

# META-XENAKIS

NEW PERSPECTIVES ON IANNIS XENAKIS'S LIFE, WORK,  
AND LEGACIES

EDITED BY SHARON KANACH AND PETER NELSON





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# 28. The Pythagorean Wall: A Visual and Auditory Drama

*Julio Estrada*<sup>1</sup>

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## The *Dekemvriana*<sup>2</sup>

In a photograph taken around 1965, Iannis Xenakis, close to his mid-thirties, appears with a conservative air and without showing the left side of his face.<sup>3</sup> A decade earlier, between the end of 1944 and the beginning of 1945, he had protested as a student during the dark Athenian *Dekemvriana* (December Days). Once the Nazis were expelled, England occupied Greece to prevent it from leaning towards communism; Winston Churchill (1874–1965) imposed the repression of all Greek links with the Stalinist enemy and armed the formerly pro-Nazi Greeks. The students demonstrated in front of the British-occupied barracks and, as Xenakis and his wife Françoise narrated, upon arriving at the square with his group, the Lord Byron Brigade, the future composer fired a nearby cannon, causing damage to the new enemy. In immediate response, a shell's shrapnel destroyed his face; he lost his left eye, and for a decade, he experienced a continuous complex noise caused by the deterioration of his auditory system—perhaps affecting his voice, which remained slightly muffled and rough.<sup>4</sup>

A musician still in training, when he emigrated to Paris in 1947 Xenakis needed to

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1 I am grateful to Lucas Barroso Rouwet for the transcription of my lecture on which this text is based, presented on 1 October 2022 in the Meta-Xenakis International Symposium, during the SUICREA-UNAM, Mexico leg of our forty-one-hour non-stop marathon. See Estrada, 2022. The translation of this chapter is by the author (with guidance from the editors).

2 The so-called *Dekemvriana* refers to civil disturbances that took place in Athens between 3 December 1944 and 11 January 1945, involving factions of the Greek Resistance movement and the Greek government, backed by British forces. See Iatrides, 2015.

3 Lipnitzki/H. Roger-Viollet, "Iannis Xenakis" (1965), *Britannica*, <https://www.britannica.com/biography/Iannis-Xenakis#/media/1/650599/15298>

4 This version of the facts surrounding Xenakis's war wound differs—somewhat—from previously published sources, but this version, published here for the first time, is the one that both the composer and his spouse, Françoise, recounted to the author in 1994, in their home on Rue Chaptal, Paris, in a rare admission. See also this exchange in Varga, 1996, p. 18: "Varga: *You were wounded in January 1945.* Xenakis: Yes, I was hit by the shell of a Sherman tank. But by then I had also blown up a few of them."

describe what that noise sounded like; he thought he would benefit from the help of Arthur Honegger (1892–1955), whose *Pacific 231* (1923) imitates locomotive sonorities, or Darius Milhaud (1892–1974), but he only found guidance from Olivier Messiaen (1908–92), the post-war master, expert in Greek rhythm, composer of *Modes de Valeurs et d'Intensités* (1949) in response to integral serialism, and someone who understood the autonomy of the Greeks. Trained as an engineer, Xenakis worked as a calculator for Le Corbusier (1887–1965) and discovered Edgard Varèse (1883–1965), who was entrusted with the music of the Philips Pavilion (1958), and whose work focused on the matter of sound—such as the *glissando*, the continuous gliding of the sirens in *Ionisation* (1933). As Xenakis said of Varèse:

His music was something special [...] I thought it was *musique concrète*, but no, they were traditional instruments that he used in his own way [...] there was practically no melody—he worked with timbre [...].<sup>5</sup>

### Metastasis

Xenakis continued to learn music in parallel with his conception of the Philips Pavilion.<sup>6</sup> The tension of its high curved walls is derived from a geometry fundamental to the architectural continuum, and its aesthetics represent an architecture-sculpture intended to be observed as an artistic object.<sup>7</sup> The precedent is Anton Pevsner's (1888–1962) sculpture, *Developable Surface* (1938–9); the Russian had emigrated to France and, since the 1920s, had revealed the structure of an innovative model: wooden tensors covered with paper to obtain three-dimensional fans or hyperbolic paraboloids.<sup>8</sup>

The fluidity of multiple turns starting from one axis is an architectural challenge that the young Xenakis calculated in an unprecedented way: starting off from Le Corbusier's drawing—which comprised a “stomach” and an indication of the entrance and exit of the public—he projected the nine hyperbolic paraboloids that emerge from the base of the Pavilion.

5 Andrew Toovey, “Edgard Varese Film with Interviews: Messiaen Xenakis Maderna” (2 June 2012), *YouTube*, <https://www.youtube.com/watch?v=QJHN8-cn9jw> (at 6:26).

6 Wouter Hagens, “Expo 1958 Philips Pavilion 1958” (20 August 2008), *Wikimedia Commons*, [https://es.wikipedia.org/wiki/Archivo:Expo58\\_building\\_Philips.jpg#file](https://es.wikipedia.org/wiki/Archivo:Expo58_building_Philips.jpg#file)

7 A meaningful text by Le Corbusier notices this connection: “the Parthenon is the exceptional monument [...], a true sculpture and not a building” [*el Partenón es el monumento excepcional [...], una verdadera escultura y no un edificio*]. Laura Chaparro, “Le Corbusier, arquitectura geométrica a la medida humana” (27 August 2018), *OpenMind BBVA*, <https://www.bbvaopenmind.com/ciencia/grandes-personajes/le-corbusier-arquitectura-geometrica-a-la-medida-humana/>

