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The Electroacoustic Music of Xenakis

Agostino Di Scipio, Makis Solomos

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THE ELECTROACOUSTIC MUSIC OF
XENAKIS

Agostino Di Scipio & Makis Solomos


UNIVERSAL
MUSIC
PUBLISHING GROUP

**CLASSICS
& SCREEN**

  
DURAND SALABERT ESCHIG

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CONTEXTS OF PRODUCTION

The majority of Iannis Xenakis's musical production includes orchestral, vocal or chamber music: he composed only 16 electroacoustic works out of a total of 138 works starting with *Metastaseis* (his first official work), following the ten or so early instrumental-vocal works. However, electroacoustic music was always very important to the composer: it allowed him to explore both radical theoretical and technological innovations. It is possible that he composed fewer electroacoustic works than instrumental ones because he received more commissions for the latter; but it is possibly also due to the fact that he did not always have access to electroacoustic music studios, and the studio (research centre) he eventually created (the EMAMu, which became the CEMAMu) never had the significant resources of which he dreamed. For this reason it is important to begin by exploring the contexts of production, and in particular the different centres and institutions (music studios, creation centres, and research laboratories) as well as their operational dimension (techniques and devices for generating or processing sounds, and relations between collaborators and studio assistants). This will allow us to fully comprehend Xenakis's autonomy of work and thought which developed over almost four decades.



THE GROUPE DE RECHERCHES MUSICALES: *MUSIQUE CONCRÈTE* (1957-1962)

Upon his arrival in Paris (1947), Xenakis worked as an assistant engineer in the architectural studio of Le Corbusier. This was an important experience as it mostly consisted of team work, including various competences and interdisciplinary tasks. He also studied musical composition, moving from the “Bartókian project” to *Metastaseis* (1953-54, orchestra). Though his first music is instrumental, he quickly became interested in the musique concrète movement which had just taken shape in France, with the Groupe de Recherches Musicales (GRM). It is likely that he attended the first public concert of musique concrète (March 18, 1950). In 1952, he bought a tape recorder (which cost him a month’s salary) and used it to carry out rhythmic experiments. In 1954, following the advice of Olivier Messiaen, he met Pierre Schaeffer, who introduced him to the GRMC (as the GRM was called

at the time). As with Le Corbusier, teamwork was essential, although aimed at individual creative efforts. Xenakis befriended several young colleagues (François Bernard Mâche and Michel Philippot) as well as the physicist and information theorist Abraham Moles¹.

Between 1957 and 1962, Xenakis was one of the most active composers within the GRM. He quickly produced his first work of musique concrète, *Diamorphoses* (1957-58) and also composed *Orient-Occident* (1960) and *Bohor* (1962). He took part in many debates and projects as well as in the general life of the team. It would even seem that Schaeffer placed him at the beginning of the 1960s at the head of the new Research Department of the ORTF, though without ever hiring² him. With the help of Schaeffer, he received requests for functional music – such as a soundtrack for the film *Orient-Occident*. His participation culminated with the “collective concert” project (1962),

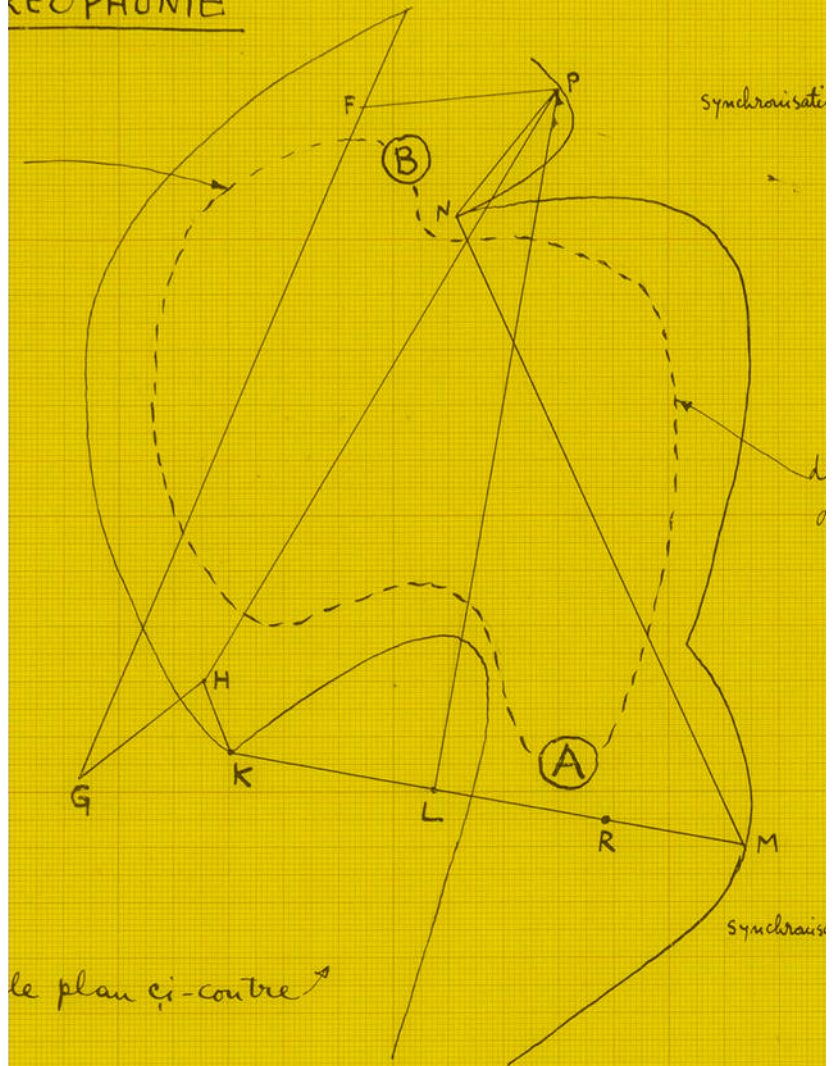
an important project for the GRM in which Xenakis was heavily involved and even headed, but from which he eventually withdrew.

Never officially hired by Schaeffer, Xenakis pursued his work as an engineer, then as an architect, at Le Corbusier’s studio until 1959, and even had the opportunity to work in other studios. He took part in the design of the Philips Pavilion, both architecturally and musically. In 1957, during the preparations for the Pavilion, Philips invited him to produce a very short tape music work, an “interlude” (which would become *Concret PH*), to be played during the public’s entrance and exit of the Pavilion, in between each of the following performances of Varèse’s *Poème Electronique*. The work’s production took place in Paris, at the DMS studio (Diffusion Magnétique Sonore), owned by Philips Disques France. In 1959, he produced *Analogique B* at the studio founded by Hermann Scherchen in Gravesano

(Switzerland), a tape on which he also worked at the GRM.

As was the case with other composers (including Pierre Henry and Luc Ferrari), Xenakis eventually withdrew from the collective concert project as his relationship with Schaeffer gradually deteriorated. In 1960, after various exchanges with Abraham Moles as well as with American and German researchers invited by Scherchen to Gravesano³, Xenakis asked Schaeffer to include the new methods of electronic calculation (computers) into musical research, a request that was ultimately rejected. In 1962, during the premiere of *Bohor*, Schaeffer left the hall as he considered the sound level to be unbearable. Xenakis ended up leaving the GRM. He would return on occasion, but, as a result, he would never become an official composer “of” the GRM – of the musique concrète school, which would then become “acousmatic”: instead, he would experience other contexts of production.

REOPHONIE



un repère de synchronisation tout
ou suivante:

tion

son qu'à partir

partir de la

être un battement

POLYTOPES, EMAM_u (CEMAM_u) AND BLOOMINGTON (1967-1977)

There is a six year gap in Xenakis's electroacoustic production, between *Bohor* (1962) and *Kraanerg* (1968-69), which can be explained by the fact that he no longer had access to the GRM studios - it should also be noted that he received an increasing number of requests for instrumental and vocal works. During this period, several things must be considered in parallel, in particular the birth of the concept of the *polytope* and Xenakis's efforts to create his own studio, in Paris or Bloomington.

It is well known that Xenakis was by definition a multidisciplinary artist. Though he composed "pure" electroacoustic (or instrumental) music, he had always been interested in multimedia art: *Concret PH*, played

in the Philips Pavilion, offered the public a total spatial experience; *Bohor*, a concert music work, is in many ways a sound installation. He also seized the first opportunity to create what he called "polytope": this would become the *Polytope de Montréal*, designed for the French Pavilion at the Universal Exhibition in Montreal (1967). He designed an electronic sculpture that combined light and music, with steel cables in hyperbolic paraboloids and 1200 electronic flashes varying every 25th of a second (the threshold of perception of the human eye). Without access to an electroacoustic music studio at the time, he composed an instrumental work (with the same title) for four ensembles, but in Montreal, this composition was broadcast on tape. The concept of polytope represents a multimedia

art, event-driven and *in situ*: multimedia because it combines several media (sound and image), event-driven because it involves unique, non-repeatable creations, here and now, and *in situ* because it is linked to a particular place for each production.

Xenakis was only able to create five polytopes. He would have to wait until 1971 for the second, the *Polytope de Persepolis*, created in the ruins of the ancient Iranian capital, with music specially written for tape. The performance calls for, among other things, laser beams, anti-aircraft searchlights and large fires on the hill in front of the ruins. The *Polytope de Cluny* - an automated light show (3 laser beams and 600 electronic flashes) and sound (original music for tape) - took place over several months in the Roman baths of Cluny

(Paris, 1972-74), with scaffolding allowing Xenakis to build over the architecture as he was not allowed to touch it. The fourth production, for which Xenakis composed his most grandiose electroacoustic work, *La Légende d'Eer*, the *Diatope* was imagined for the inauguration of the Centre Georges Pompidou (1978), with an automated visual spectacle similar to the *Polytope de Cluny*. In August of the same year, the final polytope (*Polytope de Mycènes*) was created in Mycenae – it uses several of Xenakis's earlier works, as well as fragments of sounds composed on the UPIC, resulting in *Mycenae alpha* – even more grandiose than the *Polytope de Persepolis*.

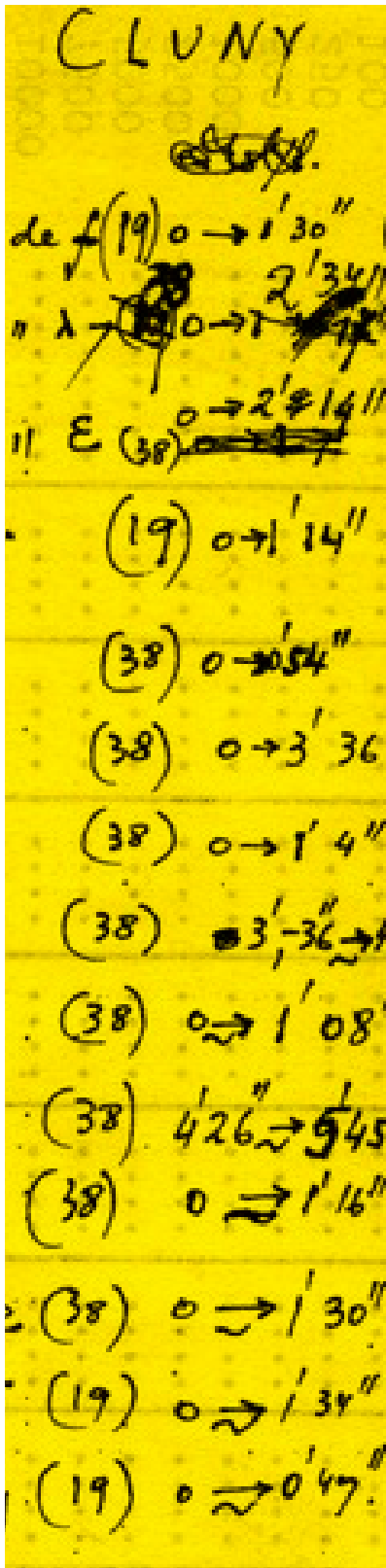
Though he was only able to create five polytopes, Xenakis produced two works that could be included in this category. Firstly, *Kraanerg* (1968-69), a mixed ballet music for orchestra and tape produced at the Studio Acousti in Paris, where he would return several years later to work on the *Persépolis* tape as well as the *Polytope de Cluny* tape. There also came *Hibiki Hana Ma* (1969-70), a work for tape composed during his residency at the Tokyo Radio Studio (NHK) for a show given in the Space Theater of the Iron and Steel Pavilion of the Universal Exhibition in Osaka, of which the visual aspect, produced by a Japanese artist, used laser beams. These two musical works are in line with the *Polytope de Montréal*: they are made up of orchestral sounds, but unlike the latter, these are reworked using electroacoustic techniques. Moreover, they are similar to the polytopes due to

their interdisciplinary nature.

In parallel to the composition of instrumental or vocal works, as well as his polytopes, Xenakis strove to establish his own studio. In 1964, while in residence at the Ford Foundation in Berlin, he urged the foundation to create a research centre, but to no avail. In 1966, after meeting two mathematicians from the Ecole Pratique des Hautes Etudes, Marc Barbut and Georges Guilbaud, he succeeded in founding the Equipe de Mathématiques et Automatique Musicales (EMAMu), which also marked his entry into the academic research community (its Scientific Council included academics such as Mikel Dufrenne, Claude Lévi-Strauss, Paul Fraise, Robert Francès and Olivier Revault d'Allonnes). For Xenakis, the centre would serve as an incubator for ideas surrounding digital audio synthesis; it would also allow him to gather various institutional contacts. The EMAMu also included engineer François Genuys. Welcomed by Louis Leprince Ringuet in the nuclear physics laboratories of the Collège de France (1969), with the financial support of various institutional figures (in particular, the Gulbenkian Foundation), the centre became in 1972 the Centre de Mathématique et Automatique Musicales (CEMAMu) and obtained the support of pioneers of computer music such as Jean-Claude Risset, Pierre Barbaud or André Riotte. Ten years after leaving the GRM, Xenakis finally managed to set up a centre focused on objectives that he had long considered important.

