Meta-Xenakis

New Perspectives on Iannis Xenakis's Life, Work, and Legacies

Edited by Sharon Kanach and Peter Nelson

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Cover image: Iannis Xenakis at the C.R. MacIntosh Museum, Glasgow, Scotland, 1987. Photo by Henning Lohner, courtesy of CIX Archives, Lohner collection.

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17. Iannis Xenakis's *Hibiki Hana Ma* and the Japanese Team for *Tekkhokan* (Steel Pavilion) at Expo '70, Osaka

Mikako Mizuno

Introduction

Artefacts of Iannis Xenakis's creative process around his electroacoustic work *Hibiki Hana Ma* (1969–70) include rich traces of collaboration between the composer and Japanese musicians and engineers. This represents a climax of alliances between Xenakis and his Japanese colleagues that began in the 1960s (as discussed below). *Hibiki Hana Ma* was repeatedly played every day in *Tekkhokan*, one of the pavilions for the Osaka World's Fair in 1970, sponsored by the Iron and Steel Institute of Japan. *Tekkhokan* was quite unique, both in terms of its architectural shape and its special sound diffusion system, which evolved from a musical idea of Tōru Takemitsu (1930–96).[1]

Official reports, along with the meeting minutes of the Japanese team (which included composers, architects, and sound engineers), plus the architectural blueprints made by Sansei Engineering, all document what occurred and the process of their collaboration.

Five meetings were held between 25 March and 11 April 1968 in order to decide the architectural design and define musical possibilities. The first meeting took place in the offices of the architect Kunio Maegawa (1905–86). Takemitsu's name, as producer, was mentioned in the third meeting on 29 March, and the fourth meeting was held in Takemitsu's office on 5 April when he presented his plan. Takemitsu asserted that the equipment must be completed at least six months before the opening of Expo '70 in order for the musicians to undertake experiments with sound and music, and that the construction should start in July 1968. In that same meeting, Takemitsu mentioned he intended to commission a new piece by Xenakis.[2]

1 "Steel - Expo Osaka 1970," *Worldfairs*, https://en.worldfairs.info/expopavillondetails.php?expo_id=18&pavillon_id=1548

2 Meeting minutes from 8 February to 11 April of 1968, Sansei Engineering (三精エンジニアリング).

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Music Program in *Tekkhokan*

For *Tekkhokan*, two types of music were prepared: music played every day, fixed on tapes, and monthly live music concerts. The table below shows the five works of tape music played daily (Table 17.1). There were seven monthly music programs which were composed of Japanese traditional music and one concert of contemporary music. Takemitsu's *Crossing* (1970–71), Yuji Takehashi's (b. 1938) *Ye Guen* (1969), and Xenakis's *Hibiki Hana Ma* had been visually designed with laser lights created by Keiji Usami (1940–2012).

	Music	Composer/performers/planner	Duration
1	*Crossing*, for two orchestra, soloists, and female chorus	Tōru Takemitsu, Seiji Ozawa, and Japan Philharmonic Orchestra	9′00
2	*Yeguen*, for Baschet's sound sculpture	Yuji Takahashi, Baschet's sound sculpture, and Japan Philharmonic Orchestra	10′30
3	*Hibiki Hana Ma*, twelve channel tape	Iannis Xenakis	17′20
4	tape montage *YEARS OF EARs "What is music?"*	planned, recorded, collected, and edited by Makoto Ooka, Shuntaro Tanikawa, Tōru Takemitsu, Keiji Usami, Akimichi Takeda, Takashi Funayama	20′00
5	music for Baschet's sound sculpture and Japan Philharmonic Orchestra	Tōru Takemitsu	

Table 17.1 Daily program in *Tekkhokan*, fixed on tape.

Collaboration with Japanese Musicians and the Preparatory Process of *Hibiki Hana Ma*

Collaboration before 1969

In April of 1961, Xenakis came to Japan and met Yuji Takahashi, Tōru Takemitsu, Seiji Ozawa (1935–2024), and Aki Takahashi (b. 1944), all through Kuniharu Akiyama (1929–96). That year, the World Music Festival in Tokyo was held, which was organized by Nicolas Nabokov (1903–78), founder of the European Cultural Foundation, which itself was financed by the United States of America. The festival was a part of the anti-communist cultural organization of the Cultural Freedom Congress (CCF), East–West Music Encounter. At that time Ro-on,[3] the Japanese Society of Contemporary

3 Ro-on was the Workers' Music Council founded in Osaka in 1949 with the slogans of "good music at a reasonable price" and "planning and management by the members." It spread to other cities

Music (JSCM), and the Musicological Society of Japan (MSJ) declined to work for the event because the CCF was thought to be an anti-communist group. But this congress was the first step of numerous future collaborations between Xenakis and Japanese musicians. At this conference, Luciano Berio (1925–2003), Elliott Carter (1908–2012), Henry Cowell (1897–1965), Roger Sessions (1896–1985), and composer/musicologist Hans Heinz Stuckenschmidt (1901–88) were present, together with Xenakis.