8 Anton Pevsner, *Developable Surface* (1938–9), Peggy Guggenheim Collection, Venice, <https://www.guggenheim-venice.it/en/art/works/superficie-sviluppabile/>

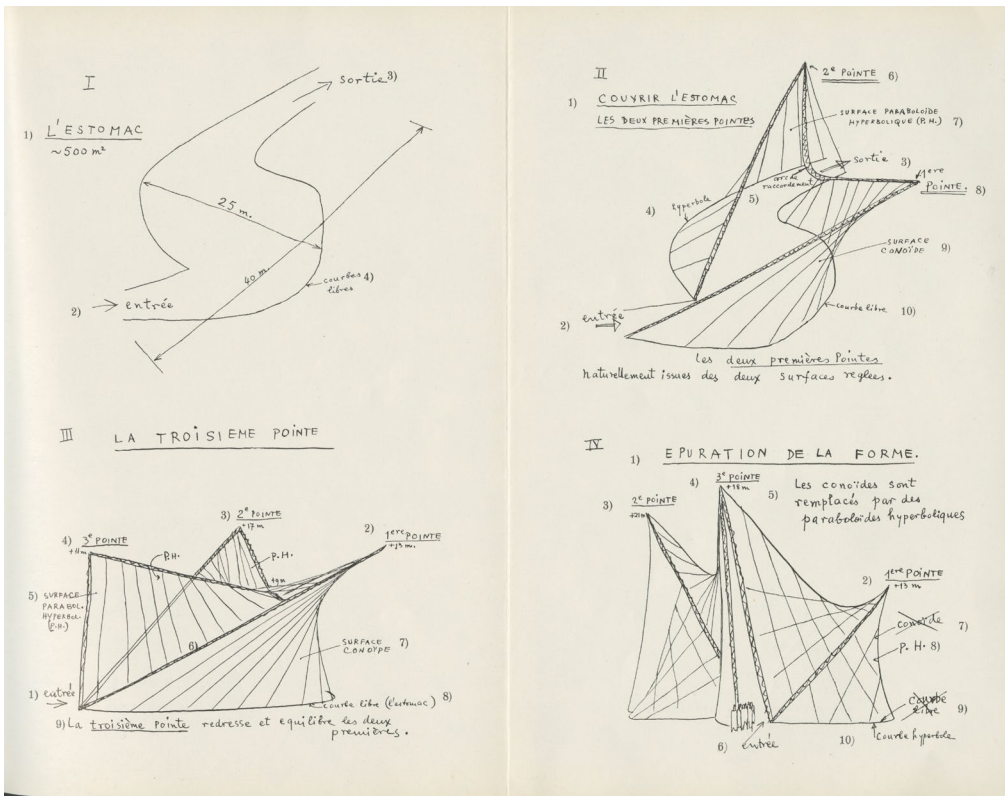


Fig. 28.1 Xenakis, the genesis of the Philips Pavilion, in four steps: from 1) stomach [*l'estomac*] to 2) covering the stomach [*couvrir l'estomac*] to 3) creating the third point to 4) refinement of the shape [*epuration de la forme*]; in *Gravesaner Blätter*, vol. 9 (July 1957), p. 25–6. Reproduced courtesy of Akademie der Künste, Berlin.

The Philips project was initiated between the Dutch firm and Le Corbusier in February 1956 and Xenakis's first sketches for it date from October of the same year.<sup>9</sup> Xenakis's designs though clearly echo his musical preoccupations when creating his breakout orchestral work *Metastasis* (1953–4): at the beginning, a unison followed by a set of straight lines—individual *glissandi* on all strings from the violin's low G—dispersing into a wide chord; at the close, another wide chord receding toward a point of unison one half-step higher than the initial pitch, low G#. Xenakis confirms this impression several years later:

In the Philips Pavilion I realized the basic ideas of *Metastasis*: [sic] as in the music, here too I was interested in the question of whether it is possible to get from one point to another without breaking the continuity. In *Metastasis* this problem led to glissandos, while in the pavilion it resulted in the hyperbolic parabola shapes.<sup>10</sup>

Furthermore, according to other sources,

<sup>9</sup> Xenakis, 2008, p. 93–94.

<sup>10</sup> Varga, p. 24.

From these first nearly-literal translations from music to architecture (Xenakis confessed to the conductor Charles Bornstein in an unpublished late interview that he felt as though he were “watching the sounds [of *Metastasis*] emerge from the ground” during the Pavilion’s construction—literally erecting a music to be seen!) [...] <sup>11</sup>

Despite that novelty, the extended middle part affirms the classical A-B-A form and the serial style, acknowledging the influence of Arnold Schönberg (1874–1951): two facts that merit further discussion.

In 1967, in a lecture by Xenakis at the Schola Cantorum in Paris, after listening to *Metastasis*, I intervened to present my perceptions: the woodblock beats reflecting the golden section during the unfolding of the initial *glissandi*; at the mid-point the dodecaphonic content; and the final *glissandi* in the opposite direction. Xenakis’s arguments about the series, even if I quoted him the crab<sup>12</sup> and mirror<sup>13</sup> projections, were curious: “pure coincidence” he said. Twenty-five years later, the musicologist Radu Stan (1928–2021), then in charge of the composer’s archives, confirmed my perception of the obvious, showing me the notebook with the notes of this series; however, this was the identity of the twenty-four transformations of the finite group theory, where the symmetries resulting from rotation and translation expand the traditional musical algebra (d-b-q-p): a new horizon for serialism! Why cover it up?<sup>14</sup>

