

Towards a Space-Time Art: Iannis Xenakis's Polytopes

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Corbusier's office in Paris. He participated in important projects, such as the La Tourette Monastery in Lyon and the famous Philips Pavilion at the 1958 Brussels World Fair. It is in this same period that Xenakis started to draw attention as a composer. In the *Polytopes*, Xenakis has transposed his temporal thinking into three-dimensional space; these art works can thus be considered as the return to architecture of a composer who, in his mind, has always remained an architect and an engineer.¹ Through the masterly use of the latest technological tools in the *Polytopes*, architecture becomes an art of time and music an art of space. In this way, these spatialized light and sound scenographies take part in the tradition that links Wagner's conception of the total art work (the *Gesamtkunstwerk*) with contemporary notions of cyberspace, in the sense that they both deal with the creation of an immersive and artificial environment. In this article, we will therefore examine the position of the *Polytopes* in this quest for a space-time art.

QUALITATIVE AND QUANTITATIVE SPACE

What we generally call "the environment" actually consists of a whole of spaces. According to the way these are defined, we can consider two types of space: material space and energetic space.²

The first one, material space, is defined by the traditional, classical architectural tectonics: walls, ceilings, floors, windows, etc. The archetype of such a space is symbolized in a famous etching from the eighteenth-century French architecture theoretician Laugier's *Essai sur l'architecture* (see example 1). It symbolizes the "primitive hut" and it is actually an allegory of the "first architectural act." As minimal as it may seem, through this small intervention of man, a fragment of the vast space of nature becomes a *place*, in the sense that, from this moment on, it distinguishes itself from the rest of the surrounding space through a certain symbolic or physical quality. Architecture here plays the role of *interface* between the inside and the outside, between the domesticated and the untamed.

The second type of space, called *energetic space*, is defined by sensory qualities, such as warmth, smell, color, light and sound. Picture for instance a campfire, around which heat and light create an immaterial space. In opposition to the quantitative aspects of physical space, one experiences this sensory space in a *qualitative* way; it is created by energetic waves travelling through the air, without taking into account the boundaries of material (architectural) space. Laugier's primitive hut is, in



EXAMPLE 1: CHARLES EISEN, "ALLÉGORIE DE L'ARCHITECTURE
RETROUVANT SON MODÈLE NATUREL"

(SOURCE: MARC-ANTOINE LAUGIER, *ESSAI SUR L'ARCHITECTURE*, PARIS:
CHEZ DUCHESNE, 1755)

this sense, a passive receiver; its identity as a *place* is created by the energetic waves of light, sound, temperature and smell that occupy it.

Through the evolution of technology in building, architecture has somehow managed to "emancipate" itself from this passive state. Technical devices such as air conditioning, sanitary installations, artificial light and amplified sound today allow for a steadily increasing control of building space. As a consequence, architecture today creates *hybrid* spaces, "amalgams," where the opposition inside/outside, which has been architecture's topological framework until the nineteenth century, has dissolved. Contemporary space is to be considered as a dynamic equilibrium between the artificial and the natural upon which man imposes his own

rhythm. This will to master and “tame” space and time is in fact the Promethean dream of man, and more specifically, of the architect.

Especially in the architecture of the exhibition pavilion, this idea of creating artificial and virtual worlds has become a *theme*. By leading all the visitor’s senses at once through images, sound, movement and text, the aim here is to immerge the audience in a certain atmosphere to make it forget the outside world or to weaken its sense of reality. This way, the commercial, political or artistic discourse passes more easily, sometimes almost unnoticed. To this aim, all parameters of space are substituted or doubled by means of all kinds of media: projections, colored lights, music, even smoke and smell. Because of their inherent temporary character, exhibition pavilions have often served as an experimental ground for innovations in architectural vocabulary. Often, they are considered as a conceptual laboratory for architecture, where the audience is confronted with the superposition of technology upon tectonics. This evolution reached its climax at Expo 70, the universal exhibition in Osaka, where a real blurring occurred between energetic and material space. Inflatable, removable, expandable pavilions were all the rage; never before architecture had been so close to immateriality.

