music sites and creates sound collages (“smashups”) by chance combinations from the thousands of files on the Internet. Gnutella is a set of technical specifications that allows the exchange of data like mp3 files.

Telephones, Satellites, Outer Space

Other communication forms than the Net have also been recently adopted by avant-garde musicians and sound artists:

- 1 Robin Rimbaud, known as Scanner, makes controversial live performances from material gathered in real-time by eavesdropping on cellular and mobile telephones and scanning satellite up-down links and police (etc.) radio transmissions.
- 2 In 1987 composers Nick Collins and Phill Niblock invited members of The Hub to create a performance linking two performance spaces at some distance to each other (Experimental Intermedia and The Clocktower in New York City) via a modem over a phone line. Two distinct trios were formed from six members of The Hub.
- 3 The ethereal sound of the digital clicks heard in data transmission have been used in works by Tim Perkis (*Clicks*), Yasunao Tone (*Musica Iconologos*), and Laetitia Sonami.
- 4 Slightly before the current speed and resolution of the Net, artist Nam June Paik created *Wrap Around the World* (1988), a spectacular satellite link-up, coordinated by Paik, which connected artists in the United States, Brazil, France, Germany, Ireland, Israel, Japan and several other countries. The event was similar to Paik's video collages or assemblies of that time in which he starkly contrasted and/or blended world cultures, with the images modulated by his original video synthesis techniques and graphics. In this piece the rock n' roll world was represented by David Bowie, the bands La, La, La, and Human Steps, and Japanese musician Ryuichi Sakamoto. Other aesthetic worlds were represented by avant-garde dancer Merce Cunningham, the Viennese Art Orchestra, a game of elephant soccer in Thailand, and an Irish car race.
- 5 Extending further out in space, Pauline Oliveros, aided by composer Scot Gresham-Lancaster and several technicians, realized her piece *Echoes From The Moon* in 1987 with Mark Gummer, a ham radiooperator in Syracuse NY, using the 48-foot dish in his back yard with Oliveros sending signals over a phone line from Hayward, CA (the return was 2½ seconds), and again in 1998 using several large Yagi arrays and the Moon and Mars mapping radio telescope at Stanford University. The recorded signal was sent by phone line to the radio telescope, converted to radio waves, and then bounced off the surface of the Moon and back. There was a slight Doppler shift in the return delay because of the motion of the Earth and Moon. The first sounds bounced were a conch shell, gas pipe whistle, Tibetan cymbals, woodblock and temple block, but eventually any one who wanted to participate could join in. Oliveros's conception was that each individual was actually touching the moon with his or her voice.

6 Many composers are already preparing for the eventuality of interplanetary performance. Composer David Cope is currently working on his Pleiades Project, a yet-unrealized plan to build a privately owned and operated radio telescope on the rim of the Grand Canyon in order to transmit music deep into space in hopes of contacting extra-terrestrials.

Spontaneity and the automatic

Spontaneity seems to be a compelling aesthetic imperative. The feeling of automatic, natural generation satisfies a deep need in the psyches of performers and listeners alike. Generally, improvisation in music involves some level of spontaneity applied to pre-chosen material or an idea. Pure spontaneity is largely involuntary and unplanned, and is surprising to the performer.

For William Duckworth's Cathedral Band concerts, in some of which this author has participated, a wonderful diversity of players who enjoy open playing are gathered. One concert in 2002 included a Chinese pi'pa performer, guitarist with electronic modifiers, Duckworth's Pitchweb synthesizer with over 1000 sound samples, a trombonist who also played rubber hose, whistles, conch shell, and wind instruments from many cultures, a DJ who mixed rhythm machines and scratched recordings of new music pieces, some by the performers. No rehearsal or discussion was held before the concert other than to decide who would start playing. The musicians were such good listeners that they would pick up on or contrast with what others were playing, and many extraordinary moments and tutti changes occurred as if they were scored. At another concert for a film society, the musicians for the most part did not watch the two projected silent era French cinema classics, yet apparently the coincidental synchronizations of image and sound were so impressive that several of the viewers thought the group had rehearsed for weeks to get the fit right. (One of Cage's stories in his lecture *Indeterminacy* mentions a sort of epiphany which occurred on tour. Having stopped at a restaurant, he watched people through the windows and the music inside seemed to accompany the activities outside.)

Other collective improvisation and spontaneous playing ensembles have existed for decades as groups that combined the African American and European traditions headed by composers like Muhal Richard Abrams, Anthony Braxton, George Lewis, Roscoe Mitchell and other former members of the AACM (Association for the Advancement of Creative Musicians), in deliberately non-virtuosic groups like the Scratch Orchestra founded by Cornelius Cardew et al in England, the Australian group Machine for Making Sense organized by Chris Mann et al, and in many other new music groups.

A more intimate spontaneous experience was realized in the recording of Robert Ashley's *Automatic Writing* (1979) that features the composer speaking in a calm, unprojected voice into a microphone with its gain turned all the way

up. The intimate sounds of his breath and the involuntary inflections of his speech are highlighted as he lets his mind wander freely, or "automatically" in the sense of the surrealist tradition of the free expression of the unconscious without control by the conscious. At some point he observes that "my mind ... is censoring my own mind". Recorded in what he called his "seedy apartment" of that time in Oakland, Ashley made a pact with himself to let all the spontaneous, involuntary musings of his mind be expressed without self-editing, and the result is hypnotic and deeply moving.

The electronic analogue to (or perhaps simulacrum of) the spontaneous experience may arise from the various original self-generating and heuristic (self-teaching) programs written to produce constantly changing combinatorial results and random variations in works by John Bischoff ("I imagine a musical soul as a large, circular room with windows ... one's imagination can walk out onto these landscapes and notice new features or catch different perspectives on each excursion"), Ron Kuivila (*Loose Canons*), Michael Schumacher (the *Room Pieces*), David Rosenboom, and a few others. A vivid interaction between performers and these enhanced computer behaviors, similar to the way that acoustic instruments trigger pre-programmed gestures in David Behrman's music, is still a pathway to be explored further.

The Future of Sound Art

In this brief study we have seen how sounds need not be programmatic or representational to still be compelling. Composers, soundtrack designers, engineers and others have continually searched for new and interesting sounds and the means to produce them. Composers from Satie to the present have offered new ways and settings in which to listen to the music, and have helped redefine the acts of listening, composing and performing. All this will continue into the future whether Sound Art be pursued

- 1 on the Net, in
- 2 ever more sophisticated home installations with beautiful surround or sourceless amplification (or perhaps in the less desirable form of super-directional HyperSonic laser-sound commercials coming from cereal boxes), or
- 3 into the desert, or
- 4 outer space.

Or, what is quite likely, in some situation and form undreamt of, yet.

"Blue" Gene Tyranny
July 2003, Long Island City, NY