Culture: Readings in Modern Music maps the aural and discursive
of vanguard music today. Rather than offering a history of contemporary music, it
ne genealogy of current musical practices and theoretical concerns, drawing lines
ection between today's radical music and earlier moments of sonic experimen-
Via writings by composers, philosophers, and cultural theorists, *Audio Culture*
s the interconnections among such musical forms as minimalism, indeterminacy,
e concrète, free improvisation, experimental music, avant-rock, dub reggae, Ambient
HipHop, and Techno. It aims to foreground the various rewirings of musical com-
and performance that have taken place in the past few decades and to provide
l and theoretical language for this new culture of sound.

ox's and Warner's book is a wonderfully accessible anthology of essen-
readings for anyone—academics and enthusiasts alike—interested in
histories of experimental music and sound art." —Debra Singer, Executive
ctor, The Kitchen

udio Culture is the best introduction to the long historical fades and
oretical jumpcuts of what millions in the 21st C. now listen to as
sic: overwhelming noise and disturbed silences, unfettered Improv
d indeterminate obstacles, the performance of recording, electricity,
ectics, mistakes and just the thought of music." —Douglas Kahn, author of
e, Water, Meat: A History of Sound in the Arts, and Director of Technocultural Studies
he University of California at Davis

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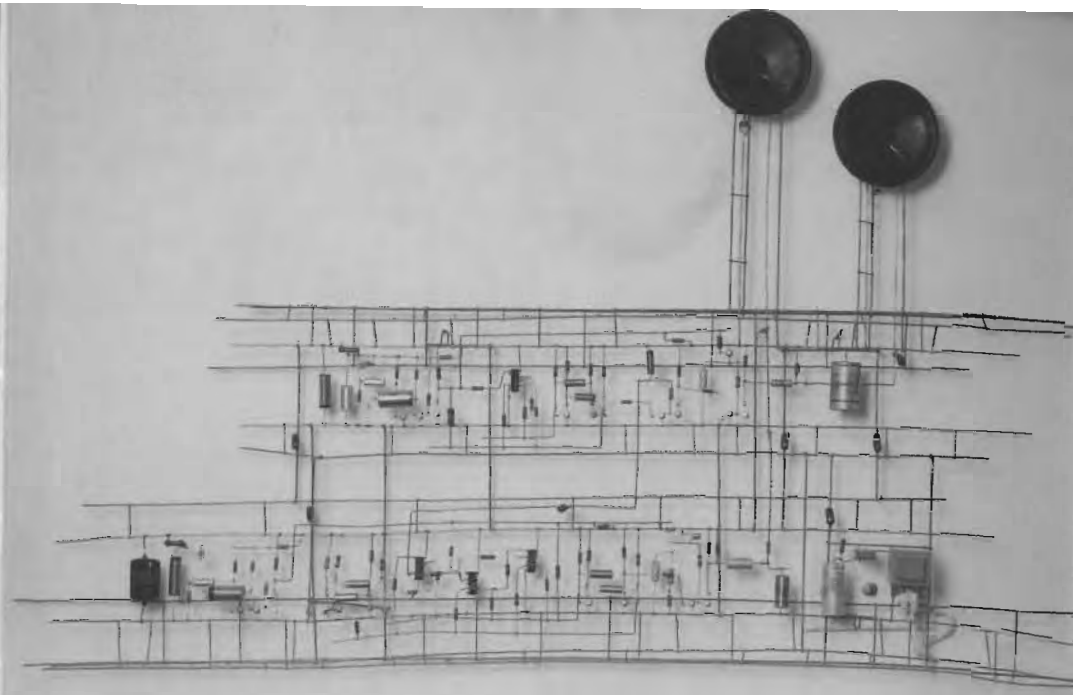

AUDIO CULTURE

READINGS IN MODERN MUSIC

EDITED BY

CHRISTOPH COX AND DANIEL WARNER

No action or sound is to be made by a player after his fingernails have received this writing or drawing, other than music.

Closing rite: each player shall erase the marks from the fingernails of another player. Your participation in the music ceases when the marks have been erased from your fingernails.

(Groups of two or more late-comers may use the same rite to join in an improvisation that is already in progress.)
(blank pages for additions)

—RICHARD REASON

Appendix 3 *List of compositions:*
La Monte Young, *Poem*
Von Biel, *World II*
Terry Riley, *In C*
Christopher Hobbs, *Voicepiece*
Stockhausen, *Aus den Sieben Tagen*
Wolff, *Play*
Cage, *Variations VI*
etc.
(blank pages for additions)

Appendix 4 *Special Projects and supplementary material*
(blank pages)

[. . . .]