FROM THE PHILIPS PAVILION TO THE H₂O PAVILION

Keeping in mind the overpowering influence of commerce and technology in twentieth-century society, it is not a coincidence that one of the icons of its architecture contains these items as its principal theme. Commissioned to Le Corbusier by the Dutch company Philips for the 1958 World Exhibition in Brussels, the Philips Pavilion’s theme was to illustrate the superior quality of Philips’ products in the field of light and sound equipment. Since the actual aim was to create a light and sound show, there was hardly any question of architecture in the brief. Le Corbusier’s reply, when accepting the commission, has become famous: “Je ne vous ferai pas de pavillon, mais un *Poème Electronique* . . . le bâtiment ne sera qu’un bâtiment qui coûtera très peu d’argent et qui sera plutôt une espèce de structure creuse au canon à ciment sans aucune existence architecturale.”³ For Le Corbusier, the architecture of the corresponding pavilion would thus have to be no more than an inverted projection screen, since a darkened space was all he needed for his *Poème Electronique*, a collage of images, sounds and colored projections composed together with Edgar Varèse. Aware of his young assistant’s interest in abstract mathematics and his engineering skills, the old master asked Xenakis to design a temporary architecture that would express the

futurist character of the show inside.⁴ Given total freedom in this task, Xenakis drew a pavilion, consisting only of hyperbolic concrete shells.⁵

Xenakis's architecture was an early and explicit manifestation of the deconstruction of Cartesian space, a process that had begun with the discovery of the fourth dimension in mathematics by Riemann a hundred years before. The notions of depth and perspective that allow one to determine the position of the body in space disappear in this architecture of continuity: floor, ceiling and walls all become part of one single and continuous fold. In this way, in the impossibility of taking a step backwards from the giant moving images and the travelling sounds they are exposed to, the audience loses all sense of orientation. Consequently, the *Poème Electronique* as a whole functions as a *vision machine*, manipulating the spectator's mind and disfiguring his body by coloring it red and blue when serving as a projection screen for the travelling images. The interaction here lies in the audience's voluntary participation in this mechanism of momentary transformation of the body and its perception; driven by curiosity, hundreds of thousands of people lined up to get into the pavilion, knowing (but undoubtedly not fully realizing) that afterwards, their perception of things would never be the same again.

Instead of establishing a link between place and space, the Philips Pavilion creates a rupture: it isolates a fragment of space by creating an opposition between an inside, virtual world and an outside, real world. By reducing the pavilion's concrete shell to the minimum of five centimeters, Xenakis seems to even want to abolish the very last characteristic of architecture in this project: its materiality. Doing so, he puts into evidence how at the end of the twentieth century, the classical architectural tectonics are no longer the only tools to create space. Based principally on illusion, the immersive experience the audience lived in the Philips Pavilion does actually not largely differ from the way virtual reality is evoked today. Special glasses and headsets replace the Pavilion's concrete shells, hence questioning the status and the role of architecture in the definition of space in the era of multimedia, internet and virtual reality. The point here is to what extent architecture is able to intervene so as to make virtuality an extension of reality, and not a substitute. In other words: how to perceive the body in an immaterial architecture.

A possible way could be to conceive an architecture that actively contributes to the construction of virtuality by provoking the active participation of the visitor's body. This is what two Dutch architects, Lars Spuybroeck and Kas Oosterhuis, have tried to demonstrate with their *H₂O Pavilion*.⁶ In this pavilion, conceived as a continuous fold in space, an interactive and pedagogical exhibition on different aspects of water is held. The approach chosen by the architects to reposition the body in

space has led to an interactivity (between the visitor and the environment) through physical actions: the visitor follows a trajectory determined by spouting fountains, projections, and mobile or oblique parts in the floor. As a consequence, his participation is based on corporal reflexes. Thus one remains enclosed in an iterative loop, since there simply are not many “creative” attitudes when risking getting one’s feet wet. In this way the audience’s reactions are predictable, and the interaction between architecture and the visitor remains a closed and isolated system. Just as in the Philips Pavilion, the “virtual” remains opposed here to the “real”; there is no interference.