1. The relatively recent publication by Anne-Sylvie Barthel-Calvet confirms my perceptions in 1967, except for one detail that had escaped me then: that of the “differential durations.” As Barthel-Calvet states in her abstract, “Starting from a critique of serialism, Xenakis analyzes some aspects of *Metastasis*: the *glissandi*, the serial transformations, the differential durations, the golden section.”<sup>15</sup>
2. Associating the massive continuum of strings to serialism and finite groups would have given a new boost to dodecaphony, as well as to Pierre Boulez (1925–2016) and Karlheinz Stockhausen (1928–2007), who had both also studied with Messiaen. The option adopted by Xenakis was to not divulge his finding, but on the contrary, to criticize serialism, strategically, the same year as the premiere of *Metastasis*.<sup>16</sup>
3. The secrecy with which Xenakis surrounded his advanced serialism seems to be, at least partially, a question of ego. Why adopt the same path as others if he had inaugurated the sonorous continuum, something that set

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<sup>11</sup> Kanach and Lovelace, 2010, p. 114.

<sup>12</sup> See “Crab Canon” (3 May 2024), *Wikipedia*, [https://en.wikipedia.org/wiki/Crab\\_canon](https://en.wikipedia.org/wiki/Crab_canon)

<sup>13</sup> See “Mirror Canon” (3 May 2024), *Wikipedia*, [https://en.wikipedia.org/wiki/Mirror\\_canon](https://en.wikipedia.org/wiki/Mirror_canon)

<sup>14</sup> See Barthel-Calvet, 2003, p. 162. It seems as though, also according to the same author, but elsewhere (Barthel-Calvet, 2012, p. 83) that this text originally appears in Xenakis’s “Carnet 13,” which spans from 26 December 1953–22 July 1954.

<sup>15</sup> Barthel-Calvet, 2003, p. 187.

<sup>16</sup> Xenakis, 1955.

him apart from the post-war musical world and turned him into a solitary creator, linked to mathematics and, very soon afterwards, to the computer through his exploration of the IBM 7090 at Place Vendôme in Paris. This silence both separated and distinguished him from the serialists.

4. Finally, the significant freedom to claim a “pure coincidence” with respect to the series does not prevent it from being heard in *Metastasis*, so that while in public he hides the dodecaphonic content, in private he embraces it, symbolically, with two wings in *glissandi*, one at the opening and the other at the end of the piece. This is Xenakis’s duality: he encloses his own past and he embraces it within those *glissandi*.

### Entrance to Music through Architecture?

While the origin of the Philips Pavilion clearly reflects Xenakis’s authorship over Le Corbusier’s, the musical work *Metastasis*—the last part of the triptych *Anastenaria* (1952–4)—whose first two parts were not premiered until 2000—has no link to any antecedent that reveals its musical origin. However, it was born by transferring the architectural projection of hyperbolic paraboloids into music by means of *glissandi*: the union of two pitches by means of continuous sliding of the finger on the string—used by Béla Bartók (1881–1945) in his string quartets (1909–39). It is a resource that Xenakis generalized and amplified, producing curves, or ruled surfaces, in sound: the union of several pitches through a sequence of *glissandi*. Transitioning from their architectural calculation to their auditory projection marks the audacious discovery that reaffirms a long-standing determination to be a musician and, moreover, an original one.

With Greek rhythm, the integration of noise, and *glissandi*, Xenakis resolved to turn the dense anarchy of the *Dekemvriana* into orchestral music: *Pithoprakta* (1955–6), whose nucleus recalls the shouting of slogans in the front row reappearing successively in the back rows, with students shouting and clapping. The most suitable formula to represent this evolution is the chronographic register, a method created by Joseph Schillinger (1895–1943), to compose and visually project music—horizontal axis: time; vertical axis: pitch, and to which Varèse also resorted to register the pitch and intensity of his *Poème électronique* (1957–8) for the Pavilion.<sup>17</sup>

*Pithoprakta*’s “noisery” is visualized with the well-known dense web of gliding pitches, movement that seems to lead the masses through streets and squares if one follows the chronographic account: a group advances from left to right, scattering treble

17 An example of this method also appears in *New York Skyline Melody*, piano (1939), by Heitor Villa-Lobos (1887–1959), who assigns melodic pitches on millimeter paper following the silhouette of the city’s buildings. See Francesc Serracanta, “Villa-Lobos,” *Historia de la Sinfonia*, <https://www.historiadelasinfonia.es/historia-2/siglo-xx/villa-lobos/>. For a few images of Varèse’s sketches for *Le Poème électronique*, see “Poème Électronique” (18 March 2020), *Wikidelia*, [https://wikidelia.net/wiki/Po%C3%A8me\\_El%C3%A9ctronique](https://wikidelia.net/wiki/Po%C3%A8me_El%C3%A9ctronique)

above, and bass below, with a gap in the center separating the two masses.<sup>18</sup> The title in Greek refers to “random actions,” an evocation of the stochastic method—conjecture or directed probability, or “directed disorder,” a formula that the composer associated with the idea of *mass*, as a filling of the space occupied by the collective movement of the manifestation, partially expressed as a sequence of pitches that slide in zigzag pattern.<sup>19</sup> Nothing needs to be precise but only to adopt the relative direction that leads to chaos; now, if direction and chaos are contradictory, what is interesting about the method is the representation of the rectilinear advance of a tangle. In contrast to the composer’s own, almost exclusively mathematical explanation of his music, the public’s understanding of probability could benefit from a more accessible analogy: the subjective noise he perceives is akin to that of a hornet’s nest, and the visualization of noise is achieved through massive *glissandi*. These concepts are akin to the rigid, resistant reinforcement tensors, or rammed textures, born from his architectural creativity.<sup>20</sup>

