



The Time of Roland Kayn's Cybernetic Music

Thomas W.
Patteson

The year 1968 looms large in the social and political history of the twentieth century. Two symbolically significant events of that year suggest that 1968 was a nodal point in the aesthetic development of Western modernity as well. In November 1968, the Museum of Modern Art in New York presented an exhibition entitled *The Machine as Seen at the End of the Mechanical Age*.¹ As the name suggests, this was a pointedly retrospective view of the machine as a theme in the visual arts. Around the same time, the Institute for Contemporary Art in London presented a multimedia extravaganza called *Cybernetic Serendipity*, which featured an array of experimental ventures into a new aesthetic field informed by the then-cutting edge disciplines of information theory and cybernetics.² Between them, these two cultural phenomena signalled a shift in the techno-aesthetic order of the twentieth century. The machine, as the quintessential symbol of the technological order, gave way, both in the organisation of society and in the popular imagination, to the more abstract, conceptual, and relational field of computers, electronics, and communications networks.

The music of Roland Kayn (1933–2011) is among the most powerful and enigmatic products of what could be called the ‘cybernetic moment’ in twentieth-century culture. Kayn’s unique and idiosyncratic approach to the problem of composition in the electronic medium represents a radical reconception of the creative role of technology and the limits of musical perception. What Kayn called ‘cybernetic music’ is a phenomenon of acute interest for the history of electronic music and has enduring relevance for contemporary artistic production. This brief essay is intended to outline the historical and intellectual conditions of Kayn’s work, the nature of his compositional method, and the aesthetic categories that might inform the sympathetic reception of his music, with an emphasis on the peculiar sense of temporality manifested in his works. Because of the relatively few accessible sources of information on Kayn’s work, this is by necessity a provisional study; may it help to inspire more foundational work on Kayn and his milieu.³

1. See Karl Gunnar Pontus Hultén, ed., *The Machine as Seen at the End of the Mechanical Age* (New York: Museum of Modern Art, 1968).

2. See Jasja Reichardt, ed., *Cybernetic Serendipity: The Computer and the Arts* (London: Studio International, 1968).

Colonize time.
Why not? 131;

The cybernetic music project received its initial impulse in 1953, when Kayn, a young musician and university student, came into contact with the philosopher Max Bense, a professor at the Technical University in Stuttgart. Inspired by the seminal writings of Norbert Wiener, Bense became among the first to channel the primarily Anglophone disciplines of cybernetics and information theory into the intellectual bloodstream of the European continent. Bense was also among the first thinkers to extend cybernetic concepts to art and aesthetics. In addition to publishing a series of books entitled *Aesthetica* (1954–60), he was active as a curator of exhibitions of computer art and concrete poetry, and he became the guru of the ‘Stuttgart School’, an informal group of artists working in various media who shared a vision of a new, rationalised form of artistic expression made possible by ‘systems thinking’ and computer technology.⁴ Kayn spent three years in the Bense circle and was deeply influenced by his teacher’s project of fusing cybernetic and aesthetic concepts. He later recounted, ‘At that time Bense’s approach was an important point of departure, because with his method of analysis, whether one was an architect or a composer, one gained the ability to approach the creative engagement with the material in an objective way’.⁵

Bense believed that cybernetic notions of information and entropy could be normatively applied to the production of aesthetic products, what he called ‘the programming of beauty’. He distinguished between two aspects of aesthetic work: the first is what he called ‘analytical aesthetics’, in which ‘aesthetic information [is] described in abstract (mathematical) terms’. Bense called the second phase ‘generative aesthetics’, in deliberate (if imprecise) analogy to the ‘generative grammar’ developed contemporaneously by Noam Chomsky.⁶ This, strictly speaking a *poetics* or technique of artistic creation, Bense defines as ‘the artificial production of probabilities of innovation or

3. In addition to the sources cited throughout this essay, the reader is referred to the following article by Kayn: ‘Komponieren zwischen Computer und Kybernetik’, in *Melos / Neue Zeitschrift für Musik* 3 (1977), pp. 22–27.

4. Elisabeth Walther, ‘Max Bense und die Kybernetik’, <http://www.stuttgarter-schule.de/bensekybernetik.htm> (accessed 19 April 2010).