The transition from the

IN THE
RUINS OF
THE ANCIENT
IRANIAN
CAPITAL...
THE PER-
FORMANCE
CALLS FOR,
AMONG
OTHER
THINGS,
LASER
BEAMS,
ANTI-AIR-
CRAFT SEAR-
CHLIGHTS
AND LARGE
FIRES ON
THE HILL IN
FRONT OF
THE RUINS



EMAMU to the CEMAMu is intertwined with that of the CMAM (the Center for Mathematical and Automated Music). In 1967, Xenakis was invited to teach in the United States, at the University of Bloomington (Indiana)⁴. There he hoped to find an interdisciplinary research centre and build a digital-analogue converter. Despite the best efforts of various administrators, colleagues (Yuji Takahashi) and assistant programmers (Cornelia Colyer and Bruce Rogers, who would later work at the CEMAMu), the team struggled to come together. The university was unable to find the necessary budget to build the converter: Xenakis had to make do with graphs of the digital signals calculated on the computer according to several stochastic methods, which were eventually published in the first edition of *Formalized Music* (Xenakis, 1971a and 1992: 145-152)⁵. When the CMAM converter was finally built (December 1971), its technical characteristics were too limited. Nevertheless, thanks to this converter, he was able to present to his students a variety of

sounds produced via digital audio synthesis.

In 1972, thanks to his university friend Olivier Revault d'Allonnes, Xenakis was offered a newly-created position in Paris, at the University of Paris 1 (in the department of Plastic Arts and Art Sciences). He also resigned from Bloomington⁷. It should be noted that the CEMAMu converter was created in 1972, built at CNET (Centre National d'Etudes des Télécommunications). Its Parisian hub was thus growing, which aimed to create a stochastic digital synthesis⁶: this implied obtaining a “micro-composition” (a composition of sound, or more precisely a musical composition from an audio-digital signal) by adapting the same conceptual means he had already developed for “macro-composition” (from the 1962 program for *ST* instrumental works). Xenakis sought to synthesize stochastic sounds for *Polytope de Cluny*, but these sounds would play an important role five years later, with *La Légende d'Eer* (1977), composed during his residency at the Cologne Radio's Electronic Music Studio (WDR).

UPIC AND GENDYN: ELECTRONIC MUSIC (1978-1994)

In 1974, Xenakis invited Patrick Saint-Jean, a young engineer and great admirer of his music, to join the CEMAMu. Saint-Jean was interested in a new generation of computers, the “mini-computers”. In 1976, he focused on the Solar 16-40 computer and designed, under the direction of Xenakis, a system of synthesis and musical creation with graphic control, which would become the UPIC (Unité Polyagogique Informatique du CEMAMu) (Saint-Jean 1977). With the use of a graphic tablet, one could draw lines and curves on it, then translate them into sounds. The method is in many ways the digital incarnation of the approach with which Xenakis designed the

famous first part of *Metastaseis* (with its huge glissandi). At the time of starting the UPIC project, the technical team of the CEMAMu included Colyer, Saint-Jean and Guy Médigue, and the project then passed into the hands of Gérard Marino, Jean-Michel Raczinski and several other collaborators. Due to the direct link established between sight and sound, Xenakis firmly believed in the educational potential of the system and was committed to having it adopted within various educational contexts (Deprés 2020); this was also the time in France when so-called contemporary music began establishing educational projects, which were strongly encouraged by cultural policies.

With UPIC, sound synthesis is based on the “digital oscillator” algorithm, the simplest form of digital synthesis. These oscillators were numerous (64 at the beginning). The most remarkable aspect concerns the visual working methods of the sound, giving the composer more flexible possibilities than the stochastic synthesis implemented several years earlier. In 1978, Xenakis composed *Mycènes Alpha* using only UPIC: this was his first work synthesized entirely on a computer. There would be other UPIC versions and in 1986, with the help of Maurice Fleuret, Director of Music and Dance at the Ministry of Culture under François Mitterrand, Xenakis founded Les Ateliers

AMONG THE MAJOR COMPOSERS OF HIS GENERATION ... XENAKIS IS THE ONLY ONE TO HAVE PUBLISHED THE PROGRAMMING CODE – AN EXAMPLE OF OPEN SOURCE SOFTWARE LONG BEFORE THE FACT!”

UPIC (initially run by Alain Després), with a dual purpose: to invite composers to use UPIC and to explore the pedagogical possibilities of the instrument.

During the 1980s, Xenakis would use UPIC for three other works, the mixed work *Pour la Paix* (1981), *Taurhiphanie* (1987-88) and *Voyage des Unari vers Andromède* (1989). It should be noted that, since the 1987 UPIC version was able to operate in real time, Xenakis improvised during the *Taurhiphanie* performance – one which could also be compared to the polytopes. UPIC was also used for another project: the visionary *Ballet de robots émancipés*, which would never come to fruition, for which Xenakis planned to use robotic arms (designed in Italy, by the COMAU research centre

in Turin, normally intended for the assembly lines of FIAT cars) playing on three UPIC systems in real time. Xenakis eventually abandoned the project due to insurmountable financial barriers (Lohner 2020).

In the mid-1980s, the CEMAMu contacted the manufacturer Hewlett-Packard, who provided them with a high-performance computer, the HP 9000 Series 500 (Colyer 1986). Xenakis took full advantage of this powerful computer workstation and returned to stochastic synthesis in order to redesign it and ultimately make it a more satisfactory system. Assisted by Marie-Hélène Serra, he created two programs: the first, GENDY1 (known as GENDYN), implemented “stochastic dynamic synthesis” derived from the simple

“stochastic synthesis” of the 1970s, but based on more refined and modular calculation mechanisms with much greater precision⁸; the other, PARAG3, was modelled according to the stochastic methods of the “stochastic music” of the 1950s (*Achorripsis* in particular), allowing to call upon multiple instances of the synthesis program. Thus Xenakis was able to generate an entire work “from nothing”, in his own words, with the application of probabilistic laws both at a micro level (sound synthesis) and at a macro level (articulation of the musical form). This operational context marks the material conditions in which *Gendy3* (1991) and *S.709* (1994) were created, two musical works entirely composed with the software and fixed on digital audio support. *S.709* must

```

`G E N D Y 1 . B A S
`=====
`This programme controls several stochastic-dynamic sound-fields.
`A stochastic-dynamic sound-field is made out of a wave-length T1
`divided in Imax% segments (durations). Each one of these segments
`is stochastically varied by a cumulated probability-distribution.
`At the ends of each one of these segments are computed the amplitude
`(ordinates) that will form the waveform polygone. Are defined:
`for the duration abscissa a probability distribution and 2 times 2
`elastic mirrors; for the amplitude ordinates a probability distribution
`and 2 times 2 elastic mirrors. In between the vertices a linear
`interpolation of points completes the waveform polygone.
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
`1st field:
`compute one sound-sample:
  DECLARE SUB DYNAS1 (I1max%, SMP&, C11&, C12&, t11&, t12&, I1%, N1%, f
                    hf&, hh&)
`by computing the amplitude-ordinate:
  DECLARE SUB PC1 (Tab11(), Tab12(), I1%, N1%)
`by computing the time-abscissa:
  DECLARE SUB PD1 (Tad11(), Tad12(), I1%, N1%)

```

be considered as Xenakis's last electroacoustic work. In 1997, given his poor health, the composer worked on *Erod*, a small work (less than 5 minutes) produced almost entirely by Brigitte Robindoré (the composer's assistant at the Ateliers UPIC) by editing fragments of existing works by Xenakis. After the premiere in Bath, England, Xenakis withdrew *Erod* from his catalogue of works.

These latter works (*Gendy3 and S.709*) are the result of fascinating research carried out over thirty years and marks the last stage of Xenakis's career within the framework of the CEMAMu and, more generally, of electroacoustic music. The publication of the GENDYN programming code (Xenakis 1992: 298-321) will allow others to study and refine the digital processes

already put in place (at least from Hoffmann 2000 to Rojas and Cádiz 2021). Among the major composers of his generation since his birth in the 1920s, Xenakis is the only one to have published the programming code - an example of open source software long before the fact! He is probably one of only two composers of his generation to have created an entire musical work in the form of software (the other being Herbert Brün, born in 1918 in Palestine, a German national and American by naturalization). These are not anecdotal circumstances: due to the strong interest aroused among several younger musician-computer scientists, this approach represents an intergenerational bridge between experimental trends focused on the original and free appropriation of digital audio media.



THE TIES TO
INSTRUMENTAL
MUSIC: MULTIPLE
TRANSFER

THE UNITY OF THE MUSICAL WORK OF XENAKIS

Though he would have liked to work on it sooner, Xenakis was only able to compose electroacoustic music from 1957-58 (*Diamorphoses*), after having invented the incredible orchestral sonorities of *Metastaseis* (1953-54) or *Pithoprakta* (1955-56). His compositional approach was therefore influenced by the development of an original orchestral writing, before expanding his field of action to that of electroacoustics. However, there is no clear separation between his electroacoustic writing and his instrumental or orchestral writing: for Xenakis, it is simply a question of a change of medium, his mind capable of moving between various mediums (instrumental or vocal music, electroacoustics, polytopes), though each medium has its own specific importance.

There are striking similarities between the glissandi of *Metastaseis* or *Pithoprakta* and those heard in *Diamorphoses* (in

the final section) or *Mycenae alpha*. With the UPIC system, Xenakis worked by drawing lines and curves (which he called “arcs”). Moreover: several authors have noticed the similarity of certain passages or sound gestures of *La Légende d’Eer* and the orchestral work *Jonchaies* (1977) (cf. Harley 2002, Hofmann 2015, Solomos 2006, Pires 2015, Bonduki and Monteiro 2015): written almost at the same time, these two works are similar both at a micro level (sounds and individual gestures) and at a macro level (articulation and musical structure). We can also mention the “brownian movements”: these were initially the random pressure curves that Xenakis designed at Bloomington; unable to synthesize them, he applied them to his instrumental music with *Mikka* (1971, violin), by transforming the two coordinates: the micro-temporality of the electronics became the macrotemporality of the instrumental (horizontal axis) and the pressure became the pitch

(vertical axis) (cf. Solomos 2001b).

Clearly, the electronic medium influenced his instrumental and orchestral writing: thus, the brass “waves” of *Eonta* (1963-64, piano and brass quintet) or the strings in the opening of *Synaphai* (1969, piano and orchestra) appear to have been created in the studio by a dynamic mixture of several layers of *crescendo-diminuendo* sound, like a counterpoint of multiple sounds dovetailing one another with “cross-fading”. In fact, as Makis Solomos (1996, 2001a) suggests, Xenakis’s music is one of *composed sonorities*, which facilitates the transformations between mediums much more than the music of notes. The extreme case of composed sonority is perhaps best represented by the clouds of short sounds encountered in bars 52-59 of *Pithoprakta*, which Xenakis composed before the granular sounds of *Concret PH* and *Analogique B*. An immersive listening is also achieved both with the 88-piece orchestra of *Terretektorh* (1965-66), scattered

among the audience, and with the multichannel projection of electroacoustic works such as *Bohor*, *Hibiki Hana Ma*, the *Polytope de Cluny* or *La Légende d'Eer*. Whatever the medium, Xenakis aspired to an almost tactile perception of the sound environment, which seems at times to take on an “oceanic sensation”.

MIXED MUSIC

One of the transfers from electroacoustic music to instrumental music can be found in *Analogique A and B* (1958-59). *Analogique A* (for nine strings) is an attempt at “stochastic Markovian music”, in that it is based on probabilistic processes with some memory of their previous stages. For *Analogique B* (“electromagnetic music”, created with electronic signals fixed on magnetic tape), Xenakis used the same probabilistic schematics, but on a much smaller scale, at the level of sound synthesis (Xenakis

preferred the idea of “micro-composition”) (cf. Xenakis 1985, Xenakis 1992: 79-109; Di Scipio 1995). In 1960, Xenakis decided to combine the two: this made it possible to experiment with the same generative core at different temporal levels (cf. Xenakis 1971c: 35).

By combining *Analogique A* and *Analogique B*, Xenakis created his first mixed music (instruments and tape). Ten years later, he composed *Kraanerg*, his second mixed work. His third and final mixed work is *Pour la paix* (1981-82, for narrators, choir and tape). These are three very different works, each conceived within unique contexts of production and operational approaches (cf. Solomos 2017). If he composed so few mixed works, it is because, unlike many of his peers, Xenakis does not seem to have considered mixed music as a worthy expressive medium. One could also think that he was wary of the superposition of these two sound worlds, especially after the relative failure of *Analogique A* and *B*.

XENAKIS ASPIRED TO AN ALMOST TACTILE PERCEPTION OF THE SOUND ENVIRONMENT, WHICH SEEMS AT TIMES TO TAKE ON AN “OCEANIC SENSATION”

THE CASE OF TRANSFORMED ORCHESTRAL SOURCES

The relationship between the worlds of electroacoustic music and the instrumental or orchestral music hints at a third question: almost all of Xenakis’s works on multi-track tape contain sound materials or musical gestures taken from musical instruments, often of non-European origin (piano and khene sounds in *Bohor*, Japanese tsuzumis in *Hibiki Hana Ma*, African sanza – or mbira – and double bass in *La Légende d’Eer*, etc.), which he played himself on occasion (in the case of *Bohor*).

In addition, for certain works, Xenakis recorded orchestral sounds which he then played on tape. This is firstly the case with the *Polytope*

de Montréal, as mentioned earlier, though the music could have been played live. However, with two other works, Xenakis developed a more systematic possibility of editing orchestral material fixed on tape: *Kraanerg* and *Hibiki Hana Ma*. In the mixed work *Kraanerg*, it is likely that Xenakis recorded the orchestral sounds with the same ensemble that performed on stage, sounds that he transformed, perhaps doing the same with fragments of recordings of some of his instrumental works. For *Hibiki Hana Ma*, we know that he used previously recorded orchestral fragments, adding various Japanese instruments as well as fixed sound objects before transforming the whole with the processes of

electroacoustic music (Di Scipio 2004, Harley 2015a).

