

Xenakis on Xenakis

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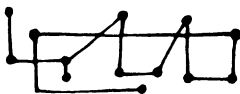


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XENAKIS ON XENAKIS



IANNIS XENAKIS

INTRODUCTION

IS IT BECAUSE he was born in Greece? That he went through the doors of the Polytechnic University before those of the Conservatory? That he thought as an architect before he heard as a musician? Iannis Xenakis occupies an extraordinary place in the music of our time.

He is compared to the sages of Greek Antiquity, to the painters of the Renaissance, to the Encyclopedists of the Century of Enlightenment. Occasionally one is tempted to scoff at his theoretical positions on the merging of music, architecture, and science.

Iannis Xenakis responds as an artist: through his philosophic questioning and the directions of his research, he gives expression to the torment that dwells within him: his violent poetry of the galaxies, his mortal wars of atom-sounds echo the primitive chaos and immortalize it in a ceaseless storm.

*Translated from the French by Roberta Brown and John Rahn.



IANNIS XENAKIS

Who, really, is the creator Iannis Xenakis? He reveals himself to us in the interview which opens this article.

Why has Iannis Xenakis emerged as one of the most important composers in instrumental music of our time?

*How do the preoccupations of the composer, developed for example in *Metastasis* (1955), meet the approach of the architect?*

Iannis Xenakis is revolutionizing the relation between music and the computer. His first works with computer (ST/4, ST/10, ST/48, conceived at IBM) go back to the years 1955–60. Since then, he has been inventing a new way to think music—from a drawing: he created the UPIC system (Unité Polyagogique Informatique de CEMAMu) in 1977 at the CEMAMu (the research center that he directs in Paris). What need led him to the confrontation between science and music?

To each of these questions, the interview here with Iannis Xenakis and the excerpts from his own writings will provide us with an initial response: a partial approach to the composer's highly complex, constantly evolving universe.

—L.B.

I. PORTRAIT OF IANNIS XENAKIS

Why music? It thrilled me. It carried me away. When I was twelve or thirteen years old, I was practicing the piano, I was reading *Astronomy* by Flammarion for hours on end. I was doing mathematics and archaeology: I didn't like life. I had all kinds of failures.

The power of music is such that it transports you from one state to another. Like alcohol. Like love. If I wanted to learn how to compose music, maybe it was to acquire this power. The power of Dionysus.

And at a certain point, you chose to go into science?

No. I wanted to do everything at the same time. Earn my living, learn math and physics: the only really serious place was the Polytechnic University in Athens. The entrance exams were difficult and I worked hard to pass them. I made it. But at the same time, I was doing music, archaeology, and law.

Did you consider music as a discipline among others?

Absolutely. Things were scattered. Each subject was a domain. I wasn't trying to make any connection. If my professors had really taught me, in the true sense of the word, they would have made the connection: they would have shown me music combinatorics which would have opened up for me a more abstract vision of harmony, of contrapuntal polyphony, of form. They didn't do it. They were speaking as musicians.

At that time, I was working with private teachers. I didn't think about the Conservatory. I thought music should be learned like that.

Like how?

Without going to school. It's strange. I had the impression that music, like

painting, escaped academics. My desire to study music was intense. But, at the same time, I was ashamed that I wanted to, as if it were a weakness.

Obviously, the milieu in which I lived was not very favorable for music: few milieus are! I was very young when my mother died. I was five. She was a musician. She played the piano. She wanted me to play the violoncello; maybe it was for that reason that I eventually wrote for the cello. As for myself, I didn't want to learn the cello. So I played the piano.

When I was seventeen years old, all of a sudden I realized that I wanted to make music, that is, that I wanted to write it myself. I looked for professors capable of teaching me the rudiments of composition. But the decision to do only that, to be a musician exclusively, came later.

I was twenty-five years old, and I was in a hopeless situation. There had been the war. I had fought in the Resistance. All the marvelous universe that I had imagined, first by myself, then in reading *The Republic* of Plato (another way of life in which art would have a fundamental place in behavior, dress, language)—everything that had pushed me to join the Communist Party suddenly collapsed. I decided to withdraw into myself. In this innermost recess, there was no science. But there was music.

Either I committed suicide. Or I started out on a new foot. I had the choice of continuing on the same course that I had followed for years with all the force and strength that youth has and that distress gives—to be a political activist (but this was no longer possible in Greece because the authorities were looking for me)—or to withdraw into music. This was the decision that I made in coming to France. Actually, I had left to go to the United States: France had been defeated. I thought it would be chaos there. I wasn't mistaken. But I had friends there. I stopped there.

The strange thing is that I never thought about going to the USSR! I have to say that I climbed on the bandwagon when the Allies became so friendly with the Russians in order to win the war. Roosevelt and even Stalin were saying how much different life would be on the planet after the war. This went right along with my militant beliefs and with reading Plato and Marx. This was the instant solution for a richer life. But all this had been shattered.

By Stalin?

Not only by Stalin. Stalin betrayed the Greek resistance, which was essentially a communist movement. But the English also betrayed the resistant fervour of that really ruined country. And even the Americans, with Truman. If Roosevelt had remained in government, there would not have been the Cold War. Truman was a simple little man from the right wing who brought to the presidency all the paltriness and the racism of his clan.

1947, in France, marked the beginning of a period of moving about from place to place that lasted until 1952. I had heard of Nadia Boulanger, and I went to see her—I was still looking for someone who could guide me. She told me that I had talent but that she was too old to take a beginner like me. For that matter, she was only sixty years old then. But she still could choose her students.

By chance, I found work with the architect, Le Corbusier, whose team included a number of Greeks, and who took me with him as engineer. For me, architecture had stopped at Antiquity. All architecture—Byzantine, Roman, Gothic and modern—was nonexistent.

That of Le Corbusier as well?

No. I realized his importance as soon as I saw him working. When an artist is not a fool, he creates around him a field of very sensitive forces. This was his case.

One day, I told him that I wanted to work at architecture. He responded, “Why not?” He, himself, had not come out of a school. He had not been admitted to the School of Fine Arts, and in the end, he did his architecture as he understood it. It was a good example.

He detested all music except that of Varèse, whom he had known personally. It should be said that his mother was a great pianist (by dint of hearing Mendelssohn all the time, he must have gotten fed up!) and that one of his brothers, the darling of the family, was a composer. As for himself, he made his way all alone, starting by engraving watch-backs at La-Chaux-de-Fonds.

I wanted to work in those days in the electronic studio of Pierre Schaeffer. This music interested me a lot. I was going to the concerts at the “Petit Conservatoire” where there were never more than three people in the audience.

I wrote to Schaeffer. He never answered me. Finally, I brought him a score, *Sacrifice* for eight instruments. Since he couldn’t read music, he gave it to Pierre Henry, who, very kindly, showed it to Scherchen, who was rehearsing *Déserts* by Varèse. They were interested.

What counted above all was the row I had with Honegger. I was enrolled in his composition class at the École Normale. The students would bring their works, and he would critique them in front of everyone.

I went there. I showed him a score. He played it and said,

“There, you have got parallel fifths.”

“Yes, but I like them.”

“And there, parallel octaves.”

“Yes, but I like them.”

“But all this, it’s not music, except for the first three measures, and even those . . .”

And the madder he got, the madder I got. I thought that he was a free-thinking man. How could he make a thing out of parallel fifths, especially after Debussy, Bartók, and Stravinsky?

So I left Honegger—hardened. I learned that I should no longer look to someone else for what existed in me.

The class of Messiaen was a different matter: he analyzed scores, also his own. It was he that made me discover the possibilities of abstraction starting with Beethoven and Stravinsky. I said to myself—they’re crazy, those guys.

Why don't they really do everything? What criteria dictated their choices? Tradition? But what is tradition? So I deduced that, theoretically, one could do everything. This was what clicked into place in my head.

What pushed you to adopt, early on, compositional methods that were absolutely new?

My development was that of sleepwalker. It's difficult for me to explain it. *A posteriori*, I think that drawing came easy to me: I was drawing, and my drawings represented musical symbols. I knew traditional solfège. But freedom of thought, for me, could not come from there. I was convinced that one could invent another way of writing music. I set myself to imagining sound phenomena, using drawings to help me: a spiral, intersecting planes. . . .

And then, I always adored the sound of nature, the sea, crickets. During the Occupation, the demonstrations against the enemy brought together hundreds of thousands of people in Athens who shouted slogans, who planted mines. Apart from these scenes which marked me politically, the sound phenomena are engraved in me. During the street fighting of December 1944 there were scattered explosions, tracer bullets, bombings: extraordinary sounds.

Your critics conclude that your ideas are not specifically musical.

Those who say that have a conception of music based on polyphony and tonal harmony. Berlioz, in the same way, thought that Chinese music wasn't music.

Didn't you think immediately of using electronic music techniques?

That was private ground. I wasn't admitted into the "Groupe de Recherche" at the French Radio until 1957, and even then—at a time when Schaeffer was ill! For me it was too late. What I had to do I did in the instrumental domain.

Besides, I think that the instrumental realm is richer than the electronic: an orchestra is made up of individuals, and each individual can transmit an infinity of sounds. The composer can obtain the greatest configurations that he could hope for. It suffices to imagine them, then to transcribe them onto paper. The human orchestra machine thus lends itself to the most complex, abstract speculations.

On the contrary, if you use magnetic tape, you must record each sound, manipulate it, and mount it: this is an enormous amount of work. Successive mixings degrade the sound and cannot be multiplied.

Electronic music obtained from frequency generators is even worse—the sounds are all the same kind. That's what happens at least when one limits one's self—like at the studio at Stanford in the States or at IRCAM—to juxtapositions of pure sounds. When one approaches the computer with new music-theoretical thought, one will make music that will go further than that of today's orchestra.

The progress in music will therefore always go, according to you, towards a greater complexity?

At a given moment, yes. But not necessarily all the time. Because from complexity to complexity, it can happen that you no longer know what you're doing. There are examples of enormous simplifications: serial music makes a simplification in harmonic relations and in tonal functions. It was because of this that it had to reintroduce the complex polyphony of the Renaissance. When Einstein formulates the equivalence of energy and matter in a short multiplication, he makes a fantastic simplification.

But all this is relative: what you find to be simple are the signs for extremely complicated realities. To get across quicksand, you have to hold onto branches. Abbreviations, names, formulae play the role of branches.

The problem is not one of complexity but of power and of freedom of action. A bad composer, a bad artist does only what he has been taught. He is incapable of making a creative blunder. To make such blunders—maybe even brilliant ones!—one cannot have mental rails. Freedom then means total responsibility. One can go everywhere. One chooses to go there and not elsewhere.

Using the computer is a way of being freer?

The computer should be used not only for sound synthesis but also for macro-structures, large-scale constructions. Technology still had to follow, and as for that, I was waiting with no success (since the beginning of the 1960s). Finally, thanks to grants from the Gulbenkian Foundation and the National Center of Telecommunications Studies of France, we built a first system for computer sound synthesis in 1971.¹

The obstacle stood on the side of the computer: how to transmit to the machine a notation and concepts that the musician learns in the conservatories. The solution was the hand: the musician gives his commands to the computer through drawings, and not punch cards or programs.

So we have made the UPIC.² This is a graphic table, a drawing table, like an architect's. Equipped with a special pen, the musician traces lines on the table. The computer interprets these signs and reconstructs them in the form of isolated sounds or of music.

The interest for the composer is that all this should happen in real time. When he writes a score, he has to wait for it to be copied and executed. With this system, he writes and the result is immediate. Moreover, he can go hunting for timbres and instruments by drawing—no need for symbols, nor for sol-fège. Nothing but lines having a certain relationship—which one learns very quickly—with the sound.

The pedagogic interest is obvious: with the UPIC, music becomes a game for the child. He writes. He listens. He has everything in his reach. He corrects immediately. He is not forced to become initiated to instruments. He can imagine the timbres. And, above all, he can devote himself right away to composition.

Is it important that the hand be involved?

Yes. What is obtained by calculation always has limits. It lacks inner life, unless very complicated techniques are used. Mathematics gives structures that are too regular and that are inferior to the demands of the ear and the intelligence. The great idea is to be able to introduce randomness in order to break up the periodicity of mathematical functions, but we're only at the beginning.

The hand, itself, stands between randomness and calculation. It is both an instrument of the mind—so close to the head—and an imperfect tool.

The products of the intelligence are so complex that it is impossible to purify them in order to submit them totally to mathematical laws. Industrialization is a forced purification. But you can always recognize what has been made industrially and what has been made by hand. Industrial means are clean, functional, poor. The hand adds inner richness and charm.

You mean that this is art?