The architectural tool applied by Xenakis when designing the music allows him to reveal the sound continuum. However, as far as the musical tool is concerned, the ear can hardly understand this unexplored territory, foreign to the music-theoretical knowledge of the time and complex even for the most experienced listeners. Hence, even when perception is based on visual-auditory synesthesia, the composer’s ability to hear everything he draws must be rare, if it is understood that there is no previous sound memory or a method to distinguish how not four, but dozens, of fixed or sliding voices sound in continuous movement:

1. The ear, since it is impossible for it to be autonomous, requires the support of what it sees; that is to say, that which it must imagine in audiovisual mode.
2. The precision of the result therefore depends on the audiovisual imagination, a unique alliance allowing the approach of musical design from architectural design.
3. The impossibility of hearing such massive density in movement, its nourished macro- and micro-variations of pitch, as incalculable at the individual level as its micro-relationships at the global level, lead the method to admit the audible as “non-signifying.”
4. The audible “non-significance” in a spatio-temporal evolution, by becoming part of the compositional resource, in turn opens the door to stochastics, an aleatory technique that participates in the creative production.
5. The audiovisual-stochastic link becomes the binomial of the method, whose creative object is derived from an architectural understanding, with

18 See, in particular, this short excerpt in Ariel González Losada, “Iannis Xenakis—Pithoprakta—(C.52–60)” (29 December 2012), *YouTube*, <https://www.youtube.com/watch?v=RC3XCfDBIK8>

19 The origin of the method comes from Xenakis’s contemporaneous architectural design of the contiguity between the glass panes of the La Tourette convent (1954–60), also realized in Le Corbusier’s studio, by permutations of the Fibonacci series. See also Xenakis, 2008, Chapters 1.14–1.20 for more information on La Tourette.

20 See Wannamaker, 2012.



the idea of the “texture” of the mass.

6. The impossibility of auditory perception, a priori or a posteriori, demands a figuration, to be obtained through the calculation of a potential set of variables: register of pitches, articulations, densities, durations, intensities, directions, or others.
7. The compositional system thus confects a combination of visual design and statistical calculation as the basis of an artistic adventure in order to confront, only afterwards, the music that is seen or deduced without being perceived by the ear.
8. The compositional strategy, by not relying on listening beforehand, requires the figuration of a material that works as a sample (“clouds” of *pizzicatti*, *glissandi*, or other things); a statistical visualization that composer and listener are going to experience simultaneously throughout the work.
9. The creation of such music leads to a fuzzy and therefore imperceptible territory, where not listening but visualizing listening implies that that territory will not be fully experienced, and that the artistic result depends both on architectural design and on mathematical virtuosity.
10. In the compositional method of the musical-architectural—a product of auditory-visual synesthesia and stochastic calculation—the individual non-significance within the massive movement is ultimately perceived as the evolution of a discontinuous matter: isolated sounds and intervals; or of a continuum: *glissandi*.

## The Pythagorean Wall

Inserting oneself in music is, for Xenakis, a complex equation that requires him to explain his aesthetics, the link between the musical-architectural, and his theoretical search allied to mathematical tools—as he does in *Musiques formelles* (1963) and its later versions—as immersion in an unprecedented territory that marks the first stage of his work and the consequent recognition of an enigmatic figure; i.e., that of a composer-mathematician.<sup>21</sup> After years of experimental and artistic essays that apply mathematical language to a relatively different music, he continues to challenge the notion of music as language, emphasizing the specificity of communication. This underscores his departure from tradition and his adherence to a musical creation through analogy, devoid of any previous language, a theme developed by Pablo Araya.<sup>22</sup> When commenting on his *Diatope* (1978), Xenakis went so far as to state:

Music is not a language. Every musical piece is like a complex rock formed with ridges and designs engraved within and without, that can be interpreted in a thousand

<sup>21</sup> Xenakis, 1963.

<sup>22</sup> See Chapter 11 in this volume.

different ways without a single one being the best or the most true. By virtue of this multiple exegesis, music inspires all sorts of fantastic imaginings, like a crystal catalyst. I, myself, wanted to deal with the abysses that surround us and among which we live. The most formidable are those of our own destiny, of life and death, of visible and invisible universes. The signs that convey these abysses to us are made up of lights and sounds that provoke our two predominate senses.<sup>23</sup>

Music and language ask to identify the idea of composition in general, as a product from the a priori of the system. In contrast, the idea of musical creation locates the system a posteriori insofar as it demands the investigation of new theoretical, technical, and methodological tools. If, in the case of Ludwig van Beethoven (1770–1827), deafness prompted a solitary exploration that infused his music with a display of strength, airs of a military nature, and unprecedented structural innovations, in Xenakis's case, his visual and auditory ailments appear to inspire two distinct responses: on the one hand, a commitment to sound realism in music, where the intuitive can express its claim to the real, and, on the other hand, a self-identification as a musician-mathematician. This positions him at a unique juncture, between the perceptual [of reality] and the analytical [through mathematics] and, therefore, halfway between the compositional and the creative.