5. Roland Kayn, liner notes, *Tektra*, Colosseum LP COL 1479.

6. Max Bense, ‘Projekte generativer Ästhetik’, in *Aesthetica: Einführung in die neue Ästhetik*, 2nd edition (Baden-Baden: Agis Verlag, 1982), p. 333.



deviation from the norm'. Through these methods, Bense believed that 'the improbability of aesthetic states can be produced mechanically through a methodical combination of planning and chance. In this way the demand that aesthetic objects have to satisfy – namely, to be unpredictable – is precisely combined with their planned construction'.⁷

In this idea of planned unpredictability we find the first crucial influence on Kayn's developing vision of cybernetic music. In the decade following the time spent with Max Bense, Kayn traversed the extremes of avant-garde musical production, from the rigorous order of serialism to the anarchic play of free improvisation. Soon after his first meeting with Bense, Kayn came into contact with Herbert Eimert at the Studio for Electronic Music of the NWDR (Northwest German Radio) in Cologne. Kayn was fascinated by the sonic potential afforded by the new technologies, but he found the studio's dominant serialist aesthetic too restrictive. He visited other studios in the following years, but was consistently frustrated by the technological limitations he encountered, and was unable to realise any completed works. For the next ten years, Kayn focused primarily on instrumental composition. In Berlin in the late 1950s he studied with Boris Blacher, whose mathematical approach Kayn credited with pushing him toward 'statistical composition'. Several of Kayn's works for piano, chamber ensemble, and orchestra would be premiered in Darmstadt in the coming years. Although he would continue to write for conventional instrumental ensembles, Kayn's focus was shifting elsewhere.

In 1964, Kayn became one of the initial members of the Gruppo di Improvisazione Nuova Consonanza, a Rome-based collective of composer-musicians dedicated to improvisatory performance inspired by free jazz, aleatoric music, and extended instrumental technique. Nuova Consonanza was founded by the Italian composer Franco Evangelisti, who envisioned collaborative improvisation as an escape from the dead end in which the classical tradition found itself. Kayn's membership in the group signalled his

7. Bense, p. 337. The best English-language introduction to the potential musical applications of Bense's aesthetics is found in M. J. Grant, *Serial Music, Serial Aesthetics: Compositional Theory in Post-War Europe* (Cambridge: Cambridge University Press, 2001), pp. 146–49. Grant highlights the connection between information theory and serialism, but makes no mention of Roland Kayn.

at right angles
to the flow of
time 132;

growing dissatisfaction with the avant-garde 'composed music' scene. It also allowed for a deeper engagement with the question of how to implement cybernetic methods in music. The concept was certainly in the air at the time: Evangelisti even used the term 'cybernetic' to describe the dynamics of listening and reaction between the members in live performance. But Kayn became frustrated with the group's lack of a 'theoretical foundation', which led to its members falling back on musical clichés. He left the group in 1968 and later attributed his departure to his inability to introduce cybernetic methods into the group's improvisatory framework.⁸

Kayn's disillusioned departure from Nuova Consonanza was the passage from an earlier, exploratory phase of his career into the mature period in which his long-germinating notions of cybernetic music finally took shape. For Kayn, cybernetic music was nothing less than a new stage in the development of electroacoustic art. He presented the history of the medium in five distinct phases, beginning in the early twentieth century and culminating with his own contribution circa 1970:

- **Electro-instrumental music** Extension and multiplication of the natural instrumental sounds by means of electro-acoustic aggregates. Incorporation of new instrumental techniques of playing and articulation.
- **Concrete music** Studio processing of existing sounds and noises, also of instrumental and vocal origin.
- **Electronic music** Electro-acoustic sound synthesis, obtained from electronic oscillation elements. Discovery of new connections between material, time, structure, space.
- **Computer music** Automation, chance, program. Logical and mathematical operations.
- **Cybernetic music** Process planning, feedback loops, control processes. Suspension of the opposition of automatic ('dead') and anthropoetic ('living') systems.⁹

8. Roland Kayn, liner notes, *Infra*, Colosseum LP SM 1478.

9. Roland Kayn, liner notes, *Simultan*, Colosseum LP SM 1473.

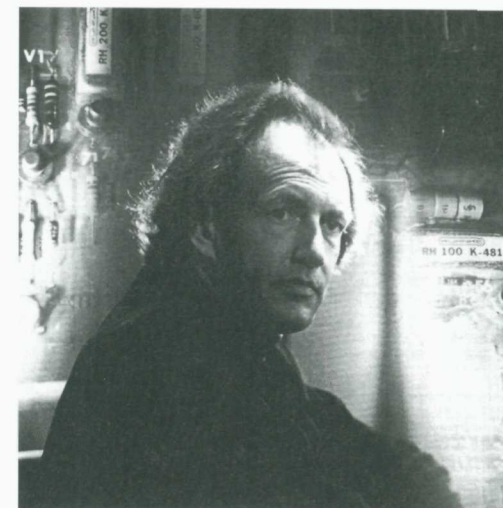


By the late 1960s, of course, the first three of these phases were already historical. Ironically, given the strong association between cybernetics and the computer, Kayn defined cybernetic music primarily in opposition to computer music. Although computer-programmed processes allowed for a more precise control of sound events, this way of working was still based on the straightforward execution of directives, with the human performer more or less replaced by the computer. For Kayn, computer music represented nothing more than an extension of the essentially deterministic approach embodied in the classical electronic studio:

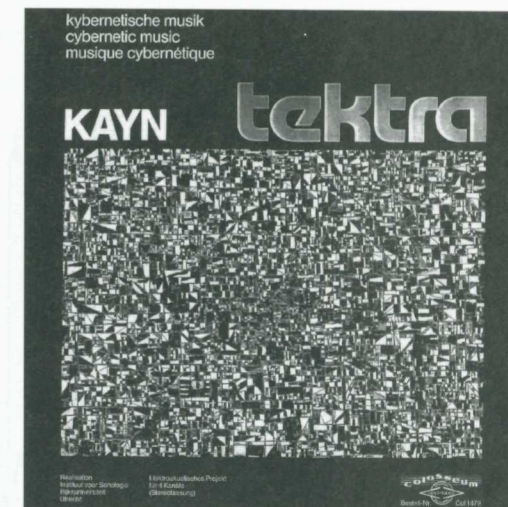
There is still no computer music capable of achieving the high degree of artistic quality ultimately demanded of it, as existing programming languages are still too limited in their capacity to simultaneously synthesize the large numbers of individual operations implicit in the underlying 'aesthetic program'. [...] Although it is the general aim of the composer to operate the computer in keeping with his own objectives, this situation is influenced by a feedback effect, i.e., a subliminal tendency on the part of the operator to think in mechanical terms. The tension between these two processes creates problems of the relationship between technology and creativity, which can only be solved by a systematic evaluation of aesthetic categories.¹⁰

Kayn's characterisation of computer music was something of an over-generalisation, ignoring the work of composers such as Iannis Xenakis, Herbert Brün and Pietro Grossi, who were pursuing non-deterministic compositional applications of the computer. But Kayn's critique of computer music served to highlight his own compositional programme, which he envisioned as a fundamentally new paradigm in the history of music. While computer music required the composer to formulate his thoughts in a programming language, which is then executed in a manner analogous to the performance of the traditional

10. Roland Kayn, liner notes, *Elektroakustische Projekte*, Colosseum LP SM 1474.



Roland Kayn, 1970s.



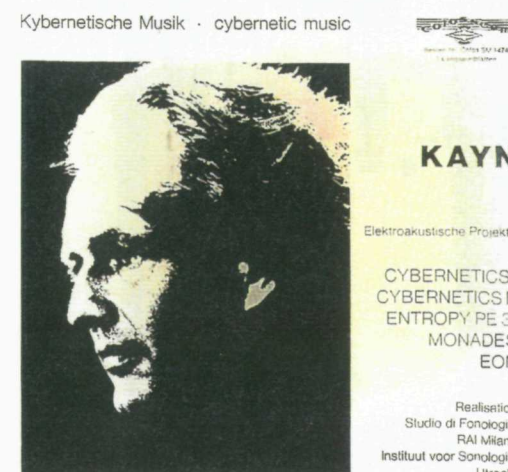
Roland Kayn, cover LP *Tektra*, 1984.



Roland Kayn, cover of the LP *Infra*, 1978-79.



