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The Beginnings of Electronic Music in Japan, with a Focus on the NHK Studio: The 1950s and 1960s

This article is based primarily on acoustic experiences associated with the research of sound documents, which is part of my task as an independent multimedia producer. The historical information here derives primarily from interviews I conducted, in many sessions over the period between 1986 and 1995, with the distinguished composers Toshiro Mayuzumi (1986), Makoto Moroi (1992), Minao Shibata (1986, 1987, 1989a, 1989b, 1991, 1993, 1994), Toshi Ichiyanagi (1989), Yori-Aki Matsudaira (1987, 1991), Joji Yuasa (1987), Katsuhiro Tsubono (1987, 1993, 1994), Yuji Takahashi (1987, 1993), Takehisa Kosugi (1993), Mieko Shiomi (1993), Shiuko Mizuno (1993), Keiki Okasaka (1987), Isao Tomita (1993), and Satoshi Sumitani (1992); as well as with former sound engineers at Nippon Hoso Kyokai (NHK), the national radio and television network of Japan: Hiroshi Shiotani (1988, 1990, 1992), Yoshinori Ando (1988), and Shigeru Sato (1992, 1993); and, finally, with the former director of the electronic music studio at NHK, Wataru Uenami (1986, 1988).

Once collected, this information was completed and verified by consulting the documents listed in the References list, among others. It is, however, possible that errors have slipped into the article, because the stories of composers and engineers, on the one hand, and the writings of different periods, on the other hand, sometimes contradict one another, making it impossible to determine which version of the facts is correct. What is more, witnesses of this period are increasingly rare, and objections

Translated from the French by Curtis Roads, with assistance from Brigitte Robindoré.

Computer Music Journal, 21:4, pp. 11–22, Winter 1997 © 1997 Massachusetts Institute of Technology to existing historical data even more so in a society where debate, discussion, and objection are not recognized social values. Sound documents and interviews are the basis of this article. Besides the tapes preserved in the NHK Studio, few sound documents are available. I have thus kept almost exclusively to works realized in the NHK Studio.

Creation of the NHK Studio and the First Works of Electronic Music

The NHK Studio was founded in 1955 on the model of the Nordwestdeutscher Rundfunk (NWDR) in Cologne. In 1955, the internal mission statement, "Technische Hausmitteilungen des NWDRs-Sonderheft über elektronische Musik" (1954 N. 1/2) was translated into Japanese by a group of NHK technical engineers, in the form of a booklet. Two articles by Robert Beyer also circulated in the milieu of Japanese composers, and were originally published in the journal Melos: "Zur Geschichte der elektronischen Musik" (Beyer 1953) and "Elektronische Musik" (Beyer 1954). A first study for electronic sounds, Experimental Music, was realized in 1954 by the members of the technical staff of the NHK, but the first musical work by a composer seems to be that of Toshiro Mayuzumi (1929-1997).

Three works by Toshiro Mayuzumi date from 1955: Music for Sine Waves by Proportion of Prime Numbers, Music for Modulated Waves by Proportion of Prime Numbers, and Invention for Square Waves and Sawtooth Waves. (The English translations of these pieces' titles are borrowed from Shibata 1971.) These three etudes followed a progression, from simple to complex. The first etude,

composed entirely with sinusoidal waves, was based on the work Studie I by Karlheinz Stockhausen (1953) and referred to the principle of Fourier analysis. However, one senses how the composer adopted theories coming from the Occident only as a formal framework, which is in fact nothing but a linear juxtaposition of sinusoidal sounds. In the second study, the composer introduced electronic modulation to enrich the spectra, without ever trying synthesis starting from an elementary spectral unit such as a sine wave. Despite the explicit reference to Karlheinz Stockhausen, the theoretical aspect-central to the German composer's studies—is totally left aside in favor of the immediate acoustic effect. In the third study, a "Monochord"-a keyboard controlling sawtooth-wave generators—intervenes. This was easy to manipulate, because it involved the realization of melodic patterns. Melodic contours, glissandi, and impressionistic effects give this part a certain "classic" character, in the sense of the Occidental classical structure, and this etude is dedicated to Bach, as its title. Invention. indicates.

During the realization of this work, Makoto Moroi (b. 1930) made a trip to Germany to witness the performance of his piano piece Piano no Alpha to Beta at the International Society for Contemporary Music (ISCM) festival in Baden-Baden. On his way home, he passed by Cologne, where he visited the NWDR studios. There he encountered Herbert Eimert and Karlheinz Stockhausen, as well as the sound engineer Heinz Schütz, who gave him technical information on the equipment and working methods of the NWDR. Upon his return to Tokyo, the NHK commissioned him to realize a piece of electronic music in collaboration with Toshiro Mayuzumi, Variations of 7 (Shichi no Variations, 1956). This work was the object of many commentaries and polemics in the Japanese musical press.

