

## **Orchestral Sources in the Electroacoustic Music of Iannis Xenakis: From *Polytope de Montréal* to *Kraanerg* and *Hibiki-Hana-Ma***

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In most of his electroacoustic works prior to the computer-generated music (the UPIC and GENDYN works dating from 1978) Iannis Xenakis used instrumental sources from the Western orchestral tradition, often in combination with other sounds, and often focusing on extended sonorities (e.g., woodwind multiphonics, harsh string bowing). In his early works, the instrumental sources, aside from obvious percussion sonorities in *Orient-Occident*, were intended to contribute to massed, often noisy, textures. This is especially the case for *Diamorphoses* (1957) and *Bohor* (1962). His studio training at GRM, beginning in 1955, taught him the classic techniques of Schaefferian “musique concrète.” He would have learned to listen closely to recorded sounds, to analyze their components, and to manipulate them utilizing standard tape techniques and processing. While these works could not be considered exemplars of the “musique concrète” aesthetic, given that they tend to direct the listener to the global evolution of composite textures rather than particular sound objects, they nonetheless achieved their aims by shaping individual sounds in the same ways other composers at GRM were doing.

The first project that brought Xenakis back to the studio after leaving GRM in 1962 was his *Polytope de Montréal* (1967). This was a multimedia project, an installation of vertical steel cables, several hundred programmed flashbulbs, and music. Without easy access to an electroacoustic, Xenakis opted to write a score for four identical instrumental ensembles intended to be placed in the cardinal points of the floor space of the atrium housing the installation (the French Pavilion of World Expo 1967 in Montreal). However, documentation from the Xenakis Archives indicates that there was never any intention to present this music live in Montreal. The music was recorded in the studios of ORTF/GRM. Part of the design of his installation there included placement of groups of loudspeakers not only around the floor level of the atrium but also vertically so the loudspeakers would project onto the different levels overlooking the atrium (in conjunction with the cables and lights that stretched vertically throughout the entire space). Therefore, while *Polytope de Montréal* can be thought of as an orchestral work, with the score functioning independently from the original installation, it more truly functioned as an electroacoustic work, the sounds being projected from a sophisticated diffusion system.

The music of this score is built from complex composite instrumental textures that are spatialized around the four “channels” by means of delays and amplitude fluctuations. In terms of basic compositional approach, *Polytope de Montréal* is very much related to Xenakis's earlier electroacoustic works. Indeed, a reading of his fundamental approach to

music composition (as outlined in *Formalized Music*) reveals that “sonic entities,” whether instrumental or electroacoustic, are the building blocks of all his work, shaped by stochastically-generated densities and textures. While the technical conditions may be different, Xenakis did not approach instrumental and electroacoustic projects with distinctive aesthetic aims, unlike many other composers active in both fields.

Xenakis’s next electroacoustic composition was *Kraanerg*, a mixed work for chamber orchestra and four-channel pre-recorded sounds, completed in 1969. This was his largest work in terms of overall duration: 75 minutes of continuous music. Intended for a full-length ballet, originally choreographed by Roland Petit, the tape part is made up entirely of orchestral recordings involving the same instrumentation as the score for live musicians. In this case, however, these recordings are treated in the studio, primarily using filters, reverberation, transposition, and gain distortion. The recordings are also spatialized for the four-channel presentation. The strategy for spatialization is very similar to that used for *Polytope de Montréal*, although the use of channel delay is much less utilized. The four-channel pre-recorded part, which mostly alternates with the live orchestra (with occasional overlapping), can never be mistaken for the other, even if it shares common score material. This is due to the studio treatment of the orchestral recordings and the spatial presentation (the loudspeakers are intended to surround the audience whereas the orchestra is seated together onstage or in the pit). *Kraanerg* is one of Xenakis’s very few ventures into the domain of mixed instrumental-electronic music (the only other such work he completed is *Pour La Paix*, for voices and computer-generated sounds from 1981, and it is actually a radiophonic work, intended for broadcast).

In *Hibiki-Hana-Ma*, from 1970, for tape alone, Xenakis again uses recorded orchestral sources, but adds traditional Japanese instruments (the work was produced in the NHK Studio in Tokyo for the Osaka World Fair). This work utilizes even more extensive studio processing than *Kraanerg*, and the shaping of the music is less tied to notated score material. Originally, *Hibiki-Hana-Ma* was produced as a 12-track work, and was projected over a large number of loudspeakers using routing technology similar to that used in the Philips Pavilion in 1958 (Xenakis was involved in the design of this pavilion and worked closely with the Philips engineers on the installation of the custom-built sound system involving a routing mechanism and several hundred loudspeakers). The primary innovation in terms of studio techniques in *Hibiki-Hana-Ma* is the extensive use of editing, i.e., cutting recordings into fragments. These fragments are usually distinguished by instrumental-textural (sometimes spectral) characteristics, and they are assigned to distinct tracks. While the work evolves over time into complex, sustained textures, there is a “collage” character to the first half of the 17-minute work, as different strands of distinctive instrumental/orchestral textures are introduced. Some of the materials are borrowed from recordings of existing orchestral works while some were produced in Japan for this project. The materials created from traditional Japanese instruments (struck and plucked) are most distinctive, but some percussive textures are highly developed, producing complex textures, in one case resembling the stochastic “grains” of *Concret PH*. The treatment of instrumental sources in the studio to create

textures that bear little direct resemblance to the sources became Xenakis's main approach to sonic materials for subsequent electroacoustic works.

The spatialization strategy for *Hibiki-Hana-Ma* is quite different from *Polytope de Montréal* and *Kraanerg*: there is little “movement” of material from one track to another by means of “panning”. Rather, each track is generally assigned distinctive materials, and the movement occurs through the routing of the tracks through the several hundred loudspeakers Xenakis had at his disposal for the premiere in Osaka. This strategy of placing distinct material onto the tracks at his disposal to be routed to available loudspeakers would become Xenakis's primary means of spatializing sound in subsequent electroacoustic works.

In the later compositions—*Persepolis* (1971), *Polytope de Cluny* (1972), and *La Légende d'Er* (1978)—Xenakis blends highly-developed instrumental sources with electronic and digital sources. Some materials, such as the re-use of Japanese percussion, are easily recognized within the overall sonic textures; other materials, even those derived from instrumental sources, are much less easily identified. These works are definitive studio creations, where the sonorities are shaped to create the structure and pitch-based materials are much less significant.

This “instrumental” phase of Xenakis's electroacoustic output raises questions about the treatment of source materials and the intentions of the composer, especially in the case of *Polytope de Montréal*, where the work could be performed as an instrumental composition (but rarely has, and not at all for the premiere). Ultimately, an understanding of such issues rests in the common aesthetic and formal approach Xenakis developed for all his music, instrumental or electroacoustic, where organizational strategies rest on the definition of sonic entities, whether they be defined by score or by studio production.