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The Generation Game: Experimental Music and Digital Culture

DAVID TOOP

David Toop (1949– ; see also chap. 51) is among the most innovative and wide-ranging writers on contemporary music. His pioneering book on HipHop, *Rap Attack*, first appeared in 1984. A decade later, Toop published *Ocean of Sound* (1995), a poetic survey of contemporary musical life from Debussy through Ambient, Techno, and drum 'n' bass. Since the 1970s, Toop has also been an important presence on the British experimental and improvised music scene. With sound artist Max Eastley, he recorded *New and Rediscovered Musical Instruments* for Brian Eno's Obscure label in 1975. Over the past decade, he has released eight other solo albums and collaborated with an extraordinary variety of musicians, among them John Zorn, Evan Parker, Derek Bailey, Scanner, Flying Lizards, Prince Far-I, Witchman, and others. In 2001, Toop curated *Sonic Boom*, the UK's largest-ever exhibition of sound art; and in 2002, he curated the double-CD set *Not Necessarily English Music: A Collection of Experimental Music from Great Britain, 1960-1977.* In this article, Toop examines the ways in which the Internet and digital technology are making possible a renewal of experimental musical activity.

In 1986, Jae-eun Choi, a Korean artist and film maker, initiated a series of experiments that she calls the World Underground Project. She buried sheets of Japanese paper in the soil of 11 locations around the world. The first pieces were excavated from the site in Kyong-Ju, Korea, after four years. Others, including those buried at sites in Kenya, France and Italy, were still underground in 1998. Japanese paper begins with a strong character, before a single mark is made on, or into its surface. The absorbency and texture encourages accident and gener-

ates unpredictability. Those sheets that were excavated had been transformed by the years of their interment into gorgeous maps of organic growth [. . . .]

Now think about Japanese paper in relation to compact discs. Unless the silver disc malfunctions or aborts, the promise of this carrier is to remain true to an original state throughout its so-called life. False optimism, no doubt, but aside from the occasions when they go drastically wrong, CDs don't exhibit the slight variations in playback sound and gradual deteriorations and fluctuations that characterise vinyl and tape. A CD is more or less a dead thing, or seems that way until it really dies.

At the polar opposite of that inertia is Christian Marclay's *Record Without A Cover*. Marclay's instruction in how to initiate the process of *Record Without A Cover* was embossed on the surface of the vinyl: "Do not store in a protective package." I've had mine since the mid-80s. Two years ago I used to lay it on a pile of 12" singles by the window. Heat absorbent black vinyl, it made an attractively warm bullseye on which our cat would sit and gaze out of the window at birds in the cherry tree. A lot of unmentionable stuff got embedded into the grooves through that particular example of functionality, and when she was out trying to catch those birds, sunshine warped the disc into a picturesque wave. And then there's the dust, collecting on the record, as a record of my ambivalent attitude to order.

Just from a simple instruction, a supposedly 'final' artefact is transformed into an ongoing musical piece that the initiator cannot control. Like an awful lot of music enthusiasts, in my own house I'm vanishing into a vast housing estate of miniature tower blocks built from CDs. The more oppressive this static, one-sided arrangement seems to become, the more I'm interested in the idea of a music that can generate itself over time, giving itself up to the user in the way that Jae-eun Choi's Japanese paper surrenders to a colony of micro-organisms under the earth [. . . .]

An email from Richard Ross, programmer for Markus Popp's Oval Process, asks me a question: "I was wondering what constituted generative music, and were computers necessary? I came to the conclusion," he writes from California, "that if you dispensed with computers as a component of it, then things like windchimes and Aeolian harps might arguably fall into that camp. Other possibilities might be Cage's *Imaginary Landscape No. 4* as a live performance. If generative music is music created on the fly, by some kind of rule-based system, then these things follow very loose sort of rules, but rules none the less."

In issue five of *Musics* magazine, published in 1976, sound sculptor Max Eastley wrote a short history of Aeolian harps, including the story of St. Dunstan, who narrowly avoided incineration at the stake in the Middle Ages for the suspiciously demonic crime of making a harp that played by itself. Eastley also related the interesting case of Ichabod Angus Mackenzie, a sculptor and musician who produced 53 wind sound sculptures in 1934. "During an interview he was asked if it disturbed him to leave his instruments performing alone without a human audience," Eastley wrote. "He replied, 'That's up to humans. They're never without an audience.'"