Variations of 7 is based on the compositional technique of Karlheinz Stockhausen's *Studie II* (1954). If this latter piece took as its point of departure for serial construction the number five, Makoto Moroi and Toshiro Mayuzumi chose the number seven. It goes without saying that the frequencies, durations, amplitudes, and timbres were controlled by the number seven, as was the macro-form of the

work. This form was conceived in seven parts, the first six realized by Makoto Moroi and the seventh by Toshiro Mayuzumi. Nevertheless, once again, this is relative, since in constructing a form related proportionally to the number seven, the composers saw fit to regularly double the length of each section to obtain the length of the following section, starting with 7 sec for the first and finishing with 448 sec for the seventh section. I consider it important for the understanding of the development of electronic music in Japan to emphasize how little importance theoretical ideas have in the eyes of its composers. In general, they serve only as alibis for intuitive compositional methods-as a kind of seal of approval or "Western guarantee," which reveals both a fascination with and an undiscerning acceptance of Western cultural products.

This work, *Variation of 7*, also follows a progression from the simple to the complex, as Makoto Moroi was more attached to the rigidity of serialism than was Toshiro Mayuzumi, who was more attracted to French impressionism and classicism. The relations of the sections between themselves is relatively loose.

Later, in 1962, Makoto Moroi, unconvinced by this collective work and by the artistic effectiveness of choosing the number seven, returned once again to the principle of serialism and to the model of Karlheinz Stockhausen's *Studie II* to realize a second electronic serial music work, *Varieté*. This work has as its basis the number five. One finds in *Varieté* the sense of humor proper to a composer who willingly called himself "Makotonio Monroi" in his journalistic activities. The structure, in brief sound capsules, makes one think of "electronic haiku" (haiku are traditional short Japanese poems).

Electronic Music before the NHK Studio

These works were the first landmarks on the path of electronic music in Japan. Nevertheless, the electronic sounds do not appear out of nowhere, nor are they solely influenced by ideas and knowledge received from the West. Few documents remain on this subject, but it appears that during the pre-war

Figure 1. Sound engineers at the NHK Studio, March 1959. Standing, left-toright: Hiroshi Shiotani, unidentified person, Takeshi Fujita. Sitting: Tsukasa Takasuji. The equipment rack at the right contains the vacuum-tube mixer. In the back is the Melochord, a six-channel sine-wave generator. The keyboard instrument at the left is the Monochord, a keyboardcontrolled sawtooth-wave generator. A vocoder is installed in the rack behind Mr. Shiotani.

Figure 2. The NHK Studio in 1966.





era a radiophonic genre called "Radio Manga" inspired the creation of rather inventive sound effects in the radiophonic studio (Sato 1992). "Manga" is the name given to Japanese comic books. In another domain, this time outside the sphere of radio, research on the vocoder contributed to the development of the electronic signal. The objective of the research was to create an acoustic language similar to that of whales, with the help of the vocoder. The hope was to locate whales more easily by transmitting these electronic signals underwater (Sato 1992).

At the time of the founding of the NHK electronic music studio in 1955, the electronic equipment was, according to Minao Shibata, the following (Shibata 1971, 1974a): a Melochord (a generator of sine waves in groups of six), a Monochord (a sawtooth-wave generator controlled by a keyboard), various oscillators, a filter bank with 32 band-pass filters, a ring modulator, and tape recorders (see Figures 1, 2, and 3). Part of this equipment was found randomly scattered in the hallways in front of Studio 10, at the old address at Chiyoda Ku, Uchisaiwai Cho.

Later, in 1968, the studio moved to its present address in Shibuya Ku, Jinnan Cho. One notes at this time the presence of new devices, in particular the Photoformer for graphic sampling of acoustical data (constructed by the technical group of the NHK), and a six-track tape recorder, one track of which was used as a control track. At the time of the move in 1968, the equipment included the items shown in Table 1 (document provided by the NHK, 1992).

First Experiments with Musique Concrète

Let us now return to the beginning years of electronic music, to speak this time of the experiments in musique concrète. From 1951–1952, Toshiro Mayuzumi studied at the Paris Conservatory. During this period he had the chance to attend the first concert of musique concrète at the Salle Gaveau, in May 1952. The sound material and the new horizons that this music offered the composer were a revelation to him, and he visited Pierre Schaeffer in his studio. Upon his return to Tokyo, Toshiro Mayuzumi applied these new techniques to the realization of a musique concrète work entitled X, Y, Z (1953), which was a commission of the Nihon Bunka Hoso (JOOR, Cultural Broadcasting Japan). X, Y, Z is a three-part work. The first part is a rhythmic assemblage of metallic sounds, sounds from metallurgy factories, airplanes, sirens, office alarms, and human cries, to which are added a chamber orchestra, a Gagaku ensemble, and a Theremin. The second part departs from this "mechani-