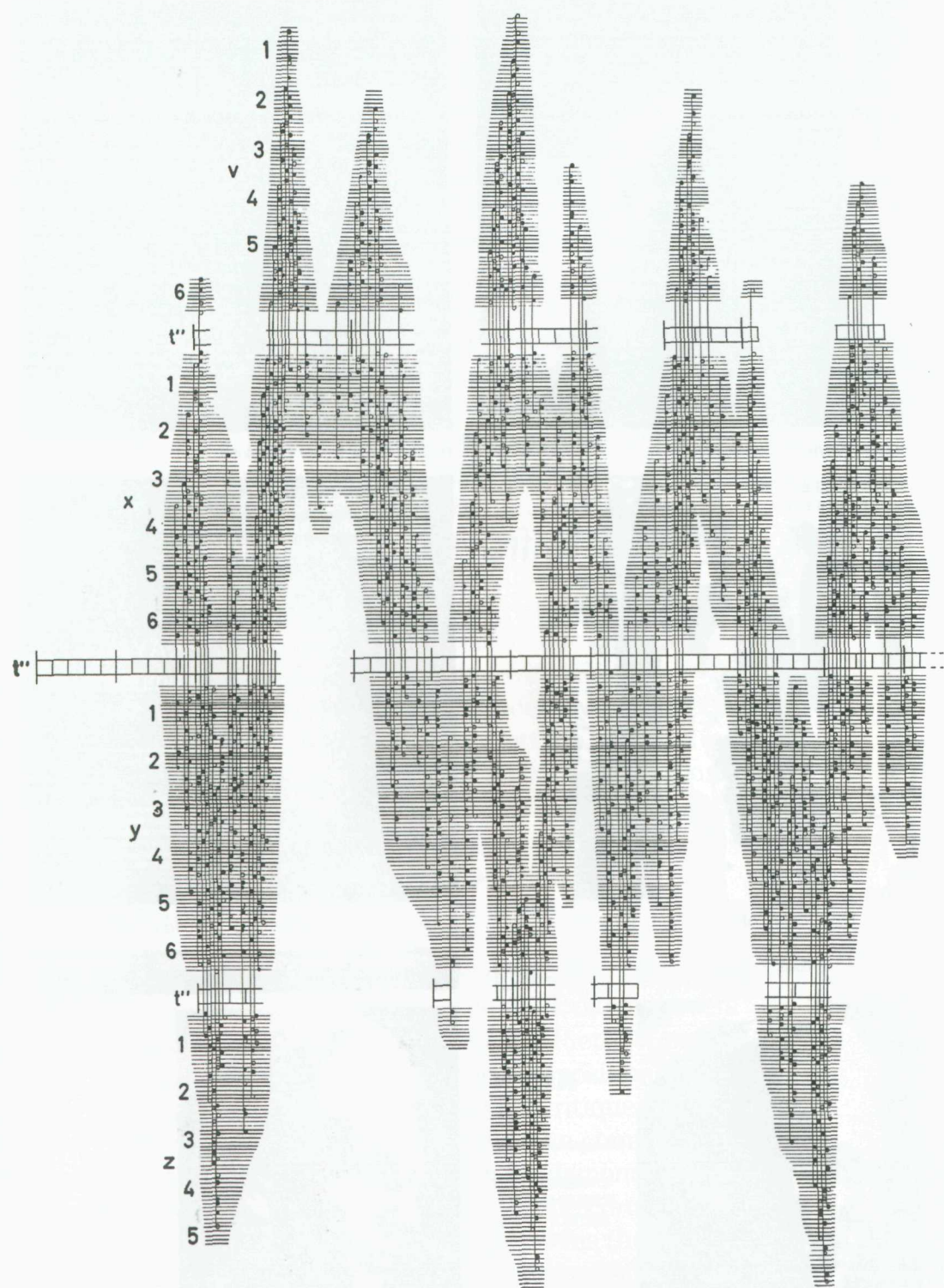
Roland Kayn, cover of the LP *Simultan*, 1970-72.



Roland Kayn, cover of the LP *Elektroakustische Projekte I*, 1966-75.



Roland Kayn, cover of the LP *Makro I-III*, 1977. Images © courtesy of Ilse Kayn.



Roland Kayn, score for *Allotropie*, for multiple instrumental formations, 1962-64, reproduced on the insert of the LP issue of *Tektra*. Image © courtesy of Ilse Kayn.

fff stacc.

III

IV

fff secco

fff pizz

due corde

A

B

C

D

E

23

Roland Kayn, page from the score of *Allotropie*, for multiple instrumental formations, 1962-64. Image © courtesy of Ilse Kayn.

1
2
A 3
4
5

1
2
B 3
4
5

1
2
C 3
4
5

ADAPTION

Roland Kayn, 'Adaption', page from the score of *Engramme*, 1972-74, reproduced on the insert of the LP issue of *Tektra*. Image © courtesy of Ilse Kayn.