This raises some of the core issues challenged by 20th century music, and 20th century thought in general: the relationship of the composer to the audience, for example, or the use of chance and accident in the creation of music; the construction of feedback systems or self-generating and adaptive mechanisms that

shape sound; the exertion or abdication of control of a musical result; the modelling of music based on ecosystems and similar complex environments and the setting in motion of events that question the definition of music as a cultural production distinguished from noise or unorganised sound by human agency and intentionality.

In the 21st century, such ideas have been expanded dramatically by the evolution of the Internet, itself a self-propagating Web lacking any central control. *Sound Drifting* was a large scale generative sound installation curated by Colin Fallows and Heidi Grundmann for the Ars Electronica 99 festival. A web of subprojects, sourced from six different countries, could be heard simultaneously and continuously, either onsite in Linz, Austria, online as a virtual installation and on air via Austrian National Radio [. . . .]

"More recently," the introduction to *Sound Drifting* explained, "there has been a growing interest in generative systems by artists working with the Internet, especially using sound, but increasingly with the appropriation of games software, search engines and so forth. Some of this work is highly critical of the ubiquity and unseemly power of generative systems in modern decision making. But the most conspicuous cultural use of generative systems has been in the field of music—which means that the word 'generative,' when used in relation to sound, usually causes people to think of music. However, although some music drifted in, *Sound Drifting* was not about 'music'—nor was it conceived as a concert hall, showcase or gallery space for the works of individual artists. *Sound Drifting* was about networking, communication and collaboration; about control-sharing between artists, users and machines; about letting go of one's own art and making ecological use of existing things; about listening to the world without adding to it; about the different concepts of duration and evolving processes at work in the material and immaterial realities of which we are part; about the aesthetics of different but connectable sounds, images, texts appearing on line—on air—on site as fugitive interfaces to a complex, invisible and not yet properly understood system of data processing."

In March [2001], Brian Eno gave a lecture at the ICA in London, linking his ideas on generative music with the model of John Conway's Game of Life. Conway, a Cambridge mathematician, invented Life as a cellular automaton, a game regulated by three logical rules: (1) Every counter with two or three neighboring counters survives to the next generation (i.e., the next move). (2) Every counter with zero or one neighbors 'dies' (of loneliness), and every counter with four or more neighbors dies (of overcrowding). (3) Every empty cell with exactly three neighboring occupied cells gives birth to a new counter. "With these simple rules of birth, survival and death," Paul Davies wrote in *God and the New Physics*, "Conway and his colleagues have discovered the most astonishing richness and variety in the evolution of certain counter configurations." In other words, out of a set of very basic conditions, or limitations, surprising events will emerge.

A week after his lecture, sitting in a patch of sunlight outside his studio, speaking on his mobile, Brian Eno talks about connections between that proposition, developed from ideas investigated by mathematicians such as John Von Neumann and Stanislas Ulam, and the compositions that first sparked his interest in generative music. "I think the Steve Reich pieces and Terry Riley's *In C*," he says. "I would call those the predecessors of this. I would say anything where the com-

poser doesn't specify a thing from the top down. What I think is different about generative music is that instead of giving a set of detailed instructions about how to make something, what you do instead is give a set of conditions by which something will come into existence."

The Steve Reich pieces he refers to are the early voice works for tape—*It's Gonna Rain* and *Come Out*—both of which explore the strange accretion of phenomena that occurs when two identical tape loops play in synch but then run progressively out of phase due to slight variations in motor speed in the tape machines. "I thought the economy of them was so stunning," says Eno. "There's so little there. The complexity of the piece appears from nowhere. You think, my God, it's so elegant to make something like that. Of course, I was hearing this at the time when 24-track recording had appeared and people were making huge, vast, heavy, soggy pieces of music with no economy whatsoever. Suddenly to hear this Reich piece, which I thought was the most beautiful listening experience, and to realise that it was made from just a few molecules of sound. That really impressed me" [. . . .]

A day after our first chat about this subject (though in retrospect, all our conversations over the years seem to have been about this subject), Eno comes back to me with an aphorism: "Generative music is like trying to create a seed, as opposed to classical composition which is like trying to engineer a tree." Gardening and engineering are key metaphors. "I think one of the changes of our consciousness of how things come into being, of how things are made and how they work," he says, "is the change from an engineering paradigm, which is to say a design paradigm, to a biological paradigm, which is an evolutionary one. In lots and lots of areas now, people say, How do you create the conditions at the bottom to allow the growth of the things you want to happen? So a lot of the generative music thing is much more like gardening. When you make a garden, of course you choose some of the things you put in, and of course you have some degree of control over what the thing will be like, but you never know precisely. That's the wonderful thing about gardening. It responds to conditions during its growth and it changes and it's different every year [. . . .]