Not necessarily. But there is a greater chance. Only one set of my works, the *ST*, came out of computer programs. All the others are mostly handiwork, in the biological sense: adjustments that cannot be controlled in their totality. If God existed He would be a handyman.

Music, today, must go through the stages that the sciences encountered in the nineteenth century. Sounds must be likened to signs and symbols. The significance of music is found in them, in their physical relation, and not in the psychological conditionings that are submissive to passing fashions. Whence my idea of symbolic music.

Do you deny that music be mystic?

Music cannot lead to mysticism. The imbeciles who listen to it that way are the mystics. Mysticism is a drug. One thinks that one is making mysticism—look at Messiaen!—but the high value of his music is elsewhere: Religious sensitivity evolves so quickly that before long this mysticism takes on the appearance of superficial froth, linked to the color of the times.

That is why I like Bach. What interests me in him, in spite of all the years separating us, are the relations among the notes. A certain number of relations, the more abstract ones, remain. The proportions and the forms are the hard body of the work.

The architecture of ancient times was swept away by a female form of Byzantine art, the dome. Then it reappeared in the Renaissance era. Likewise, mathematics has withstood millenia thanks to its inner force. This force is both rational and intuitive: A machine is able to compute, but it does not understand mathematics. A work of art, it too, remains thanks to its hard yolk. It is neither the perfumes of an era nor the mysticism which gives it this power.

I appear perhaps very optimistic: Finally, maybe, nothing lasts. And yet, paleontology shows that biological data three billion years old lives on in us without our being aware of it. All of our fundamental chemistry dates back to

that era. And it goes even further: According to certain theories, life on earth comes from the cosmos. In the artistic sphere, we ourselves are also no doubt rooted in the cosmos.

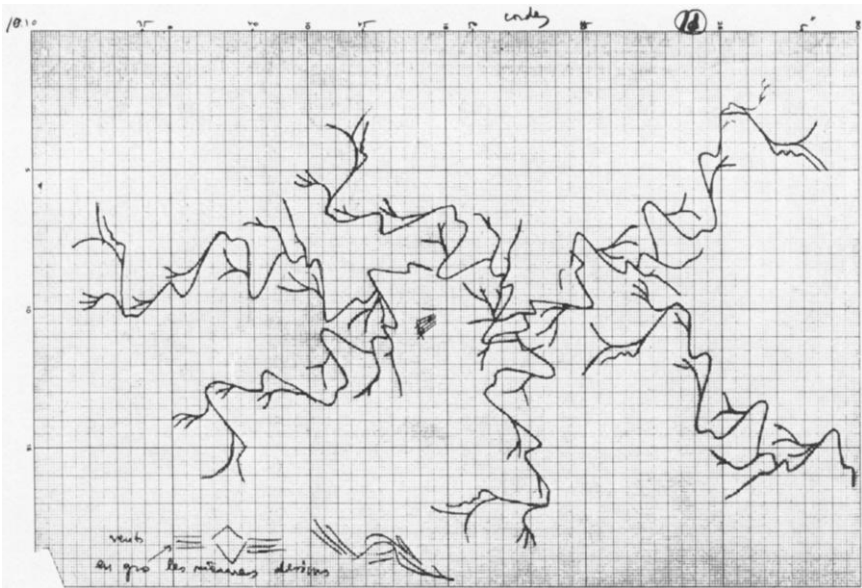
—Remarks noted by Pascal Dusapin and Anne Rey

II. THE INSTRUMENTAL MUSIC OF IANNIS XENAKIS

Xenakis continually explores new territories in stochastic music. In the years 1965–70, several totally spatialized works appeared: with Terretektorh (1965) for eighty-eight musicians scattered throughout the audience, Nomos Gamma (1969) for an orchestra of ninety-eight musicians spread throughout the audience, and Persephassa (1969) for six percussionists surrounding the audience, he becomes the first composer to confront a new auditive and sonorous space.

During the last ten years, a period when a certain burn-out is being felt among the musicians of his generation, and when many are speaking of a general crisis in contemporary esthetics, Iannis Xenakis is establishing his style of composition. No trace of vacillation marks his most recent compositions.

He develops various kinds of research. Thus, in Mikka (1976) for violin solo, we find his discoveries in "random walks" from the same lines of research as in N'Shima (1975) for ensemble and voices.



ARBORESCENCE OF *Erikhthon*

Jonchaies (1977), for full orchestra, stems directly from his theoretical work on sound synthesis and computer music—accomplishments leading as well to the electroacoustical piece *La Légende d'Er*, performed within the architectural structure he created in Paris for the inauguration of the Centre Beaubourg: the *Diatope* (1978).

With his most recent large scores, *Cendrées* (1973) for orchestra and chorus, *Aïs* (1980) for orchestra, amplified baritone, and percussion, *Nekuia* (1981) for orchestra and chorus, he is working to further develop some of his theoretical findings: He works in several directions, making a sort of amalgam of stochastic music and of tree structures of melodic lines. He also concerns himself with melodic scales, pitch, and time in a systematic way. From these perhaps a new style will develop in his current compositions.

—L.B.

III. IANNIS XENAKIS: MUSIC AND COMPUTERS

In the following interview, Iannis Xenakis explains why he introduced the computer into his compositional work. He wrote *Achorripsis* in 1956–57 with the assistance of his slide rule. Then he automated this approach, which led to compositions such as *ST4*, *ST10*, *ST48*. In 1966, Xenakis founded the EMAMu (*Équipe de Mathématique et Automatique Musicales*) which in 1972 became CEMAMu (*Centre d'Études de Mathématique et d'Automatique Musicales*). established at the CNET (*Centre National d'Études des Télécommunications*) in Paris, and underwritten by the Ministry of Culture.

In 1977, CEMAMu set up UPIC I, the first generation of the *Unité Polyagogique Informatique* of the CEMAMu. UPIC 2 came in 1983. Since then the CEMAMu has been collaborating with Hewlett-Packard and IBM and is presently installing under UPIC a system of real-time sound synthesis.

—L.B.

The fundamental problem is that a musician is not necessarily a computer expert, an engineer or a mathematician (that will change, for a new category of musicians is appearing); it is therefore necessary to provide tools for the user that are simple and elegant. The difficulty is thus to conceive well-adapted interfaces between thought and music. When I founded CEMAMu in 1966, I wanted primarily to construct something that would allow musicians and composers to produce music by graphic design, using a micro-computer. The result was UPIC, signifying *Unité Polyagogique Informatique de CEMAMu*. This computer system allows one to compose music directly by means of a graphic design, even without knowledge of music or computer science. As you can



IANNIS XENAKIS

see, it is a matter of immediate access and of making complete use of computer science. A child can use it.

What does the child do with the machine?

He draws houses, flowers, suns, then he coordinates what he hears with what he draws.

You mean that he modifies his design according to what he hears?

Yes, that's it . . . and the youngest children are the most inventive. That is why this mechanization, if it is fun and appealing, can radically change the practice of composing music. In addition, it allows us to discover things that the books on acoustics don't tell us.

What things for example?

The importance of modifying the tone and the color of the sound by contractions of time. The same sounds, heard in different time frames, produce unexpected timbral effects: The ear perceives them in another way. To summarize, with this type of computer system, creativity interacts intimately with all of the physico-mathematical apparatus.

For you, is the physico-mathematical apparatus an aid to creation?

Not purely . . . it is a basis for my compositional work. As for computer science, it provides the necessary equipment, the hardware as the Anglo-Saxons call it. However, music is the sonorous rendering of thought. If this thought is limited to veins of feeling, it does not go very far; but if it is molded by philosophic and mathematical procedures, then music becomes a part of fundamental research.

What are you alluding to? Particle physics?

Yes, as an example. What goes on in particle physics? One defines subparticles by the symmetries that they breed. Now, music is steeped in the problem of symmetry, and symmetry is made accessible by the theory of groups. Among other examples, we could take genetics, where one finds permutation groups. What is music, if not very often a set of structures made from the permutations of notes, of sounds? I believe that with this type of scientific approach, we could have another perspective on music, even on that of the past—and that we could create the music of the future.

This is thus the perfect marriage between artistic creation and technique?

Yes, almost perfect, but beware, technique can submerge the user: We must defend ourselves; it is good to use techniques, but we have to dominate them, to stay on the alert. Technology allows the exploration of new domains proposed by theoretical thought and esthetics; but once these domains are explored, we must push further. In fact, computer science is a product of simple rationality; as a composer, I unceasingly bring complexity, sometimes irrational, to this rationality.

How do you envisage the evolution of music and computers in the years to come?

First of all, the development of microprocessors will allow the multiplication of systems like the UPIC. The introduction of such machines at universities, at

conservatories, and at all the cultural centers will open tremendous perspectives, not only for research, but also for pedagogy. Secondly, this is the first time in the history of humanity when man can have direct access to composition. He no longer needs to know the symbolism of solfège or have to play an instrument. In the years to come with the development of computer networks and of individualized computer science—the computer in the home—an individual will be able to create alone at home, with an electromagnetic table connected to peripherals. I think that in a certain way, the social foundation of art could also be resolved by computer science. Finally, the man on the street will be able to *think* in terms of music.

—*Pour la Science*, November 1982

IV. IANNIS XENAKIS THE ARCHITECT

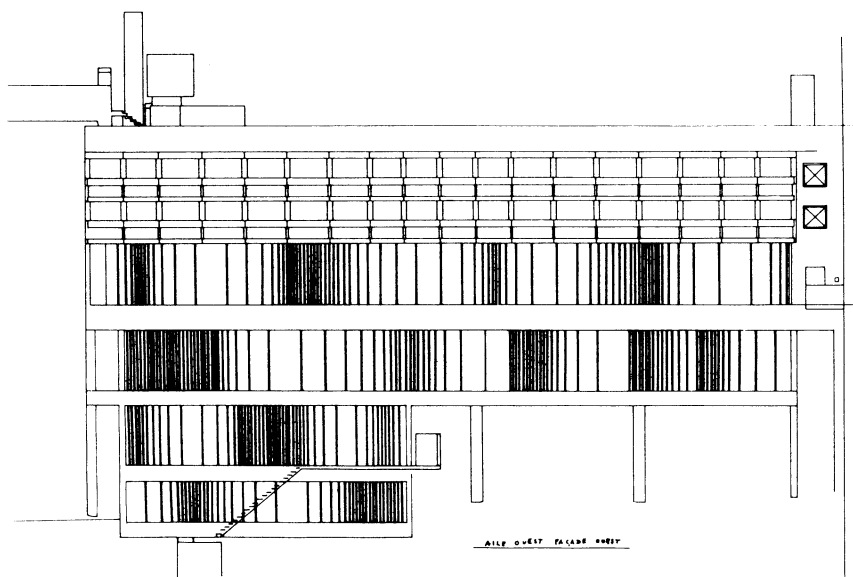
In 1947, Iannis Xenakis exiled in France. He was brought into the office of the architect Le Corbusier and while there, produced some of the most recognized works of modern art: the Couvent de la Tourette (at Evreux on the Arbrèsle, from 1953 to 1957), the Philips Pavilion at the Brussels International Exposition (1956 to 1958) . . . where he executed some choices of a “musical” nature. The façade of the Couvent de la Tourette displays immense plates of glass—“screens of musical glass”—arranged vertically in superimposed layers of irregular densities and intervals. Thus we once again find the composer has these concerns: simultaneous layers of durations, complex and rhythmic polyphony.³ Le Corbusier testifies to this collaboration:

These two solutions are static. We have therefore adopted a third one, provisionally named ‘musical glazed panels.’

Here, the dynamics of the Modulor are given free reign. The elements are set face to face, in masses, in the two cartesian directions, horizontal and vertical. Horizontally, we obtain variations in the densities of membranes in a continuous manner, after the fashion of the undulations of elastic media. Vertically we create a harmonious counterpoint of variable densities. The two scales of the Modulor, the red and the blue, are used either separately or together, thus creating a subtle balance, using the whole of the two Moduloric processes.

(In the end, for fear of being bitten by snakes or adders, we adopted for this invention the name of ‘undulatory glazed panels.’)

—Le Corbusier, *Modulor II*,
translated by Peter de Francia
and Anna Bostock (London:
Faber and Faber, 1958), 323-26.