In February of 1962, Yuji Takahashi premiered *Herma* (1960–61) in Tokyo. In 1966, the festival Orchestral Space was realized for three days in Tokyo's Nissei Theater under the artistic direction of Takemitsu and composer/pianist Toshi Ichiyanagi (1933–2022). During the festival, Xenakis's *Stratégie* (1962) was performed on 1 May by the Yomiuri Nippon Symphony, conducted by Seiji Ozawa and Hiroshi Wakasugi (1935–2009), which was released on LP in Japan in 1967, and issued in 1978 in the United States. *Eonta* (1963) was also played in the festival by Takahashi on 4 May, soon after the world premiere in Paris.

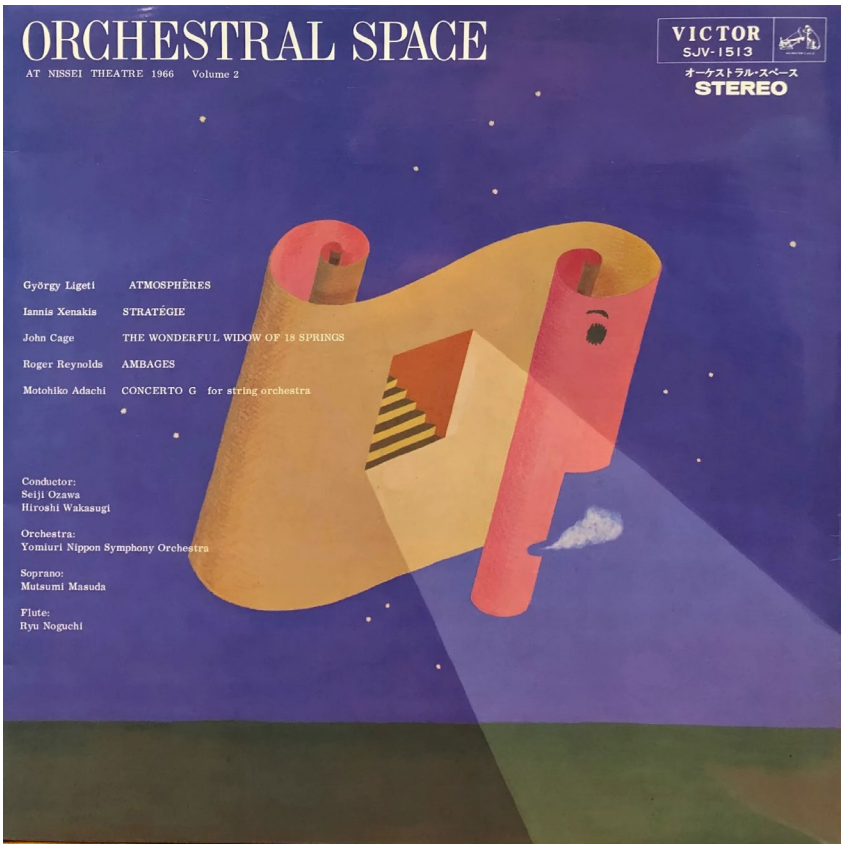

Fig. 17.1 LP cover issued in 1967 in Japan of live performances from the Orchestral Space program, volume 2 (author's personal collection).

throughout Japan, and in 1955, the National Liaison was formed with twenty member organizations and 130,000 members. In the 1960s, the scope of the organization's activities was further expanded.

The Creative Process of *Hibiki Hana Ma*: The Composer's Worksheets and the Japan Team's Materials

In June of 1969, Xenakis came to Tokyo again and talked about his piece for the Osaka World's Fair. He started sketching general sound schema and instrumentation immediately after Takemitsu had asked him to compose a new piece.

In the production process of *Hibiki Hana Ma*, Xenakis made a music score, presumably after sketching several potential spatial sound designs. The music score was performed and recorded by the Japan Philharmonic Orchestra conducted by Seiji Ozawa in Kawaguchi City Hall. The recorded sounds were edited according to Xenakis's sound score, notating two sets of six-tracks. The Table below (Table 17.2) shows the chronology of communications and collaborations around Xenakis's work.