In the late 1960s and early 1970s, collaborative group music was one of the most powerful available tools for experimenting with new models of society, forms through which individual expression might thrive within collective organisations [. . . .] During the period in the late 1960s when he shifted his group, Spontaneous Music Ensemble, away from the compositional models of Ornette Coleman, Eric Dolphy and George Russell into uncharted territory, [John] Stevens began to formulate pieces that could help musicians who were new to this way of playing (and that included just about everybody back then). *Click Piece*, for example, was a simple instruction to play the shortest sound possible on your instrument. The difficulty of this varied from instrument to instrument, player to player, and quite a considerable amount of concentration was needed to pare each sound down to its smallest event and keep it there. As a player, you became aware of the way in which a group sound was emerging only after some time had elapsed. The paradox lay in the way that a complex group interaction, quite ravishing to listen to on occasions, could emerge from individual self-absorption. The piece seemed to develop with a mind of its own and almost as a by-product, the basic lessons of

improvisation—how to listen and how to respond—could be learned through a careful enactment of the instructions.

Evan Parker remembers the way in which his duo with John Stevens pushed this atomistic way of playing to a limit. "The moments of interaction got shorter and shorter," he says. "You couldn't go any further than that." So a method that stimulated considerable variety in a large group comprising players of mixed ability and experience, quickly became an unproductive limitation for a duo of two well-matched, skilful and confident musicians.

I put it to Parker that Brian Eno's gardening analogy might be applied to his solo playing for soprano saxophone along with many of the theories of webs, swarms and emergent phenomena found in books such as Kevin Kelly's *Out Of Control: The New Biology Of Machines*. "We all are delighted if we can find some way of talking about something that is very difficult to talk about," he admits. "Fractal maths and chaos theory are very useful for talking about the solo playing, though of course the number of calculations involved to arrive at a fractal diagram or drawing is probably a magnitude of millions different from the number of calculations involved in me playing a solo. But in the sense that the whole design is built up from one calculation, the output of which becomes the input for the next calculation, there is in some way a connection with the way I work in the solo thing. I set up loops of stuff and then observe the loop and listen closely to the loop and say, ah, now I'll emphasise that note, or now I'll bring out that difference tone, or I'll try and put something underneath it in relation to that or on top. Gradually the centre of attention in the loop shifts somewhere else. The loop suddenly is a different loop. It's something that's still bearing fruit for me. I'm not saying that's exclusively the method I'm using in solo playing but it's the core method."

This sets up a complex feedback system between the saxophone and independently functioning regions of his own distributed consciousness, enabled by Parker's circular breathing and his knowledge of the overtones available through advanced fingering techniques. "Absolutely," he agrees. "It's the key notion of the 20th century. I'm not an expert on cybernetics but bringing an ability to generalise about feedback is a 20th century phenomenon. Before that there were specific applications but I don't think there was a general awareness of how many control systems can be analysed in terms of the feedback between inputs and outputs. Its certainly high on my list of analytical tools."

In 1966 and 1967, Pauline Oliveros produced two tape pieces—*Alien Bog* and *Beautiful Soop*—using Don Buchla's "Buchla Box" 100 Series synthesizer and her own tape delay system. Working at the Tape Music Center at Mills College in Oakland, she had been influenced by the sounds of frogs living in the pond outside her window at Mills. Tape delay systems were means of creating unpredictable variety in music. Terry Riley's system, the time lag accumulator, was a technological equivalent of the feedback system later developed by Evan Parker and one of the inspirations behind Brian Eno's use of tape loops.

For Eno, the system that allowed him to create *Discreet Music* was fine, except it was limited to the length of a vinyl LP. "All of those phase systems," he says, "they're theoretically endless, generating new stuff as they go, new combinations. I always wanted that kind of music—not only *Discreet Music* but the things that followed it like *Music For Airports*—to be endless pieces. I saw them more like paintings, just things that stayed in place, than compositions, things that had

a structure to them. I was always looking for creating, not a recording of the results of the generative process, but creating a generating machine itself." This led to his use of Tim Cole's Koan software, a program he had hunted for in research centres in Stanford and Palo Alto but failed to find.