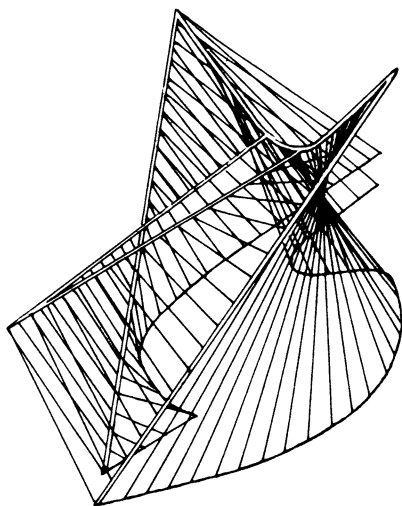
“UNDULATORY GLAZED PANELS”

Philips Pavilion

A two minute interval, and an eight minute show. First decision: the container will be a sort of stomach with a separate entrance and exit for five hundred people. Second decision: to use two almost vertical, concave walls allowing the audience, standing and looking forward, to see above the heads of their neighbors.

We had at first considered a construction of plaster—which is the basic, fragile material used for temporary exhibitions—a bottle suspended in a cage of tubular scaffolding. But Xenakis, who was put in charge of the study, quickly abandoned the plaster. After having considered timber and concrete, Xenakis, who had known Bernard Lafaille well, turned towards self-supporting, curved surfaces. Having made his draft, Xenakis constructed a first model with wire and sewing thread. Then a second model that he covered with cigarette wrappers.

—Le Corbusier, “La Poème électronique,” in *Les Cahiers Forces Vives* (Paris: Éditions de Minuit 1958), 24.

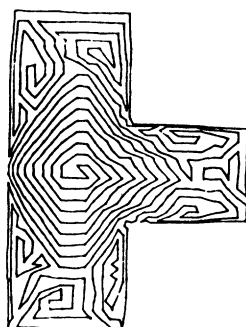
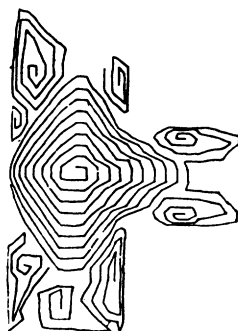
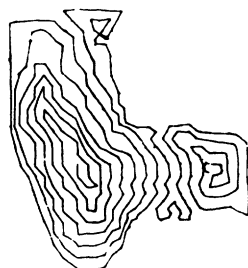
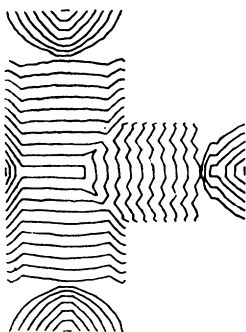
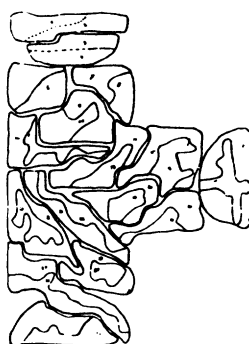
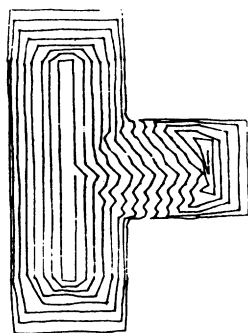
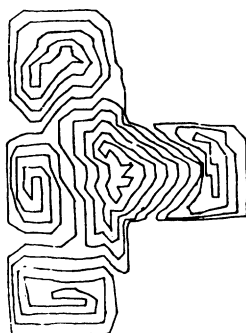
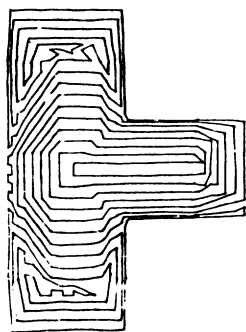


Very quickly, Iannis Xenakis produced his own cosmic cities,⁴ the Polytopes—original sound and light spectacles which met brilliant success.

First adventure: the *Polytope de Montréal*, in 1967. Within the French pavilion, a structure of steel cables, curved into hyperbolae, 1200 flashes, 35 programmed stages, and 90,000 changes of light in six minutes! As a contrast, giant loudspeakers broadcast continuous, smooth music, in uninterrupted glissandi comprised of four recorded orchestras.

In order to assimilate the medium of sound and light, Xenakis pursued this exploration in *Persepolis* (1971), in Paris, with the *Polytope de Cluny* (1972), the first show to be totally organized and controlled by computer. At Beaubourg, in 1978, for the inauguration of the Centre Georges Pompidou, his *Diatope*—a structure with three curved apices—marks a decisive step: the realization of a tri-dimensional composition (architecture, light and sound). For the musical part, *La Légende d'Er*, the tape combines recordings of African or Asian instruments with microsounds created with converters, a supernaturally strange effect. All these researches, conducted for years in his Parisian studio of the CEMAMu, have led him to the invention of the UPIC machine.

(author unknown)



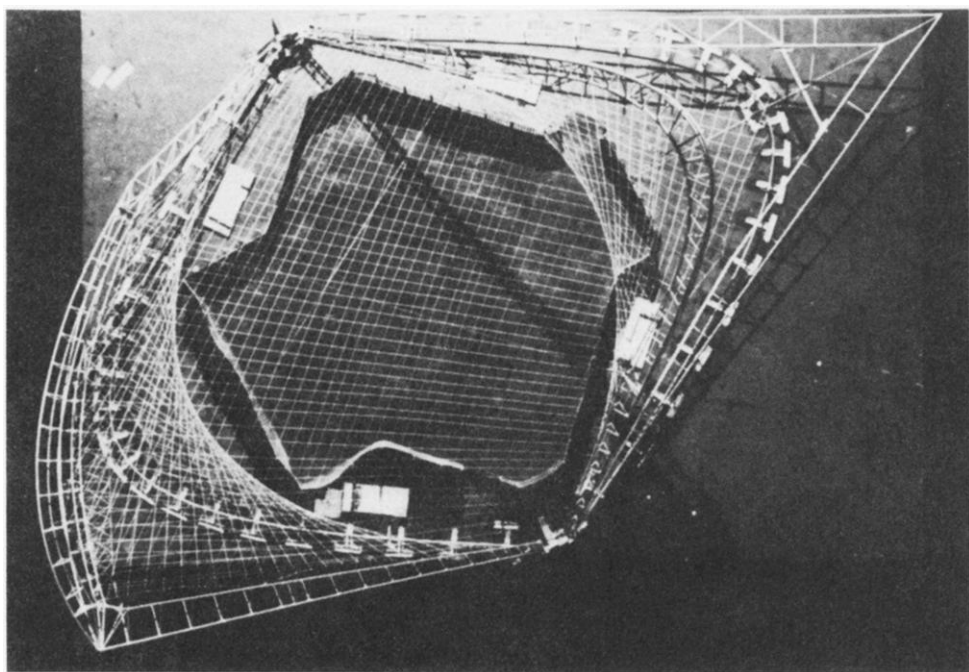
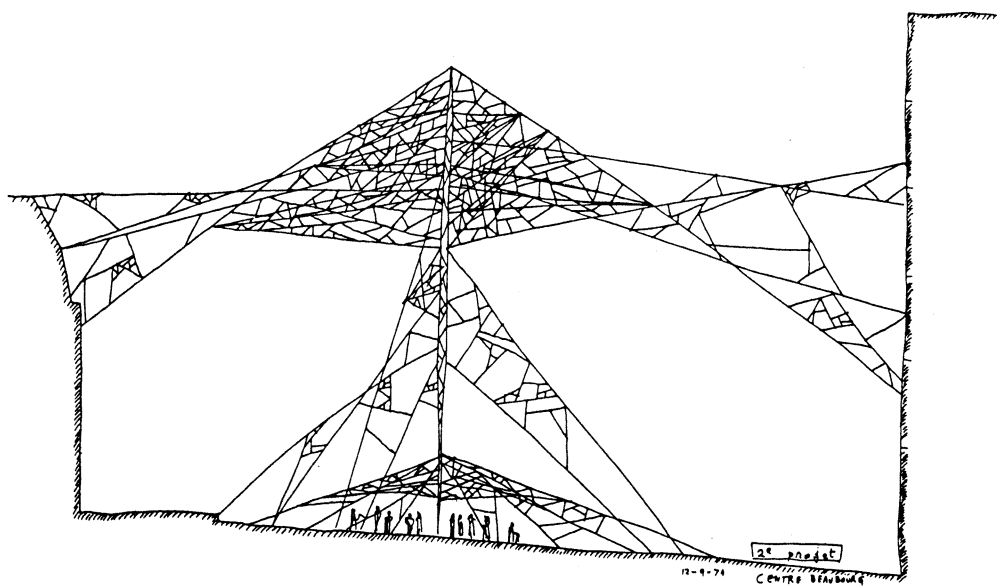
On the subject of this Diatope. Iannis Xenakis himself comments upon his experience.

La Légende d'Er (first version):
Song of Light and Sound of the *Diatope*
at the Georges Pompidou Center

Music is not a language. Every musical piece is like a highly complex rock with ridges and designs engraved within and without, that can be interpreted in a thousand ways without a single one being the best or the most true. By virtue of this multiple exegesis, music sustains all sorts of fantastic imaginings, like a crystal catalyst. Myself, I wanted to deal with the abysses that surround us and among which we live. The most formidable are those of our destiny, of life or of death, visible and invisible universes. The signs that convey these abysses to us are also made of the lights and sounds that provoke the two principal senses that we possess. That is why the *Diatope* would like to be a place for the condensation of those signs from the many worlds. Rational knowledge coalesces with intuitive knowledge, or revelation. It is impossible to dissociate one from the other. These abysses are unknowable, that is to say, knowledge of them is an eternal and desperate flight, composed of milestones—hypotheses across the epochs. It is difficult and probably not necessary to attempt to explain the light-show and the music of the *Diatope* on all levels. The sense of these acts of light and sound will be glimpsed in the extracts of significant texts published elsewhere.⁵ This spectacle and its music form multiple resonances with the texts, a sort of sonorous string held by humanity in cosmic space and eternity, a string composed of ideas, sciences, revelations. This spectacle is created from the harmonics of that cosmic string. These texts explain it better than any other discourse. They form the argument for the spectacle.

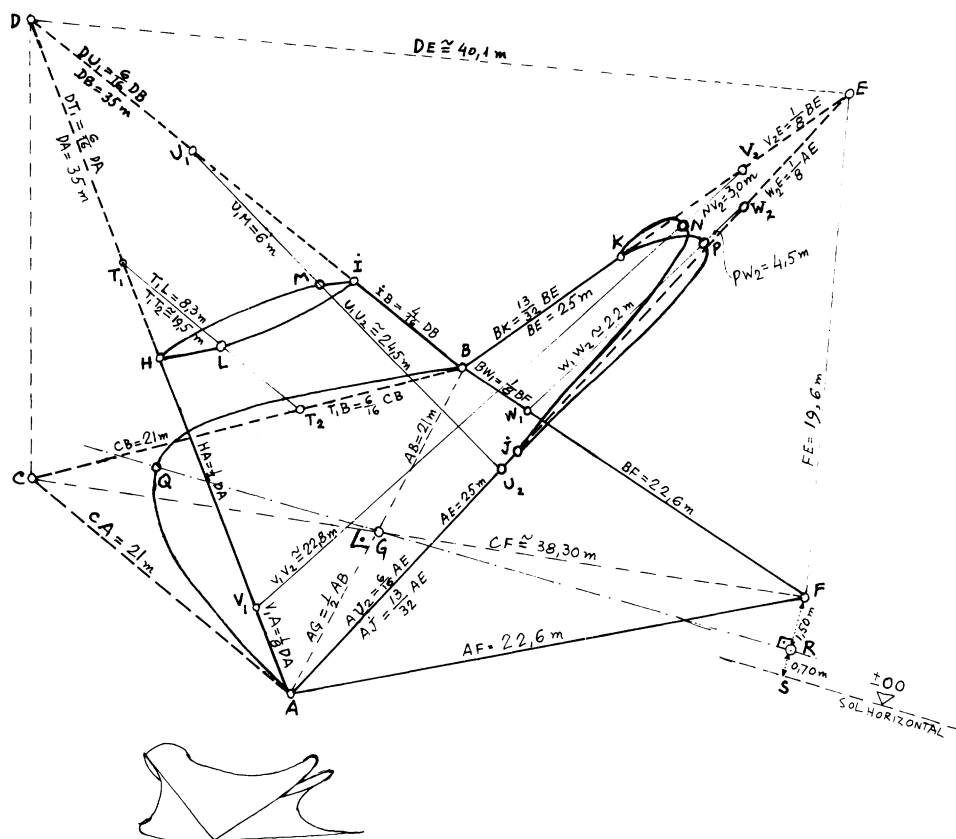
I chose in a sort of panorama some of the epochs which were significant and particularly rich in ideas and poetics, and I present here in a group the few texts that appear to me to be the summits, those of course that I preferred among others. I gave the generic title “La Légende d'Er” to these texts, because this legend which paradoxically completes the *Republic* of Plato, incorporates ideas of morality, of destiny, of the physical and extraphysical, of death, of life, in a system which is closed but highly poetic due to its apocalyptic visions.