It is customary in electroacoustic music for a composer to use recorded instrumental (or vocal) sounds, but very few have used orchestral music written specifically for a work on tape (Di Scipio 2004). On a purely aesthetic level, the sharp contrast between the large-scale works based on orchestral materials (*Hibiki Hana Ma* and *Kraanerg*) and the very short and entirely synthetic works (such as *Mycenae Alpha* or *S.709*) speaks to the wide variety of means and strategies explored by Xenakis throughout his career as a composer. But in no way does this remove the underlying unity of a highly inventive and fertile musical conception.

The background of the image is a complex, abstract pattern of thin, intersecting lines in red, blue, and green. These lines crisscross the entire frame, creating a dense, web-like structure against a solid black background. The lines vary in thickness and orientation, some appearing as straight paths while others form more intricate, overlapping patterns. The overall effect is one of dynamic energy and spatial complexity.

PERFORMANCE:
SOUND CONTROL
AND SPATIAL
PROJECTION

THE RESPONSIBILITY OF PERFORMING XENAKIS'S ELECTROACOUSTIC MUSIC

Like all acousmatic music, Xenakis's tape music is performed in concert on an electroacoustic system including a means of sound reproduction, a control console (mixing table) and a number of loudspeakers, arranged around the audience (at ear level or higher). During the performance, one can control and modify the sound levels and even do some panning (by changing the outputs to the speakers). Spectrum equalisation devices are also advised in order to adapt the general sound colour to the acoustic qualities of the concert hall and the loudspeakers available.

A document from Salabert editions (dated March 3, 1995, unsigned – it is not certain whether it is by Xenakis) provides some instructions for performing these

works “in a concert situation”. It indicates that “the sound management must take into account the particular acoustics of each room”, that the loudspeakers (at least four) must be placed “at the geometric vertices [of the room] so as to circumscribe the space intended for the public”. It also suggests the possibility of introducing “amplitude variations in relation to the dynamics of the tape”, but always in a discreet way, “without ostentation”. Finally, it raises the possibility of performing “spatial movements (panning)” between the loudspeakers either “laterally or closer or further away”, in a slow and unpredictable way, “without abusing this effect”; and even to add a “light reverb [...] when the sound of the room is dry”. As these indications are brief, and perhaps in contradiction with

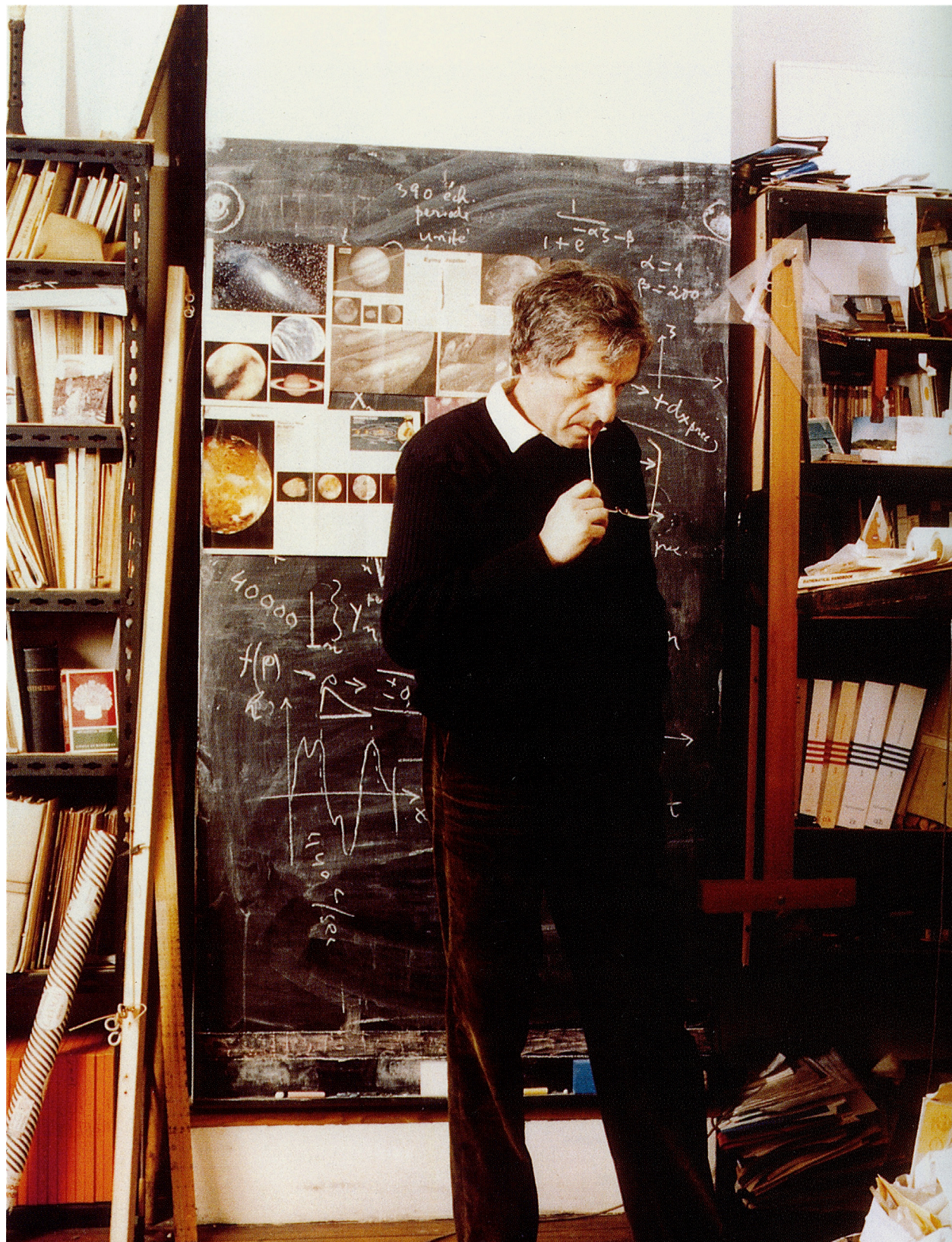
XENAKIS'S WORKS FOR TAPE DO NOT INCLUDE ANY SIMULATION OF SPATIAL DEPTH OR RESONANCE (REVERBERATION)

Xenakis's own views, notably in the case of reverberation, we will try to elaborate on them.

There are accounts of how Xenakis himself broadcast his electroacoustic works. He is known to have played them at a high volume, in order to plunge the listener in an immersive sonic whirlwind. His various collaborators, including Volker Müller, Daniel Teruggi and Gerard Pape, have provided valuable information. However, these testimonies are insufficient and it is certain that the performance of this music in concert is not self-evident. Several authors have discussed this issue, including electroacoustic music performers (cf. Pape 2010, Friedl 2019, Harley 2015b, Teige 2012). In addition, there is the question of technical obsolescence and the upgrade of audio media, as well as the changes in audio formats to which the original tapes have been subjected. For works conceived within the framework of multimedia projects,

with very particular performance conditions that are challenging to reproduce, Xenakis himself produced alternative versions compatible with more common sound diffusion technologies.

There are also questions of strictly musical relevance. It is important to note that, as a rule, Xenakis's works for tape do not include any simulation of spatial depth or resonance (reverberation) – this is rare in the international repertoire of acousmatic music. This is not a fault but rather a choice by Xenakis, a choice which means that the interpretation of this music in concert requires an unusual assumption of responsibility. We can split this issue into two complementary questions: on the one hand, the sound projection or spatialisation of sound; on the other hand, the particular character and morphology of the sound materials of these works, often very “dry” or even “rough” (including in particular the sounds obtained by synthesis).



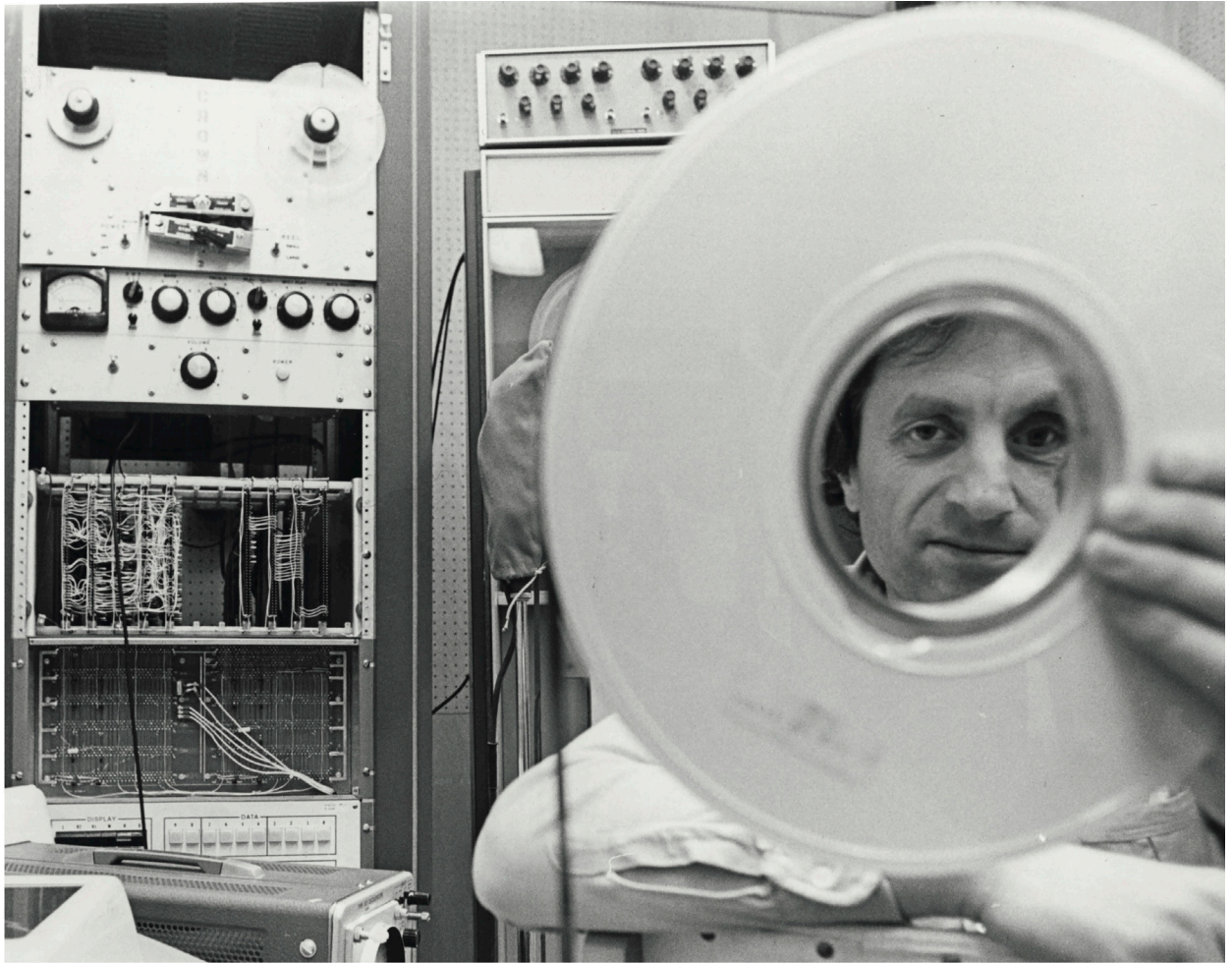
SOUND PROJECTION

Just under half of Xenakis's electroacoustic repertoire (*Analogique B*, *Bohor*, *Kraanerg*, *Hibiki Hana Ma*, *Persépolis*, *Polytope de Cluny*, *La Légende d'Eer*) consists of works on multitrack tape. Such works require a multi-channel sound diffusion system (multiple independent amplification channels, each coming out of an individually controlled loudspeaker or group of loudspeakers). The other works are music on stereo tape (*Diamorphoses*, *Concret PH*, *Orient-Occident*, *Pour la Paix*, *Taurhiphanie*, *Voyage absolu des Unari vers Andromède*, *Gendy3*, *S.709*)⁹ or even on mono tape (*Mycènes alpha*). For the latter, multi-channel projection is always required, on at least four loudspeakers – it should be noted that, for some of these works, Xenakis produced versions on four-track tape.

As far as multitrack tapes are concerned, Xenakis practiced a “discrete” distribution of the sound

materials on the available tracks: at any given moment, each track contains only one type of material (of course, the materials can move from one track to another), so that each sound is intended to come out of a single loudspeaker (or a group of linked loudspeakers). Of course, there is the possibility of panning, gradually moving the sounds of a track between two or more loudspeakers, but this is not always possible due to the design of the professional mixers commonly used (panning can generally only be done between two channels or groups of channels together). Fortunately, thanks to today's digital audio programming systems, it is possible to draw dynamic panning matrices on any number of channels, without the limitations of traditional mixing consoles.

Let us consider *Bohor*, the first work by Xenakis for eight tracks, diffused in concert through eight loudspeakers placed around the



public. The sound families are discretely distributed over four tracks coupled in stereo, as indicated by the names of the stereo tracks in Xenakis's manuscripts ("piano", "organ", "Byzantium", "Iraq"). Each pair of tracks is associated with two loudspeakers placed at two diametrically opposite points in the hall; ideally, all of the speakers should form a circle¹⁰. Thus, there are four stereo tapes whose sounds are differentiated in timbre as well as in the spatial direction. We could explain such a sound diffusion method by looking at the limitations of the means of

recording and sound reproduction of the early 1960s, but we can also note more relevant aspects regarding the method of composition. First of all, the clear distribution of the materials on different pairs of loudspeakers offers great sound dynamics (a very wide range from *ppp* to *fff*). Secondly, this distribution affords an auditory clarity or transparency in the alternation and counterpoint between different sonorities, because their mixing actually occurs not on tape or in the mixer, but in the room. In other words, the mixing is not the result of any work in the studio but

takes place in the projection space, therefore always different depending on the concert hall, which in turn favours and enhances the performative dimension. A direct and almost tactile perception of the volume is also favoured (volume of the particular hall). One must also note that each listener will have their own individual auditory perspective, different from that of other members of the public: there is no sweet spot, no pre-coded preferential listening point in the room.