Figure 3. Another view of the NHK Studio in 1966. At left is the Melochord. The left equipment rack contains a low-frequency function generator, bridge, ring, and balanced modulators, a third-octave filter, and a random rhythm generator. The next rack contains a "flip-flop oscillator," a variable-frequency filter, and an octave filter. The third rack from the left contains a linear amplitude modulator. The



cal" universe, as the composer himself described it in an NHK radio broadcast during this period, to come upon the world of humans (laughter, crying, exclamations, speech, etc.) and animals (dogs, chickens, and cranes) with the participating sounds of a chamber ensemble. The third and last section is a composition based on instrumental elements produced by a dodecaphonic violoncello solo. The instrumental material is subjected to dodecaphonic principles, after which it is submitted to the transformations of musique concrète. Using a posteriori reasoning, it seems that the progression of the sonic material, which contrasts in a dualistic manner with the mechanical, the human, and the "musical," signifies a type of imagery of the 1950s in which nature was considered at once the antagonist and the partner of new technological advancements.

I have referred to X, Y, Z as though it were the first work of *musique concrète* in Japan. In fact, before this date, one finds mention of a work by Yasushi Akutagawa (1925–1989), *Music for Microphone*, in the program of a concert organized by the Jikken Kobo (Experimental Workshop) on 6 February 1956 at Yamaha Hall in Ginza (Jikken Kobo 1956). The title of this concert, the first of electronic and *concrète* music in Japan, was "*Musique Concrète*—Denshi Ongaku Audition." The interdisciplinary group Jikken Kobo, founded in 1952, included among others the composers Toru Takemlower parts of each rack contain the power supplies for the vacuum-tube circuitry.

Table 1. Electronic music equipment at the NHKStudios, 1968

Generators white-noise generator pulse generator square-wave generator sawtooth-wave generator multifunction generator Photoformer (optical sampling device constructed at NHK) Filters four high-pass/low-pass filters Mel-band filter 1/3-octave-band filter octave-band filter variable-frequency filter *Modulators* linear amplitude modulator ring modulator Tape recorders variable-speed tape recorder six-track tape recorder mono tape recorders stereo tape recorders

itsu, Joji Yuasa, and Hiroyoshi Suzuki, the critics Katsuhiro Yamaguchi and Kuniharu Akiyama (d. 1996), and the performers Takahiro Sonoda and Sumiko Nagamatsu (Yamaguchi 1956; Uenami 1985). The French term musique concrète in a Japanese context seems due to the composer Minao Shibata. The program also included an experimental work by Hiroyoshi Suzuki with "auto slide projectors," adventures of eyes of mr. W.S., a Test-Pilot [sic] (1953). These same "auto slide projectors" appear in a musique concrète work from the same year by Joji Yuasa, Resupyugu—Mishiranu Sekai no Hanashi (1953) (Galliano 1992a). Musique concrète and multimedia performance therefore existed as early as 1952 in the context of the Jikken Kobo group. Music for Microphone by Yasushi Akutagawa dates from 1952. The program notes, written by the composer himself, describe the work as a piece that experiments with the possibilities of magnetic tape and voice, destined to be broadcast by the NHK radio program "Ongaku no Atelier" (Studio Music). As far as I have been able to deter-

mine, no existing sound document allows for more precise identification of the work on either a technical or an artistic basis. A recent publication mentions, among others, two works for microphone dating from this same year: the *Suite for Microphone* by Shiro Fukai, and *Magnum, Music for Mikrophone [sic]* by Saburo Tominaga (Sawabe 1992).

Following X, Y, Z, Toshiro Mayuzumi composed a second musique concrète work in 1954, again a commission of the JOQR. This work is a radiophonic drama based on the libretto *Boxing* by writer Yukio Mishima.

Looking toward the NHK Studio, the first work to be realized was by Minao Shibata (1916-1996). Rittai Hoso no tame no Musique Concrète (Mus*ique Concrète* for Stereophonic Broadcasting, 1955). [Editor's note: An excerpt of this composition appears on the Computer Music Journal Sound Anthology CD, Volume 21, 1997.] Here again, the work consists of three sections which contrast time and again the themes of nature, living organisms, and mechanical devices. The antagonistic juxtaposition of themes appears to be popular during this experimental time. To cite only one aspect of the work, the rhythm of a beating heart superimposed upon that of a clock's hands expresses, according to the composer, the paradox of a finite life in opposition to the infinitude of space and time. The compositional principle is serial (Shibata 1974b).