The desire to make a music that exists in a state of being, theoretically without beginning or end, is paralleled by Evan Parker's interest in relatively long forms and their relationship to improvising. "What happens when you work with the longest elements?" asks Parker. "Maybe you're not improvising anymore. You're just remembering." That dialectic, at the core of his music, contributes to the subjective impression in the listener that something is alive and growing, like a timelapse photograph of plant growth, one of the creatures grown in the "garden of unearthly delights" by William Latham's computational breeding program or the volatile communities generated by Conway's Game Of Life.

The observation of nature, either through bioacoustic study, environmental sound recording or ecology, has led some musicians to the creation of emergent systems based on non-human source material. Mamoru Fujieda, for example, wired up plants using a Plantron interface devised by botanist Yuji Dogane. The data collected by electrodes recording changes to the surface electric potential of the plant leaves was converted to MIDI and then transformed into melodic patterns using MAX, the graphical music programming environment developed by Miller Puckette and other authors at IRCAM in 1986.

While Fujieda translates plant activity firmly into the human sphere, Michael Prime's work is more of an intuitive mapping of the interface between humans and non-human species. As in Fujieda's *Pattern Of Plants*, Prime, a member of London Improv group Morphogenesis, uses a bioactivity translator. This controls oscillators which are used as sound sources. His *L-fields*, a work for hallucinogenic plants, is named after studies in voltage potential made in the 1930s and 40s by a Yale scientist, Dr. Harold S. Burr. According to Prime, speaking in an interview with Francois Couture of Québec radio: "He had several local trees connected to voltage meters for a period of years, and discovered that their voltage potentials varied not only with periods of light and dark, but also with the cycles of the moon, magnetic storms and sunspots. The fields of humans varied not just with these natural rhythms, but also according to mental state, health, presence of cancer, etc. He finally postulated that these fields were not just a pattern produced by living organisms, but were also the morphogenetic blueprint that controlled their development."

Prime describes his use of a bioactivity translator as occupying "a kind of hinterland between composition, improvisation and process/generative music." One of his inspirations is the musical use of human brainwaves explored by Alvin Lucier, Richard Teltelbaum and David Rosenboom in the late 1960s, another version of generative music that relates to speculations made by Evan Parker about the role of left brain/right brain activity during his solo performances. In a sense, Prime simply plugs into biological activity and during the period in which he is plugged in, the unpredictable and inevitably mysterious signals given off by plants both create and are folded into Prime's soundscape. The intricacy and alien beauty of bioacoustic feedback systems such as the hunting relationship between bats and moths—the bat tracking moths with ultrasonic pulses, the moths using

evasive flying measures whenever they hear ultrasound—can suggest new ways of "growing" music.

Pieces like "Chaos & The Emergent Mind Of The Pond," created by sound recordist and composer David Dunn in 1990, are illustrations of the way in which "shaped" soundscapes can become a category of found art that links to generative work of all kinds.

In his book, *Why Do Whales And Children Sing?*, Dunn quotes the anthropologist and musician Steven Feld, whose research and recording among the Kaluli people of Papua New Guinea and the rainforest in which they live has drawn new maps of the relationship between favoured sound patterns, aesthetic preferences and social relations. "Steven Feld describes the New Guinea rainforest as a world of coordinated alarm clocks," writes Dunn, "an intersection of millions of simultaneous cycles all refusing to ever start or stop at the same point." In books such as *Music Grooves*, co-authored with Charles Keil, Feld has written extensively about valued sonic qualities among the Kaluli, including ". . . interaction of patterned and random sounds; playful accelerations, lengthenings and shortenings; and the fission and fusion of sound shapes and phrases into what electroacoustic composer Edgard Varèse called the 'shingling' of sound layers across pitch space."

Feld's observation of simultaneous cycles working out of phase, or the Kaluli love of "in-sync, out-of-phase patterning" recalls Brian Eno's enthusiasm for *In C*, *It's Gonna Rain* and Paragraph Seven of *The Great Learning*. One of the most enthralling examples of this phenomenon can be heard when large groups of frogs are calling, each frog responding to another, calls sometimes falling in perfect synchronisation, moving in and out of phase, then falling suddenly silent for reasons a human can't divine. David Dunn has extrapolated from his recordings of this emergent mind to develop a series of real-time multi-channel electroacoustic performances and installations for live computers.