1 2 3 4 5 6 7 8 9

10 11 12 13 14 15 16 17 18

19 20 21 22 23 24 25 26 27

28 29 30 31 32 33 34 35 36

37 38 39 40 41 42 43

44 45 46 47 48 49 50

51 52 53 54 55 56 57

58 59 60 61 62 63 64

65 66 67 68 69 70 71

72 73 74 75

76 77 78 79

80 81 82 83

84 85 86 87

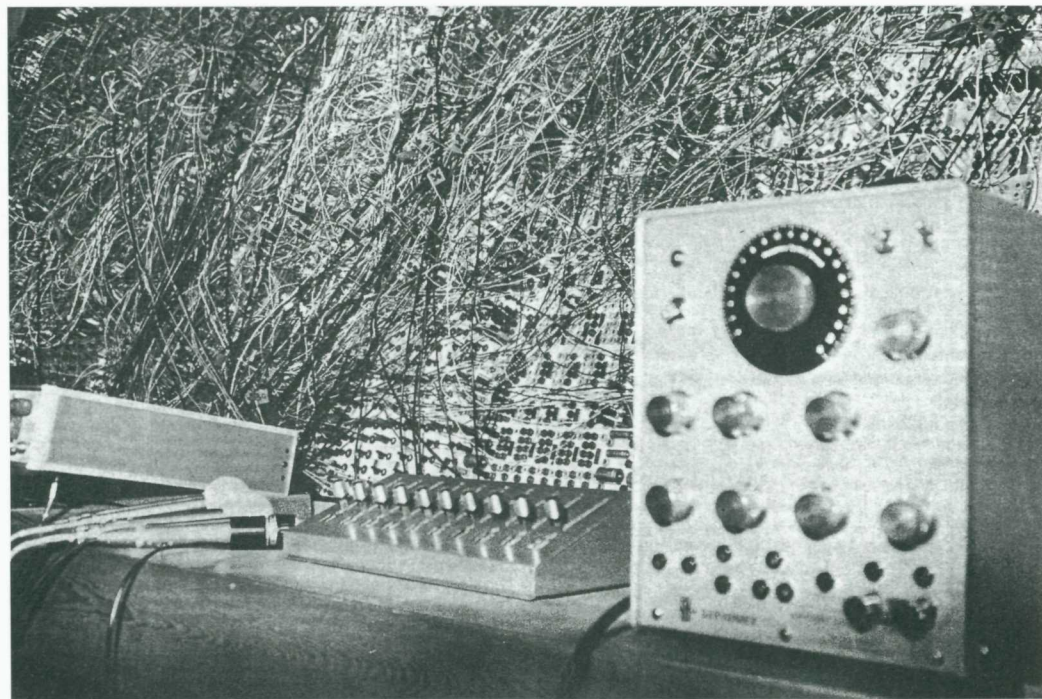
88 89

90

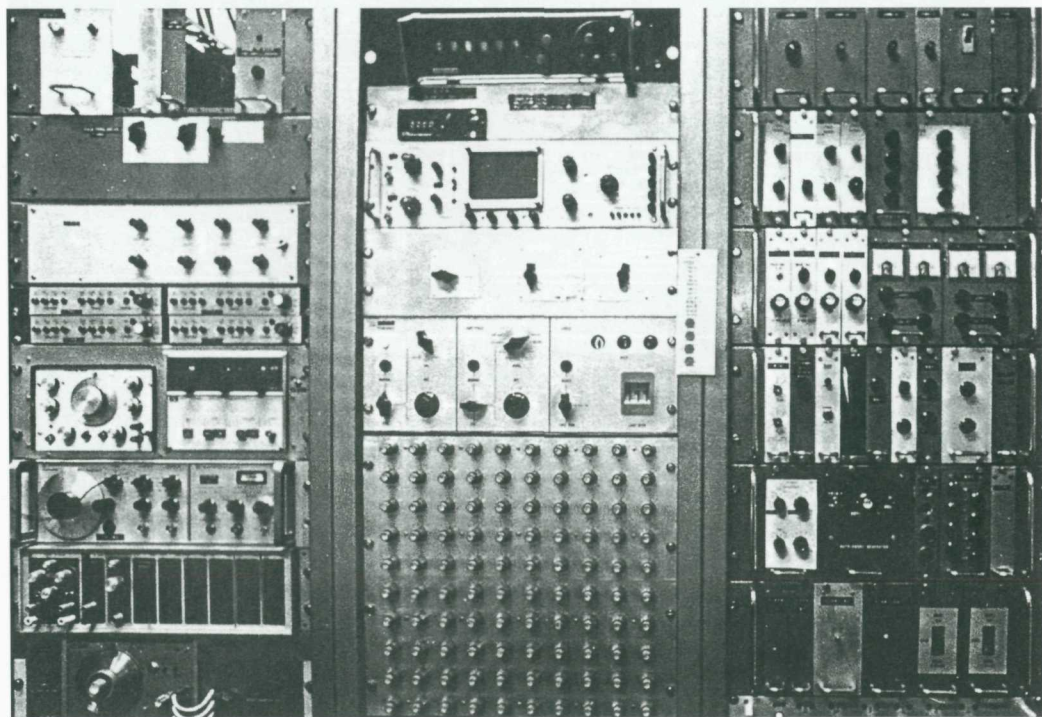
E

abcdefghijklmnopqrstuvwxyzß

Roland Kayn, score for *Cybernetics*, sign memory and control system, reproduced on the insert of the LP *Elektroakustische Projekte I*. Image © courtesy of Ilse Kayn.



Music computer, early 1970s. Photo on the insert of the LP issue of *Simultan*. Courtesy of Ilse Kayn.