Beyond these compositional details, the work signals a date in the history of electronic radiophonic music in Japan, in that it puts the medium of radio to use as it is—as a channel for sound transmission with its own intrinsic technical capacities. I use the term "electronic radiophonic music," because one of the conditions of access to the NHK Studio for composing electronic works was that the works be broadcast via radio transmission. One of the intrinsic technical capacities of the medium of radio is that of broadcasting in stereo, or rather on two channels, for at this time, although one was certainly familiar with the two-channel tape recorder. there was as yet no consideration of stereophonic radio broadcast. The principle was as follows: the sounds to be broadcast were recorded separately on the two channels of a tape recorder and rebroadcast

independently on two different frequencies of the NHK—the Dai Ichi (first station, 594 kHz) and the Dai Ni (second station, 693 kHz). The listeners, who were supposed to have two radio receiving sets, adjusted the two frequencies according to a tuning signal sent out by the transmitters. They could thus listen to the radiophonic message as a simulated stereophonic image.

The technical concept, implemented about the same time as the creation of Minao Shibata's work, was used for the regular program "Rittai Hoso Do" (The Place of Stereophonic Music). It is said that sports matches rebroadcast using this method enjoyed a certain notoriety. It is worth remarking that the term "rittai," which is commonly translated in the musical world by "stereophonic," has two meanings: "bi-dimensional" and "cubist." A cubist *musique concrète* for radio broadcasting? This idea seemed to please the renowned composer and musicologist Minao Shibata.

The third musical notable to have brought musique concrète upon the scene was Toru Takemitsu (1930–1996). While Mr. Takemitsu never worked with pure electronic music, he was attracted to the inherent semantic connotations of concrète sound material, and to the sound-object connotations that linked him to the world of graphics and visuals. As early as 1948, he began making daily tape recordings, without taking the step of individualizing his expression within this medium. His output is mainly in the domain of film or theater music. He composed, to cite just a few works, musique concrète for the drama En (1955, libretto by Inoue Yasushi), which became in the same year the independent work Relief Static, as well as musique concrète for the theatrical piece Eurydice by Jean Anouilh in 1956. In collaboration with the poet Shuntaro Tanigawa, he produced the tape works Vocalisme AI, Ki, Sora, Uma (Tree, Sky, Horse; Shin Nippon Hoso) and Clap Vocalism (Shin Nippon Hoso). All three works date from 1956. The acoustic part of the 1957 radio drama Aru Otoko no Shi (libretto by poet Shuntaro Tanigawa, with a scenario inspired by the story of Billy the Kid) became the tape work Sky, Horse, and Death in the studios of the NHK in 1958. The production is extremely visual and anecdotal.

Let us now conclude our discussion of the experimental period of *musique concrète* and electronic music in Japan. Quickly the composers Makoto Moroi and Toshiro Mayuzumi, in particular, grew weary of the theoretical ideas imported from Europe—ideas which they incorporated into their work only as a concession to the musical trends coming from the West.

The "Return to the Source" Movement

As early as 1957, Toshiro Mayuzumi began to turn toward the resources of Japanese music to find an identity for Japanese electronic music. Beginning with this date, a series of works that marry the techniques of Western electronic music to the principles, or rather the sounds, of traditional Japanese music, was created in the NHK Studio. The first attempt in this new direction was Toshiro Mayuzumi's work Aoi no Ue (1957). The title was borrowed from a 15th-century Noh theatrical work; the composition is an acoustic-electronic reconstitution of the traditional Noh play. The recitative is interpreted without subsequent electronic modification by three performers from the Kanzei group (Kanzei Ryu, Kanzei Hisao, and Kanzei Hideo), and is recorded onto magnetic tape. The accompaniment is produced synthetically: the Noh flute (Nohkan) is synthesized using sine waves, and the tsutsumi taiko (a two-sided drum lace used in the Noh theater) is simulated by click noises fed through a band-pass filter and an echo device.

The second work that I wish to present in this current is *Campanology*, by Toshiro Mayuzumi (1959). In *Campanology*, the composer attempts to group the sounds of bells, recorded in Buddhist temples throughout Japan, into a melodic pattern with indeterminate frequencies. He is confronted here with the paradoxes of acoustic perception: Asian temple bells are relatively indeterminate in their pitch, and their timbre varies considerably between the attack and the resonance, in the form of a slow modulation of the sound. The result is that while changing the recording speed to adapt the bells to the desired pitches of the melody, the composer obtained sounds whose resonances rose or fell abruptly and vibrated in a somewhat unnatural way—which did not correspond to the original idea. To circumvent this problem, Mr. Mayuzumi decided to separate the attack from the resonance of the sounds, replacing either one or the other by synthetic sounds, or even by the sounds of Western church bells, which he found more precise in pitch and more stable in resonance. Outside of cases such as this one, where the composer is faced, despite himself, with a specific problem to resolve, few Japanese composers questioned themselves on the issues of acoustic perception when working with *concrète* or electronic sounds. In many cases. they appeared to let chance dictate the results of their experiments, linking their resultant sounds according to the inspiration of the moment. The absence of preconceived outlines or underlying theoretical ideas allowed them to elude a confrontation between idea and result, between theory and practice.