Opposite Plato's grandiose poetics and rational realism, I place the hermetic text, “Poimandres” of Hermes Trismegiste. Then the admirable text of Blaise Pascal, a universal thinker possessing extraordinary philosophical and scientific intuitions. Then the vision of Jean-Paul Richter in “Siebenkäs” where man is alone in the black of the universe. Ultimately, our universe as seen by modern astrophysics.



SOME PRINCIPLES OF COMPOSITION

Architectural. The form of the plastic shell of *Diatope* is a materialisation of a project which I have had in mind for more than twenty years. It is a response to the perennial, never-resolved question: What architectural form is to be given to musical or visual performances? I say that there is no unique answer. But I also say that the effect of architectural forms has a quasi-tactile influence on the quality of the music or show that is performed there. This apart from all considerations of acoustics or of optimal proportions for seeing or hearing. Architectural forms, their types, are an element which is generally neglected or scorned. Whence we get halls that are cubical or rectangular polygons, that is, vertically cylindrical or conical as the case may be. Architects are inhibited

GEOMETRIC DEFINITION OF THE ARCHITECTURE OF THE *Diatope*

when it is a matter of giving free rein to the imagination of new and rich forms which contort three-dimensional space.

I wanted to give a different solution comparable to that which I conceived and executed for Le Corbusier with the Philips Pavilion at Expo '58 in Brussels. But the form of *Le Diatope*, because of the laser trajectories, had to conform to the following principle: a maximum of free volume for a minimum of enclosing surface. The classical answer is the sphere. But the sphere, beautiful in itself, is bad for acoustics and less tangibly rich than some other, double-curved, warped or skewed forms. Whence the current configuration, which makes use of hyperbolic paraboloids, thus shaping a kind of enveloping form, closed and opened to the world at the same time by the convergence of its geometrical construction.

Musical. The music of *La Légende d'Er* is made of the following families of sounds:

- a) instrumental, for example, the sonorous shooting stars of the beginning and the end, or the sounds of the African jew's harps, or of the Tzuzumis (small Japanese hourglass drums).
- b) noises, for example, clapping special blocks, scrapings against cardboard. . . .
- c) realised by mathematical functions on a computer and converted from digital to analog at the Centre d'Études de Mathématique et d'Automatique Musicales (CEMAMu).

Here, I have inaugurated a new approach to the production of sounds, different from and even opposed to the methods of the electronic music studios and laboratories using computers and digital-to-analog conversion. It is no longer a matter of starting from analysis and of Fourier synthesis, which permits the generation of sound by means of bundles of sine-tone harmonics or partials. This new method constructs and acts directly on the pressure-time curve which itself acts on the tympanum of the ear. (See my text, "New proposal in microsound structure," Chapter 9 of *Formalized Music*.) I have used probability functions to generate the pressure-time curves, that is, I worked directly with the 1/40,000 of a second. Nothing remains of the traditional approach except the notion of periodicity, but taken in its more general sense, that is, the stochastic renewal of equivalence classes of values for pressure and values for duration. The functions used here are, essentially, Cauchy functions ($t/((t^2 + x^2)*\pi)$) and the famous "logistic" $\alpha * \exp(-\alpha * x - \beta) / (1 + \exp(-\alpha * x - \beta))^{**}(-2)$, as

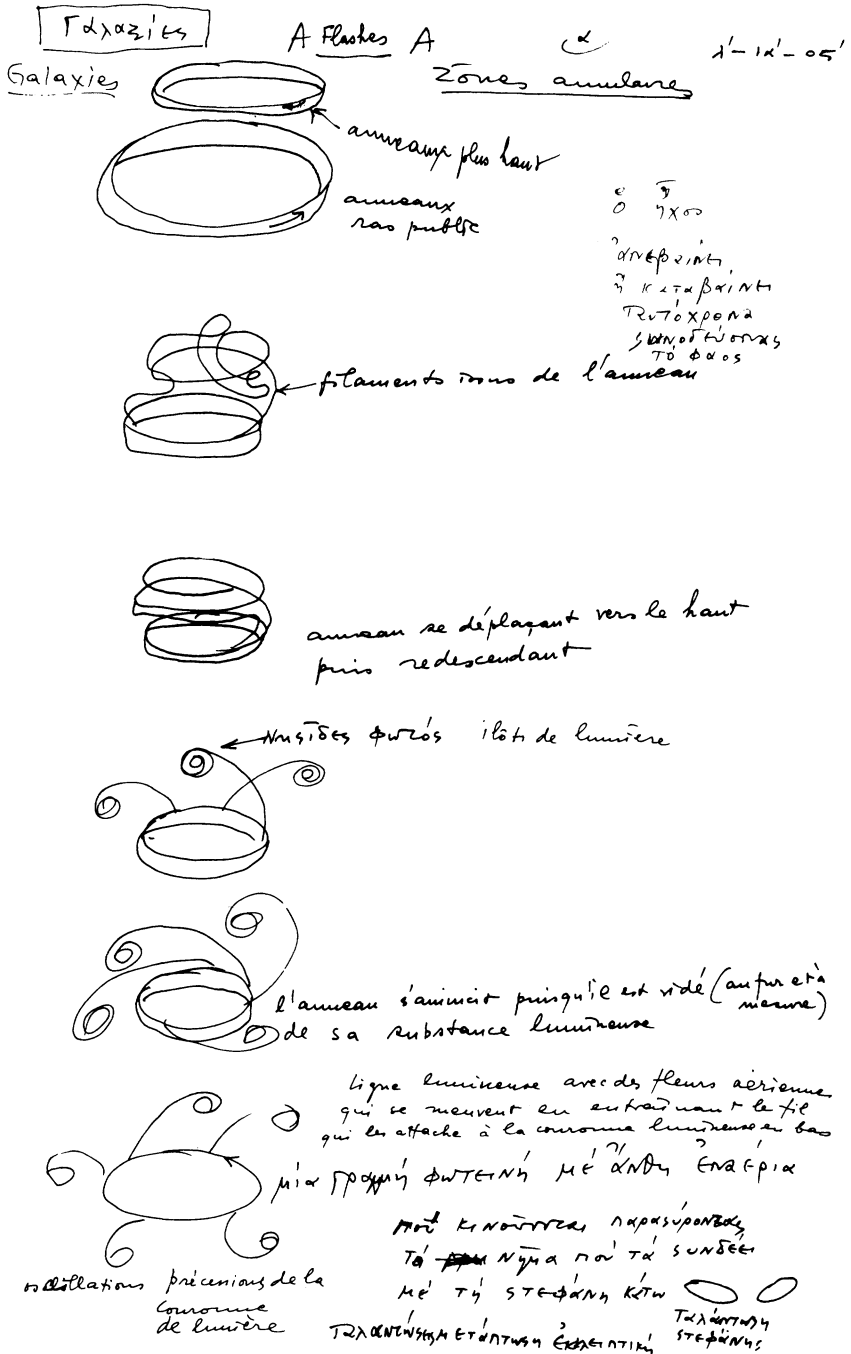
well as functions of these functions. It is then a means of controlling Brownian motion (random walk).

These families of sounds, some of them realized at WDR (West Deutsche Radio), are then treated by filtering, reverberating, transpositions of speeds, and various mixings at the electronic music studio of WDR, which has also commissioned this music and which has financed all its processing. The music is on a seven-track tape. Each track is distributed over the eleven high-quality loudspeakers arranged under the shell of *Diatope*. This static or cinematic distribution is realized by means of a special computer program.

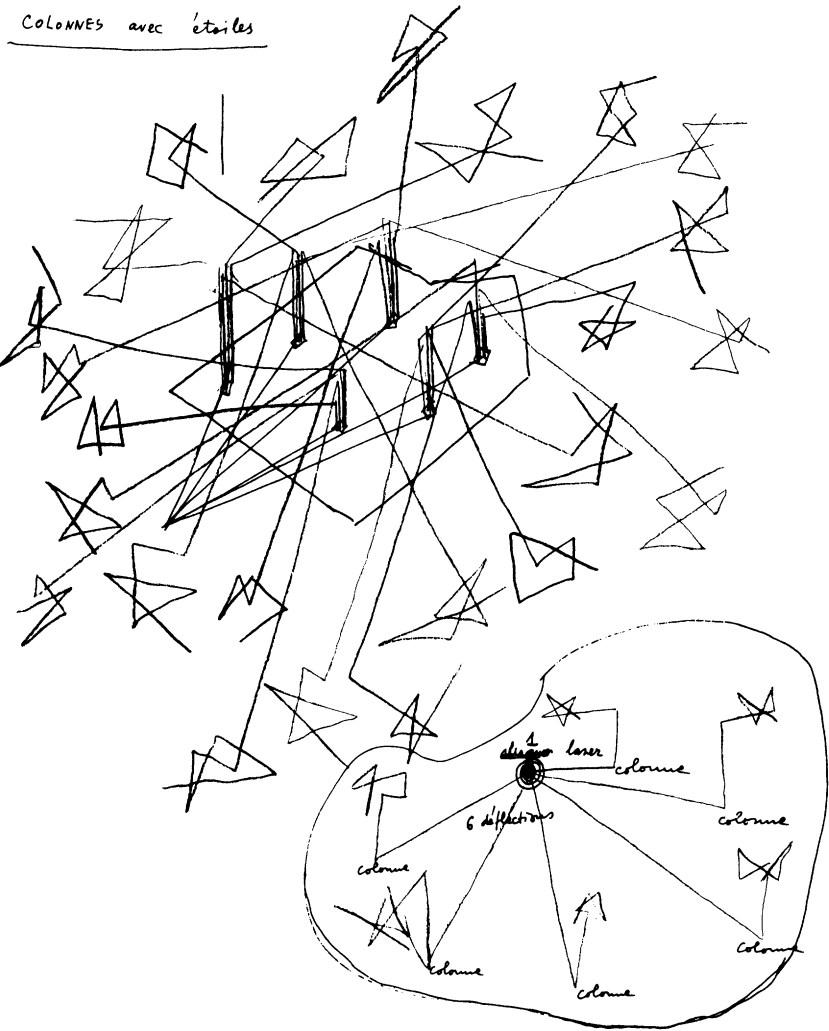
Visual. The visual acts are built from mobile configurations, either of points (electronic flashes) or of lines (laser beams). The 1680 flashes form galaxies in movements, thanks to the rapid turning on of the flashing lights (every 1/25 second), and all kinds of interpenetrating, disappearing, rebounding, transforming figures. It goes without saying that the organization of these light gestures in their continuity or their discontinuity is regulated by tangles of mathematical functions ranging from functions of imaginary (complex) numbers to probability distributions. The beams of the four lasers are taken in charge by some four-hundred special mirrors as well as by optics designed for the intended effects. In short, just as our universe is formed from grains (of matter) and straight lines (photon radiation) ruled by stochastic laws (probability), this spectacle offers a reflection of it which is miniature but symbolic and abstract. So music and light unite together. In some sense, this is a kind of cosmic "harmony of the spheres" which, by means of art, becomes one with that of thought.