The designation musician-mathematician places Xenakis behind a Pythagorean wall or a veil, thus isolating the still-unprepared listener, especially when in an acousmatic situation.<sup>24</sup> If the intuitive and the experiential are perceived in Xenakis, the priority he gives to his theoretical-constructive rationalism serves to keep the spectator at an intellectual distance. Thus, in order to achieve the creative autonomy of a music tailored to his own capacities and needs, he deploys a kind of prosthesis that reinforces his perception of the artistic world with methods whose mathematical language replace music as language. This represents a decades-long intellectual armor Xenakis wore to advance in the competition towards the future of twentieth-century music, also aligned with an idea that was then in vogue, *art-science*. The arts do not operate with truths and, if they are or were languages for some, those truths that are more proper to them come from a perceptive experience rather than from the merely rational. Art and perception are assembled in a unity whose difficult rupture is greater than the ease of allying with mathematical language, beautiful for some, even if its territory is not aesthetics (a sophisticated and useless accessory with which to appreciate, prove, or demonstrate the richness of the link).<sup>25</sup> The mathematics-music binomial, of proven usefulness for the theoretical Xenakis, formulating novel notions or methods for music, i.e., the modular formation of scales, does not extend to the optimization of the perceptive quality of the artistic result. Assimilating probabilistic procedures or complex mathematical approaches with the ear, even with an explanation of the method and the objective, does not ensure the path to music

23 Xenakis, 2008, p. 261.

24 See Kane, 2014.

25 Using mathematics as a basis for music is difficult to achieve if it doesn't involve the perception of a creative ear.

but leads back to the aforementioned idea of “mathematical beauty,” an enthrallment whose experience is difficult and artistically uncertain for musicians and audiences alike who, even if they are conservative, still resort to listening in order to appreciate the result in the field of art.<sup>26</sup>

In the 1950s and 1960s, several works with impersonal titles recall the stochastic method: *ST/4* or *ST/48* (1956–62), whose sequential or vertical connections, lacking any auditory reference, are still theoretical and unpredictable. Although the non-significant within massive stochastic processes produces a macro-spectrum that seems to work at times in *Pithoprakta*, the experience with small masses is less effective for the ear to deal with in detail, particularly when faced with a subject whose compositional process does not give priority to listening. Therefore, by not sharing with how others are hearing the experience of each result, perception is in the waiting: it observes at a distance and in the long term, including then memory; that is, it assumes or predicts what comes next. This is how our connection with music tends to work when we try to listen to the application of game theory to music through probabilistic decisions that govern the competition between two groups, as in *Duel* (1959) or *Stratégie* (1962), both for two orchestras, or *Linaia-Agon* (1972), for brass trio. Such “games” were part of the composer’s artistic purpose, and the scores required the musicians to solve the matrices; therefore, the approach was threefold: musical, dramatic, and mathematical. Prior to the more recent recordings,<sup>27</sup> during the live performances I experienced, I expected meaningful responses—such as hearing more or less rhythmic or sonic energy in each response, or hearing a response to the “duel,” or a sequence of events equivalent to a “strategy”—and when I did not get them, I became disappointed. Listening to such material is challenging because it does not necessarily allow one to appreciate the qualities of contrast between groups or individuals, nor the dramatic sense of knowing what an outcome could have. Such works tend to be valued more for their theoretical enunciation than for their artistic value. Neither non-mathematical musicians nor non-musical listeners need to listen to music with the express intention of verifying its theoretical or scientific propositions, but only to experience the nature of its evolution, where explanations are superfluous. Music cannot be explained but, if described, it is in terms of perception: observing with the ear, appreciating and judging its beauty in terms of the result. Even if music is based on mathematics, is exquisite in its structure, and may resemble it in its abstraction and its need to calculate the result, the processing of one and the other asks for different mental dispositions: mathematics requires affirmation and verification, while music, whether to be created

26 This discussion recalls Xenakis’s short text from 1994, “Beautiful or Ugly”: “[...] Personally, whenever I find something ‘beautiful,’ I replace the term by ‘interesting.’ In this case, interesting means ‘that which lures,’ without any allusions to ‘beauty’ which, in my opinion, is an adjective that is too naïve, superficial, on the surface of human reactions. [...] Moreover, when I say ‘interesting,’ I can add degrees such as ‘very,’ ‘barely,’ ‘slightly,’ without ever negating its primary quality [...]”. (Xenakis, 2008, p. 130).

27 In particular, of *Linaia-Agon*, “Xenakis Edition 14-Linaia-Agon,” *Mode Records*, <https://moderecords.com/catalog/284-xenakis/>

or to be heard, requires understanding through perception.

Observed at a great distance, the evolution of Xenakis's compositional and creative systems retains its intimate identification with the non-significance of "stochasticity," which is compensated by its marked affiliation to temporal drawing: a factor that facilitates the understanding of his intuitive contributions of plasticity to his design of musical space, as the images put forth by Xenakis in *Formalized Music* show.<sup>28</sup>

In each of these twenty squares there is an image made of straight lines with the same massive tendency, in which the order, be it unidirectional, bidirectional, dispersive, convergent, or rather curved, spiral, or in semicircle and, as it appears in the second ten, formed by points with an identical tendency (tendency here being equivalent to architectural texture)—giving a way of filling a surface with finishes, coatings, reliefs, or other forms typical of the plastic method. This refers first to the "point and line" of Vassily Kandinsky's (1866–1944) plastic science,<sup>29</sup> and second, to Walter Gropius's (1883–1969) proposal<sup>30</sup>—uniting the visual arts within architecture—to which Xenakis responded three decades later by amplifying the original spectrum of the Bauhaus with the insertion of his discovery: music *as* architecture.