Campanology served as a study for the realization of a work commissioned by the 1964 Olympic Games in Tokyo, *Olympic Campanology* (1964, four channels), and later for the work *Campanology for Multi-Piano* (1967). In this last version, the composer took the problem the other way around. Instead of attempting to create a determinate-pitch melody with sounds having relatively indeterminate pitches, he set about to create a melody based on relatively indeterminate sounds, similar to bells from Buddhist temples.

As with the "sound breaker" of which I will speak later, and as with the Photoformer or the sixchannel tape recorder, the Multi-Piano is an internal technical creation of the NHK. With the idea in mind of creating a prepared electric piano, the technical crew furnished the 88 strings of a piano with magnets, which were electrically connected to devices such as filters and modulators that transformed the sound electronically. *Campanology for Multi-Piano* is a live electronics piece.

The third work of which I would like to speak is Shosange by Makoto Moroi, a much later work dating from 1968. [Editor's note: An excerpt of this work appears on the Computer Music Journal Sound Anthology CD, Volume 21, 1997.] Shosange is the title of a piece of music from the repertoire of the Tendai and Shingon Buddhist sects. For Mr. Moroi, the idea of returning to Japanese sources

takes as its object the traditional Buddhist ceremony of the Mizu Tori—a ceremony of purification by water and fire that takes place annually during the months of February and March in the Todaiji temple in Nara. Karlheinz Stockhausen participated in this ceremony during his stay in Japan in 1966.

A special set of instruments are used for this ceremony: the horagai (a conch shell primarily used during Buddhist ceremonies), a shakuhach (the Japanese bamboo flute), and a futozao shamisen. The shamisen belongs to the lute family, has three strings, a long fingerboard, and a small resonant body covered with cat skin. The strings and the cat skin are simultaneously struck with a plectrum that can weigh up to 300 g. "Futozao" means "thick strings." The futozao shamisen is the bass instrument of the shamisen family. It is primarily used during the epic recitation of the Bunraku theater (the Japanese doll theater). The work Shosange is based on the electronic transformation of sound sources by means of echo, filtering, and ring modulation. Makoto Moroi's point of view was the following: rather than attempt to artificially recreate a complex spectrum by using primal elements such as sinusoidal tones-whose final result would be spectrally poor and inferior to natural sound—it was preferable to begin with naturally rich material (for example, the sound of a shakuhachi), and subsequently sculpt it. The shakuhachi held special interest for Mr. Moroi due to its spectrum, which is rich in harmonic partials and white-noise zones. Here we find a similar point of view to that of Toshiro Mayuzumi, and quite far from that of the Western theoretician-composers, although both composers freely referred to the Western model at the level of formal structure. They sought to use the natural material as it was and to find the quickest route to sonic expression, while certain Western composers sought above all to construct a system that would be subsequently justified by compositions elaborating it and the theoretical ideas that supported it.

These three works are extremely interesting from an acoustical and historical/political point of view; perhaps, particularly, for non-Japanese listeners. Why? Because, to a certain extent, non-Japanese listeners are less conscious of the impasses of this tradition, whose elements are employed in a rudimentary way—that is, without prior clarification as to their semantic and sociocultural connotations. The question that remains unanswered by the composer is whether the "raw" use of these traditional schemes is compatible with thought that is turned toward the future. This type of question does not even appear to be posed within the Japanese culture.

Aoi no Ue by Toshiro Mayuzumi, for example, can be interpreted as a simple electronic retranscription of a game from traditional Noh theater, and *Shosange* by Makoto Moroi as a juxtaposition of traditional elements, elegantly merged due to the spectral haze of the electronic effects. It certainly must not be a coincidence to find that the movement of returning to the source, despite its illustration by interesting acoustic examples, has not experienced a decisive development in Japanese electronic music.

In other words, a dynamic approach to the use of traditional elements could have been brought about if the conditions had been fulfilled for a prior analysis of the sound material, its semantic articulations, and its roots in the traditional system. Yet this type of approach would appear to project a purely Western reasoning onto a sociocultural context that is, in fact, quite difficult to grasp. As I have already stated, analysis is not one of the valued characteristics of Japanese thought, and when it must nevertheless be dealt with, it appears to be looked upon with suspicion, as a kind of betrayal of "original" Japanese culture.