Furthermore, with regards to multitrack tapes, Xenakis's first four-track tape, *Analogique*

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MOMENTS
OF SOUND
PROJECTION
AND “CINE-
MATIC”
MOMENTS

B, provides a similar yet unique example. We find a discrete distribution of sound materials on the four tracks: each track contains granular textures characterised by specific frequencies, amplitudes and density ranges. The four loudspeakers are positioned in such a way as to create a cross: two on the sides, one in front and one behind the audience. Xenakis adds the (preferable) option of using eight speakers, so as to create two crosses offset from each other by 45 degrees. This results in two sets of four tracks, each with its own individual sounds (the same situation as *Bohor*). In general, it can be said that there are multiple individual tracks diffused by a number of loudspeakers that is equal to, or greater than, the number of tracks. This precisely defines the approach to multi-channel projection that Xenakis would follow and rework several times, before composing *La Légende d'Eer*.

For the premiere of *Persépolis*, Xenakis placed 59 loudspeakers along the paths in the ruins of the ancient Persian capital. *Hibiki Hana Ma*'s twelve-track original soundtrack was diffused through hundreds of loudspeakers scattered throughout the Space Theater in Osaka and Xenakis wrote a “cinematic score”, that is to say a switching schematic (constructed by NHK technicians) in order to vary the distribution of the twelve

tracks on the loudspeakers – this is reminiscent of the projection of *Concret PH* and *Poème Electornique* inside the Philips Pavilion in Brussels, according to trajectories or “sound routes” thanks to a system of multiple synchronized relays, built for the occasion by Philips technicians.

An important milestone was reached with the automated spatialisation of the *Polytope de Cluny* and *La Légende d'Eer (Diatope)*. These two works were both produced on seven tracks, because the eighth track was to be used for synchronisation (which finally was not the case). A nine-track tape recorder with digital data automatically controlled the visual aspect and sound panning. For *La Légende d'Eer*, the spatialisation program was perfected, aiming to alternately create “static” moments of sound broadcast and “cinematic” moments, with rotations and “galactic sound dust” (very rapid random changes in the track-to-loudspeaker assignments), through eleven loudspeakers positioned irregularly inside the shell of the *Diatope*, across two levels. Xenakis aimed for the complete automation of multi-channel diffusion, in parallel and in synchronisation with the spectacle of lights and laser beams. This is a good example of how the dynamic spatialisation of sound became a central factor in his work. Furthermore,

it clearly contextualises the Xenakian notion of the “spatialisation of sound” within a more general perspective of multimedia art. The profusion of means of electroacoustic projection served, above all, to draw the public into a whirlwind of forces that enveloped and submerged them – a technique which was equally important in certain orchestral works such as *Terretektorh* or *Nomos Gamma*.

These multitrack tapes generally concern works that are rather long – the longest being *La Légende d’Eer* (45’) and the mixed piece *Kraanerg* (75’) – and which evolve gradually (of course this is not the case with *Hibiki Hana Ma*, which is shorter and eventful in its entirety and even less with *Analogique A* which must be performed with *Analogique B*). The works for stereo tape are generally shorter (*Concret PH* lasts less than three minutes, *S.709* lasts seven minutes, the longest, *Gendy3*, is under nineteen minutes). Although several of them are of great sonic power, on the whole, these works focus on few sound sources or on a fairly limited range of timbres: some are true “monochromes” (*Concret PH*, *Taurhiphanie*, *S.709*) or “quasi-monochrome” (*Mycenae Alpha*). There seems to exist in Xenakis’s electroacoustic repertoire a relationship between duration, number of tracks or channels and the variety of sound sources.

QUESTIONS REGARDING SOUND MORPHOLOGIES

There is another important question regarding the sound morphologies involved in these works, which is always strongly characteristic and unique. It is not always easy to imagine how they should be conveyed to the listener. The strongest example is probably *Concret PH* – a characteristically monochrome work. Even if the concrete origin of this dust of sounds is well known (a crackling of burning embers), the listener generally perceives a flow of friction, a cloud of impulses with a very broad spectrum, without an obvious musical pitch – closer to the sound of glass or metal. Listening at a low volume produces a certain auditory sensation; if you listen at a louder volume, the perceived sonority is different: in the first case, you are faced with an irregular but delicate texture;

in the second case, you are faced with an almost aggressive sound. So these are two very different scenarios. It should also be noted that the quality of today’s loudspeakers plays a very important role: it can reveal certain details, but it can also be dangerous for the ear (in the case of a loud diffusion), due to very strong treble frequencies. As it is certain that today’s audio technologies may bring out sounds that Xenakis himself did not hear¹¹, certain choices are necessary, technical choices but also historical ones, that is to say, with regards to the evolution of sound equipment.

These questions of interpretation pertain notably to the fully synthesised works – especially *Mycenae Alpha* and *S.709*. These artificial sounds seem to escape any natural attitude of listening. The lack of simulation of a resonant space – no reverberation in

THE DRYNESS AND THE ROUGHNESS OF THE SOUND GIVE THIS MUSIC THE CHARACTER OF ABSOLUTE ORIGINALITY - WHICH REPRESENTS IN A WAY A SIGNATURE, A SINGULARITY CONTRIBUTING STRONGLY TO THE “XENAKIS SOUND”

the recording – suggests a lack of a material body and a lack mechanically vibrating systems. On the other hand, the dryness and the roughness of the sound give this music the character of absolute originality - which represents in a way a signature, a singularity contributing strongly to the “Xenakis sound”.

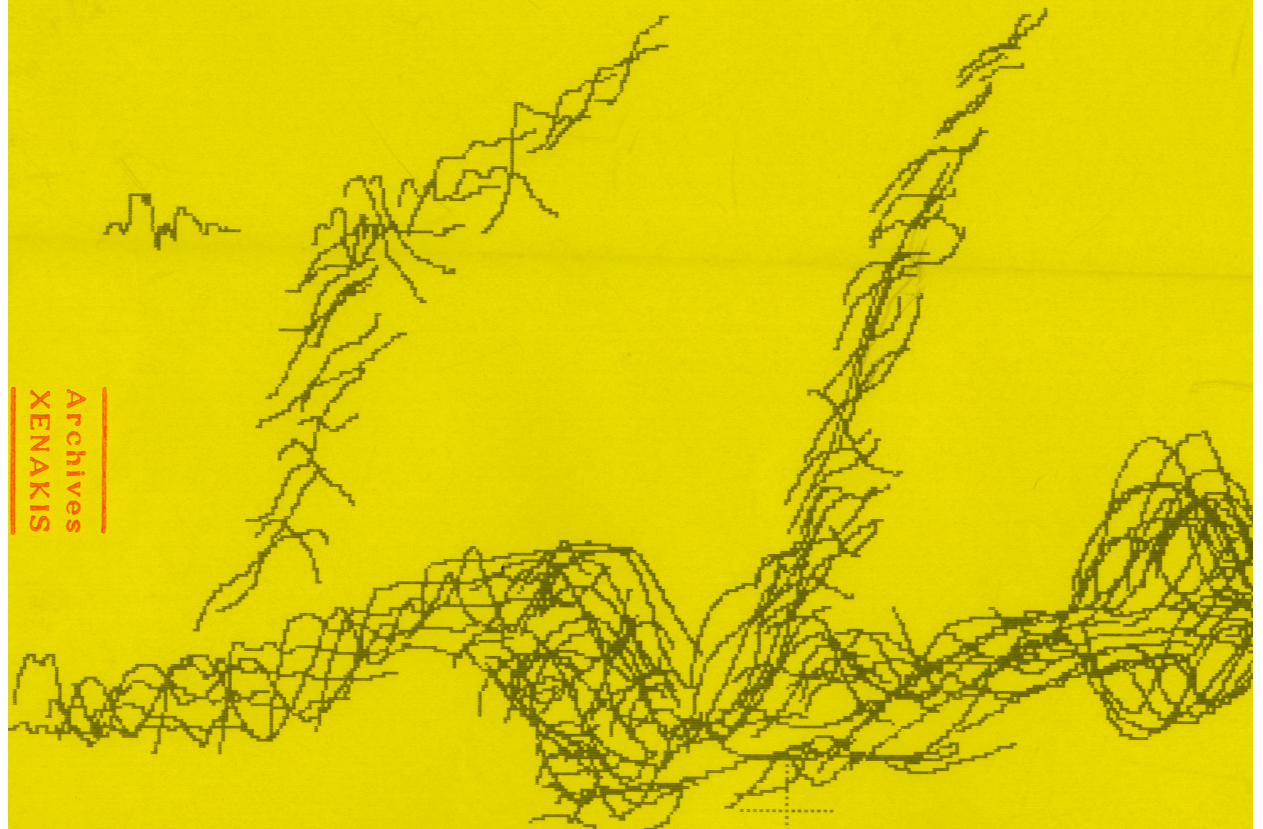
If the Salabert document cited above suggests adding artificial reverberation (in case of presentations in very dry, non-resonant spaces), it is no doubt in order to reduce the radical nature of such an approach to sound, but it is not certain that

Xenakis would have agreed to such an idea. When recording his chamber music, Xenakis asked that the microphones be placed very close to the instruments, so as not to pick up the ambient sound and without adding artificial reverberation (Supper 2022; cf. also Hoffmann 2001: 173). Obviously, such a practice goes hand in hand with the dryness and roughness of the works on tape. The “Xenakis sound” seems to be implicitly driven by a cognitive dialectic between proximity and distance, subtle yet perfectly perceptible when listening: the physical proximity of the sound

source (the “presence effect” of low frequencies, the absence of acoustic reflections of surrounding space, the whistling of high frequencies) can cause the listener to worry and seek to distance himself from these strange sounds. This happens when the listener unconsciously refuses to immerse themselves in the sound, or in other words, to be “involved” in what they are listening to. Whether it comes from instruments or computers, the “Xenakis sound” requires a form of responsible listening and calls for the necessary involvement of the listener in what is being heard (cf. Di Scipio 2015).

PAGE 8 = Zoom de p. 6 (8,5; 48)
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60 possible

différentes boues pour les 20
cf. pages suivantes



Archives
XENAKIS

THE WORKS



DIAMORPHOSES

DATE OF COMPOSITION

1/1957-7/1957 and 1958

MUSIQUE CONCRÈTE

2-track tape, produced at the GRM

DURATION

6'53"

PUBLISHER

Salabert

PREMIERE

Bruxelles, 5/10/1958

TITLE

"configurations" in Greek

BIBLIOGRAPHY

Brech 2009

Delio 2002

Frisius 2009

Malt 2015

Paland 2009

Solomos 2011

De Stefano 1998

"I was very happy to be able to use, again in *Diamorphoses*, noises that were not considered musical and that, I believe, no one had used before in this way. I used shocks from dumpsters, things like that, earthquakes recorded quickly, and then I put them together to try to also understand their internal nature, by opposition or by similarity, and to make them evolve, and move from one to the other. And that could only be done by working on the fly with the material itself. By getting one's hands dirty, really getting into it, and not just in an abstract way. [...] There are parts that are very constructed, with small glissandi of bells. [...] That is above all the second part of *Diamorphoses*" (*Xenakis, in Delalande 1997: 39*).

Xenakis's first work on tape, *Diamorphoses* shows how much he had mastered the techniques of *musique concrète* from the beginning and his innovations. In addition to the bells, the work uses around twenty *concrète* sounds, the names of which suggest the very nature of the sounds: "planes", "thunder", "dumper crashes", "bomb explosions", "saw", "wind", "earthquake"... It is possible that several of these sounds were borrowed from existing recordings. Even if they were transformed, we sometimes recognise their origin, which goes against the concept of *musique concrète* as professed by Pierre Schaeffer. Moreover, Xenakis also innovates considerably by not creating "sound objects": he implements a logic of continuity, the sounds blend into each other.

The work develops a contrast between *concrète* and environmental sounds (which are noises) on the one hand, and bells on the other (for which he used the phonogene built by Jacques Poullin, which makes it possible to generate *glissandi*). Furthermore, Xenakis experiments with the bells' density, superimposing various layers in order to reinforce the idea that the perception of density is logarithmic. Through the accumulations of ringing bells, it could be said that we are already in a granular conception of sound.

CONCRET PH

DATE OF COMPOSITION

1957-58

MUSIQUE CONCRETE

"Interlude" for the Philips Pavilion show

COMMANDE

Philips control

DURATION

1st version ("sound interlude"): for the Philips Pavillon, diffusion using a 3-track tape recorder, 1'52"; b), 2nd version (Concret PH): 2-track tape, 2'42". Produced at the DMS studio (Diffusion Magnétique Sonore) owned by Philips Discs France and at the GRM

PUBLISHER

Salabert

PREMIERE

Philips Pavilion (Brussels), 1958

TITLE

"concrete": reference in English to the Philips Pavilion (perhaps also a reference to *musique concrète*)

BIBLIOGRAPHY

Brech 2009, Bridoux-Michel 2022
Di Scipio 1995, M. Malt 2015
Kiourtsoglou 2016, Meric 2005
Tazelaar 2013, Vale et al. 2010

« Œuvre commandée par Philips pour son pavillon de l'Exposition Universelle 1958 de Bruxelles. *Concret PH* devait préparer psychologiquement le public au spectacle élaboré par Le Corbusier et accompagné d'une musique de Varèse. Les 400 haut-parleurs qui tapissaient l'intérieur de la coque devaient remplir l'espace de cette scintillation sonore et réaliser une émanation commune de l'architecture et de la musique, conçues comme un tout : en effet, la rugosité du béton et son coefficient de frottement interne trouvaient en quelque sorte un écho dans le timbre des scintillations. La continuité statistique des développements formels des sonorités granulaires et la stéréophonie cinématique devaient établir une homologie complète entre les sons et les formes plastiques du Pavillon dont j'avais également conçu l'architecture entièrement fondée sur les surfaces réglées gauches ou "Paraboloides Hyperboliques" (P.H.) »
(*Xenakis, Archives Xenakis : Dossiers écrits 3/3*).