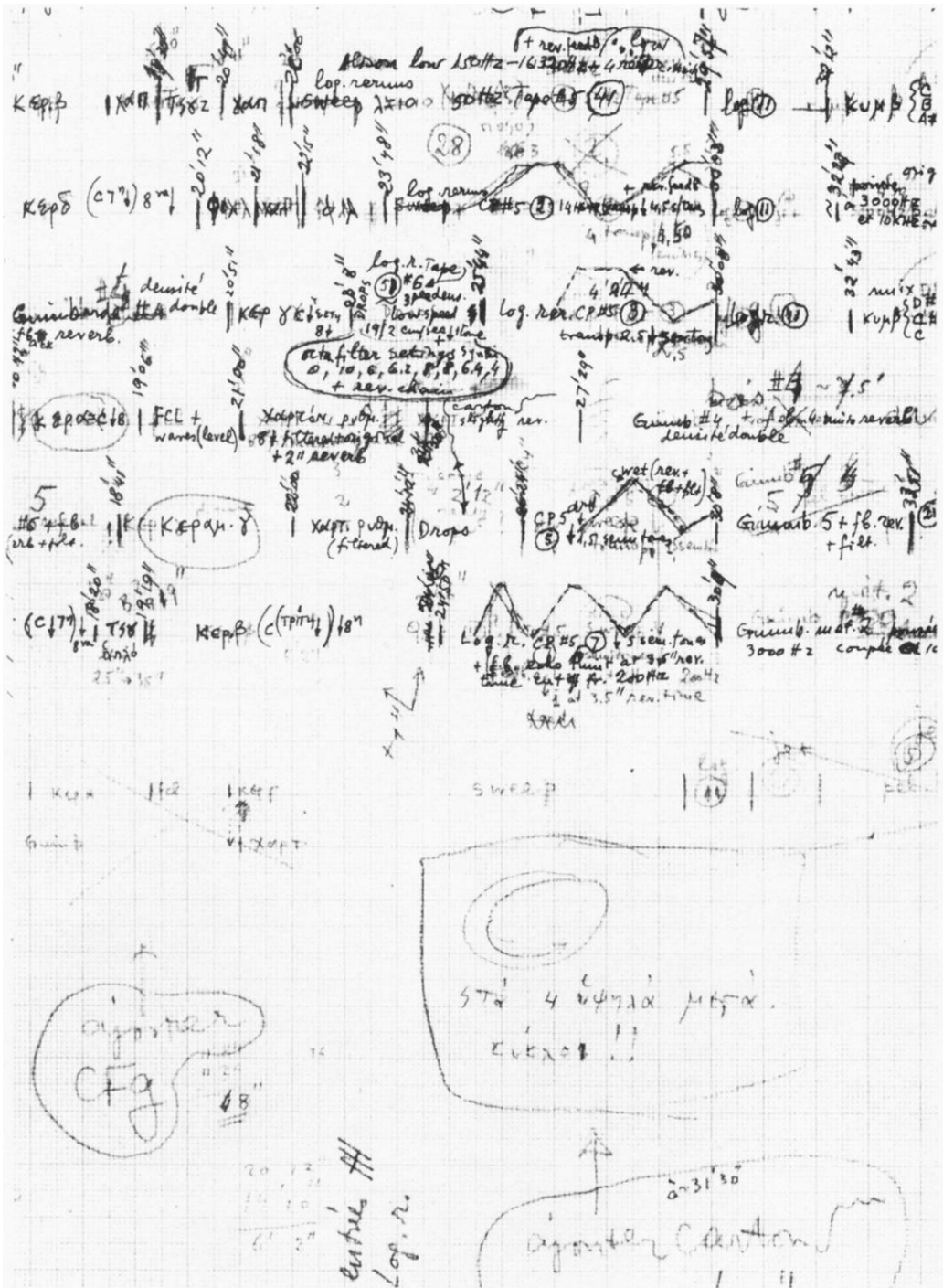
Finally, on the occasion of the debate recently provoked by new theaters in Paris (Bastille Opera and La Villette), Iannis Xenakis expresses his notions about architecture and the hearing of music.

By removing the main floor seating, one can arrange the audience on bleachers while accentuating frontality, which is the most effective procedure from the point of view of visibility. One can imagine planes, platforms that rise and descend, differentiated reliefs. This is unlike traditional opera, where space is always expected to remain oriented toward the place of action, of drama, toward the scene. It is possible to imagine the multiplication of places of action, such as Mnouchkine in the Théâtre du Soleil. Space can even be occupied up above: Look at the acrobats of the Peking Circus! The physical presence of singers, of the choristers, of the constraints imposed by the drama, with the unities of place, occasionally of time, mark the limit of an eventual reform of the traditional building. It will always be necessary to construct a place where the characters play, meet one another. . . . The presence of musicians is also a constraint. One can remove the orchestra from the pit, place it on



COLONNES avec étoiles





the stage or elsewhere, but its presence in a given spot is inescapable.

Opera is an object of art in itself, one which tells the thought and the mentalities of an epoch. *Nó* theatre will never be staged in French! The constraint that I am evoking is of the same order; it is a question of language.

Today we have at our disposal more numerous technical means than before, such as electricity, instruments for programming the lighting, the possibility of changing the scene more rapidly. One can find acoustical solutions other than the orchestra pit. That's an easy change to make.

On the other hand, with present audio-acoustical procedures and the computer, we can create spectacles where neither the action nor the voice are necessarily localized. One can think in terms of human voice, human presence, and no longer do opera. Artistic creation is no longer done in the same context as before and we can imagine new spaces.

At La Villette, free experimental space will be created. I have proposed in my architectural project some ideas for the future edifice. First of all, there will not be a single floor, but rather platforms, perhaps mobilized, arranged in space so that one can look in all directions. The spectator, suspended in space like a spider at the end of its filament, should no longer have the feeling of living on one plane, but rather in all three dimensions. These floors resemble little islands, clouds on which one could place the spectators, the performers, the equipment. Light must be designed to come from all directions, including from below. Technically it is entirely possible to construct transparent floors which allow light and sound to filter through. It would also be necessary that the sound sources be spread throughout the space, something that is never anticipated in halls. The mixing consoles would be situated in the hall, and not in a recording room where one hears nothing. This space, empty and capable of being filled, is never oriented either for seating, for viewing, or for listening. Music, spectacle, contrary to that which happens in traditional opera, does not favor one particular type of orientation.

This has nothing to do with a polyvalent hall. I do not believe in mobile systems, in an infinitely adjustable frame structure. The designer must anticipate a distribution of elements in space. In what sense? That liberty, that neutrality must be handled in such a way that the diversity created will be interesting. There are technical questions bearing on distances. . . but that all belongs to the domain of the study. As far as the forms are concerned, we do not have an infinite number. They must withstand the construction. We had many problems when constructing the Philips Pavilion, due to the extreme thinness of the concrete, warped shells. Mobile architecture is nothing but garbage, because no one is able to replace an architect of worth. As an artist, I prefer to use something fixed, interesting, captivating, rather than leaving total liberty of structuring the space with each use. Polyvalence is proof of the absence of taste, of will, of the architect's reflection. One must create a space which is strong, rigid, but which nevertheless allows for a richness in arrangement, in

the permutation of things and events.

This space, it would at first be like an envelope which would serve as a sonorous shelter, as thermal insulation. The envelope could have certain sonorous qualities based on forms and volumes, and not on correcting panels, as usually happens. Acoustics is bound to the conformation of space, to the shape of the covering. The architectural form need not be conventional. The sphere, the right angle, level surfaces are absolutely to be avoided. I would use instead a contour surface, a sail. That is what I did with the Philips Pavilion. The contoured surface had the advantage of better reflecting and diffusing the sound. At the polytope of the Pompidou Center we used a fabric that had no sonorous inertia, but that nevertheless reflected a part of the sound, and there was no untimely echo, rather a satisfying diffusion of the sound.

The envelope need not be unique because there are many things arranged around the periphery. What? Sources of lighting, eventually sources of sound, and then the direct contact of the production department with the space. . . . To allow for the most liberty, we need a sort of metallic net on which to hang all sorts of things, like islands fastened to the envelope. Behind the cloud of these objects, there is the shell, the actual cover. What form should it assume? What material might be used?

Just as the first membrane, the netting, is open and pierced, it is this second membrane, this shell, which will serve as reflector. While visible forms always play a role, we can also be sensitive to invisible forms. The human eye and ear are sufficiently skilled and cunning to sense the proximity of forms from afar. Finally, we must connect this closed space with the exterior. Now and then, one must be able to leave the events of the interior.

The edifice gains nothing in being weighed down by a conventionally thick, useless shell. The elegance of the material is found in its effectiveness. The shell of the Philips Pavilion was five centimeters thick, no more. The limit of the non-constructible is continually pushed further.

To realize something different from the traditional building implies a rediscovery of fundamental questions, of lines of force, abandoning certain architectural prejudices.

Identical elements are too frequently multiplied, repeating a rhythm, a module: *pilotis*, posts, orders. . . . The utilization of repetitive elements complies with simple motives, firstly economic—those of industrialization—the ease, the rentability—the peace of mind. Secondly, repetition is very strong, it is also the architectural tradition of the discrete. The shell, the sail on the contrary represents an aspect of continuity in construction, in space. It is naturally more expensive to construct. In a final analysis, all will depend on the ultimate controller, the State, which must decide if it wants to leave its name in contemporary architecture.

There are prejudices concerning the purpose of the edifice, its function. Even here things are not simple. Function can be considered in several ways. I

remember, when the apartments of Marseilles were being designed, Le Corbusier spoke about women's liberation with respect to the opening out of the kitchen toward the living room and thus toward the exterior. A woman was certainly no longer shut away in the kitchen, but she was still subservient for the simple reason that she always did the cooking, even if she had a lovely countryside view.

One must invent this architectural space and not choose it as if it were already in existence. It is a place to be discovered according to the fundamental necessities that face us. There are things that one cannot imagine, and yet that must be discovered and created. This is an entirely different, dynamic attitude. It is not a question of permutations or of combinations of existing things, that is what I want to say. . . .

There is no automatic rationality that can in itself bring one to an interesting solution. First one must consider the needs and the initial functions, and from there, search and invent. In everything that we do, in architectural matters or anything else, we inevitably manipulate certain concepts, certain structures. It is thus necessary to work in the theoretical domain, without which we are slaves, trapped by clichés, by inherited structures that we manipulate without knowing them perfectly. Theoretical exploration avoids making such unfortunate mistakes. A theoretical effort starts in any case from premises which are intuitive, esthetic, from an idea; it then explores and uses tools: logic, other knowledge coming from other sciences. For example, if you compose music on the computer that you consider bad, it is not necessary to respect that music on the pretext that it is the result of a computer, as do certain contemporary musicians. On the contrary, one frees oneself from such a theory in order that the result may be interesting. Theory and the machine are not a criterion. Music is the final criterion.

Thus, you set down the basic necessities, then you discover the elements that correspond to the emotions, to the imagination. If you succeed for example in creating a space that gives the impression of flying, that is tremendous. At Saint Sophia in Constantinople, one has this impression. . . . It is only in this way that you manage to create something that is universal. These aims are inevitable. Great artists are those who attain the universal. In reality, the universal is not so far removed; it is found in you since you are human. To find the difference between that which is of value diachronically and synchronically—across the ages and on the planet—and that which is not, provides solutions, expressions that are not petty. To get beyond pettiness is not easy. To say that women were going to be “liberated” in the new apartments of Marseilles is an example of such small-mindedness. But at that particular moment, no one realized it. In opera music there are universal aspects which remain and which certainly will remain, because they are present much in the same way as are certain

Egyptian bas reliefs. The bas reliefs of the masters of ancient Egypt are not confused with those of the copyists who spread them throughout the realm. . . .

—Remarks noted by Stephane Galzy and François Grucon

V. THE MIND OF IANNIS XENAKIS TODAY

In these two articles recently published in France, Iannis Xenakis develops some of his favorite themes for reflection, notably his lofty philosophical preoccupations: the composer joins the mathematician, the physicist and the astrophysicist.

—L.B.

THE SOURCE OF THE HUMAN EXPERIENCE

First proposition: rules can only be imposed by the work itself.

—One always comes back to the same question—what is true or what is false in artistic matters?—or to the only response worth considering, to refuse all rules outside the work is to refuse to be crippled, blind, and deaf.

—All philosophical thought, all rules are provided in an original way by the actor, by the artist. We touch here upon the foundation of art: what is originality.

—The analysis will certainly bring us back to genetics. It suffices already to remark that though man's original acts are numerous (as in daily life, the event of walking. . .), the more they are rare and symbolic the stronger is their degree of originality.

Second Proposition: nothing is born from nothing.

—To speak of our originality is to speak of our constitution, and as a consequence of the making of the universe and of its process. It is the same for art as for the destiny of humans and of the universe. The preoccupations of the musician join those of the astrophysicist.

—For centuries, scientific tradition has predicted that nothing can come from nothing. It has viewed the universe as an automation, continuing to exist without a point of return, without a new creation. Suddenly in 1973, a professor from the University of New York put forth an opposing hypothesis: All

the matter and energy in the observable universe could have emerged from nothing.

—I am not an astrophysicist, but, for a long time, I have thought that music is nothing but a path among others, permitting humankind first to imagine, then, after long generations, to lead the existing universe to another, entirely created by humanity.

—Since 1958, I have been writing on the subject of the originality of art and music:

τὸ γὰρ αὐτὸ νοεῖν ἐστίν τε καὶ εἶναι
τὸ γὰρ αὐτὸ εἶναι ἐστίν τε καὶ οὐκ εἶναι

“For it is the same to think as to be” (Poem by Parmenides); and my paraphrase, “For it is the same to be as not to be.” In a universe of nothingness. A brief train of waves, so brief that its end and beginning coincide (time in nothingness) disengaging itself endlessly.

Nothingness resorbs, creates. It engenders being.

—Still today, through lack of conceptual and suitable experimental tools, astrophysicists are unable to respond to this question, to this captivating notion of a universe open to spontaneous creation, which could form or disappear without respite, in a truly creative vortex. From *nothingness*. A disappearance into nothing.