This may partly account for composers' reluctance to use Japanese instruments in contemporary music compositions. When dynamically inserted into a new approach without analysis, these instruments emerge within works as superimpositions of unstrained traditional residue. By carrying with them the entire halo of traditional connotations, they repel the composer—who thought thereby to elaborate a "different" and "new" world.

An Aesthetic Unique to NHK?

Let us return to the NHK Studio. With three works that tried to renew contact with Japanese tradition came the end of an era, because those were the first

Year	Composer	Title	Notes
1959	Makoto Moroi	<i>Pythagoras no Hoshi</i> (The Stars of Pythagoras)	Based on a poem by Tatsuji Ishihara
1959	Akira Miyoshi	Ondina	
1960	Makoto Moroi	Akai Mayu (The Red Cocoon)	Text based on a story by Kobo Abe
1960	Ioshiro Irino	Nami to Fue (Wave and Flute)	
1961	Makoto Moroi	Nagai Nagai Michi ni sotte (Alongside a Long, Long, Way)	Text based on a work by Wolfgang Borchert
1962	Makoto Moroi	Yamamba	
1964	Makoto Moroi	Kusabira	Text from a traditional Kyogen (the Kyogen is a type of comic interlude inserted within a Noh theater piece)
1965	Makoto Moroi	<i>Gyosha Phaeton</i> (Phaeton, the Chariot Driver)	
1972	Makoto Moroi	Waga Izumo	

Table 2. Radio dramas produced at the NHK using electronics

experiments with electronic and *concrète* music. and the first reflections on the identity of a Japanese electronic music. Contrary to the European studios, musique concrète, electronic music, radio dramas, spots for TV broadcast (Makoto Moroi among others), and film music existed side by side without apparent problem in the NHK Studio. This is due in part to the personality of its director, Wataru Uenami, who was the advocate of a "free set" studio, without predetermined technical, theoretical, or aesthetic agendas. In his conception, the ideal studio would be an empty one, in which specific devices would be placed when a composer requested them for a particular artistic production (Uenami 1993). Although this vision could not be realized on the level of the studio's equipment, it must be acknowledged that theoretical and aesthetic liberty were respected. No particular ideological barriers appear to have existed.

On the other hand, the absence of a mentor—a theoretician or researcher closely linked to the studio, as were Werner Meyer-Eppler in Cologne or Pierre Schaeffer in Paris—can be seen in the lack of focus and theoretical and aesthetic developments that would be unique to the NHK Studio.

The only characteristic feature that I have been able to discern is the curriculum of the studio's productions, which can, without a doubt, be attributed to the director's background. Wataru Uenami, schooled in literature, encouraged composers to write radio dramas that utilized electronic sounds, and to use the resources of traditional Japanese theater, such as the Noh or the Bunraku, in their electronic productions. *Aoi no Ue* by Toshiro Mayuzumi, *Kusabira* by Makoto Moroi (1964, based on a Noh/Kyogen theater piece), or *Mandara for Electronic Sound and Voice* by Toshiro Mayuzumi (1969) are a few examples, among so many others. The principal radio dramas using electronics and produced at the NHK are listed in Table 2.

These productions are, however, patterned on the traditional radio drama and, for the most part, make extensive use of the orchestra, to such a degree that it is difficult to classify them as "electronic music." The same holds true for a certain amount of mixed works, such as *Music for 12 Instruments and Electronic Sound* by Shiro Kon (1965) or *Kuroi So-In* by Shin-Ichi Matsushita (1959). This latter work used electronic sounds, the orchestra, a choir, and a speaker. Realized in the NHK-Osaka studio, it is subtitled *Composition with Voice (Koe ni yoru Composition)*.

The 1960s: Influence of American Ideas

In the turning point of the 1960s, we enter into a period marked by three events:

- 1. In 1961, Toshi Ichiyanagi (b. 1933), who studied between 1954 and 1957 at the Juilliard School in New York and was then in the entourage of John Cage, returned to Japan, where he began applying the ideas of Cage in the famous piece *Cage Shock* (Shibata et al. 1969).
- 2. The same year, the composer Iannis Xenakis visited Tokyo, invited by the Sogetsu Art Center. There he made a strong impression with his innovative ideas for musician-machine interaction and the use of computers in music.
- 3. In 1966, Karlheinz Stockhausen was invited to the NHK Studio in Japan for three-and-onehalf months (January to April) by Wataru Uenami. Mr. Stockhausen realized two works there, *Solo* (1966) and *Telemusik* (1966, fivechannel tape), which introduced the ideas of feedback and spatial distribution of sound, respectively. His influence was felt particularly in 1970 at the time of his performances at the Universal Exposition at Osaka. He also gave lectures on the techniques of electronic music, which influenced the configuration of certain Japanese studios.