Concret PH has become legendary for at least two reasons. On the one hand, it is the first granular piece in the history of electroacoustic music. Xenakis had made the hypothesis that "all sound is an integration of grains, of elementary particles, of sound quanta. [...] One would have to imagine a complex sound like a firework of all colours in which each point of light would appear and disappear instantaneously against the black sky" (Xenakis 1963: 61). In *Concret PH*, he uses bursts of burning embers as sound "grains" or "quantas" - according to François Bayle (2006), these are "the crackling sounds of a fire using vine shoots, recorded in the courtyard of the GRM Studio, at the Rue de l'Université" - which he mixes in several layers, varying their density and their frequencies.

The other factor that has ensured *Concret PH's* notoriety is that the work was first conceived as a "sound interlude" during the entrance and exit of the spectators of the *Poème électronique* performed inside the Philips Pavilion during the Brussels Universal Exhibition of 1958. It was diffused by some 450 loudspeakers scattered all along the walls of the pavilion, using a completely new method of sound spatialisation ("sound routes"). The idea of using granular material is brilliant: diffused in this way, the discontinuous material contrasts with the rough and continuous concrete walls of the hyperbolic paraboloids of the pavilion. The original version (the interlude) was played on a three-track tape recorder and lasted less than 2 minutes; to create *Concret PH*, Xenakis lengthened the material and made a stereo tape - the original spatialisation has never been restored, except according to a virtual reconstruction (Vale et al. 2010).

MUSIQUE 2' D'INTERLUDE PAVILLON PHILIPS

(3 feuilles)

PARTITION DE LA STEREOPHONIE

demi ceinture
gauche (A)(B)

synchronisation A

Bande (I)

demi ceinture
droite (A)(B)

synchronisation A

Bande (II)

les droites acoustiques utilisées dans
cette partition sont les suivantes:

\overline{FG}	\overline{NM}	\overline{LM}	\overline{LK}
\overline{GK}	\overline{NP}	\overline{GH}	
\overline{KR}	\overline{PH}	\overline{PL}	
\overline{KM}	\overline{FP}	\overline{KH}	

Elles sont figurées en projection sur le plan ci-contre

Les trois bandes: (I), (II), (III) ont un repère de synchronisation tout
au début qui est noté de la façon suivante:

—*— A synchronisation

les bandes (I) et (II) n'ont de son qu'à partir
de la seconde 0".

La bande (III) a un son à partir de la
seconde -30". Ceci pour permettre un battement
élastique entre la fin et le début du spectacle.
La durée totale depuis: —*— A synchronisation,
jusqu'à la fin des trois bandes, est d'environ:

2 minutes 45 secondes.

Le début du spectacle enchaîne sans interruption.

Vitesse des bandes: 38 cm/sec

Niveau: 0

synchronisation A

Bande (III)

Fait à Paris le 6 avril 1958

Y. Xenakis 29 rue Clauzel 9^e

ANALOGIQUE A and B

DATE OF COMPOSITION

1958

MIXED MUSIC

must be played with *Analogique A* (1958, 9 strings);

4-track tape, produced at H. Scherchen's studio in Gravesano and at the GRM, duration 2'30" (about 7'30" for *Analogique A and B*)

DURATION

2'30"

(about 7'30" for *Analogique A and B*)

PUBLISHER

Salabert

PREMIERE

Gravesano festival, summer 1959

TITLE

the granular hypothesis "exerts a powerful influence, as an image, upon Xenakis's conception of the work, for his notes include photographs of grains or cells distributed around nuclei of greater concentrated density, distinctly grouped together. [...] How can a visual image be transformed into a composition process? (Matossian 1981: 158)

BIBLIOGRAPHY

Arcella and Silvestri 2015
S. Bokesoy 2004
Di Scipio 1995, 2003, 2006
Hagan 2005
Roads 2001

Analogique A (1958) was written for nine strings and is dedicated to Fred Goldbeck. It is a model of Stochastic Music. The sounds are chosen statistically from arbitrary ranges of frequency, intensity and density. These ranges change in accordance with the transition probabilities following a process of chain events (Markov process). These probabilities form matrices (whose equilibrium entropies are close to one another), coupled using parameters. This results in 8 "sound states" linked in turn according to an equally Markovian process, much broader, tending towards a stationary state. It is full of disturbances. By definition, the sound mechanism returns to its state of equilibrium. [...] *Analogique B* (1959), dedicated to Oliver Messiaen, is of the same structure as *Analogique A*, and introduces an additional hypothesis: the corpuscular constitution of all sound. A sound "grain" is approximately a sinusoidal sound of a given frequency and intensity and a duration according to the specific moment in time. *Analogique A and B* for strings and for sinusoidal sounds are examined as two beings of the same species with the help of certain disciplines of cybernetics" (*Xenakis, score of Analogique A and B*).

Analogique A and *B* are one of the few mixed works by Xenakis. Instrumental parts and electroacoustic parts follow the same model: the hypothesis of the emergence of a "second-order sonority" (the fusion of many short and simple sounds into a complex sound), using a stochastic generative process. *Analogique A* makes use of punctual string sounds (short *arcos*, *pizzicatos* and *col legno* strikes), but the density is not enough and the punctual sounds do not sound enough like grains or quantas of sound. Furthermore, as Xenakis writes, "the hypothesis [...] of a second-order sonority could [...] be neither confirmed nor invalidated" (Xenakis 1963: 122). He therefore resorted to electronic means and composed *Analogique B*, a granular work which now used sinusoidal sounds to attempt to generate a synthesis. He was able to create denser frames and more convincing "sound clouds". But the work required in the studio is exhausting, and the results remain largely unsatisfactory. Xenakis finally superimposed the two, thus making it possible to experiment with the same generative core at different temporal levels (cf. Xenakis 1971: 35).

Due to the difficulties experienced, Xenakis did not repeat the experiment and abandoned the granular paradigm he had just created. Furthermore, it is one of the composer's most formalised works, and uses Markovian stochastics to link different sound states. It was a veritable *tour de force* of automated composition (entirely by hand!), but nevertheless Xenakis added to the formalised model a great deal of manual intervention.

Interpolation électronique
Bande (i) 21" sound.

ff sf pp sf
ff sf pp ff
f pp
f pp
f pp

E.A.S. 17169

ORIENT-OCCIDENT

DATE OF COMPOSITION

12/1959-3/1960

MUSIQUE CONCRÈTE

Score for the film of the same name by Enrico Fulchignoni, of which Xenakis made a concert version;

2-track tape (4-track version in 1969), produced at the GRM, 3 versions

DURATION

10'56" for the concert versions and 20'12" for the film

PUBLISHER

INA-GRM

PREMIERE

Cannes, 5/1960 (film) and Stockholm, 1963 (concert version)

TITLE

Title of the film

BIBLIOGRAPHY

Fulchignoni 1981

Malt 2015

Solomos, 2009

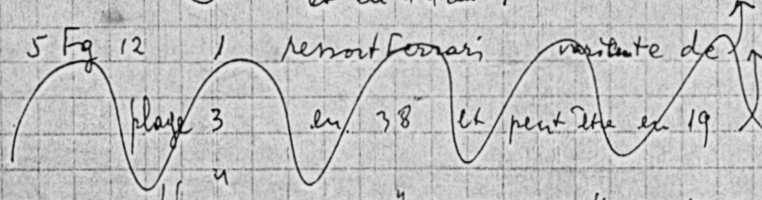
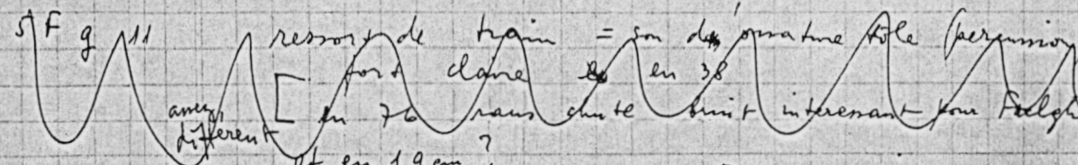
"This is a suite taken from the accompanying music for the film *Orient-Occident* directed by Enrico Fulchignoni for UNESCO, and whose subject deals with the interference between the cultures of Europe, Asia and the Africa since Antiquity. It is the very subject of the film that guided the composer in his choice and organisation of sounds and sound structures according to the electroacoustic means available at the studios of the *Groupe de Recherches Musicales* of the ORTF where the work was composed. (*Xenakis, Xenakis Archive*)

The music follows the film's evolution, which recounts the passage from one civilisation to another, from the prehistoric era to Alexander the Great. Though Xenakis did not compose illustrative music, it cannot be denied that certain sonorities are very suggestive: for example, he tells us that, in the film, "there was an Egyptian wooden statuette which was of fantastic beauty, and which I depicted in *Orient-Occident* with sighs; it was a cardboard box that made hissing sounds and it sounded like sighs, moans. Moans of admiration in the face of Beauty" (Xenakis in Delalande 1997: 133). After the screening of the film, Xenakis had the idea of transforming the music into a purely electroacoustic work, which he did by cutting several parts, especially those including Asian music or sounds that were too figurative, thereby reducing the duration of the work from 20'12" to 10'56".

Perhaps because he had little time to compose the work, Xenakis used several sounds from the sound library of the GRM, sounds that one encounters in works by other composers of musique concrète: Pierre Henry, Pierre Schaeffer, and François-Bernard Mâche among others. In terms of its sound, the work comes across less Xenakian than other electroacoustic works by Xenakis.

Ecoute de sons

- 5 F b 15 ? intéressant hariss une petite portion (Fôle + grosse l'oue) ^{76 cm/sec}
 amplitude grès un long silence et à la fin (rythme) amplitude son très aigu au début
- A flûtes 5 F b 153 grincement aigu bleaux
- quelques coups de timbale en 38 5 F b 152 ffs, aigu au milieu
- B contrebasse Maderna en 19 ou 38 5 F b 151. I fluté aigu à violon mélodie continue Maderna
- 5 F b 17 1, ~~2, 3~~ shove fole roulette dentée de contrebasse
 2 pourrie blanche claire
- minutés flash de son aigu (38) 3 grincement très aigu + un peu
- 5 F e III éprouvatoire assez intéressant comme son de xylophone noir
- 5 F e 21 tube en carton soûpirs
- ? 5 F e 31 1 Papier d'emballage, des arbre 1, 2, 3, 3 parenté
 3 grattement porceain de verre
- lions imprimés 5 F f 21 cordes de violon volume bois avec ressort (horrible) désagréable en 38, essayer en 19
incastation



- Pauses rythmes
- 5 F g 13 ressort allongé
 - 1) effet de gong bouddhique en 76
 - 2) rythme, très pp en 38 prélevement petit
 - 3) " " " en 76 tranches snare lumineuse
 - 4) " " " " " "
- Cymbales grava

BOHOR

DATE OF COMPOSITION

1962

DEDICATED TO

Pierre Schaeffer

MUSIQUE CONCRETE

8-track tape (creation: 4 2-track tape recorders), produced at the GRM

DURATION

21'36''

PUBLISHER

Salabert

PREMIERE

Salle des Conservatoires (Paris),
15/12/1962

TITLE

see note by Xenakis

BIBLIOGRAPHY

Coupré 2005

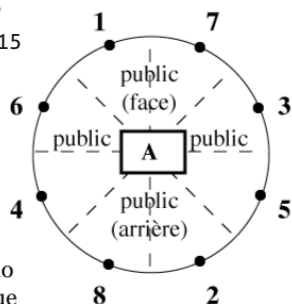
Friedl 2019

Gibson 2015

Hünemann 2009

Malt 2015

Turner 2015



1, 2 : piano
3, 4 : orgue
5, 6 : Byzance
7, 8 : Irak

"*Bohor* or *Bohort* the Exiled, cousin of Lancelot du Lac [Lancelot of the Lake]. It belongs to the medieval cycle of King Arthur. In *Bohor/ort*, dedicated to Pierre Schaeffer, spatial projection is used for the purpose of enriching the sound quality. The resulting refinement of perception reveals, by a kind of increase in information, the infinitely varied diversity of microstructures. [...]. The author has voluntarily given no descriptive indication about his work, leaving it to the listener to choose himself an imaginary journey. [... It is a] monistic music of internal plurality, converging, gradually closing in on itself as it approaches the end" (*Xenakis, Xenakis Archives: work file 9/16*).

Bohor is the last work Xenakis composed at the GRM. When it was first performed, the break with Schaeffer had already taken place and the premiere of *Bohor* did not help things: "*Bohor* was, for worse (I mean for better), the spark that lit the fire. It was no longer just small embers [Schaeffer refers here to *Concret PH*], it was a huge assault, an offensive onslaught of strikes in the listener's ear at the maximum capacity of the potentiometers", wrote Schaeffer (1981) – it is true that Xenakis diffused extremely loudly during the premiere, something he repeated afterwards.

The sound material is rather simple: piano sounds played directly in the strings, a khene (a Laotian mouth organ), bells, shaken jewels, Hindu bells, and "affolants" (metallic plates). They are divided onto two split tracks, named by Xenakis "Piano", "Organ" (khene), "Byzantium" (bells), and "Iraq" (jewelry). Quite remarkably, it is Xenakis that plays virtually every sound, as is revealed in the Xenakis Audio Archive. As the sound transformations are quite simple and yet very present – for example, the sounds of khene are extremely slowed down, becoming sort of low pedals –, it could one day be possible to perform the work in real time.