Third Proposition: the universe is in perpetual creation.

Plato already fought, on a more religious level, against the theory of a continuously extended universe. According to him, God creates the universe, builds it and leaves it. The automaton deregulates itself and becomes increasingly chaotic (this could be the current epoch. . .), to the point where the Creator takes it in hand again and reconstructs the universe.

Transcribed to a scientific level, the anecdote assumes its true force: Because of gravitation, the universe could stop dilating and could commence to contract until it becomes an implosion towards nothingness. This pendulum movement creates the state of perpetual creation.

Again, we are referred back to the foundation of art. You often hear it said: To construct, it is necessary to destroy. In my opinion, this assertion is false. It suffices to put the proposition: The contribution of an individual depends on his originality, his own distinctiveness, even though he is caught in a global and general flux. Einstein would not exist without the breakthroughs of Lorentz. We could extrapolate forever.

Thus opens before us the reason for certain remarkable works, sorts of

unsurpassable paradigms (for example the Egyptian bas reliefs. . .); what is done is an absolute. Likewise in music, the architecture of a work, its performance, depend on technique, but also on factors which are impossible to name—the life of him who composes it, of him who performs it, the instrument, the acoustics. Richness elaborates upon itself by stages, to the point of the highest universal preoccupations.

Thought is nothing but a part of doing, whence the absence of archetypes, and a different existence each time. That is, in effect, at least partly, the theory of probabilities: a flux of aleatoric functions.

* * *

It is in fact the inner initiative, the transfer to a deed which engenders fulfilment. I am not speaking of happiness, which is a myth, for nothing is absolute. They exist, of course, the joys, the tears. But that is not what should count: They are nothing but epiphenomena of that which one does, suffers, or lives. Death, for example, a supreme misfortune, is a part of life. We sense it, we anticipate it. But we prudently avoid speaking about it, as if it were a guest that we must avoid. Nevertheless, it is there, omnipresent, at our sides. Our organism, degenerating every second, knows it. Now, this definitive disappearance can be transposed in the domain of work: the choices that I make when I compose music, for example. They are distressing, for they imply renouncing something. Creation thus passes through torture. But a torture which is sane and natural. That is what is most beautiful: to decide at any moment, to act, to renounce, to propose something else. It's great. The joy is the fulfilment of living. That's what it means to live.

This tormented life is necessary. Everywhere, at all times. Only, one does not live with it, one refuses it. We surround ourselves with references, politeness, taboos, ethics, for ourselves as well as for others. Or, as a last resort, we spread butter on the psychoanalyst's bread, but what a myth it is to believe that in remembering something, we delve more profoundly into ourselves! The subconscious also forgets. Like memory, it is putrescible. It is not a veil one can lift from the shadow cast by a long abandoned planet. A sort of Hades from Antiquity. In our life, there are entire patches of the past which have completely disappeared, or that we will never find again. It is illusory to think that the subconscious can retain the fantastic quantity of impressions, of suggestions, of fascinations experienced at such and such a moment in our existence.

I can nevertheless ponder: Is it because I no longer remember it that a particular thing no longer exists? The fact that I do not remember it does not mean that the thing no longer exists in my subconscious, certainly. However, I cannot maintain that these memories exist, since they are inaccessible. And if

anyone claims that they are accessible, I would very much like to possess the methods for access to them. Because it would be fascinating to explore them, if only in order to turn one's past into a cinema.

The inaccessibility of this memory thus implies that we cannot prove its existence. That is the theory. In addition, practically speaking, it is unthinkable, impossible that the human brain conserve intact, and not degraded, traces or prints of the past. Which are extremely fine and subtle. Let's take the example of our most recent recollections. When we remove them from memory's drawer, we damage them like pinned butterflies. In fact, we replace them with others. And, if we go back further, we realize that memory, if it still exists somewhere, is still more inaccessible, tucked away more deeply. Because it is covered with new traces. Starting from the oldest, yes, but completely restructured. We are speaking of a theoretical view. For me, psychoanalysis is a subconscious view. Moreover (just as other disciplines) it has suffered from an abusive extrapolation; people have wanted to see it as a panacea.

Paleontologist, geneticist, biologist, physician, chemist, mathematician, historian and expert in human sciences. These qualifications comprise the identification card of tomorrow's musician. Of him whom I call the conceiving artist. Who searches after the secret order that rules the universal apparent disorder. Who considers a new relation between art and science, notably between art and mathematics. Since Greek Antiquity and right up to our twentieth century, moreover, certain conquests in music and several discoveries in mathematics spring forth almost at the same moment. And, contrary to what we often think, there have been interactions, osmosis, reciprocal influences. In 500 B.C., for example, the relation between the pitches and the lengths of strings had been established. Music thus gives a serious impetus to the theory of numbers (positive rational) and to geometry. Later (eleventh century), the bi-dimensional spatial representation of pitches as a function of time by the use of staves and *puncta* undoubtedly influenced Descartes' analytical geometry, proposed six centuries later. Direct influence? I do not know, not knowing Descartes in person at all! But ideas cross one another like currents of air. And sometimes very little suffices for the spark to burst forth.

Another interesting example: the fugue. A fixed structure, and fixed if there ever was one, when speaking of school work, the fugue is an abstract automatism, which was utilized two centuries before the birth of the theory of abstract automata. It was the first automaton. And what is an automaton if not the expression of mankind's profound need to reproduce? To project worlds, universes, to create himself in his proper image?

In constructing robots, man took the place of gods. For he felt that the latter were nothing but his own reflection. And now, we are constructing biological robots which tomorrow will give birth to little robots: The dreams of the gods are materialized!

Yet, we always live in the shadow of Sisyphus and Tantalus. Because every-

thing around us moves, shifts, is in constant turmoil. We are not moving through an epoch of certitudes: Cosmonauts in a swarm, we navigate in the provisional, we must reconsider each thought at every instant. This isn't all bad, moreover, for our life thereby becomes much more complicated, more complex, more alive, finds itself all the more enriched. We live more intensely when we must confront swarms of problems, when we must decipher this growing complexity, which is here, before our eyes, hieratic, even if we try to ignore it. That which we live is a bloody hand-to-hand with nature. Which engenders anguish. But, luckily, when we are afraid of something, when it becomes bitter, acidic, we immediately erect defenses. We cannot live without defenses, anyway, at the risk of being immediately annihilated. And our defense is to refuse to see, is to deny the complexity that surrounds us. It is also to create beliefs, myths, good or bad gods. Or elegant theories of physics, which structure our spiritual environment and reassure us, be they legitimate or not. These are our bunkers, our mental machines, veritable automata interconnected with our defensive tactics, with our lines of conduct, with our physical and mental self-protection. So that we can act, know how to act and what to do.

I was about to forget memory, which is forgettable, we all know that. Fortunately. It is even made to be forgotten, it is perishable. For, if we should remember, what with the acuity of reality, of all the past instants, marvels and transformations, we could never take the shock. Memory, nothing but the trace of these instants, equalizes, cushions, lulls. Another self-defense.

But in other respects, one must avoid the trap of becoming imprisoned in memory. It is good to look around, to risk shock, to keep a critical spirit, a power of constant renewal. In brief, a fresh outlook. This risk, for there is one, comprises a part of our existence, just as defense, survival. It is our fate to be destiny.

Society, which stifles us, constitutes an additional risk. It is thus in self-defense that we try to participate as little as possible. So that we can judge it from the exterior. For it rubs off on us, just as history taints the present. Thus, I would rather be outside—putting on the decals—than within—being plastered with decals. Everyone of us tries, according to our ability, to pull away from society and from the work it implies. Work which, for many, is synonymous with slavery. Yet another proof—if one were wanting—that servitude always exists. For if one does not find in his work the possibility of being oneself, the joy—or anguish—of existing, then one is enslaved. And one buys moments of release time—but which are not free—liquified instants of real life, which one doesn't know how to live anyway. Because one doesn't know, one no longer knows.

In his *Republic*, Plato says that a society is just when its citizens do what they like to do. This amounts to saying that all present societies are unjust. In spite of social or socializing theories which seek to liberate humans, to render them

creative, to lead them to make decisions in their own interior solitude. And not to impose them from the outside. If only that were practiced since childhood! When I was at school, we were set one against the other, creating an idiotically competitive spirit, a superficial emulation. For what reason? Perhaps one day to obtain recompenses, glory, fortune, privileges . . . material things. Thus, from the very beginning, we do not act according to our own, profound individuality. We must recognize that this aberration, that this false route is a powerful arm of society.

The force of a work is in its truth. And truth is that which can exist without crutches. Those crutches which are often sentimentality, sensitivity, "emotional filth," as Kundera says. Sentiments, understood in this sense, are the alibi of cruelty, of barbarity, of blackmail. Me, I again find myself in that which I do. In movements outside of creation, in the strings which hold it as if in perpetual expectation. Movements of clouds, of galaxies, of crowds, of ourselves within ourselves. All truly creative people escape this foolish side of a work, the exaltation of sentiments. They are to be discarded like the fat surrounding meat before it is cooked. This blubber which envelops the work can also be secreted by our own way of seeing, now: Thus, when one listens to the "Ride of the Valkyries," for example, we should make an effort to abstract ourselves from all the mythology which surrounds these viragos, from all that which Wagner and his crowd have found to say about this music. So as to listen only to the music, to have it within us. That is what confers its value, its perennity, independently of the sentiments of the time. That is also why we listen to it.

It is the same for African, Hindu, Chinese, or Egyptian art. Why am I so sensitive to them without ever having studied them? Because I appreciate them just as I appreciate the curl of a leaf, the photograph of a galaxy or of a cosmic dust cloud lighted by the stars. For in these sorts of things there exist signs made by mankind. Signs that we must see, not as representations, but as relations among them, without any romanticism. If these relations are sufficiently rich, necessary, and elegant, then the piece is a work of art.

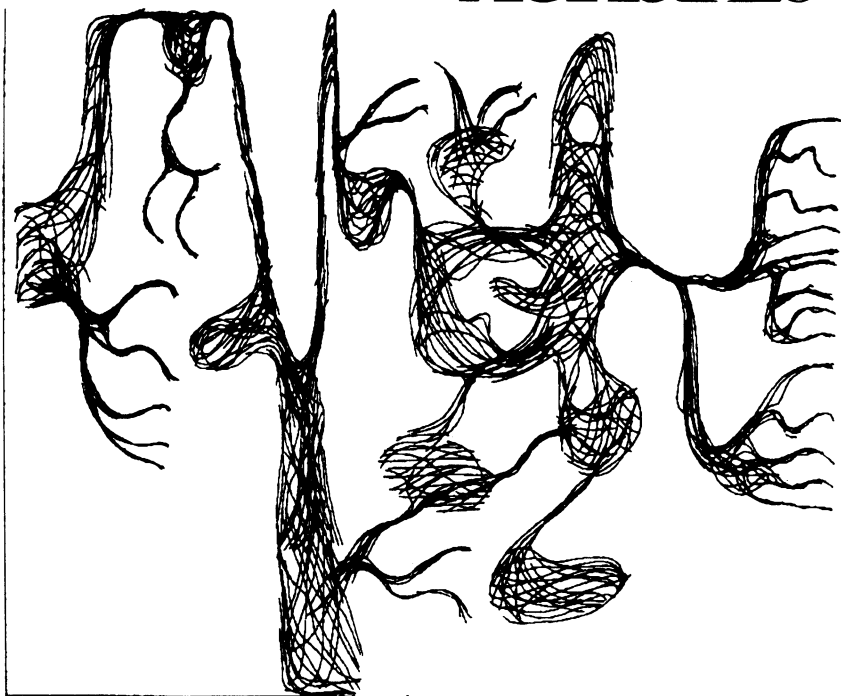
The greatest work is thus that which invokes the highest level of abstraction. That which presents the fewest possible references to representation. In this sense, Altdorfer's *The Battle of Alexander*, with its myriads of soldiers advancing under the vault of heaven, immense, is a much more abstract painting than a Mondrian or a Malevitch, because it implies an effort of abstraction on our part, of enormous reduction to nothingness. We must cleanse it from the historical time that clogs it. There is the true festival of the imaginary: to construct abstractions from that which is the most scrupulously concrete. There also is the force of humanity, which is in its power of generalization, of universality. To see reality with new eyes, that is reality, that is life itself.

NOTES

1. CEMAMu: Centre d'Études de Mathématique et d'Automatique Musicales.)
2. Unité Polyagogique et Informatique de CEMAMu (realized with grants from the Ministry of Culture in France).
3. See the text by Iannis Xenakis in Le Corbusier, *La Tourette and Other Buildings and Projects 1955–1957* (New York: Garland Publishing, Inc., and Paris: Fondation le Corbusier, 1984).
4. See Françoise Choay, *L'Urbanisme: Utopies et réalités* (Paris: Éditions du Seuil, 1965).
5. In the booklet printed by the Centre Georges Pompidou, to accompany the production of *le Diatope*.