Category	Date	Events
Commission	June 1968	Takemitsu asked Xenakis to compose for the Osaka World Fair
	July 1969	Yuji Takahashi described the outline of the sound system to IX
Composition	5 November 1969	completion of the score of *Yeguen* by Yuji Takahashi
	31 December 1969	completion of the score of *Crossing* by Takemitsu
	5 January 1970	Japan team received the score of *Hibiki Hana Ma* by Xenakis
Recordings	16 November 1969	recording of *Yeguen* in the rehearsal place of Japan Philharmonic Orchestra
	12 January 1970	recording of *Crossing* with 111 players in Kawaguchi City Hall
	13 January 1970	recording of *Hibiki Hana Ma* in Kawaguchi City Hall
Completion in *Tekkhokan*	21 January 1970	*Crossing* and *Hibiki Hana Ma*
	6 April 1970	Xenakis visited *Tekkhokan*

Table 17.2 Chronology of Communications and Collaborations for *Hibiki Hana Ma*.

Xenakis's score was received by the Japanese team on 5 January 1970. On 10 January, Xenakis came to Japan to supervise the recording.

The recording date was 13 January and the completion in the real *Tekkhokan* speaker system was accomplished on 21 January 1970.[4] That means that the creation

4 Expo '70 (1970), *Nippon Bankoku Hakurankai*, Space Theater, Tekkhokan no kiroku.

and sound editing took only one week. Xenakis's notation for editing the tape, as he wrote "special separate graphs" in his manuscript, indicated how he wanted to edit two sets of six-track tapes (twelve channels) from the materials. He said:

> This music is based on 19 basic structures and textures which are written in score form and will be recorded in Tokyo by Seiji Ozawa. Each structure will be mixed with itself in various speeds so as to produce new, more complex textures. This work should be done in Tokyo or in Osaka at an electronic music studio. Pultec Filters and reverberation devices, together with speed variations of the tape will be welcomed. The final multitude mixing will be made on the two six tracks tape recorders of the Pontillia. Both this final mixing and the distribution of the tracks over the speaker systems is described on special separate graphs.[5]

Xenakis refers to Pultec filters and to Pontillia recorders in this statement. This was written before the final decision of the technical environment in *Tekkhokan*. Meanwhile, the published program note presupposes the realized architecture and equipment.

The text above is not to be found in the official program note, which was published as the pamphlet of *Tekkhokan*. The published program note is as follows:

> Electroacoustic piece for 12 channels, 800 speakers. Composition for the 1970 Osaka World's Fair, *Tekkhokan*. Dedicated to my friends Kuniharu Akiyama, Seiji Ozawa, Yuji Takahashi, and Tōru Takemitsu. Extremely complicated systematized sounds; that is, various *glissando* of string instruments, polyphony of the wind instruments, groups of percussions, basic structure of Japanese music. And the orchestral sounds of the Japan Philharmonic Orchestra conducted by Seiji Ozawa, Biwa sound by Kinshi Tsuruta, tsuzumi, and various noises. These sounds have been edited in the electronic [music] studio, and set onto the splendid or, on the contrary, sad maze of the glass box, following the labyrinth and distributed into the space.[6]

It is noticeable that Xenakis made several levels of his score in the production process of *Hibiki Hana Ma*. These are various types of documents: from primal textual memos to the final sound diffusion plan. The music score was written as an orchestral score, the aim of which was to produce sound materials for creating his electroacoustic composition. The second score for sound editing was used by the sound engineers, and it notates the arrangement of the materials for the two sets of six-tracks. The third score, which is not in music notation but a colorful graph, shows the calculation of the speed of each sound material.[7]

5 Xenakis quoted in Kanach, 2009, p. 95.
6 Xenakis, 1970.
7 See various examples in Kanach, 2009.

Plans for *Tekkhokan*'s Sound System, Based on Tōru Takemitu's Idea

Yuji Takahashi gave Xenakis the information on the architecture and the sound diffusion system of *Tekkhokan* in July 1969. In Xenakis's worksheet for *Hibiki Hana Ma*, several phrases concerning sound diffusion can be found. One example is: "Conclusion: 12 ch for fixed + 6 ch autom. Then any movement is possible."[8]

However, the idea of the sound diffusion system, which was unique and originally designed by Japanese engineers working at that time at Sansei Engineering, had started with Takemitsu's comment about sound diffusion: "sound movements should not be from point to point, but should be from phase to phase, which include global time differences and in which the audience should be travelers going through the spectrum of different times."[9]