Studio 2 (or 3), Institute of Sonology, Utrecht, late 1960s, early 1970s. Unknown photographer. Image courtesy of Ilse Kayn.

linear time
becoming
circular 132;

**‘the electric current has no
memory, is governed only
by the present, and is thus
in great measure authorised
to unleash improbable
phenomena’**

musical score, cybernetic music is based instead on 'a generative process in which existing sound materials are fed back upon themselves in order to create deviations from that which came before'.¹¹ In its simplest form, this process begets only cyclical variation – 'negative feedback', which aims for equilibrium and stability, typified by the quotidian technology of the thermostat. But as more information is introduced into the system, the more unpredictable its behaviour becomes. The non-linearity of cybernetic systems allows the music to break out of regulated cyclical patterns and perform 'sudden jumps' from one state to another.¹² The interweaving of inputs and outputs creates positive feedback, as signals crisscross the system and redouble upon themselves, causing unforeseeable transformations: this brings about 'the immense expansion of the acoustic domain...which can neither be imagined nor attained through other than cybernetic means'.¹³

These rather abstract aesthetic postulates begin to make sense only in the context of their technological realisation. This requires a brief return to Kayn's biography. In 1970, he took a position as a programme director at the Goethe Institute in Amsterdam, relocating to the Netherlands, where he would spend the rest of his creative life. In the same year, he was invited to work at the electronic music studio of the Institute of Sonology in Utrecht, where he joined two other German expatriate composers, Gottfried Michael Koenig and Konrad Boehmer. Over the course of a decade of work at the Institute of Sonology, Kayn created a series of electroacoustic compositions in which he elaborated his concept of cybernetic music: *Monades* (1971), *Simultan* (1970–72), *Eon* (1975), *Makro I-III* (1977), *Infra* (1979–80), and *Tektra* (1980–82). Ironically, though the Institute would become well-known in the mid-1970s because of the computer programs for algorithmic composition and digital sound synthesis developed by Koenig, Barry Truax, and others, it was the studio's analogue equipment that made possible Kayn's long-awaited realisation of cybernetic

11. Kayn, *Infra*.

12. Kayn, *Elektroakustische Projekte*.

13. Kayn, *Tektra*.

immunity to
time 132;

music.¹⁴ In the late 1960s, the studio had been outfitted with a sophisticated voltage-control system of modular units, such as oscillators, filters, envelope generators, and logic circuits. At the centre of this configuration was a 'variable function generator', essentially a primitive sequencer that could be programmed to store a series of voltages that were then used to control the various components in the studio. In Karlheinz Essl's words, with this equipment 'one could implement an algorithm that produced sound in real time'.¹⁵ In the Utrecht studio, Kayn could map out sonic scenarios whose results would be neither fully random nor fully predetermined, but rather 'guided' or 'steered' in the etymological spirit of cybernetics. This was the technological basis of what Kayn called the 'programming of the unprogrammable': configurations whose temporal development was unforeseeable on the basis of their initial conditions, including everything from the fundamental sound material, which determined the sonic character of the music, to the interconnections and feedback loops, which governed in a general way how the piece would unfold. Musicologist Frans van Rossum described Kayn's method:

[Kayn's] electronic pieces start by defining a network of electronic equipment. The nature of the network, and its inherent potential, play a large role in determining the audible result. Next, the composer collates the basic information about this network and develops a system of signals or commands that it can obey and execute. These have to be incorporated in a system of controllers, adjustments, and operations, which can realise the composition. This demanding work may take years of construction and tests, and when the system is activated, the resulting composition is recorded to tape only once from the beginning to the end. [...] The composer presents his music as an

14. From 1967 to 1969 Koenig, who had become artistic director of the Institute in 1964, composed a set of works, namely his eight *Funktionen* (Functions), that likely have the closest genetic relations to Kayn's cybernetic music. Koenig used the function generator to automate the production of sound material by applying its control signals to various inputs and recording the results, which were later spliced together to form completed compositions.

15. Karlheinz Essl, 'Algorithmic composition', in *The Cambridge Companion to Electronic Music*, eds. Nick Collins and Julio d'Escriván (Cambridge: Cambridge University Press, 2007), p. 123.



artifice which he constructs and sets in motion, but once he has done this, it is left to move through space, a 'free' music, which, like the fabric of the cosmos, follows its own internal laws and conditions.¹⁶

The product of Kayn's compositional work was not a symbolic set of directions, but rather a material-technological configuration of electroacoustic components and patch cables. The 'score' of the piece was identical to the particular configuration of units that generated the music. The instrumental apparatus of the electronic music studio is both the medium of the composition and its sonic source. Furthermore, the imperfections of analogue devices were the keys to a new kind of musical poetics, beholden neither to the control fetish of Western art music nor to its dialectical negation through Cageian indeterminacy. For Kayn, analogue electronics, with their 'integrally determined fluctuations' and 'relative instability in states of reciprocal interconnectivity', were aesthetically superior to digital components.¹⁷ Speaking of his composition *Makro*, Kayn wrote that 'the instability of electro-acoustical systems is calculated as a generative principle, as it were, up to and including malfunctions'.¹⁸ In this new paradigm, according to Kayn, 'The composer is entirely divested of his original function. He can merely decide whether to intervene, guide, and direct, or whether he is prepared to accept what emerges as an auto-generative procedure'.¹⁹ Kayn's compositional technique, predicated on the unique generative properties of analogue components, thus constitutes a remarkable rejection of the implicit teleological arc of electronic music. At the very historical moment of the ascendancy of digital sound technologies, Kayn's music inaugurates the valorisation of the analogue that would become one of the most unexpected and characteristic tendencies in electronic music of the last quarter of the twentieth century.