These three events each had profound importance and left deep impressions on the later development of electronic music in Japan. Nevertheless, the ideas of John Cage, without a doubt, provoked the strongest repercussions in the musical domain. The Sogetsu Art Center, a multidisciplinary center counting among its team Toru Takemitsu, Yori-Aki Matsudaira, Toshiro Mayuzumi, and the art critic Kuniharu Akiyama, played an important role in the dissemination of John Cage's ideas, particularly in inviting him to Tokyo in 1962. For the first time since the birth of the NHK electronic music studio, one sees the ideas of America begin to filter into Japan. The 1960s subjected Tokyo to the attractions of "happenings," the group Fluxus, the aesthetic of the "ready-made," collage, and indeterminacy. At the same time, musical improvisation as a collective practice began to spread, and the group Shudan Ongaku (Group Music) appeared as a typical product of this period-a sociocultural novelty in a country still primarily concerned with serialism, French impressionist music, and the Groupe

de Six, within the context of the concert hall and the conductor.

Changes in Musical Aesthetics

Parallel Music (1962) by Toshi Ichivanagi is a work grounded in indeterminacy. Sounds follow one another without apparent links between them. Each source is treated independently according to the rules of chance, and evolves in parallel with the others, from whence the title, Parallel Music. In 1965, Toshi Ichiyanagi produced a second work in the NHK Studios, strongly influenced by John Cage's ideas: Kuu, translated at the time as the English word "Contemplation" (Uenami 1984a). The tape, lasting 61 min, consists of a calligraphy-writing session held before a microphone. Paper noise, office sounds, daily-life sounds, and the blurred signals from a short-wave receiver juxtapose and mix intermittently with the recording. The radio performance, improvised by the composer himself, is one of the works that Toshi Ichiyanagi more or less shuns today, but one that reflects in a characteristic way the sociomusical changes taking place during the early 1960s.

This same year, Yuji Takahashi (b. 1938) composed Phonogène for electronic sounds and an ensemble of 12 instruments (1962). The relationship between the electronic medium and the instrumental sources appears rather arbitrary, as the electronic and instrumental passages are simply juxtaposed. However, one can recognize the talent of this musician-composer in his handling of the acoustic aspects of the electronic passages within a confined zone between the human and the machine. The electronic material is an accumulation of brief, extremely rapid, and vibrant rhythms, bearing the stamp of probability calculus. On a secondary level, one can perceive that the rhythm is animated by a commonplace conversation: a window opened on the daily life and agitation of the street. Yuji Takahashi had just debuted as a pianist in 1960, wearing a red shirt that symbolized his sympathy with the currents of social agitation in the 1960s and his openness toward the outside world. The rapidity with which the piano sound grains fly

by—reaching the limits of human performance and approaching the realm of artificial performance—reveals a penchant for the machine-performer ideal, reflecting the influence of his 1961 meeting with Iannis Xenakis.

If Toshi Ichiyanagi and Yuji Takahashi's approach to the electronic medium was intuitive, one could find in Joji Yuasa (b. 1929), who spent many years in the USA, a concern for overall form and the relationship between sonic detail and global structure. One can speak here of the work *Projection Exemplastic* (1964), a composition based at the start on sinusoidal tones. The question can be posed: Is it possible, by adding sine tones—the microscopic element of the spectrum—to create a continuum in the spectral domain, a kind of sound cluster that sweeps continuously across the space between two points in the acoustic domain?

This is the problem of the sound continuum and the malleability of acoustic sound material by the application of the 20th-century's new technical and theoretical knowledge—a problem that profoundly interested the European post-war composers, among whom were Iannis Xenakis, György Ligeti, and Karlheinz Stockhausen. For Joji Yuasa, the point was to render audible the space that exists between two points of the acoustic domain—a music stressing difference, or "differential music" (Sato 1992).

A second work by Joji Yuasa composed during this period attempted to demonstrate the universality of sound material by verifying the principle in the opposite, subtractive way. Would it be possible, by filtering, to carve out white noise-that macroscopic material theoretically containing all the frequencies of the spectrum—to obtain a continuum that linked all the discrete points of the sound domain? And if so, would this glissando be perceptible in an acoustically equivalent way to that which is created by the addition of sine tones? The answer was the work entitled *Icon*, composed in 1967 in the same NHK Studio. The experiment was, however, not conclusive as to the verification of this theoretical idea, and the dream of the 1950s was left in suspense. This dream incorporated the continuum of sound material and the existence of a minimal element, an atom of musical material

which, by its universal quality, would allow for the equivalence between the two results.

Two other works representative of this epoch are *Transient '64* and *Assemblage* by Yori-Aki Matsudaira. Born in 1931, Yori-Aki Matsudaira is a self-taught composer with multiple interests. He turned time after time to the different styles arriving from the West—the 1950s serialism, the indeterminacy of the early 1960s, and the collage art inspired by the ideas of Robert Rauschenberg in the mid-1960s, to cite just a few of the first steps of his evolution.