"They explore the global behaviour of hyper-chaotic analogue circuits modelled in the digital domain," he tells me, via email from New Mexico. "These circuits exhibit an immense range of sonic behaviour, all generated from the equivalent of three sinewave oscillators linked together in a feedback path that exhibits two of the essential traits of a chaotic system: non-linearity and high sensitivity to initial conditions. The emergent complexity results from the dynamical attributes of cross-coupled chaotic states interacting in a multidimensional phase space [. . . .]"

"My main question on generative music is: can we trust machines to create for us?" asks David Rothenberg, musician and author of *Hand's End: Technology And The Limits Of Nature*. The life's work of John Cage could be interpreted as that question almost in reverse: can we trust humans to create music? Through the influence of books as much as anything else—the oracular hexagrams of the *I Ching*, James Joyce's *Finnegans Wake* and the writings of Gertrude Stein—Cage arrived at *The Music Of Changes* in 1951, a composition he described in *Musicage*, his conversations with Joan Retallack, as "where the process of composing was changed from making choices to asking questions."

Although Cage's ghost is present almost anywhere we care to look, his philosophy of nonintentionality has become a resource, rather than a way of life, for many musicians currently working with electronic media. As a member of the think-

tank (also including architect Paul Shepheard, landscape architect Georgina Livingston, digital sound artist Joel Ryan and Brian Eno) that offered guidance to Jem Finer in his development of the *Longplayer* project, I remember a phase during which Finer considered using a segment of Cage's prepared piano music as the source material to feed through SuperCollider, the real time sound synthesis program developed by James McCartney. The intention of *Longplayer* was to generate a piece of music that would last for 1000 years, using SuperCollider's capacity to loop small segments of music and gradually move the start point of the loop, with each new loop applying the same process to itself to create a nest of loops, all working within the differing boundaries of its parent loop to create constant evolution. Fascinating, but though informed by Cage, perhaps not a particularly Cageian way to compose [. . .]

Issues of intentionality, linearity and the model of active composer and passive listener are being challenged by software and software users yet held in place by the dominant carrier of music, the compact disc. "Our minds have become nodes in the expanding space of the Internet," wrote Kim Cascone for the liner notes to *Selected Random Works*, released on Ritornell, "connecting freely with other nodes in a rhizomatic manner. Comparing this fluidic, smooth space with the linear space of the audio compact disc, we find that a linear model of time has been imposed onto an inherently non-linear medium."

Live streaming, installations, MIDI files and the release of authored software, rather than finished product, offer ways around this contradiction, though the effect at the moment can feel and sound like the aimless exploration of a huge choice of possibilities, something like the experiments of the 1960s when the excitements of process and change could obscure the imperatives of making music that was worth a second listen [. . .]

There is a significant difference between software programs such as Logic Audio or Cubase, basically emulations of the recording studio, and more open applications such as MAX/MSP, Cloud Generator developed by Curtis Roads and John Alexander, or interesting curiosities such as Akira Rabelais's Argeïphontes Lyre (elliptically explained to me by Rabelais by means of a lengthy chunk of Greek mythology). Composers who have devoted a lifetime to compositional methods that go beyond the customary means of committing sound to tape, its equivalents or emulations, are increasingly important in this shifting field: Iannis Xenakis, for example, for his theory of stochastic processes, derived from mathematician Jacques Bernouilli's "law of large numbers" or the cybernetic and entropic compositions of Roland Kayn [. . .]

For Markus Popp of Oval, one of the most important factors in his recent trajectory is the presentation of his Oval Process software, developed with Richard Ross, as an interactive installation object. "That is this tangible interface," he says, speaking from his studio in Berlin, "declaring the interface public domain and just handing it over to the audience or whoever is present at the given time of the exhibition or wherever the unit is on display. This is one aspect of it, and the other aspect, which might even be considered the stronger statement is, of course, the available audio content which is on my CD, which is a quite vigorous statement against the typical productivity work flow in music."

He describes his [. . .] recent CDs—*ovalprocess* (2000) and [. . .] *Commers* (2001)—as the tangible front end of an attempt to introduce an alternative rhetoric to the production of electronic music. At the same time, Oval Process is a statement to encourage non-expert audiences [. . .]

Like Japanese paper buried underground, the final organisation of the music is relinquished by its maker, though the elements remain intact. Popp seems to interpret the current situation in music as a moment for making statements that jump out of established historical frameworks, for when people are confronted by music designed to grow and evolve beyond the composer's intentions or even understanding, the old science fiction anxieties still recur [. . .]