Takemitsu described much more in the official book of *Tekkhokan*:

> The traditional form of a concert hall gives us a specified sound environment where listening is a quantitative experience of some fixed sound sources and is divided into two quantitative places; the stage, which eventually provides space for performing, and the audience, which is placed in a strongly determinate space. In the concert hall, the qualitative proper space which each sound has in its inner space has been replaced by conformed quantity. [...] Music has developed a new realm since 1948 through electronic procedures, and has made it possible to simultaneously listen to multiple heterophonic sound images and heterogeneous time structures. This new music (*musique concrète*) has great influences on live instrumental music. Sound sources are granted free disposition, which is very different from the standard instrumental music [...]
>
> Space and the spatial timbre –time texture of sound images [...] are added as important parameters which compose the music. [...]
>
> The qualitive space which was divided into two quantitative spaces can now multiply quantitative movements in the other space of information supply. But the fixed audience space has no freedom to "Earlize" (= move around) the multiple realized sound space.
>
> The term "Earlize," in reference to "Televise"; meaning trimming objects to fit a television screen. [...]
>
> How can we make the audience space into a qualitive space of movements? Let's get rid of the fixed audience space in the concert hall. The structural space of the concert hall should be planned as a situation in which qualitatively different and numerous spaces are multiplied. Therefore, both the fixed sound sources and the performance places should be put in an elastic situation. And the sound space should not move from point to point but be required to be intersecting planes. [...]
>
> Is it possible, for example, to establish global time differences or different time zones in the space of a concert hall?
>
> If so, the sound layers are movements circulating around the audience, and the audience

8 Kanach, 2009, p. 91.

9 Takemitsu, 1970, p. 1–4. All translations from Japanese by the author.

> becomes travelers passing through the spectrum of sounds and time zones. Such a new concert hall is an organ which changes the quantitative space where the stage is simply separated from the audience into a qualitative space.[10]

The quotation above comes from the official booklet of *Tekkhokan*, but the idea itself had been announced already at the general meeting of the Japan Team.

The Japanese acousticians calculated twelve directions of sixty degrees as the best shapes that would enable the audience to feel that they were surrounded by sound sources from all directions. The next section describes what was actually realized in *Tekkhokan* in April 1969.

Technical Realization of the Space Theater within *Tekkhokan*

Takemitsu's rather philosophical text was technologically interpreted by Jyoji Esaki (1925–2008), an electronic sound engineer. Table 17.3 below shows Esaki's description in the first stage of realization.

Space Concept by Takemitsu	**Technical Idea by Esaki**
different fixed sound sources	lots of speakers
elastic performance space	multiplicity of sound fields
intersecting sound planes	one group of speakers turned to one direction and simultaneously operated with the other speaker groups turned to the diagonal or contrasted directions

Table 17.3 Space concept and technical idea.

Sound Control System of *Tekkhokan*

Design Outline

The most unique point is the method to store diffusion patterns and the play control system by using 16 mm film, which was designed by Esaki. The system included the specific design of cine-sync (cinecoder), auto-cueing magnetic tape, control mixer, output-control depending on the performance idea, input-control depending on the performance idea, filters, echo-machine, and PA.[11] It was a kind of real-time sound modulating and cueing control system using cinema film, including control over the movement of the speakers.

10 Takemitsu, 1970: four paragraphs by Takemitsu as a staff member.

11 *Cinecoder* was made by the combination of: 16mm film, a solar cell screen, and a fader amplifier. Ishii, 1985, p. 34.

Number and Placement of the Speakers

The total number of speakers was actually 1,008, excluding monitor speakers.

- 84 speakers in the ceiling, 32 of which included 4 speakers inside and 52 of which included 2 speakers inside; this makes a total of 232 speakers.
- 24 speakers in the walls, all of which included 2 speakers inside, making a total of 48 speakers.
- 16 speakers on the stage, all of which included 2 speakers inside, making a total of 32 speakers.
- 696 single speakers under the floor.[12]

The number of the speakers was calculated considering that the most suitable angle for two channels was sixty degrees so that several people could share the speakers in case of a large audience. It also takes into account that people are not as sensitive to sound coming from below or behind. The ultimate goal was that each audience member may sense sounds coming from all directions, although the audience could move around as well. Each of the 1,008 speakers was connected to a separate amplifier.

The stage and the auditorium of *Tekkohkan* were divided into four equal areas: East, West, South, and North. Each zone was acoustically independent and did not interfere with the others. The resonance could be artificially controlled. *Crossing* by Tōru Takemitsu was performed mainly with manual operations and only used the automatic control for support. *Yeguen* by Yuji Takahashi was performed both manually and by the automated system.