In Transient '64, Yori-Aki Matsudaira dealt with a technical problem concerning acoustic perception: capturing what is unstable in a sound in its transient phases. To do this, he used sine-wave generators, which at that time contained vacuum tubes. The effect of these tubes was that the sound, once set in motion, took a certain amount of time to reach a stable state—and it is just this period of instability between two stable states, the sound transient, which Yori-Aki Matsudaira wished the listener to perceive. Indeterminacy and chance operations controlled both the contour of the events and their ordering. On the technical level, the composer used a six-channel tape machine that had recently been conceived by the NHK team and which was to serve for the composing of Karlheinz Stockhausen's Telemusik (1966) and for Joji Yuasa's Icon (1967).

On the level of acoustics, the work explores the thresholds of the human ear's perception, the threshold between the audible and inaudible. The composer's notes refer to the Fletcher-Munson curves of loudness perception. In Transient '64, the composer sought to surpass the deeply rooted dualism found in the mentality of the period-the dualism that I already mentioned when speaking of the concrète music of Toshiro Mayuzumi and Minao Shibata, which contrasted instrumental music with electronic music, "human" music with "mechanical" music. To achieve this, he used transition procedures and indeterminacy, which, by their vague and organic values, would help to overcome the rigidity of the mechanical world and orient the work toward a more supple domain, closer to human-life processes.

Assemblage, also by Yori-Aki Matsudaira, realized in 1968 in the NHK Studio, again takes up the principle of chance operations, once more emphasizing the "art of combination." Several types of sound material are combined together: ready-made music (such as rock), voices of announcers, sounds created by the Photoformer described above, and amplified sounds from everyday life. Here also, the composer is interested in the transients of perception, in his use of a fictional device called the "sound breaker." The sound breaker is simply a means of artificially creating zones of instability in sound by using defective machines, such as deteriorating microphones or speakers. It appears that the sound breaker was also used in Transient '64, but the composer's testimony and that of the NHK technicians are contradictory, so the technical means of the work must remain a mystery. Perhaps it is simply a studio gag that was passed along as a historical fact . . . Yori-Aki Matsudaira speaks of these two works of "non-tempered music" (Matsudaira 1984).

Another piece influenced by the combining or collage art of Robert Rauschenberg is Tokyo 1.9.6.9. by Toshi Ichiyanagi. [Editor's note: An excerpt of this work appears on the Computer Music Journal Sound Anthology CD, Volume 21, 1997.] As its title suggests, the composition dates from 1969, when the composer returned from his second voyage to the USA. At that time America was for him a world of psychedelic trends, pop music, the hippie movement, and flower children. It was a social movement, an opening toward the outside world, and the sounds of everyday life. The Japanese musical world, until this moment almost exclusively hermitic and limited to the concert hall, also began to open up to the outside universe, the life of the street, and current trends. In Tokyo 1.9.6.9., which expresses the 1960s atmosphere in an anecdotal way, we hear a collage-type mixture of arbitrarily recorded everyday noises, pop melodies, a pop-rock improvisation, radio announcers, etc. At the end of the work, one can hear a solo melody from a song by Miyako Harumi, synthesized by computer in a commercial research laboratory.

When introducing the 1960s, I spoke of Shudan Ongaku (Group Music) and of musical improvisa-

tion. In this spirit, it is important to mention the work *Ikari no Hi* by Shuko Mizuno (b. 1934). Shuko Mizuno was a member of the Shudan Ongaku group, also called the Group Ongaku, founded on the influence of John Cage in the early 1960s, and including members Mieko Shiomi, Akimichi Takeda, Takehisa Kosugi, and Yasunao Tone. Jazz rhythm, rock, hayashi, and all types of popular rhythms served as inspiration for the group's improvisations. (Hayashi is an ensemble, present at numerous traditional Japanese festivals, that consists of taikos, which are two-skinned barrel drums, along with flutes, shamisen, and other instruments.)

Ikari no Hi by Shuko Mizuno is a work in three parts. The first part was produced by sine-wave generators. The second part derives from choir sounds, and the third uses the sounds of bells. It is the first part, composed in 1971, that interests us here. This is meant as a live improvisation for sine-wave generators. However, the composer refers for this realization to a detailed graphic score, which almost nullifies the concept of "live improvisation." Once more, we witness the paradoxical world in which Japanese composers act. Viewed through the filter of Western eyes, we observe the difficulty they have in linking theory and practice in a "logical" way, to adapt practical ideas to the studio situation.

Editor's note: In a forthcoming article, Ms. Loubet describes the musical developments at the NHK Studios from 1970 to 1993.

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