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**ORCHESTRE/ENSEMBLE A CORDES
STRING ORCHESTRA/ENSEMBLE
STREICHORCHESTER/ENSEMBLE**

SYRMOS (1959)*

Pour 18 ou 36 instruments à cordes (6.6.0.4.2. ou le double).

Durée : 14 minutes.

ANALOGIQUE A et B (1959)*

9 instruments à cordes (3.3.0.2.1.), et bande magnétique 4 pistes.

Durée : 7 minutes.

AROURA (1971)*

12 instruments à cordes (4.3.2.2.1.), ou un multiple.

Durée : 12 minutes.

RETOURS-WINDUNGEN (1976)*

12 violoncelles.

Durée : 8 minutes.

POUR LES BALEINES (1982)

Grand orchestre à cordes.

Durée : 2 minutes 30".

SHAAR (1983)

Grand orchestre à cordes.

Durée : 14 minutes.

**ŒUVRES POUR ORCHESTRE
ORCHESTRAL MUSIC
ORCHESTERMUSIK**

METASTASIS (1953-54)*

Pour orchestre de 61 instruments : piccolo, flûte, 2 hautbois, clarinette basse, 3 cors, 2 trompettes, 2 trombones ténor, timbales, percussion (xylophone, triangle, woodblock, tambour, caisse claire, grosse caisse, timbales) et cordes (12.12.8.8.6.).

Durée : 7 minutes.

Editions Boosey & Hawkes.

PITHOPRAKTA (1955-56)*

Pour orchestre de 50 instruments : 2 trombones ténor, xylophone, woodblock et cordes (12.12.8.8.6.).

Durée : 9 minutes.

Editions Boosey & Hawkes.

DUEL (1959)

Jeu pour deux orchestres.

2 piccolos, 2 hautbois, 2 clarinettes en sib, 2 clarinettes en mib, 2 clarinettes basses, 2 bassons, 2 contrebassons, 4 trompettes, 2 trombones, percussion (2 caisses claires, 2 tambours, 4 bongos, 6 congas) et cordes (2.2.0.8.4.)

Durée variable : environ 10 minutes.

ST/48 (1962)

Pour orchestre de 48 musiciens : piccolo, flûte, 2 hautbois, clarinette, clarinette basse, basson, contrebasson, 2 cors, 2 trompettes, 2 trombones, 4 timbales, percussion (4 toms, 5 temple-blocks, woodblock, tambour, vibraphone, marimbaphone) et cordes (8.8.6.6.4.).

Durée : 11 minutes.

Editions Boosey & Hawkes.

* sur disque - on record

STRATEGIE (1962)*

Jeu pour deux orchestres.

2 piccolos, 2 flûtes, 2 hautbois, 2 clarinettes en sib, 2 clarinettes en mib, 2 clarinettes basses, 2 bassons, 2 contrebassons, 4 cors, 4 trompettes, 4 trombones ténor, 2 tubas, percussion (2 vibraphones, 2 marimbaphones, 2 maracas, 2 cymbales suspendues, 2 grosses caisses, 2 × 4 toms, 2 × 5 temple-blocks, 2 × 4 woodblocks, 2 × 5 cloches à chèvres) et cordes (12.12.8.8.6.).

Durée variable : environ 10 à 15 minutes.

Éditions Boosey & Hawkes.

TERRETEKTORH (1965-66)*

Pour orchestre de 88 musiciens éparpillés dans le public : piccolo, 2 flûtes, 3 hautbois, clarinette en sib, clarinette en mib, clarinette basse, 2 bassons, 3 contrebassons, 4 cors, 4 trompettes, 4 trombones ténor, tuba, percussions et cordes (16.14.12.10.8.), chaque musicien devant posséder en plus : 1 woodblock, 1 fouet, 1 maracas, 1 sirène Acmé.

Durée : 18 minutes.

POLYTOPE DE MONTREAL (1967)*

Spectacle lumineux et sonore, avec une musique pour quatre orchestres identiques : piccolo, clarinette, clarinette basse, contrebasson, trompette, trombone ténor, percussion (grand gong, woodblocks japonais, 4 toms), multiples de 4 violons et 4 violoncelles.

Durée : 6 minutes.

Éditions Boosey & Hawkes.

NOMOS GAMMA (1967-68)*

Pour orchestre de 98 musiciens éparpillés dans le public : piccolo, 2 flûtes, 3 hautbois, clarinette en sib, clarinette en mib, clarinette contrebasse, 2 bassons, 3 contrebassons, 6 cors, 5 trompettes, 4 trombones ténor, tuba, percussion (7 batteurs munis de 4 toms échelonnés, 1 timbalier), cordes (16.14.12.10.8.).

Durée : 15 minutes.

KRAANERG (1968-69)*

Musique de ballet pour bande magnétique 4 pistes et orchestre : piccolo, hautbois, 2 trompettes, 2 trombones et cordes (multiples de 3.3.2.2.2.).

Durée : 75 minutes.

Éditions Boosey & Hawkes.

ANTI-KHTHON (1971)*

Musique de ballet pour orchestre.

3.3.3.2 (+ CB) - 4.3.3.1., percussion, cordes (10.8.6.6.4.).

Durée : 23 minutes.

ERIDANOS (1973)

2 cors, 2 trompettes, 2 tubas et cordes (16.14.12.10.8.).

Durée : 11 minutes.

NOOMENA (1974)

3 (+ Pic), 3 (+ CA), 3 (+ Cl. mib & BC), 3 (+ CB) - 6.5.4.1., cordes (18.16.14.12.10.).

Durée : 17 minutes.

EMPREINTES (1975)

1 piccolo, 2 flûtes, 3 hautbois, cor anglais, 1 clarinette en mib, 2 clarinettes, 1 clarinette basse, 2 bassons, 1 contrebasson, 4 cors, 4 trompettes, 4 trombones ténor, 1 tuba, cordes (16.14.12.10.8.).

Durée : 12 minutes.

JONCHAIES (1977)*

2 piccolos, 2 flûtes, 4 hautbois, 2 cors anglais, 1 clarinette en mib, 2 clarinettes en sib, 2 clarinettes basses, 2 bassons, 2 contrebassons, 6 cors, 4 trompettes, 2 trombones ténor, 2 trombones basse, 1 tuba contrebasse, timbales, 4 percussionnistes (4 jeux de 4 toms, 10 blocks chinois, 3 cymbales suspendues, grosse caisse, vibraphone, xylomarrimba), cordes (18.16.14.12.10.).

Durée : 17 minutes.

LICHENS I (1984)

4 flûtes (1 picc.), 4 hautbois (1 CA), 4 clarinettes sib, 3 bassons (1 CB), 4 cors en fa, 4 trompettes, 4 trombones ténor, 2 trombones contrebasse, 1 tuba contrebasse, 4 timbales à pédale, 4 percussionnistes : 3 × (1 paire de bongos, 3 tom-toms, 1 grosse caisse très large), 1 xylophone, 1 fouet, 1 woodblock, 1 cymbale suspendue, 1 gong chinois large, 1 piano, cordes (16.14.12.10.8.).

Durée : 16 minutes.

ALAX (1985)

Pour 3 ensembles instrumentaux : 3 × (flûte, clarinette en sib, 2 cors en fa, trombone ténor, harpe, 1 percussionniste, violon, 2 violoncelles).

Durée : environ 21 minutes 1/2

**PIANO ET ORCHESTRE
PIANO AND ORCHESTRA
KLAVIER UND ORCHESTER**

SYNAPHAI (1969)

Piano et orchestre.

3.3.3.3. - 4.4.4.1., percussion (3 tambours sans timbres), cordes (16.14.10.10.8.).

Durée : 14 minutes.

ERIKHTHON (1974)

Piano et orchestre.

3 (+ Pic.) 3.3. (+ BC). 3 (+ CB). - 4.4.4.1., cordes (16.14.12.10.8.).

Durée : 15 minutes.

**BARYTON, PERCUSSION ET ORCHESTRE
BARITONE, PERCUSSION AND ORCHESTRA
BARITON, SCHLAGZEUG UND ORCHESTER**

AIS (1980)

Pour baryton, percussion solo et orchestre : 4, 1 piccolo, 4, 1 C.A., 4, 1 clarinette basse, 4, 1 CB. - 4.4.4.4. - percussions, piano, cordes (16.14.12.10.8.).

Durée : 17 minutes.

**CHŒUR ET ORCHESTRE
CHORUS AND ORCHESTRA
CHOR UND ORCHESTER**

POLLA TA DHINA (1962)*

Pour chœur d'enfants et orchestre : 20 voix d'enfants, piccolo, flûte, 2 hautbois, clarinette, clarinette basse, basson, contrebasson, 2 cors, 2 trompettes, 2 trombones, percussion (vibraphone, 4 toms, 5 temple-blocks, maracas, cymbales suspendues, timbales) et cordes (8.8.6.6.4.).

Durée : 6 minutes.

Editions Modern Wewerka.

CENDREES (1973)*

Chœur mixte de 72 voix (ou minimum 36) et orchestre.

2 (Pic.) 2.2. (CB) 2 - 2.2.2.1. cordes (16.14.12.10.8.).

Durée : 25 minutes.

ANEMOESSA (1979)

Pour chœur et orchestre : 4 flûtes (dont 1 pic.), 4 hautbois, 4 clarinettes en sib, 3 bassons, 1 contrebasson, 4 cors, 4 trompettes, 4 trombones, 1 tuba, 2 timbales, 1 grosse caisse, chœur mixte : sopranos, altos, ténors, basses (80 personnes environ, ou 56 minimum), cordes (16.14.12.10.8.).
Durée : 15 minutes.

NEKUIA (1981)

Chœur mixte et orchestre : 4 (1 pic.) 4.4.4. - 6.4.4.1. - 4 percussions, 2 harpes, piano, cordes (14.12.10.8.8.).
Durée : environ 26 minutes.

**CHŒUR ET ENSEMBLE
CHORUS AND ENSEMBLE
CHOR UND ENSEMBLE**

ORESTEIA (1965-66)*

Musique de scène pour chœur mixte, chœur d'enfants et orchestre de chambre : piccolo, hautbois, clarinette, clarinette basse, contrebasson, cor, trompette, trompette piccolo en ré bémol, trombone ténor, tuba, percussion (instruments traditionnels et inusités) et violoncelle.
Durée : 100 minutes.

Editions Boosey & Hawkes.

Suite de concert pour chœur mixte et orchestre de chambre.

Durée : 46 minutes.

Editions Boosey & Hawkes.

MEDEA (1967)

Musique de scène pour chœur d'hommes (jouant également des rythmes avec des galets de rivière ou de mer) et ensemble instrumental : clarinette, contrebasson, trombone, violoncelle, percussion (4 toms, 3 woodblocks, claves, maracas).

Durée : 25 minutes.

A COLONE (1977)

Chœur d'hommes (ou chœur de femmes), de 20 personnes minimum. (1 cor, 1 trombone, 6 violoncelles, 1 contrebasse).

Durée : 14 minutes.

POUR LA PAIX (1982)

Chœur mixte, bande magnétique et récitants.

Durée : 26 minutes 45".

Voir aussi version pour chœur a cappella.

CHANT DES SOLEILS (1983)

Chœur mixte, chœur d'enfants, cuivres, (6.6.6.0.), percussion.

Durée : 8 minutes.

IDMEN A (1985)

Chœur mixte et 4 percussionnistes (clavier : marimba, marimba basse, glockenspiel, xylophone, vibraphone. Avec diverses peaux).

Durée : environ 14 minutes 1/2

Idmen A peut être joué conjointement avec *Idmen B*.

IDMEN B

Voir page 12

**MUSIQUE D'ENSEMBLE
ENSEMBLE MUSIC
MUSIK FÜR ENSEMBLE**

ACHORRIPSIS (1956-57)*

Pour 21 instruments : piccolo, hautbois, clarinette en mib, clarinette basse, basson, contrebasson, 2 trompettes, trombone ténor, xylophone, woodblock, grosse caisse, 3 violons, 3 violoncelles et 3 contrebasses.

Durée : 7 minutes.

Editions Bote und Bock.

ST/10 (1962)*

Pour 10 instruments : clarinette, clarinette basse, 2 cors, harpe, percussion (5 temple-blocks, 4 toms, 2 congas, woodblock) et quatuor à cordes.

Durée : 11 minutes.

Editions Boosey & Hawkes.