The pieces were performed by six persons, one of which was a conductor. The other five people controlled the diffusion to the speakers where the sound was directed.

Control System

The auto-control system of *Tekkohkan* was composed of two parts:

1. Music was analyzed and recorded on 16 mm film. The program was processed by projecting this film onto the solar cell screen through an electric control panel.
2. The program, which receives electricity produced by the solar cell automatically, decided the volume through an auto-fader.

The film moved at twenty-four frames per second. There could be ten levels set for sound decaying.

Sounds were recorded on four six-channel tape-recorders, meaning twenty-four tracks; that is, twelve stereo sound sources were divided onto two sets of two tape-

12 Fujita, 1970, p. 14.

recorders, eight were connected to the ceiling, and four were linked to the bottom. Two film projectors were used in order to adjust the electricity. The recorded sounds were played by the two film projectors plus human manual operations. Figure 17.1 below shows examples of spatializations for *Hibiki Hana Ma*.[13]

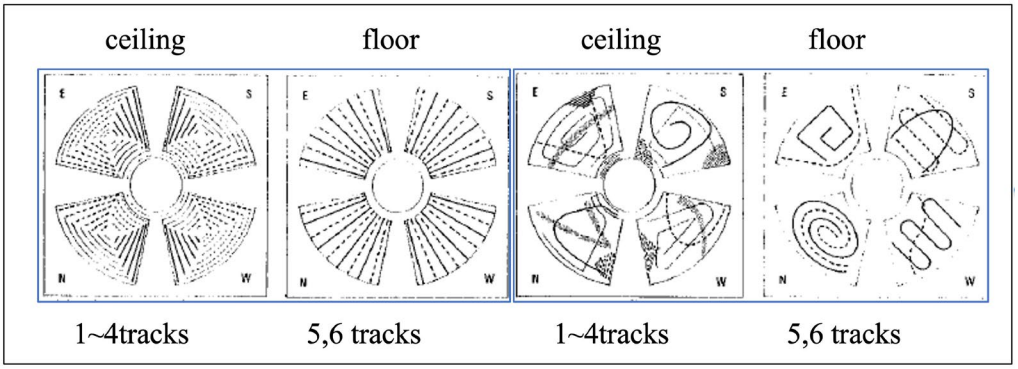

Fig. 17.2 Spatialization in *Hibiki Hana Ma* (Source: Esaki, 1970).

Channels 1–4 were assigned to the ceiling (air), 5 and 6 were assigned to the floor (ground). In the two left patterns of Figure 17.2, *Outside/Inside* are opposite the site of right/left among the group East/West and the group South/North. In the two right patterns of Figure 17.2, each block has different patterns. There were three patterns of *spatial movement:*

3. Permutation of single channels.
4. Permutation of 4 channels and permutation of 2 channels.
5. Ceiling or floor for each.
6. Permutation of both 2 channels and 4 channels.

Conclusion

The planning and construction of *Tekkhokan* proceeded under such a tight schedule that the creators did not have enough time to discuss the collaborative work, as shown in the testimonies by composers Takemitsu and Minao Shibata (1916–96), and musicologist Akimichi Takeda (1937–2003), and others.[14] The information concerning the sound system which Yuji Takahashi discussed with Xenakis in July 1969 may have been different from the system that was realized in March 1970.

On Xenakis's worksheets we can see his idea which requires independent mono track control, not stereo control. For example, air (ceiling) track 3 of East/West runs to

13 Esaki, 1970, p. 13.
14 Takemitsu, 1998, p. 51–2. Shibata, 1975, p. 48–59. Takeda, 1995, p. 18–23.

ground (floor) track 2 of South/North, while air (ceiling) track 4 of East/West runs to ground (floor) track 1 of South/North.

Xenakis wrote, "jamais croiser gr. to air,"[15] meaning that the sound should never intersect from down to up; such spatial movement was not included in *Tekkhokan*'s diffusion patterns.

It is uncertain if Xenakis's original ideas of sound spatialization, noted on his worksheets, were realized when *Tekkhokan* started in March 1970. This may be a future topic of research. We can propose here that there can be possible realizations of the spatialization of this mammoth piece other than the one originally realized in *Tekkhokan* in 1970.

Fig. 17.3 Photo of Performance hall in *Tekkhokan* (Space Theater) in Osaka. Photo by Juan Manuel Escalante (2024).

15 Kanach, 2009, p. 91.

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