The graphic formula, as a method of conducting constructive creativity, already expressed in dense lattices of curvatures or massive zigzagging, integrates the musical imagination with a visual imagination: hearing by reading what is seen. Such a contribution amplifies the process of listening and allows the musician to dispense with the mathematical; for the latter, something that may be inaccessible or "non-signifying." The synesthesia between vision and listening guides the deaf, at the same time as it describes by ear-sight when it guides the blind. What used to be a melody-harmony of columns supporting chords—in turn the struts of the melodic drawing—becomes an *auditory wall*: smooth, fluid, curved, and orderly in *Metastasis*, or irregular, granular, and disorderly in *Pithoprakta*; an appropriate denomination for the architectural model where a moving mass reveals flights of the imaginary, or where a wall narrates its fractures. If the idea of an image with a certain temporality is found in oriental painting, in front of which the spectator moves from side to side to appreciate a story unfolding in space, an auditory wall places the musical spectator in front of a question, entreating to imagine the visual equivalence of what is heard.<sup>31</sup> The new in art tends to be born of necessity, and Xenakis's sensorial identification with the chronographic register of music opens the way to a perceptual requirement—a reason that may have led him gradually to abandon experimentation and to refine the musical utility of the mathematics he employed—allowing him to interpret, from a consolidation of his audiovisual creative nature, his own personal loss.

28 Xenakis, 1992, p. 214.

29 Kandinsky, 1979.

30 See *Bauhaus Manifesto*, <https://bauhausmanifesto.com/>

31 Guillermo Pabillon, *Philips Pavilion Under Construction* (17 January 2017), [https://es.wikiarquitectura.com/pabillon\\_philips\\_ilistr\\_period/](https://es.wikiarquitectura.com/pabillon_philips_ilistr_period/)

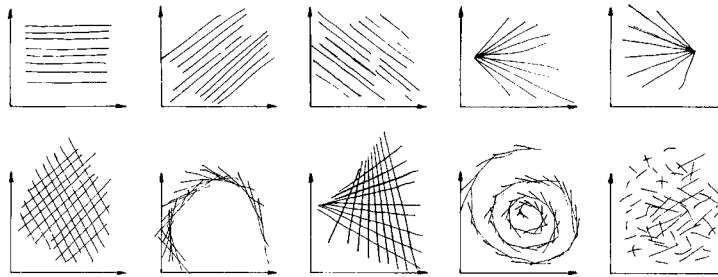


Fig. VIII-4

Let us now suppose the inverse, forms constructed by means of discontinuity, by sound-points; for example, string pizzicati. Our previous remarks about continuity can be transferred to this case (see Fig. VIII-5). Points 1.–7. are identical, so very broad is the abstraction. Besides, a mixture of discontinuity and continuity gives us a new dimension.

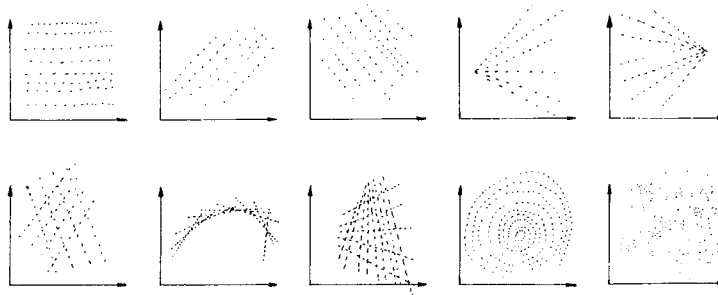


Fig. VIII-5

Fig. 28.2 Xenakis, 1992, p. 214. © Pendragon Press, reproduced by permission.

An important aspect of the music-architecture link lies in the openness to the physical space of representation, an element that denotes an intuitive and calculated choice of various spaces in works such as *Persephassa* (1969), for six percussionists, *Terretektorh* (1965–6), for orchestra, or the *Polytopes*.<sup>32</sup> In all of them, the spectator's ear is placed before a heterogeneous matter that gives it the idea of movement. *Terretektorh*<sup>33</sup> illustrates the link between Xenakian creativity and his unique perception of space: the musicians occupy fixed places in a wide circle, a sphere that explores two-

<sup>32</sup> Xenakis, 2008, Part 4, p. 198–277.

<sup>33</sup> Iannis Xenakis, "Study for *Terretektorh* (Distribution of Musicians)" (1965), *Lines & Marks*, <https://linesandmarks.com/iannis-xenakis-observations/iannis-xenakis-study-for-terretektorh-2/>

dimensionality. The conductor, in the center, indicates the path taken by the music, expressed through heterogeneous sonorities that advance, disperse, or come together, where the function of the texture approaches the combination between two main elements, time and space, the sequential and the vertical, in a serpentine movement whose head and tail give kinetic density to the work's spatial evolution.

### Concrete Analogy

The notion of *analogy* in music is ancient—like the *crescendo* in Claudio Monteverdi (1567–1643) to evoke spatial proximity or, as in Antonio Vivaldi (1678–1741), to allude to nature. This notion resurfaces emphatically in the post-war period with an accident close to junk art: the technologies of the phonograph and of magnetic tape discover the “broken record,” as Pierre Henry (1927–2017) and Pierre Schaeffer (1910–95) observed when faced with a simple matter, a *sound object* whose potential requires inventing alternative uses of the machine to generate *musique concrète*.<sup>34</sup> In the 1960s, Xenakis resorted to the flaw of that analogy which, without going through the sieve of musical writing, facilitates immediate access for the adoption, production, and transformation of audible matter. He therefore joined the musical research group created by Schaeffer at the National French Radio, GRM (Groupe de Recherches Musicales) to produce, amongst others, *Bohor* (1962), a work that refers to the experience of listening as being inside the sound (or from “under a bell”) itself; perhaps the noise he had then already perceived for nearly twenty years.<sup>35</sup> In 1980, after that dramatic experience, he told Bálint András Varga (1941–2019):