16. Frans van Rossum, liner notes, *Roland Kayn: Tektra*, Barooni CD BAR 016.

17. Roland Kayn, 'Soziologische-, technologische- und aesthetische Aspekte akustischer Innovation am Beispiel eigener Werke', <http://www.kayn.nl/publications.html> (accessed 20 December, 2011).

18. Roland Kayn, album cover, *Makro*, Colosseum LP SM 1477.

19. Kayn, 'Soziologische-, technologische- und aesthetische Aspekte...'

our linear way
of regarding
time 143;

Kayn's compositional poetics have direct implications for the audition of his music. According to Kayn, the generative self-formation of cybernetic music should be mirrored by the listener's act of perception:

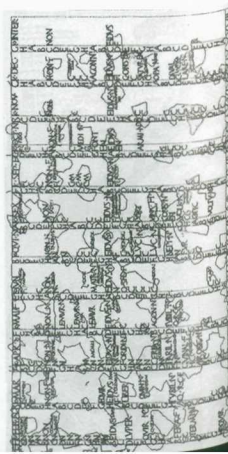
The characteristic impression made on the listener by sound events which arise in this way seems to be one of simultaneity or dependence between control structures and program structures – that is, the fact that the process of creation is integrated into the acoustic supersignal, and remains transparent. The control structure lies within the range of audibility, thereby forming an integral component of the generating process. The listener is thus able to follow the compositional process as it develops; the acoustic construct is hence made more lucid and more of a total auditory experience for the listener – the acoustic sphere is, so to speak, 'socialised'.²⁰

Like American minimalist composers such as Steve Reich, Kayn intends the generative process behind the music to be apparent on the perceptual surface. But while minimalist music generally unfolds in a linear fashion from an initial temporal disjunction, Kayn's notion of process encompasses not only growth-like accumulations but also the 'sudden leaps' typical of nonlinear interactions. This difference is made clear in Kayn's distinction between two models of musical temporality: a conventional 'running down' (*Ablauf*) as the reservoir of potential energy contained in the score is converted into acoustic waves, and an inverted temporality unique to cybernetic feedback processes, which Kayn characterises as a 'winding up' (*Aufzug*), the before-your-ears unfolding of electroacoustic signal chains.²¹ The cybernetic system manifests a capacity for negentropic rejuvenation, which for Kayn signals nothing less than the 'suspension of the opposition of automatic ('dead') and anthropoetic ('living') systems'.²²

20. Kayn, *Elektroakustische Projekte*.

21. Kayn, 'Soziologische-, technologische- und aesthetische Aspekte...', and *Elektroakustische Projekte*.

22. Kayn, *Simultan*.



Kayn asserts that 'the electronic system develops a sort of capacity to think for itself, a capacity which in a sense can be described as artificial intelligence [...] Existential Being, as it were, takes the place of a logically functioning consciousness'.²³ Music appears not as a means of subjective expression, but rather as a mode of knowledge, something like the act of epistemological 'unveiling' that Martin Heidegger identified as the essence of technology.²⁴ Kayn's cybernetic configurations could thus be heard as the Aeolian harps of the information age, instrumental means of channelling naturally occurring sonic forces. This metaphorical image corresponds to the typically slow and drone-like character of Kayn's music, resembling an eerily flowing stream intermittently disturbed by eddies and vortices. (Van Rossum describes Kayn's trademark sonority as a 'continually changing resonating structure', while Massimo Ricci refers to 'the tonal instability, that familiar slow oscillation that seems to be the *anima mundi* in Kayn's work'.²⁵) This music lives in the *longue durée* of musical time, unfolding over vast temporal expanses, from the typically 20- or 30-minute length of a single work to the over five-hour duration of his 1982 magnum opus *Tektra*.