Bohor is Xenakis's first work presented in the form of a large continuum, which ends with the white noise of the "affolants" (metal sheets). If we add to this its long duration, it already evokes what would become the music of the *polytopes*, aiming to create an immersive experience. The latter is reinforced by the fact that it is an octophonic piece: the GRM mentions it in its catalogue as the first octophonic piece in its history, though in reality it is played on four two-track tape recorders, and diffused according to a specific schematic. The fact that they were analogue tape recorders caused lags, but given the sonic nature of the work (continuum), this lag was not significant

KRAANERG

DATE OF COMPOSITION

1968-69

COMMISSIONED BY

Commissioned by the Ballet Guild of Canada;

BALLET MUSIC

mixed music (for ensemble of 23 musicians and tape);

4-track tape, produced at the ORTF studio (French radio-television) and at the (private) Acousti studio, duration 75' for mixed music;

DURATION

75' for mixed music

PUBLISHER

Boosey & Hawkes

PREMIERE

Inauguration of the National Arts Center, Ottawa (Canada), 2/6/1969 (National Ballet Guild of Canada) Roland Petit, choreography, Victor Vasarely, sets, Lukas Foss, conductor

TITLE

See note by Xenakis

BIBLIOGRAPHY

Frisius 2003

Gibson 2023

Harley 2015b

"In just three generations, the world's population will have grown to 24 billion, of which 80% will be under 25 years old. Fantastic transformations in all areas will occur as a result. A biological struggle between generations will sweep across the planet, destroying political, social, urban, scientific, artistic, ideological frameworks on a scale never before experienced by humanity and wholly unpredictable. [... "Kraanerg" means:] A fusion of two Greek words (like "skull-energy") which can be translated as "brain energy". There is also "accomplishment" for the Kraan root" (*Xenakis, Xenakis LP cover, Erato, STU 70526-30*).

A ballet music with sets designed by Vasarely, *Kraanerg* left the critics largely unsatisfied due to its choreography: "The choreography nevertheless remained the weak element of the evening, but it is difficult to compete with men like Xenakis and Vasarely" (review of the premiere). This is revelatory of Xenakis's notoriety in the months surrounding May 1968. This notoriety, at the time, is less that of the "mathematician" who introduced "formalisation" in music and more that of the "revolutionary". We can see in *Kraanerg* a work in which May 68 resonates strongly, especially if we read its foreword.

The fact that it is a music for ballet explains the length of the work: the most important of all Xenakis's works. It would seem that Xenakis had little time to compose: most of the material for the instrumental parts is borrowed (and recycled) mainly from *Nomos gamma* (1967-68, for large orchestra), but also from *Akrata* (1965 for winds) or *Nuits* (for 12 mixed voices) (cf. Gibson 2023). As for the tape materials, it is possible that they come from previous recordings with the same orchestration and were reworked with the usual means of electroacoustic music – certain transformations are quite weak and make it possible to create echoes in relation to the live instrumental ensemble. While the two elements, instrumental music and music on tape, tend to alternate at the beginning, they increasingly overlap as the work progresses before returning in the end to the initial alternation. The overall form is quite rare for Xenakis: there is no dramatic construction, we are simply presented with the principle of editing, but one could also describe it as a "mosaic" form, as suggested by J. Harley (2015b).

HIBIKI-HANA-MA

DATE OF COMPOSITION

1969-70

DURATION

17'39"

ELECTROACOUSTIC MUSIC

Music for the Space Theater, Japan
Iron and Steel Federation Pavilion,
Osaka World Expo; a) diffused in Osaka:
12-track tape; b) then: 8-track tape.
Produced at the NHK studio (Tokyo)

PUBLISHER

Salabert

PREMIERE

Universal Exhibition in Osaka, 1970

TITLE

See note by Xenakis

BIBLIOGRAPHY

Di Scipio 2004
Harley 2002
Harley 2015a

"Reverberation. Flower. Interval. The elegance and distance of sound, the echo, the flower, the beauty. The gap between space and time. This electronic composition for 12 channels and 800 speakers [...] is dedicated to my friends Kuniharu Akiyama, Seiji Ozawa, Yuji Takahashi and Toru Takemitsu. The sound is organised with great complexity: various forms of string glissandi, brass polyphony, percussion groups and the fundamental structures of Japanese music are used. In addition, the Western orchestral sound of the Japan Philharmonic Orchestra conducted by Seiji Ozawa, the sound of the biwa (an Eastern lute) played by Kinshi Tsuruta, and various sounds of hand drums were used. These sounds were mixed in the studio and broadcast in such a way as to turn in a circular fashion or to follow a labyrinth" (*Xenakis, from the cover of the RCA Victor Japan JRZ-2501 disc*)

Hibiki-Hana-Ma is the music for a show, the visual part of which, produced by the artist Keiji Usami, used laser beams in abstract shapes. For the soundtrack, Xenakis wrote down a few bars for each instrumental texture, which were recorded by an orchestra, before transforming them (through changes in speed, reverberation and filtering). To these sounds were added several *concrète* sound objects (a thin sheet of steel, the sound of airplane engines) as well as instrumental sounds from earlier works. According to the sketches, the work was to consist of nineteen short sections, but by ear it can be divided into four sections (0'00"-3'00", 3'00"-6'32", 6'32"-11'07", 11'07"-17'39"). The audible evidence of the copy and paste, the looped repetition of certain phrases or gestures, as well as other editing processes and artefacts, are all factors that give a certain "electroacoustic" quality to a music which in reality uses almost exclusively orchestral material.

The premiere of the work took place in a special room, the Space Theater, designed by engineers from NHK and the Sansei Engineering Company. This room housed a system of almost 1000 evenly-distributed loudspeakers (Sansei 1970). For the broadcast, Xenakis wrote a "kinetic score" distributing the tape's twelve tracks over multiple groups of loudspeakers. This was the first time that he could use such a large number of speakers. This is a very different diffusion method from the *Poème électronique* of the Philips Pavilion of 1958, but also from what he would later do in *Persépolis*.

HONMA PONIMA Cinematic Score. To χαρίσω στις φίλτες μου, κενιχάρου Ακινάκη, Σεϊτζι Όσάβα, Ύτζι Τακασκι και Τορσι Τακέμιτσου.

Dedicated to my friends Kuniharu Akiyama, Seiji Osawa, Yuji Takarashi, Toru Takemitsu. βί, αμεδ

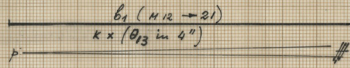
ヒビキ・ハナ・マ
HIBIKI HANA MA

AUTOMATIC 6 TRACKS TAPE RECORDER

FIXED 6 TRACKS TAPE RECORDER

The upper letters correspond to the musical score letters their indices correspond to various metronomic speeds

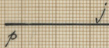
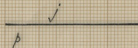
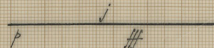
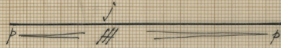
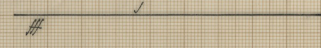
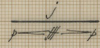
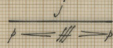
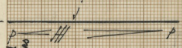
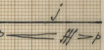
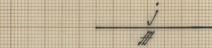
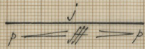
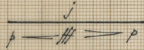
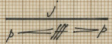
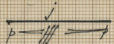
The lower greek letters indicate loudspeakers and/or movement patterns according to the designs made on special sheets of paper. The even lower latin letters are level indications as in usual musical scores



$B_1 \vee B_2$ means: play first the pattern B_1 then B_2

$B_1 \wedge B_2$ means: play both patterns simultaneously.

L_1, L_2 means: either L_1 or L_2 .



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PERSEPOLIS

DATE OF COMPOSITION

1971

COMMISSIONED BY

the Shiraz Festival

MUSIC FOR THE PERSEPOLIS'S POLYTOPE

8-track tape, produced at the (private)

Acousti studio

DURATION

55'06''

PUBLISHER

Salabert

PREMIERE

Shiraz festival, Persepolis (Iran),

26/8/1971

The *Polytope de Persépolis* was a grand spectacle, occupying the ancient site and the surrounding mountains (with searchlights soaring skyward and laser beams), even calling for high school students carrying torches, etc.

The music for the show, soberly titled *Persépolis* and which represents Xenakis's longest electroacoustic work (*La Légende d'Eer* has a similar duration), was diffused by groups of loudspeakers inside the ruins as the public wandered around. It has often been remixed, no doubt because it is typically Xenakian in its incredible sounds, the mixing and temporal unfolding of which aim for total immersion. Xenakis draws upon *Bohor*'s principle and amplifies it: the piece is one gigantic continuum, a very dense sound paste that unfolds continuously, with very gradual transformations, giving the sensation of an inarticulate sonic eternity. The beginning is very characteristic: for more than six minutes a continuum of low pedals takes shape and grows, in which several other sounds merge (creeping, friction, metallic sounds, various high-pitched sounds, etc.) – one could describe it as a "fusional" sonority in the psychoanalytical sense. In addition, we hear many sounds that would later be found in the *Polytope de Cluny* and in *La Légende d'Eer*, and there are also sounds from *Kraanerg* (filtered and slowed down orchestral sounds), string *glissandi* from orchestral works, possibly jet take-offs, and the "thunders" and the "earthquakes" of *Diamorphoses*...

POLYTOPE DE CLUNY

DATE OF COMPOSITION

1972-73 (version I)

1973-74 (version II)

COMMISSIONED BY

the Festival d'Automne in Paris

MUSIC FOR THE CLUNY'S POLYTOPE

7-track tape, produced at the Acoustic studio (and at the CEMAMu), versions I and II

DURATION

24'

PUBLISHER

Salabert

PREMIERE

Cluny Museum (Paris), 10/13/1972

BIBLIOGRAPHY

Carré 2022

Jeudy 1975

"The *Polytope 2* is controlled by a digital tape using the most powerful computer, the CDC 7600 from Franlab-Informatique. This entirely new tape is based on a program produced by the Cemamu. 600 electronic flashes will form a continuous or discontinuous luminous music, of a unique galaxy. The lasers are be equipped with new ultra-fast switches (changes every 40/000 seconds). [...] The principles, theories and formulae that Xenakis applied to his musical composition are here directly applied to light: sieve theories, probabilistic distribution, probabilistic and deterministic trajectory... The music is also different, partially produced using the CEMAMu's digital analogue converter which is at CNET" (*programme from the Festival d'Automne*).

The *Polytope de Cluny* was an incredible success: its two versions, performed several times a day for several months, totalled perhaps more than 200,000 spectators. Lying on the ground, the public was presented with an epic luminous show (using laser beams, flashes and mirrors) and sounds characteristic of Xenakis. Everything was automated: the music was played on seven tracks of an eight-track tape recorder (the last track, for synchronisation, was not used); then, digital data on a 9-track tape recorder spatialised the sound and controlled the flashes and lasers. We thought the visual spectacle was lost, but the recent digitisation of the 9-track tape recorder has allowed the piece to be performed once again at IRCAM in June 2022 (cf. Carré 2022).

The soundtrack, which is a self-contained musical work with the same name, consists mainly of *concrète* and instrumental sounds. Several of these sounds are recycled from other tracks and would later be reused in *La Légende d'Eer*. Unlike the latter, the shape of the work is, much like *Persépolis*, relatively static. It begins with a continuum of low sounds upon which more and more sounds are grafted, forming a great mix of sounds that lasts for a while, with many transformations, which finally gives way, much like the end of *Bohor*, to a very noisy continuum. Similar to a sound sculpture, the *Polytope de Cluny* continues the pioneering work of Xenakis in terms of immersion.

For the second version, as shown by the quote above, Xenakis had wanted to synthesise sounds at the CEMAMu. In an article from 1971, he evokes a "prelude" (Xenakis, 1971c). In an interview from the same year, he speaks of the "entirely computer-produced" "introductory sound" (Xenakis n.d.), but he specifies that it only lasts 4 seconds. It would therefore seem that Xenakis had to make do with these 4 seconds, though he had planned a real prelude and perhaps a postlude, much like the "interlude" (which would become *Concret PH*) of the *Poème Electronique* at the Philips Pavilion.

CLUNY

Piste 1 38cfs

Winds grave	1	Piste 1	de f (19) 0 → 1' 30"
gong jap.	1	"	" λ 0 → 1' 34" ^{2' 34"}
Xapt.	1	"	" E (38) 0 → 2' 14"
Philippines	1	"	dolby (19) 0 → 1' 14"
Gumbande	5 1	"	" (38) 0 → 3' 54"
"	1 1	"	" (38) 0 → 3' 36"
"	2 1	"	" (38) 0 → 1' 4"
"	1 2	"	" (38) 3' - 36" →
"	3 1	"	" (38) 0 → 1' 08"
"	1 3	"	" (38) 4' 26" → 5' 4"
"	4 1	"	" (38) 0 → 1' 16"
Bridge	1	"	de e (38) 0 → 1' 30"
Xén. *	1	"	de δ (19) 0 → 1' 34"
pel. Lasque	1	"	dolby (19) 0 → 0' 47"

MONTAGE des 7 portes.

Δt		FINAL
$(= 2' 48'')$	2' 48''	2' 52''
$(= 2' 34'')$	2' 34'' 5' 22''	5' 28''
$(= 2' 14'')$	7' 36''	7' 41''
$(= 2' 24'')$	10' 00''	10' 06''
$(= 0' 54'')$	10' 54''	10' 59''
$(= 3' 36'')$	14' 30''	14' 35''
$(= 1' 6'')$	15' 36''	15' 36''
$(= 0' 48'')$	16' 24''	16' 24''
$(= 1' 06'')$	17' 30''	17' 29''
$(= 1' 15'')$	18' 45''	18' 45''
$(= 1' 15'')$	20' 00''	19' 59''
$(= 1' 28'')$	21' 28''	21' 26''
$(= 0' 45'')$	23' 00''	22' 58''
$(= 1' 30'')$	24' 30''	24' 30''

BnF
MUS.

LA LÉGENDE D'ÉER (*DIATOPE*)

DATE OF COMPOSITION

1977

COMMISSIONED BY

The WDR (Westdeutscher Rundfunk, Cologne) for *La Légende d'Éer*

MUSIC FOR THE DIATOPE

A 7-track tape, produced at the WDR studio and at the CEMAMu, 2 versions, duration 45'48" (first version), 55' (second version); there is an 8-track version, fully spatialised, produced by the WDR (Volker Müller)

PUBLISHER

Salabert

PREMIERE

Bochum platetarium, WDR festival, 11/2/1977 (concert) and Centre Georges-Pompidou (Paris), 11/2/1978 (Diatope)

TITRE

The "myth of Er" as told by Plato in *The Republic*

BIBLIOGRAPHY

(Légende d'Éer et Diatope) : Barrett 2002, Di Scipio 1995, Erbe 2009, Friedl 2015, 2019, Iliescu 2015, Kiourtsoglou 2016, Pape 2010, Pardo 2003, Solomos 2006

"Music is not a language. Every piece of music is like an intricately-shaped rock with ridges and designs carved onto it and into it and which men can decipher in a thousand ways, none of which is the best or the truest. By virtue of this multiple exegesis, the music arouses all sorts of phantasmagoria, like a catalyst crystal. I wanted to deal with the abysses that surround us and among which we live. [...] The signs sent to us by these abysses are also made up of lights and sounds that arouse the two main senses that we possess. This is why the *Diatope* is designed to be a place of condensation of these signs of the worlds" (*Xenakis 1978: 9-10*).