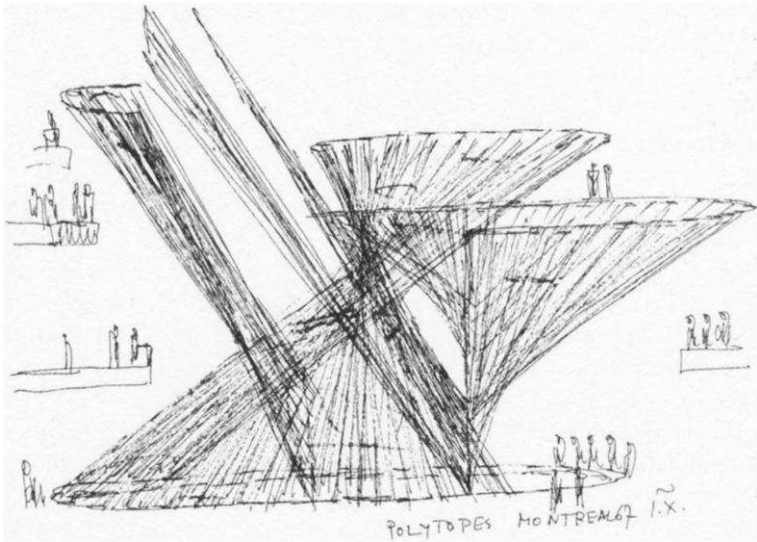
THE POLYTOPES

It’s precisely at this point that Xenakis’s Polytopes add a new element in the discussion about interaction between space, architecture and body. As we have mentioned above, already in their name, these technological spectacles announce the integration of space as a fundamental parameter. In this sense, the Polytopes are typical for the new art forms that emerged after the Second World War, such as happenings, performances, installations and environments. A common element in these artistic expressions is a general tendency towards dematerialization of the art object and the wish to blur the distinction between the space of the spectator and that of the art work itself.

In the Polytopes, Xenakis inserts—by means of loudspeakers and flashing lights—several layers of light and sound into existing architecture or a given historical site. The resolution of these layers is such that they almost allow him to draw, or even to *construct* in these superimposed, immaterial spaces. Transposing his abstract and geometrical vocabulary (based on the axiomatic entities of point and line) to the sphere of light and sound in the Polytopes, Xenakis realizes a global and parallel formalization in the spaces of architecture, light and sound. Doing so, he pursues in a certain way Kandinsky’s theories as exposed in *Point and Line to Plane*, where the latter developed the vocabulary of abstract painting as based on the elementary notions of point, line and movement.

Given the initial morphological homogeneity in his basic material, Xenakis purposely dissociates the musical and visual discourse in the Polytopes. In the Montreal Polytope, for instance, Xenakis used hundreds of flashing lights, attached to steel cables suspended in the central void of the French pavilion at Expo 67 (see example 2). These steel cables acted as the regulating lines of several large hyperbolic surfaces. As a consequence, a transparent volume, six storeys high, occupied the

entire void of the pavilion. Once every hour, during six minutes, Xenakis's music would occupy the entire pavilion, while waves of light moved feverishly through the central void. The audience could freely change its viewpoint from the balconies by moving around on the different floors. After these six minutes, the pavilion would return to its original state.



EXAMPLE 2: *POLYTOPE DE MONTRÉAL*, SKETCH OF THE INSTALLATION
(SOURCE: XENAKIS ARCHIVES, PARIS)

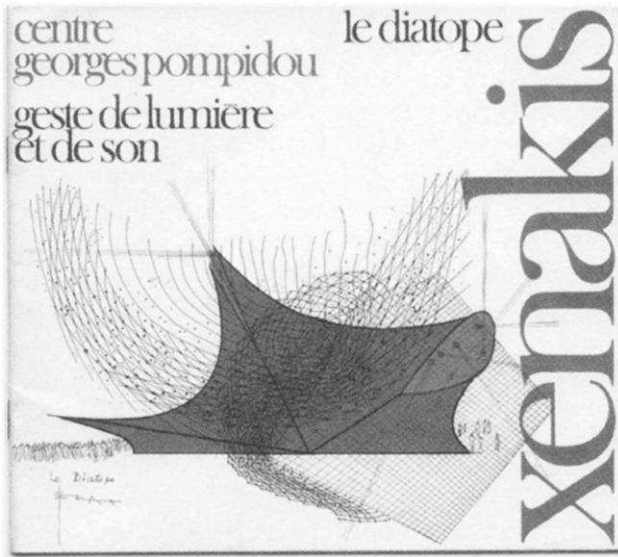
For the Cluny Polytope (1972), installed in the Roman Thermae (baths) of the Cluny Museum in Paris, Xenakis drew a structure of steel tubes, much like a Cartesian grid folded alongside the vaults of the existing space. On this structure, the flashing lights and loudspeakers were adjusted. This is a good example of what could be called a *media architecture*, in the sense that the steel structure aids in creating a spatial experience without imposing itself. This way, much like in the Polytope of Montreal, Xenakis's installation creates a *modulation* of the existing space. However, the audience is now *in* the spectacle, witness of the temporary transformation of this historical site into a violent cataclysm.