ATREES (1960)*

10 instruments : flûte, clarinette, clarinette basse, cor, trompette, trombone, percussion (maracas, cymbales suspendues, gong, 5 temple-blocks, 4 toms, vibraphone), violon, violoncelle.

Durée : 15 minutes.

EONTA (1963)*

Piano, 2 trompettes, 3 trombones.

Durée : 18 minutes.

Editions Boosey & Hawkes.

HIKETIDES (1964) (Les Suppliantes d'Eschyle)

Suite instrumentale, 2 trompettes, 2 trombones, cordes (6.6.0.8.4. ou multiple).

Durée : 10 minutes.

AKRATA (1964-65)*

Pour 16 instruments à vent : piccolo, hautbois, clarinette en sib, clarinette en mib, clarinette basse, basson, 2 contrebassons, 2 cors, 3 trompettes, 2 trombones ténor et tuba.

Durée : 11 minutes.

Editions Boosey & Hawkes.

ANAKTORIA (1969)*

Clarinette, basson, cor, 2 violons, alto, violoncelle, contrebasse.

Durée : 11 minutes.

PHLEGRA (1975)

11 instrumentistes : flûte (piccolo), hautbois, clarinette en sib, (clarinette basse), basson, cor, trompette, trombone, violon, alto, violoncelle, contrebasse.

Durée : 14 minutes.

N'SHIMA (1975)

2 cors, 2 trombones, 2 mezzo-sopranos, violoncelle.

Durée : 17 minutes.

EPEI (1976)

Cor anglais, clarinette en sib, trompette en ut, 2 trombones ténor, contrebasse.

Durée : 13 minutes.

AKANTHOS (1977)

Flûte, clarinette, soprano, 2 violons, alto, violoncelle, contrebasse, piano.

Durée : 11 minutes.

PALIMPSEST (1979)

Hautbois (et cor anglais), clarinette sib, (et clarinette basse), basson, cor, piano, percussion (2 bongos, 1 tumba, 3 toms-toms, 1 timbale), quintette à cordes.

Durée : 11 minutes.

KHAL PERR (1983)

Quintette à cuivres et percussion : 2 trompettes en ut (2 petites trompettes en sib), 1 cor en fa, 1 trombone, 1 tuba, 1 percussionniste (vib., 2 bongos, 3 tom-toms, 1 grande caisse large).

Durée : 10 minutes 30".

THALLEIN (1984)

Pour 14 instrumentistes : flûte (piccolo), hautbois, clarinette sib, basson, cor en fa, trompette en ut (aiguë sib), trombone ténor, 1 percussionniste, piano, 2 violons, alto, violoncelle, contrebasse.

Durée : 17 minutes

ANALOGIQUE A et B*

Voir p. 4.

AROURA*

Voir p. 4.

RETOURS - WINDUNGEN*

Voir p. 4.

**CHŒUR A CAPPELLA
A CAPPELLA CHORUS
CHOR A CAPPELLA**

NUITS (1967)*

Douze voix solistes mixtes.

Durée : 12 minutes.

A HELENE (1977)

Texte d'Euripide.

Chœur de femmes.

Durée : 12 minutes.

SERMENT-ORKOS (1981)

Texte d'Hippocrate.

Chœur mixte.

Durée : 7 minutes.

POUR LA PAIX (1982)

Version pour chœur mixte.

**MUSIQUE VOCALE
VOCAL MUSIC
VOKALMUSIK**

N'SHIMA (1975)

voir p. 8

AKANTHOS (1977)

voir p. 8

POUR MAURICE (1982)

Baryton et piano.

Durée : 4 minutes.

**MUSIQUE ELECTRO-ACOUSTIQUE
ELECTRO-ACOUSTIC MUSIC
ELEKTRO-AKUSTISCHE MUSIK**

DIAMORPHOSES (1957)*

Musique électro-acoustique pour bande magnétique 4 pistes.

Durée : 7 minutes.

R.T.F.

CONCRET PH (1958)*

Musique électro-acoustique pour bande magnétique 4 pistes.

Durée : 2 minutes 45".

R.T.F.

ORIENT-OCCIDENT (1960)*

Musique électro-acoustique pour bande magnétique 4 pistes.

Durée : 12 minutes.

R.T.F.

BOHOR (1962)

Musique électro-acoustique pour bande magnétique 8 pistes (existe également en version 4 pistes).

Durée : 23 minutes.

HIBIKI HANA MA (1969-70)*

Musique électro-acoustique sur 12 pistes magnétiques (également en version 4 pistes) pour un spectacle audiovisuel à base d'orchestre.

Durée : 18 minutes.

PERSEPOLIS (1971)*

Spectacle lumineux et sonore avec musique électro-acoustique pour bande magnétique 8 pistes (existe également en version 4 pistes).

Durée : 57 minutes.

POLYTOPE DE CLUNY (1972)

Spectacle lumineux et sonore avec bande magnétique 7 pistes (existe également en version 4 pistes).

Durée : 24 minutes.

LA LEGENDE D'EER (1977)

Pour le Diatope, actions de lumières et de son, pour 1 600 flashes électroniques, 4 rayons laser, 400 miroirs, optiques diverses et bande magnétique 7 pistes.

Durée : 46 minutes.

MYCENES A (1978)

Bande stéréo, musique composée sur l'UPIC du CEMAMu

Durée : 10 minutes.

POUR LA PAIX (1982)

voir p. 7

MUSIQUE INSTRUMENTALE DE SOLISTES INSTRUMENTAL MUSIC FOR SOLOISTS INSTRUMENTALISCHE MUSIK FÜR SOLISTEN

Piano

HERMA (1960-61)*

Durée : 9 minutes.

Editions Boosey & Hawkes.

EVRYALI (1973)*

Durée : 11 minutes.

MISTS (1981)

Durée : 12 minutes.

Voir aussi :

MORSIMA-AMORSIMA, p. 12

EONTA, p. 7

SYNAPHAI, p. 6

ERIKHTON, p. 6

DIKHTHAS, p. 11

AKANTHOS, p. 8

PALIMPSEST, p. 8

POUR MAURICE, p. 9

Clavecin

KHOAI (1976)*

Durée : 15 minutes.

NAAMA (1984)

Durée : 16 minutes.

Clavecin et percussion

KOMBOI (1981)*

Durée : 17 minutes.

Orgue

GMEEORH (1974)

● Version pour orgue de 56 notes.

● Version pour orgue de 61 notes.

Durée : 29 minutes.

Violon

MIKKA (1971)*

Durée : 4 minutes.

MIKKA "S" (1976)*

Durée : 5 minutes.

Violon et piano

DIKHTHAS (1979)*

Durée : 12 minutes.

Alto

EMBELLIE (1981)*

Durée : environ 7 minutes.

Violoncelle

NOMOS ALPHA (1966)*

Pour violoncelle solo.

Durée : 17 minutes.

Editions Boosey & Hawkes.

KOTTOS (1977)*

Durée : 11 minutes.

Voir aussi :

CHARISMA,* p. 11

Contrebasse

THERAPS (1975-76)

Durée : 11 minutes.

Hautbois et percussion

DMAATHEN (1976)

Durée : 10 minutes.

Clarinette et violoncelle

CHARISMA (Hommage à Jean-Pierre GUEZEC : 1971)*

Durée : 4 minutes.

Instruments traditionnels japonais

NYÛYÔ (SOLEIL COUCHANT) 1985

Pour shakuhachi, sanger et 2 kotos

Durée : 10 minutes

Cuivres

EONTA (1963-64)*

Pour piano et 5 cuivres : 2 trompettes, 3 trombones ténor.

Durée : 18 minutes.

Editions Boosey & Hawkes.

LINAIA-AGON (1972)

Jeu musical.

Trombone ténor, trompette en fa, tuba.

Durée variable.

Nouvelle version définitive 1982.

KHAL PERR (1983)

Quintette de cuivres et percussion.

Voir p. 8.

Percussion

PSAPPHA (1975)*

Percussion solo.

Durée : 13 minutes.

PERSEPHASSA (1969)*

Six percussionnistes.

Durée : 24 minutes.

PLEIADES (1978)

Six percussionnistes.

Durée : 46 minutes.

IDMEN B (1985)

Pour six percussionnistes et interventions éventuelles de chœur

Durée : 13 minutes 1/2.

Idmen B peut être joué conjointement avec *Idmen A* (voir page 7).

Voir aussi :

KOMBOI, p. 11

DMAATHEN, p. 11

AIS, p. 6

KHALPEER, p. 8

IDMEN A, p. 7

Trio à cordes

MORSIMA-AMORSIMA (1962)*

Pour piano, violon, violoncelle et contrebasse.

Durée : 11 minutes.

Editions Boosey & Hawkes.

IKHOOR (1978)*

Durée : 11 minutes.

Quatuor à cordes

ST/4 (1956-62)*

Durée : 11 minutes.

Editions Boosey & Hawkes.

TETRAS (1983)

Durée : 16 minutes.

LIVRES ECRITS PAR XENAKIS BOOKS WRITTEN BY XENAKIS BUCHER VON XENAKIS

MUSIQUES FORMELLES

232 pages. La Revue Musicale, double numéro spécial 253-254.
RICHARD MASSE, Paris 1963, épuisé. Nouvelle édition STOCK,
Paris 1981.
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160 pages, collection Mutations-Orientation. CASTERMAN, Tournai
Belgique 1971. Deuxième édition, revue et augmentée, 238 pages, 1976.
Edition japonaise, traduction de Yuji TAKAHASHI, Zen-On Music
Company CTD Tokyo 1976, 178 pages. Edition italienne SPIRALI,
Milano 1972. Edition catalane Antoni BOSCH, Barcelone 1982.

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273 pages en anglais. INDIANA UNIVERSITY PRESS, Bloomington,
Indiana (U.S.A.). Londres 1971.
Aussi en italien SPIRALI, Milano 1982.

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Thèse de doctorat ès lettres et sciences humaines. CASTERMAN,
Paris 1979. Edition américaine : ARTS/SCIENCES, ALLOYS, traduction
Sharon Kanach, New York, Pendragon, 1985.

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Avec Olivier REVAULT d'ALLONNES. BALLAND, Paris 1975. Edition
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Tokyo 1978.

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IANNIS XENAKIS. L'ARC 51, Paris 1972.

REGARDS SUR IANNIS XENAKIS. STOCK, Paris 1981, articles par
47 auteurs.

IANNIS XENAKIS. Par N. MATOSSIAN, FAYARD, Paris 1981.
Edition anglaise KAHN & AVERILL, London 1984.

IANNIS XENAKIS (ENTRETIENS AVEC) par Balint Andras VARGA,
Budapest 1982 (en hongrois).

DISCOGRAPHIE

De nombreuses éditions françaises et étrangères.
Pour des enregistrements de travail sur cassette, vous pouvez vous
adresser aux Editions Salabert.

IANNIS XENAKIS – OEUVRES NOUVELLES (1986)**A L'ILE DE GOREE (1986) EAS 18386p**

clavecin (amplifié) et ensemble instrumental :

1 (plcc.).1.1.1. – 1.1.1.0. – cordes (1.1.1.1.1.)

Durée : 14 minutes

Création : Amsterdam, 1986, par l'Ensemble

Xenakis et Elisabeth Chojnacka

AKEA (1986) EAS 18445p

piano et quatuor à cordes : 2 violons, alto,
violoncelle

Durée : 12 minutes

Création : Paris, 15 décembre 1986, par Claude

Helffer et le Quatuor Arditti

KEGROPS (1986) EAS 18362p

piano et orchestre de 92 Instruments :

4.4.4. (cl. basse). 4 (cbasson). – 4.4.4.1., harpe,

timbale, 1 percussion (grosse caisse, 3 toms, 2

bongos), cordes (16.14.12.10.8.)

Durée : 17 minutes

Création : New York, Lincoln Center, 13 novem-

bre 1986, par le New York Philharmonic,

direction Zubin Mehta, soliste Roger Woodward

KEREN (1986) EAS 18450

trombone solo

Durée : 6 minutes

Création : Festival de Strasbourg, 19 septembre

1986, par Benny Sluchin

HOROS (1986) EAS 18414p

orchestre de 89 Instruments

4.4.4.4. – 4.4.4.0., percussion, cordes (16.14.

12.10.8.)

Durée : 16 minutes

Création : Tokyo, Inauguration du Suntory

Hall, 24 octobre 1986, par the Japan Philharmonic

Orchestra, direction Hiroyuki Iwaki

Pièce pour 15 Instruments (titre non établi) (1986)

Durée : 10-15 minutes

Création : Paris, 26 janvier 1987, par l'Ensemble

Intercontemporain, direction Pierre Boulez

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