The *Diatope* uses the same visual device as the *Polytope de Cluny* (flashes, laser beams, mirrors) with the same automation though more complex (also for sound spatialisation, with the 7 tracks distributed over 11 loudspeakers). However, there are two additional elements: the architecture (a tent that stood in front of the Centre Georges Pompidou), designed by Xenakis; and essays written by authors included in the program. One of the latter is taken from the end of Plato's *Republic*, which tells the myth of Er, who was thought to have been killed in a battle, but whose corpse did not putrefy; upon returning from the realm of the dead, Er recounts what he saw there – it seems that Xenakis was plagued by the question of death at this time.

The music forms an autonomous work, which was moreover created before the premiere of *Diatope*. There are 14 sources of *concrète* or instrumental sounds, for a large part already used in the *Polytope de Cluny*, to which, in his sketches, Xenakis gives abbreviated names, mixing Greek and French: "barre métal. (sounds of the beginning: metallic bars), "Müller" and "James" (possibly sounds of the EMS synthesizer available to the WDR – the only time Xenakis would have used a commercial synthesizer – made by his assistants, Volker Müller and James Whitman), "κυμβ" (cymbals?), "fcl vagues" (hit *col legno*, drawn from orchestral works); "κεραμι" (an abbreviation of "κεραμίδι", tile), "τζουζ" ("tsuzumi", a Japanese percussion instrument from *Hibiki Hana Ma*), "drops" (droplets?), "διαττ. ("shooting star", for "διάττοντας": the sounds of the end), etc.

MYCÈNES ALPHA or MYCENAE-ALPHA

DATE OF COMPOSITION

1978

ELECTRONIC MUSIC (UPIC)

Excerpts of music for the Polytope de Mycènes, combined into a concert work; tape 2track mono tape (UPIC), realized at CEMAMu

DURATION

9'36"

PREMIERE

Mycènes, 8/2/1978

PUBLISHER

Salabert

BIBLIOGRAPHY

(Mycènes Alpha and Polytope de Mycènes) : Fajond 1981

Gill 1981

Levy 2012

Slaviček 2023

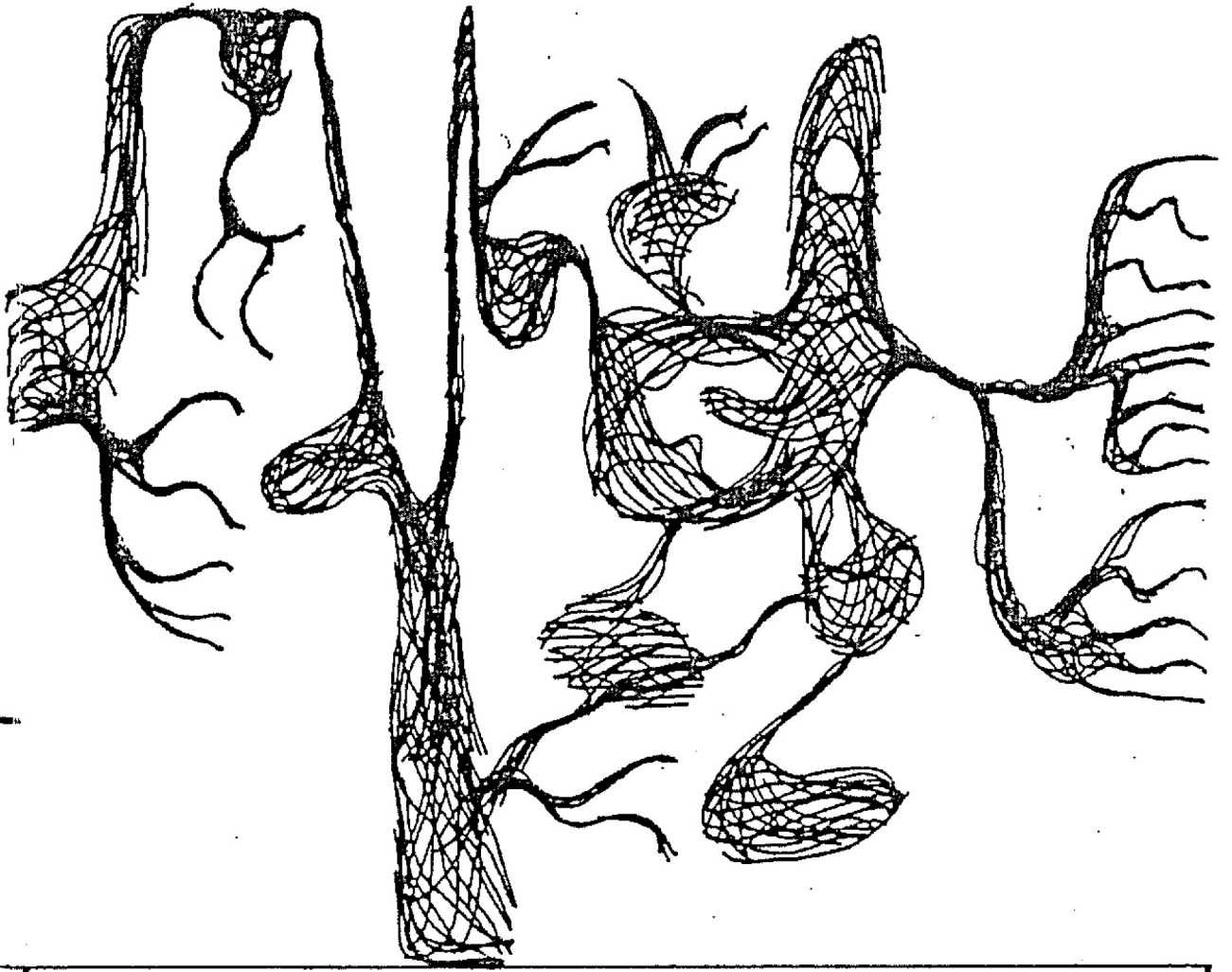
Squibbs 2020

Touloumi 2012

The *Polytope de Mycènes* celebrates the recognition of Xenakis's work by the Greek government, shortly after the fall of the dictatorship of the Colonels, once his Greek nationality was restored to him and he was able to return there: it is a grand spectacle which occupied the ancient site, the surrounding hills, with anti-aircraft searchlights and hundreds of children carrying torches...

Either because he did not have time to write a great work or by choice, Xenakis assembled for the music various excerpts of existing music: extracts from the *Oresteia* (1965-66), songs from *À Hélène* (1977) and *À Colone* (1977), percussions from *Persephassa* (1969) and *Psappha* (1975). As a new work, there are excerpts or sound interpolations composed using the UPIC. It is by assembling these extracts that *Mycènes alpha* was created.

The concert work known as *Mycènes alpha* is made up of thirteen sections drawn up separately from as many drawings made by Xenakis on the graphic tablet of the UPIC system. Each UPIC "page" includes freely drawn figures, often following an evolution according to an obvious orientation (in particular sections 2, 5 and 6), other times according to more complex, ramified diagrams and in the form of a tree structure. The transition between sections is never completely smooth, except for the legato between sections 9 and 10. The sounds exhibit varying degrees of spectral variety. There are, however, some almost pure, sinusoidal sounds (for example at the end of section 9). Some sections are very similar graphically or almost identical to each other (sections 7 and 13, sections 3 and 6, sections 11 and 12), though they sound quite different to the ear due to some differences in UPIC programming



4'17"

5'16"

POUR LA PAIX

DATE OF COMPOSITION

1981-82

MIXED MUSIC

Radiophonic work, mixed music (4 narrators, choir and tape); exists in 4 versions: radio or concert version with everything on tape; concert version with narrators, choir on stage and tape; concert version with narrators on stage and the rest on tape; concert version with choirs only; 2-track tape (UPIC), produced at the CEMAMu and GRM

DURATION

26'45"

(version with everything on tape)

PUBLISHER

Salabert

PREMIERE

Radio France (Paris), 23/4/1982
(Danielle Delorme, Françoise Xenakis, Philippe Bardy, Maxens Maylfort, speakers, Radio France Choir, Michel Tranchant, conductor)

BIBLIOGRAPHY

Del Ghingaro - Solomos 2022
Frisius 1986
Solomos 2015
Tsougras 2005

"The human being is a prisoner of the ideologies and beliefs of society and the State which use him like a blind pawn, in their machineries that often destroy lives and destinies. The nostalgia of two childhood friends taken as soldiers in two enemy camps. So little, in the face of the atrocities of incessant wars, of their suffering for nothing. But the sighs of their memory do not prevent them from running to their death. This is the plot of the text taken from *Écoute* and *Alors les morts pleureront* by Françoise Xenakis and recited between and during the musical sequences. These sequences are sung by a mixed choir accompanied or separated by sound interventions on a stereo tape composed on the UPIC" (*Xenakis, programme for the premiere*).

Pour la paix is Xenakis's only radiophonic work, hence the fact that it is the only work – apart from his *Oresteia*, but which is sung in ancient Greek – for which the text is so important. The poignant story prompted Xenakis to compose very illustrative UPIC sounds. He also put his own experience into the work: after the final explosion, the UPIC sounds consist of *glissandi* reminiscent of *Metastaseis*, a work in which he evokes the sounds of war and the beginning of the civil war, during which he almost died. As for the choir, it is the "musical" element of the whole, it sings with pure phonemes a very expressive notated composition.

UPIC sounds feature prominently in *Pour la Paix*. Divided into 30 sequences of very unequal duration (from 0.5" to 5'37"), they total 18'24". From a morphological point of view, these sounds are extremely varied, ranging from quasi-harmonic spectra to noises of various types. As it has been said before, they are often illustrative: for example, the sounds resembling voices in sequence 18 evoke the "joyful smile" mentioned in the text. But not all sound sequences are illustrative. This is particularly the case of the long sequences, in particular the 29th (the longest), which prepares the final explosion, the role of which is dramatic: through a stable sound, it creates a worrying suspense. One detail in particular is important: the final explosion contained in this sequence is not very convincing. "We struggled to make a convincing explosion for when the bomb falls on the two swimmers," says Teruggi (in M. Solomos 2012); but Françoise Xenakis is not of the same opinion: "He created a soft death. The children are relieved" (*in ibid.*).

The radio or concert version with all the elements on tape (acousmatic diffusion) is not the most convincing. In fact, *Pour la Paix* sounds best when the narrators and the choirs are on stage, because it highlights the fragility, the dramatic balance between these three opposing elements, the narrators who tell the story, the UPIC sounds which illustrate the text through which dramatic situations are created, and the choirs which create a kind of musical parentheses fixing the drama.

Signal enregistrément

voir p. 10

De une guerre. un recitaur

~~25 2~~

12/1

une guerre

deux recitaur

par phrases hachées, par images, par couplets voici, dans son horreur, la guerre. Atrocités, massacres, tortures, infinie souffrance des hommes, des femmes. Nous sommes n'importe où. Là où l'on pend, fusille, massacre.

XENAS 2 # 24

recitaur neutre

1

25 2

Ici le cessez-le-feu est officiel. C'est le deuxième en vingt-quatre heures. Et il aura duré ce qu'a duré le premier : quelques heures. Les armes devront se taire à 18 h 45 les grands l'exigent. Alors muets se battent à l'arme blanche — et le sable les recouvre, enfants-frères du même drap de sable, FRAN.

IX2 XENAS #05

IX2 XENAS #05

2
Garcia sans barbe?
C'est Garcia

~~recitaur~~
- voix neutre - il dir
c'est tout

Fr

perdus depuis?

Ils étaient du même village et s'étaient mieux connus parce que pour une fête il

9e
indiqui

fallait deux enfants de taille identique pour se glisser dans des vêtements de grenouilles qui étaient à petits carreaux noirs et blancs et qui pourquoi? avaient le dedans des oreilles en matière plastique orange.

XENAS 1 07-106

enfants soldats 12"

chacun d'eux dans un camp. ils s'étaient perdus la guerre. ils tuent

mais chacun cherche

autre: son ami perdu depuis (3? 4 ans?)

Écoute le vent Dans le haut des arbres. Le vent qui décoiffe les morts, casques roulés au loin. Le vent qui caresse les visages et décoiffe les cheveux.

3 recitaur
Attention à l'histoire inconnue

TAURHIPHANIE

DATE OF COMPOSITION

1987-88 (first version),
1988 (second version)

COMMISSIONED BY

the Arles Festival and the Radio France-
Montpellier Festival

ELECTRONIC MUSIC (UPIC)

Music for a show with bulls and horses,
Arènes d'Arles;
2-track tape (UPIC), produced at the
CEMAMu, 2 versions

DURATION

10'45"

PUBLISHER

Salabert

PREMIERE

Radio France Festival in Montpellier,
Arènes d'Arles, 7/13/1987

TITLE

tauros (bull) + *hippos* (horse) +
epiphania (appearance).

BIBLIOGRAPHY

Coupré 2020
Paland 2009

"The work was premiered at the Arènes d'Arles with a peaceful demonstration of Camargue bulls and horses on July 13, 1988. The music of *Taurhiphanie* was, moreover, partially improvised in real time on the UPIC which was placed in the centre of the arena. In addition to *Taurhiphanie*, *Pléiades* and *Psappha* were performed by the Percussions de Strasbourg and the Pleiades ensemble conducted by Sylvio Gualda. High-quality loudspeakers surround the audience. At least 4 loudspeakers (ABCD), connected diagonally (AC and BD), must be provided" (*Xenakis*).