Developing the idea of a “musicalization of space,” two other Polytopes can be considered as musical land art pieces. Installed at Persepolis

in Iran (1971) and Mycenae (1978), these Polytopes occupy entire archaeological sites. The arsenal Xenakis deploys here to conquer these landscapes is enormous: laser beams, electroacoustic music, huge campfires, children's choirs bearing torches, animals, and giant anti-aircraft light projectors. This strange confrontation between technology and archaism followed a precise scenario, established by Xenakis and guided by him during the show with the help of only a simple walkie-talkie. Just like in the Cluny Polytope, where he had installed a double of the architectural space in order to transform the site's original identity, Xenakis manipulates all spatial parameters (light, sound, color, movements, etc.) in his interpretation of the highly historical landscape. By ruling the site's space-time, Xenakis aims to add a new chapter to the site's history. However, these are temporary interventions; once the show is over, it is not the landscape that has changed, but the way the site is perceived and remembered by the audience or the visitor. Suddenly, the site's history has become alive.

Consequently we can see how progressively the mastering of the space of the performance and its audience become more and more important in the Polytopes. With the Diatope (Example 3), originally conceived for the opening of the Centre Pompidou in Paris in 1977, Xenakis actually closes a circle; for this Polytope, he himself designed the space of the show: a nomadic pavilion with a tensile canvas, conceived to travel around the world, as a kind of cultural and commercial ambassador for the Centre Pompidou. Here, Xenakis actually realizes Le Corbusier's initial idea for the Philips Pavilion, i.e., to construct a simple scaffolding with a tensile covering, its only intention being to isolate and darken the interior space. The main difference, compared to the Philips Pavilion, is that the architecture of the pavilion here becomes an active part of the whole. It consists of two parts: a passive part, a membrane in red textile, and an active part, a steel net covered with flashing lights. The latter can be considered as a three-dimensional screen with the flashing lights as its pixels, enveloping the audience. The glass floor reinforces the impression of immersion; the audience seems to be suspended in the pavilion's interior.

The Diatope's canvas is also translucent and permeable: light, sound and cold enter from the outside. The change in prefix in the Polytope's name already announces this: "dia" signifies "through." This causes an imperfection in the artificial reality Xenakis wants to evoke in his Diatope: for reason of the poor acoustic, thermic and visual isolation, the visitor is obliged to constantly oscillate between the interior and the exterior, between the artificial and the natural, between his imagination and reality or virtuality and reality. This way, he is forced to be aware of



EXAMPLE 3: THE DIATOPE, DRAWING BY XENAKIS
(SOURCE: XENAKIS ARCHIVES, PARIS)

the *simultaneity* of these situations. This is expressed by Xenakis in his sketch of the Diatope: contrary to the Philips Pavilion, the Diatope is open to the energetic waves that circulate in our environment. This way, Xenakis's Diatope is a hybrid, halfway between reality and virtuality.

CONCLUSION

In the Polytopes, Xenakis actually builds in light and sound space. His architecture is not defined solely by columns, beams or walls, but by atmospheres and energetic waves that provoke dynamic and spatial experiences. When he creates architecture, in the proper sense of the term, it has a “medial” character. The steel cables of the Montreal Polytope, the Cartesian structure of the Cluny Polytope or the Diatope do not really have spatial qualities in themselves; they serve as a support for the technical devices Xenakis needs to create in his “superimposition of spaces” (poly-topes). They remain almost invisible though, to disappear

fully during the show. Contrary to Le Corbusier's *Poème Electronique* and the isolated, enclosed space of the Philips Pavilion, Xenakis's Polytopes are integrated in their setting. In the Polytopes, there is not really a contrast between the real and the artificial world; what is being dealt with is the creation of temporary transformations or modulations of a given space or site. As a consequence, in Xenakis's Polytopes, the space of architecture, the *topos*, has become an expressive medium in itself.