There is something else I have to tell you. I think I've become the way I am because of my wound. First my hearing was damaged because the explosion occurred directly by me. The massive sound volume irreparably damaged my inner ear: I can't hear high pitches as well as I used to and there's a constant noise—even now.<sup>36</sup>

Rebecca Kim reports that in his sketches, Xenakis identifies “four sound sources used to create *Bohor* [...]: a Laotian mouth organ, prepared piano, Iraqi and Hindu jewelry, and Byzantine chant.”<sup>37</sup>

I remember hearing *Bohor* in an old theater in Paris with the composer in control of the volume, always at the maximum amplitude, characteristic of his hearing, as if that energy—a subject developed by Mauricio García de la Torre—communicated the need to envelop oneself in noise together with the ear of the other.<sup>38</sup> The chronographic

34 “La naissance de la musique concrète et électro-acoustique”, INA (Institut National Audiovisuel de France), <https://fresques.ina.fr/artsonores/fiche-media/InaGrm00208/la-naissance-de-la-musique-concrete-et-electro-acoustique.html>

35 “Iannis Xenakis’s *Bohor* (1962)”, *Columbia University*, <http://sites.music.columbia.edu/masterpieces/notes/xenakis/notes.html>; “Iannis Xenakis – *Bohor*” (23 December 2018), *YouTube*, <https://www.youtube.com/watch?v=DODVNHukY0I>

36 Varga, 1996, p. 48.

37 Rebecca Kim, “Iannis Xenakis’s *Bohor* (1962)”, *Columbia University*, <http://sites.music.columbia.edu/masterpieces/notes/xenakis/notes.html>

38 See Chapter 7 in this volume.

recording method of the work indicates the mixing of the sound sources based on the dynamic variation in each one, which illustrates a tendency to accumulate and distort the original sounds, in search of a blurred and indecipherable matter. The instruments used in the recording of *Bohor* seem to come from a free selection of the sources, in contrast with written music; the materials are sometimes heard in their original form and sometimes slowed down or compressed and then reassembled. That gradual advance towards chaos is cut short by a final tear that personifies evolution, from the beautiful to the brutal, and tells the ear how the invocation of precious resonances leads to impurity, a rude sign of auditory identification with broken matter.<sup>39</sup>

### Seeing is Hearing

After years of working on handmade conversions of his drawings to the composition of instrumental and vocal music, Xenakis, as the head of the Center for the Study of the Mathematical and the Automatic in Music (CEMAMu), assumed for decades the need to conceive, produce, and optimize a computerized equipment for the production of electronic music through drawing. This was the UPIC (Unité Polyagogique Informatique du CEMAMu), his most characteristic contribution to technology as well as a new tool for music research and immediate experimentation.<sup>40</sup> The UPIC, being accessible to the non-expert, lets me highlight here the enriching experience I had in 1981 with a group of people with visual impairments in Bordeaux (Figure 28.3) whose drawings on the machine made them listen to the invisible, from hearing geographical contours such as the courses of rivers, or the borders between countries or between sea and land, etc., allowing them to display a powerful freedom to imagine their own space.

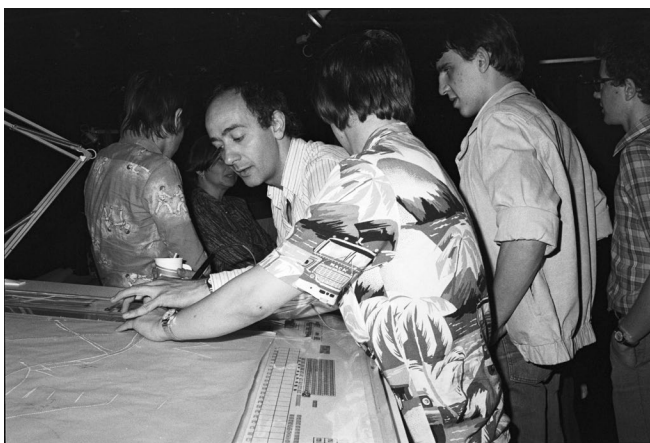


Fig. 28.3 UPIC Open House, Forum des Halles, Paris, 1981: Julio Estrada leading a composition workshop with a group of visually impaired youths. Photo by Bruno Rastoin (1978), courtesy of CIX Archives, Rastoin collection.

39 Rebecca Kim, "Iannis Xenakis's *Bohor* (1962) [Sketch]," *Columbia University*, <http://sites.music.columbia.edu/masterpieces/notes/xenakis/sketchBig.jpg>

40 Different authors have tackled the subject of said system; I direct the reader to a recent anthology of texts on the subject: Weibel et. al, 2020.

*Mycènes Alpha* (1978) is the first musical realization produced with UPIC:

My first contact with Mycenae took place during a school excursion when I was fourteen. In front of the beauty of the site, of the Cyclopean ruins and the strange tombs, I experienced vast and implacable impressions. What I saw looked familiar, but also extraordinary, as if it belonged to another world. I buried this memory very deeply. Then, forty years later, as soon as I was free to return to Greece, the first thing I did was to visit, now as pilgrim, this same place, driven by what I instinctively felt was necessary and primordial.<sup>41</sup>

The description illustrates the idea of a polytope—multiple spaces, equally referring to a 3D spatiality—to take place at the archaeological site. In Xenakis's *Polytope de Mycènes*, human processions carried torches on a mountain and groups of animals adorned with bells roamed in formation. Earlier musical works were performed live, by an orchestra, choruses, percussion, between which “interpolations” (or “interludes”) of individual pages of his (and the first) UPIC score, *Mycènes Alpha* were blasted through a PA system.<sup>42</sup>