The show-performance that took place in the Arènes d'Arles was almost a *polytope*. During the show, enter "first the horses, mares each with their foal and two stallions on a leash, it's a parade opening, with as accompaniment the music I had written for Europa-Cantat, in Strasbourg, two years earlier, *Idmen* [1985]" (*Xenakis* in Massin 1987). Then, the horses withdraw and we hear the percussions of *Pléiades* conducted by Silvio Gualda. Finally, the bulls enter, "each has microphones on its horns" (*ibid.*). *Xenakis* was in "a wooden tower in the middle of the amphitheatre, and on its top, about two to three meters from the ground, there was a table. The UPIC equipment was placed there, inside the tower, so that I could improvise during the performance. This is now possible with the system. I also controlled the loudspeakers" (*Xenakis* in Varga: 192). But it seems that the microphones on the bulls didn't work very well...

A few months later, as was customary with his performances, *Xenakis* put together UPIC parts to form what would then become the music of *Taurhiphanie*, lasting just over 10 minutes. The work really sounds like "bulls", with *Xenakis* having found the appropriate sounds! One of the other peculiarities of the work is the systematic use of auditory illusions (sounds which seem to constantly rise or fall), previously explored by Jean-Claude Risset.

VOYAGE ABSOLU DES UNARI VERS ANDROMÈDE

DATE OF COMPOSITION

1989

COMMISSIONED BY

Dr. Paul Eubel, director of the Goethe-
Institut in Osaka, Japan

ELECTRONIC MUSIC (UPIC)

Music for a kite exhibition; 2-track tape
(UPIC), produced at the CEMAMu

DURATION

15'30"

PUBLISHER

Salabert

PREMIERE

Premiere: Kamejama Hontokuji Temple,
International Kite Exhibition, Himeji
(Osaka), 4/1/1989

TITLE

see note by Xenakis

BIBLIOGRAPHY

Coupré 2020
Goutmann 2022

"The broadcast of this music on stereo tape could be illustrated in the programme notes by one or more pages of the graphic score [...]. This score is made up of pages drawn on UPIC at the CEMAMu. [...] It is about a space voyage in the distant future towards the Andromeda galaxy, with episodes during the crossings of sidereal spaces. The music, lasting 15'30", is on 1/4 inch stereo tape at 38 cm/s and must be played on several high quality loudspeakers. The left and right channels should be played through diagonally connected loudspeakers. Loudspeakers surround the audience. At least 4 loudspeakers must be provided, A, B, C, D, (connected diagonally, AC for the left channel and BD for the right channel)" (*Xenakis, preface to the score, Salabert editions*).

Voyage absolu des Unari vers Andromède is an important milestone in terms of synthetic sonorities, sometimes varied and changing, sometimes more static. It can be divided into three large sections of increasing duration (0'00"-3'00", 3'00"-8'00", 8'00"-15'29"), with only a few moments of stasis (1'00", 9'30", 14'00"). The sounds (waveforms) are very different from other UPIC works, and the sound morphologies ("UPIC pages") are also new: sound braids of all kinds seem to dominate, but there are also straight lines.

The "unari" are traditional Japanese kites in the shape of a cicada or a fly, decorated in a particular way and equipped with a "sound arc", a cord stretched in the wind which creates a buzzing sound that resembles the sound of cicadas¹². As for the Andromeda Galaxy, in the past called the "Great Andromeda Nebula", it is an enormous spiral-shaped galaxy, the closest to the Milky Way ("our" galaxy).

15-2-89

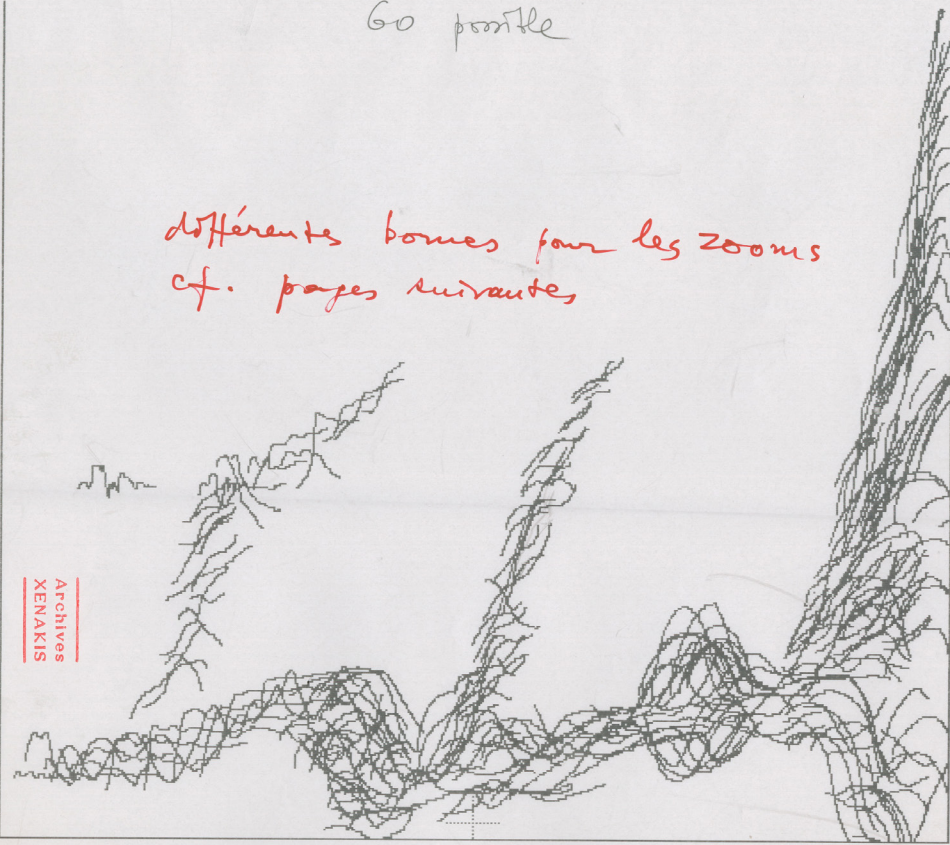
PAGE 8 = zoom de p. 6 (8,5; 48)

DUREE 0h 0mn 30.1s DUREE DE LA PAGE 0h 0mn 30.1s

Go profile

différentes bômes pour les zooms
cf. pages suivantes

Archives
XENAKIS



GENDY3

DATE OF COMPOSITION

1991

ELECTRONIC MUSIC (GENDYN)

2-track tape (GENDYN software),
produced at the CEMAMu

DURATION

18'45"

(there is an earlier version named
Gendy301 presented at the
International Computer Music
Conference in Montreal, 10/18/1991)

PUBLISHER

Salabert

PREMIERE

International Meeting of Contemporary
Music, Metz, 11/17/1991

TITRE

the GENDYN software (dynamic
generation)

BIBLIOGRAPHY

Di Scipio 1995

Di Scipio 2009

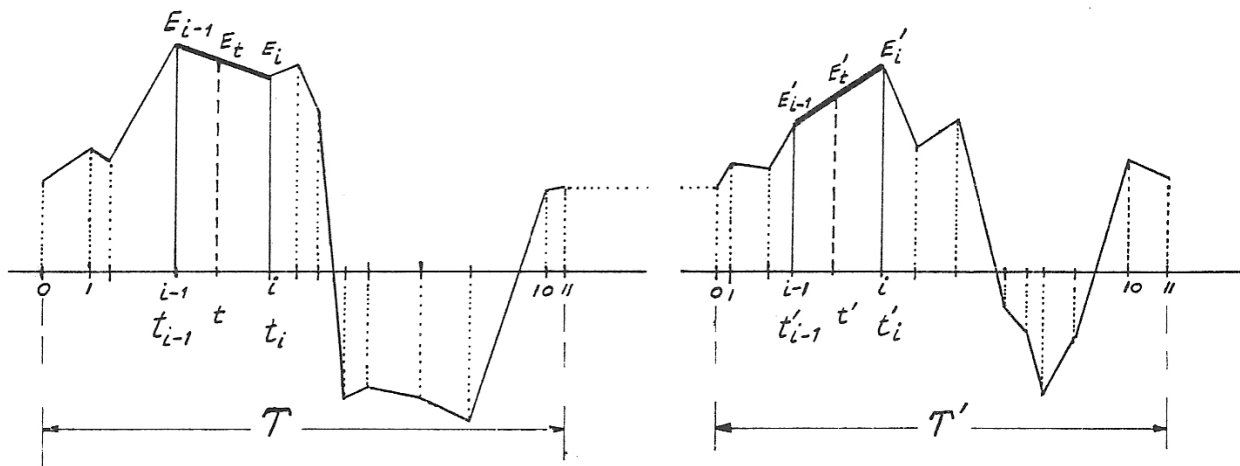
Hoffmann 2001, 2009a, 2009b

Ikeshiro 2015

"This work was composed at the CEMAMu on a computer using stochastic processes applied over several layers of complexity. For example, the architecture of the musical form produced by the most general layer also uses a stochastic process" (*Xenakis, Xenakis Archives: works file 8/11*).

Gendy3 is composed with the GENDYN program, which performs "general dynamic stochastic synthesis": polygonal waveforms are calculated using probabilistic laws, while other laws govern temporal and amplitude fluctuations within the waveforms. The work is divided into eleven sections, each focusing on particular sonorities, sometimes by harmonic spectrum and often *glissandi* (for example section 1), sometimes continuous spectrum, similar to very dense noise (for example section 4). However, there are also passages with brief random frequency disturbances and frequency modulations (very fast glides) as well as noisier textures that conceal harmonic sounds in the background, revealing them only for brief moments. Peter Hoffmann (2009a) has given the eleven sections very suggestive titles, which reflect this variety: "the harbour", "heavy metal", "apotheosis of noise", "atmosphere of fog", "buzzing insects", "sirens", "stochastic organ", etc.

As Peter Hoffmann (2009b) has shown, Xenakis manipulated the process of sound synthesis in such a way that particular pitches ("screens" – scales – of pitches) sometimes emerge from the digital audio signal, as in a process of self-organisation at a micro-compositional level, that is to say of the synthesis of sound.



S.709

DATE OF COMPOSITION

1994

ELECTRONIC MUSIC (GENDYN)

2-track tape (GENDYN software),
produced at the CEMAMu

DURATION

7'03"

PUBLISHER

Salabert

PREMIERE

Radio-France (Paris), 12/2/1994

TITLE

Number of one of the "sound files"
selected for the work

BIBLIOGRAPHY

Paland 2009

S.709 is the last work composed with the GENDYN software, and not only the last electroacoustic work by Xenakis, but also one of his final works. This can be felt in its short duration, its systematic nature (the sounds are not very varied, and the piece is made up of a single piece). Xenakis is clearly tired: his last instrumental works, increasingly shorter in length (5'50" for *Koïranoï*, 3' for *Hunem-Iduhey*, 4' for the ultimate, *O-Mega*, which stops abruptly) are often conceived in a single block, like a fragment of eternity seized upon death. But while these instrumental works often sound like sustained notes, *S.709* provides the exact opposite: intense noise activity, in which one might imagine they were in a kingdom of insects. During the premiere, which one of the authors of this text attended, the public looked at themselves: not knowing that Xenakis was gradually getting sicker, they believed this was a new taunt by the composer!

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NOTES

1. With Michel Phillipot, Abraham Moles and Alain de Chambure, they founded an informal group called MYAM - an acronym derived from M(oles), Y(annis), (A)lain and M(ichel).
2. François Bayle (2007) explains why: “It was necessary [...] to resist the project of a Xenakis workshop (that of redirecting the GRM’s resources towards its own theories. Françoise, Iannis’s wife, negotiated as a dynamic and intelligent team player who admired her husband and had total confidence in his genius”.
3. Xenakis had participated in the annual conferences of the Gravesano experimental studio since 1955: on Xenakis’s presence at Gravesano, cf. Barthel-Calvet 2023.
4. On Xenakis’s teaching at Bloomington, cf. Feld 2022.
5. These graphic signals were obtained with the STOCHOS programme (written in Fortran), a reworking of the ST algorithmic composition programme written by Xenakis in 1962 (Rogers 1972, Byrd 1977).
6. These audio documents survive in the Xenakis Archives. Among the students was Curtis Roads, who two years later produced the first form of granular synthesis on a computer.
7. In an interview, he explains that he also resigned for political reasons: criticising “this terrible, fascist, annihilating war against Vietnam” being waged by the United States, he explains that “this is probably the main reason why I resigned and left the United States” (Xenakis in Pilichos 1973).
8. The differences between “dynamic stochastic synthesis” (1990s) and “stochastic synthesis” (1970s) are briefly outlined in Xenakis (1985: 176-180). Essentially, this involves the introduction of a form of linear interpolation between two stochastic variables (Di Scipio 2009).
9. It should be noted that the two latest works, Gendy3 and S.709, are stereo only in one particular sense: there is *one* audio signal on *two* tracks, but with a slight time shift between the two. Extremely short (of the order of hundredths of a second), this delay produces audible effects of phase shift and perceptual lateralization of the source. This is an unusual stereo situation, a sort of “double mono with phase shift”.
10. It has been pointed out (Gibson 2015), and rightly so, that concert halls do not always allow a truly circular arrangement of loudspeakers around the audience. In his article, Gibson illustrates alternative spatialization schemes tried by Xenakis.
11. Daniel Teruggi (in Solomos 2012) explains that during the digitisation of *Bohor* for the EMF disc, Xenakis, who was present, was worried because he was hearing low tones that he did not recognise.
12. Cecile Laly, Traditional Japanese Kites, Quai Branly Museum Collection, Musée du quai Branly - Jacques Chirac, Paris, 2014.

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- Page 59: SCORRANESE Daniel, DI SCIPIO Agostino 2024: "Gli 'sciami' di glissando' in *Diamorphoses*. Ricostruzione mediante Digitale Morphophone Environment", in *Actes du 24eme Colloquio di Informatica Musicale*, Université de Turin, 2024: p.24-31.