The peculiar sense of time articulated in this music has to do not merely with the sheer chronological spans it occupies, but also with its pace of information and its characteristic sonic gestures. The temporality projected in Kayn's music sometimes suggests macro-historical biological processes, as in *Eon* (1975), where the distorted song of circuits fluctuates between states of relative chaos and order, seeming to break down and reconstitute itself through the blind groping of a quasi-evolutionary sentience. In other pieces, such as *Apeiron*, the final part of *Infra* (1979–80), we are confronted with a sonic image of geological time, in which the epochal drift of millennia is suddenly riven by catastrophic blasts and tectonic stridulations. According to Kayn, 'the electric current has no memory, is governed only by the present, and is

a single,
timeless
instant 143;

thus in great measure authorised to unleash improbable phenomena'.²⁶ Through the apotheosis of human artifice, Kayn's music aims to confront us with an experience of time almost beyond human conception: *kairos*, the unforeseeable and unrepeatable event.

Just as Kayn's music purported to reverse the entropic arrow of time, the flows of aesthetic influence in the Internet age promise to scramble all attempts at neat, linear models of artistic development, let alone 'progress'. Turning, in conclusion, from the short time span of musical perception to the long time span of reception, influence and dissemination, we must confront the fact that Kayn remains a musicological nonentity, in spite of his engagement with many of the major musical and aesthetic currents of his time, and the radical implications of his work for some of the basic categories of Western musical thought. He is nowhere to be found in histories of electronic music, and his recordings are unavailable, even in most university libraries. To some extent, this fate could be seen as self-imposed: Kayn made little effort to accommodate himself to the demands of contemporary musical life. He presciently believed that the future of music lay outside of traditional 'high culture' institutions such as orchestras and concert halls, and his invocations of 'environmental music' and 'house music' (*Hausmusik*, i.e., domestic music-making) demonstrate a striking affinity with the emergent discourses of soundscapes and ambient music that were percolating alongside his work in the 1970s. In response to the stultifying productions of mass media, whose deleterious effects he compared to environmental pollution, Kayn envisioned a '*musica nuova reservata*' created for the delectation of self-selected circles of acoustic initiates. Not surprisingly, then, Kayn's vision of the reception of his own music ultimately took the form of a rather extreme fatalism: he invoked the quintessentially Adornian notion of the 'message in a bottle' (*Flaschenpost*) to describe his work, 'which no longer knows of any recipients and perhaps reaches only those who possess the appropriate antennae for deciphering its message'.²⁷ And indeed, the metaphor of

23. Kayn, *Elektroakustische Projekte*.

24. See Martin Heidegger, 'The Question Concerning Technology', in *Martin Heidegger: Basic Writings*, ed. David Farrell Krell (San Francisco: Harper, 1977), pp. 283–317.

25. Massimo Ricci, 'The Significance of Roland Kayn's "Tektra" in the History of Contemporary Music and its Effect on Conventional Rules of Sound Perception', <http://www.kayn.nl/literature.html> (accessed 28 December 2011).

26. Kayn, 'Soziologische-, technologische- und aesthetische Aspekte...'

27. Kayn, 'Soziologische-, technologische- und aesthetische Aspekte...'



the message in the bottle has proved strikingly apt for the reception of Kayn's music, which has emerged from oblivion into the ears of early twenty-first-century listeners (the author included) via digitised versions of out-of-print LPs made available on blogs devoted to forgotten artefacts of experimental music.

Kayn's enduring obscurity is all the more perplexing considering the undeniable links connecting his work with both contemporary and later trends, from live computer music based on algorithmic principles to the emergence of drone-based, ambient, and generative music. The sonic surface of Kayn's most understated pieces could be compared to the slowly morphing drone textures of French composer Eliane Radigue, created in parallel with Kayn's work in the 1970s. His technical vocabulary resurfaces, albeit in a very different aesthetic context, in the American 'computer network band' known as the League of Automatic Music Composers (1977–1983), and its later offshoot, The Hub. Perhaps the most intriguing affinity with Kayn's work, however, is found in the American 'live electronics' school that formed in the late 1960s around David Tudor, which shared with Kayn the project of exploring what Nick Collins has called 'the music implicit in technology'.²⁸ These demonstrable parallels with Kayn's work notwithstanding, one might reasonably share the composer's belief that, in the famous words of Gustav Mahler, 'his time will come'. Writing in the final years of the twentieth century, Kayn lamented the backwardness of music in responding to the technological situation of the information age and modestly framed his work as the foundation for later developments as yet impossible to predict. His own contribution was only 'the beginning of an evolution whose future course can at present hardly be foreseen'.²⁹

28. Nicolas Collins, 'Live Electronic Music', in *The Cambridge Companion to Electronic Music*, p. 46. Certain of Kayn's works, such as *Monades*, betray a striking sonic affinity to the chirping menagerie of electronic sound in Tudor's contemporaneous works from the 1970s.

29. Kayn, 'Soziologische-, technologische- und aesthetische Aspekte...'

Time itself was
disrupted 148;