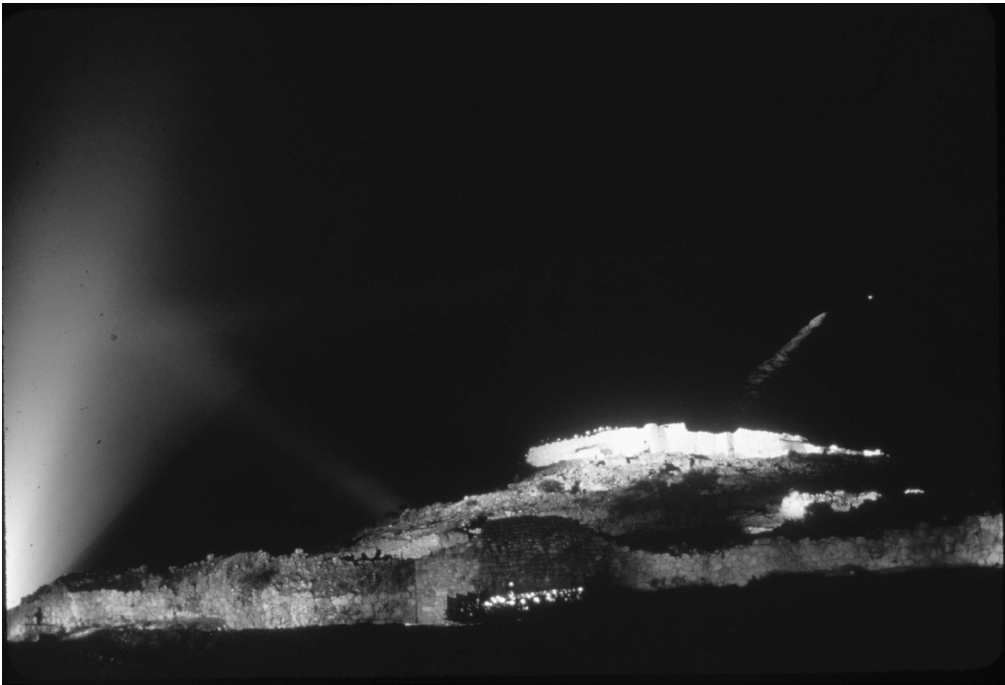


Fig. 28.4 Performance in Mycenae (Greece) of *Polytope de Mycènes*. Still of the ruins of the acropolis and the *Polytope*'s light show. Orchestra lit from below (1978). Photographer unknown, courtesy of CIX Archives.

41 Xenakis, 2008, p. 239.

42 Xenakis, 2008, p. 241–3.



The drawings of *Mycènes Alpha*, whose images, between the abstract and the figurative, and with greater spontaneity than those previously designed to be turned into instrumental and vocal works, provide a new reference for further reflection on the visual as access to the aural in Xenakis.<sup>43</sup> Indeed, often, when *Mycènes Alpha* is presented in concert version, these hand-drawn UPIC pages are projected on a screen as illustration for listening. For the most part, the imagery of the work tends towards a curved design that lends itself to a free interpretation of the content: clouds, tangles, zoomorphisms; a mode open to vision in order to recognize oneself through listening, in turn a modern, cognitive pedagogy that expands seeing and hearing. Meanwhile, other images of an abstract order explore superimpositions of horizontals that refer both to the stillness of the massive chords of *Metastasis* and to forms of superimposing electronic timbres, an aspect close to the mixture of the auditory wall. Among the pages of *Mycènes Alpha*, one in particular stands out: the combination of superimposed straight lines with the free figurative profile, the formula at the origin of a couple of elements: on the left of the page a helmeted character holding a weapon and pointing, in the sense of writing, to the figure next to him, whose smaller size and fragile stroke is perhaps perceived as a specter; at the bottom right, only four traces remain. Listen and see, in particular, between 7'20"–8'38" of *Mycènes Alpha*.<sup>44</sup>

Xenakis described the *Polytope de Mycènes* (1978) as "a feast of light, movement and music."<sup>45</sup> *Mycènes Alpha* represents, beyond the exploration of an innovative technology, the freest immersion in the visual and auditory world created by the composer, whose figurative symbols of war allude both to the Athenian past and to his return to Greece in 1978 after the 1974 amnesty and more than a quarter of a century of exile.

In an interview in 1997, Xenakis put forward a discourse in which he seems to combat his former image by retracting the demand he imposed on himself, as if at the end of his career he was recalling his permanent aspiration to be free, something he only allows himself to declare when he recognizes the end:

My music rests on movements of the soul, sometimes incoherent movements, but there is no theory. I am governed only by intuition, objectivity, and subjectivity. Everything. I am completely incapable of predicting what may happen in the compositional act.<sup>46</sup>

43 It is interesting to note that Éditions Salabert's catalogue of Xenakis's work (*Iannis Xenakis 1922–2001* (2002), Paris, Durand-Salabert-Eschig) specifies, under *Mycènes Alpha*: "Rental may include a set of slides to be projected during the tape performance."

44 Dodecatone, "Iannis Xenakis, *Mycènes Alpha* (Score-Video)" (25 June 2022), YouTube, <https://www.youtube.com/watch?v=gl-g9Em6Eow>

45 Xenakis, 2008, p. 254.

46 Bruno Serrou, "Iannis Xenakis: 'He buscado toda mi vida'" (29 May 2022), *Scherzo*, <https://scherzo.es/iannis-xenakis-he-buscado-toda-mi-vida/>

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