Instead of bringing into action all the expressive media at one time, to end up in what could be called "an immense tautology,"⁷ in the Polytopes, Xenakis goes the opposite way: after a deconstruction to their basic formal entities, each of the participating media is treated independently, while following the same global logic that holds the ensemble together. Contrary to a great deal of contemporary multimedia production, Xenakis's goal is not to find or create correspondences or similarities in and between the different ways of artistic expression. In his polytopic conception of space, this would even be a contradiction! Xenakis's aim is precisely to play with the diversity of the senses, and not to create correspondences in their expression. When Xenakis remarks: "Man is intelligent enough to follow two discourses at once,"⁸ his aim is to integrate in his installations as much intelligence, difference and variation as possible. The audience has to contribute *actively* to the construction of the sense of these art works; the spectator himself has to effect the operation of synthesizing the poly-temporality of the proposed spectacle. Therefore, instead of focusing the spectator's attention by simply playing with his reflexes or his corporality, or hypnotizing him with sequences of familiar images, Xenakis's abstract and multi-layered Polytopes try to open the audience's mind to diversity and simultaneity. This way, these electronic poems express the idea of an intelligent space, long before it became a fashionable concept in contemporary architectural theory.

NOTES

This article is based on a lecture given at the symposium “Musique, Arts, Technologies: Pour une Approche Critique” (Montpellier/Barcelona, December 2000).

1. During the 1960s, Xenakis had already integrated space as a compositional parameter in pieces like *Eonta* (1964), where some of the musicians move around the scene while playing, and in *Terretektorh* (1965), where the eighty-eight musicians are dispersed amongst the public. On this subject see: Maria Ana Harley, “Spatial Sound Movement in the Instrumental Music of Iannis Xenakis,” *Journal of New Music Research* 3 (September, 1994): 291–313.
2. The idea to apply these two notions, introduced by the architecture theoretician Reyner Banham, to the work of Xenakis was inspired by the following article: Philipp Oswalt, “Architecture of Densities,” in *Présences de Iannis Xenakis*, ed. Makis Solomos (Paris: Centre de Documentation de Musique Contemporaine, 2001), 211–7.
3. Le Corbusier, *Le Poème Electronique*, ed. Jean Petit (Paris: Editions du Minuit, 1958), 23.
4. From 1956 on, after their successful collaboration on the Monastery of La Tourette, Xenakis had become one of Le Corbusier’s closest collaborators. In addition to the Philips Pavilion (1958), he was also the project architect for the Youth Center in Firminy (1956–65) and the Olympic Stadium in Bagdad (only partially realized in the early 1980s). In his role of engineer, he made important contributions to several of the Unité d’Habitation projects and the government buildings in Chandigarh, India. For a general survey of Xenakis’s architectural work, see my article “Spiel mit dem Raum: Iannis Xenakis, Architekt des Ephemeren,” *MusikTexte* 90 (August 2001): 36–42.
5. Even though hyperbolic paraboloids in concrete were a common feature in 1950s architecture, the Philips Pavilion is one of the only buildings ever to be composed with only this kind of surfaces.
6. This interactive multimedia pavilion has been commissioned by the Dutch government to celebrate the achievement of the important water works in the South of the country, one of the biggest public works ever in European history. On the link between this pavilion

and the Philips Pavilion, see Bart Lootsma, “En Route to a New Technics,” *Daidalos* 68 (June 1998): 35–47.

7. See Makis Solomos and Jean-Michel Raczinski, “La Synthèse des arts à l’ère du multi-média: A propos du Diatope de Iannis Xenakis,” *Cahiers de la Maison de la Recherche* 20: “Le Mélange des Arts” (Lille: Université de Charles-de-Gaulle, 1999).
8. From an interview with Xenakis, in Jean-Yves Bosseur, *Le Sonore et le Visuel* (Paris: Dis Voir, 1996): 44.